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# THE CHARACTERISTICS OF THE MAJOR APARTMENT AREAS OF JOHANNESBURG AND THEIR PLANNING IMPLICATIONS

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A Dissertation Submitted to the Faculty of Architecture University of the Witwatersrand, Johannesburg.

For the Degree of Master of Science in Town and Regional Planning

Johannesburg, October, 1973.

## FORMAL DECLARATION

I, MICHAEL KAHN, declare

a) that this dissertation is my own unaided work insofar as the structure, data collection and processing, interpretation and written work is concerned; but that I received technical assistance for the extraction of information from the Census Tapes and the programme of the Factor Analysis whilst employed in the Urban and Regional Research Unit of the University of the Witwatersrand;

b) that the substance or any part of the dissertation has not been and is not being submitted for another degree to this or any other University;

c) that the information used in the dissertation was obtained during my period of employment as a Senior Bursar in the Urban and Regional Research Unit, from Census Tapes in the possession of that Unit and from sources available to me at the Johannesburg City Council's Forward Planning and Town Planning Branches.

.....

MICHAEL KAHN




METROPOLITAN CONTEXT OF MUNICIPAL JOHANNESBURG

ABSTRACT

This Study is concerned with the socio-demographic, locational and certain planning aspects of multi-storeyed apartment developments in the city of Johannesburg. These developments form part of the great urban-industrial complex of the Witwatersrand and occurs at specific locations within the city, in numerous forms, and in several concentrations of differing geographical extent. The structure of this spatial differentiation of apartments within the morphology of the city reflects the interrelationships of differing demographic characteristics of apartment dwellers, the nature of development, and the setting of the concentrations of apartments. This has implications for planning because of the interaction between population groups and their need for a specific set and mix of social facilities and amenities. These planning implications are of particular relevance to local authorities that not only demarcates the location and type of apartment development, but must also provide or make allowance for the necessary social facilities.

To assess planning implications, the approach adopted in this study involved the collection of data regarding the population, the apartment buildings themselves, and the existing provision for various social facilities and amenities in and about each concentration of apartments. Population data was extracted from computer tapes of the 1960 Census and included all relevant socio-economic information. Similarly information about each area was researched from sources at the Johannesburg City Council and collated to match the form of the Census. This included information on apartments sizes, age, density, as well as parkspace, creches, and recreation centres.

The information on the physical form of apartments and the population data was processed for a Factor Analysis application. This technique was utilized to obtain the principal factors that differentiate the various apartment areas from each other.

The interpretation of the resultant factors indicated a clustering of several distinct types of apartment areas. These apartment areas were looked at in relation to various concepts and theories of urban structure and change, as

well as the particular historical development of Johannesburg.

Each identified apartment cluster was then analyzed in terms of its population type's particular requirements for various social facilities and amenities by means of planning standards derived from several accepted sources. The method was applied to facts as of 1960, as a test case. Analysis indicated the scale of deficiencies for social facilities and amenities for each apartment cluster.

Changes in the characteristics of apartment clusters, additions to existing clusters, as well as the development of new clusters for the period 1960 to 1970 are described. These changes were looked at in order to assess the general dynamics of apartment development, as well as the nature of change and growth in the specific apartments clusters studied in terms of the theories and concepts of urban structure and change outlined in a previous section.

The deficiencies observed during the 10 year period revealed the scale and nature of the change in social facilities in each apartment cluster. The need to understand the nature of the urban system and its various components, as well as to monitor change was indicated.

Analysis and understanding of the processes of apartment development allows predictions to be made in regard to new development - where, how, in what form, to attract which population types requiring which specific social facilities and amenities.

In this study the analysis of the interrelationships between population characteristics and social facilities in each cluster indicated the lack of playlots and playgrounds in the Hillbrow/Berea/Yeoville/Bellevue complex; the lack of parks for nearly all the apartment clusters; the need for creches, libraries, recreation centres and health clinics in relation to the various socio-economic factors prevalent in each area.

The study attempts a comprehensive and systematic approach to the assessment of the interrelationship between demographic characteristics and the physical form and location of apartment areas. It relates different population

types and their specific needs, in terms of social facilities and amenities. It indicates the possibility of forecasting change within the specific areas studied. Thus, the study has implications for both theory and policy relating to planning, in that it can be utilized in the more effective and comprehensive planning of apartment areas to meet human needs.

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PREFACE.

This study was undertaken by the Author as a result of grants made available by both the University of the Witwatersrand and the Council for Scientific and Industrial Research, through the auspices of the Urban and Regional Research Unit of the University of the Witwatersrand.

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Within the Department of Town Planning I would like to convey to Dr. N.N. Patricios my appreciation for his methodical and careful scrutiny of my work, and his advice in supervising the study through each stage of its progress.

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# 1. INTRODUCTION

## 1.1 Background to the Study

This study involves an investigation into the characteristics of the apartment areas of Johannesburg and analyzes the planning implications that result from this particular land use. Apartment dwellers, and apartment buildings, are always seen in the context of their role in the total urban system and in particular the residential system. In order to understand the characteristics of the apartment areas it is necessary to understand the processes and problems of urban growth and change in cities and the forces that influence change, all of which contribute to the spatial organization of the city, which then exhibits a particular structure.

This study is primarily concerned with the apartment areas within the municipal boundary of Johannesburg as at 1960. Johannesburg has increased in size, and there has been tremendous growth on its urban fringe, so that in effect Johannesburg is now a metropolition region made up of several independent, but functionally interdependent, cities. Concommitant with this growth in size and population has been the growth of apartment development, for the most part within the municipal boundaries of Johannesburg itself. In 1960 some 32% of all dwelling units within Johannesburg were apartments, and this accounted for approximately 20% of the population. Thus the planning implications that result from apartment development are of some importance as they affect substantial amount of the population

The purpose of the dissertation is to establish an approach by which to assess the planning implications of apartment areas. In order to do so, however, it is necessary to identify the characteristics of the apartment areas in terms of population, physical form, and the provision of social facilities and amenities in particular, and to analyze the interrelationships between these aspects.

For the purposes of the dissertation, the term "apartment" has been used instead of the more common usage in this country, of the term "flat". The choice has been made for two reasons. Firstly, the term "flat" when used in conjunction with words such as area or development could have an ambiguous meaning that implies a level area or development, secondly, the term "flat" tends to have a connotation of high-rise or medium-rise high-density development only, whereas the term "apartment" implies any high density residential development involving contiguous dwelling units and thus includes dwelling types such as duplexes, terrace and patio housing, and town houses, which are included in the dissertation.

The aspects of planning to be studied include the location and setting of apartments within the city structure, the form of apartment development, the population characteristics of apartment dwellers, and the social facilities and amenities that ought to be provided by the local authority.

1.2 Processes and Problems of Structural Change in Cities:

Modern cities exhibit regularities in land-use patterns which result from the distribution of urban activities and populations. These basic patterns (or structure) reflect the degree of internal spatial organization that arises from the operation of the processes of urban development. These basic patterns are also subject to change as advances in transportation, building and communication technology combine with shifts in social and economic requirements for space and location.

The processes producing these patterns and changes are varied but intimately interrelated. This study is concerned specifically with those aspects which have encouraged the development of apartments in various locations throughout the city, and which have contributed to social and physical change, as well as the problems in apartment areas.

There are many approaches to analyzing the growth and structure of cities. (Chapin, 1964). These approaches are concerned with the development of a framework which identifies and explain the internal organization of the city. They include the traditional concepts of urban form, which emphasize land-use distributions and growth, and the characteristics of residential areas (Meadows and Mizruchi, 1968, p76); as well as the processes which have given rise to these patterns.

Approaches to the understanding of the processes which give rise to the spatial structure and to the patterns of growth and change, have taken two directions. The first approach is defined by the role of the market mechanism and the natural forces of competition among economic activities in an urban area; while the second is concerned with the behaviour of urban residents, as well as the decision-making processes which produce urban patterns. These approaches also distinguish between the pattern of "intra-place" and "inter-place" interaction - where intra-place interaction involves forces within a land-use type and inter-place interactions deals with those occurring between land-use types.

Processes of Growth and Cycle of Change in Cities.

The evolution and development of the urban form involve the sequences of change that occur within particular parts of the city. These processes are generated primarily through the mobility of residents, and shifts in land-uses in the course of adjustment. These processes of growth have been identified by Chapin as (i) Dominance, gradient and segregation, (ii) Centralization and decentralization, and (iii) invasion and succession (Chapin, 1964, p23). These processes will be implicitly and explicitly used throughout the discussion.

The changing patterns of metropolition spatial organization are the result of the processes of growth and the influences of many forces. According

to John Dyckman the forces exerting the greatest influence include: (1) the new advances of technology; (2) the trends of modern organization towards complexes involving interdependant and hierarchial ordering of parts, because of a process of specialization; (3) the appearance in advanced economies of a different society, that permits a weakening of old economic drives and motivation; (4) the increase in communication facilities that has raised the potential for changing old boundaries; and (5) the growing awareness of the importance of cultural consumption in modern society with concommitant respect for the communual arts and public services.

The advances in technology have led to an expanded range of locational choice with changes in standards and aspirations of urban residents. It must be borne in mind that "these developments are so closely interwoven that it is impossible to separate their contributions to the changing physical form and the cultural image of the city". (Dyckman 1961, p15).

Rising real income, increased personal and functional mobility, shifting age composition of the population, household size and formation, and changing tastes have combined to provide both the means and incentive for altering spatial relationships. This expanded range of locational and social choice for urban activities and populations has to some extent decreased the "attractiveness" of the central city for apartments and increased the attraction of suburban areas. (Dyckman 1961, p14).

The physical ageing (or deterioration), and the economic obsolescence that ageing implies, contrive another set of factors which in themselves tend to encourage locational changes. (Bourne 1967). Only where central locations are of such importance can replacement costs be justified. These changes in the patterns of land uses and social areas in the city are referred to as the processes of invasion

and succession (Chapin 1964) in neighbourhoods and of "filtering down" in housing (Bourne, 1967).

The existing spatial structure and building inventory act as a constraining framework for change. The inner city in large metropolitan areas is mostly highly developed, and redevelopment requires replacement with a more intensive use. Because of the durability of buildings, and high land values, change is costly and slow, and where reduction in intensity is demanded charge is largely impossible. Apartments are therefore much less concentrated in the central city areas than formerly and there is also a substantial increase in high density apartments in suburban areas.

The CBD expands at the expense of the surrounding areas which in turn expand into adjacent residential zones. Residences are not generally capable of competing with these intensive land uses and therefore bear the brunt of such expansion. In this change, the centre and each outlying residential zone undergo a process of relative adaption to those functions for which they are most suited (Blumenfeld, 1967, p55). Much of the central area's spatial structure represents many phases of rebuilding as a result of a series of general invasion-succession cycles with increasing intensity of use; while the development of apartments in the suburbs reflects the first cycle of change, except for the suburban fringe which is a completely new development.

These trends are seen within a broader theoretical framework of urban structural change and take the form of an adaption process. Buildings go through a continuous cycle of change with increasing age and external pressures for re-use. Replacement as a form of adaption in the spatial structure of the city, is therefore directly related to replacement in the life cycle of buildings (Bourne, 1967).

The process of centralization and decentralization is operating over and above the inter-place process.

This results in the congregation of people and urban functions in particular parts of the city, in functional use areas for economic cultural and social satisfactions, while at the same time some central area activities accompany the movement of people to fringe areas.

It is obvious that the form of a city is also affected by the decisions made by institutions as well as individuals. Individual decisions reflect that man is not entirely economically rational and his decisions reflect personal preferences, objectives, ignorance and errors. (Bourne 1971, p135). These factors have relevance in the discussions on th residential components of apartment areas, in that the changes occurring are not necessarily due to rational decisions.

The institutional decisions, taken by local and government politicians, can drastically affect the form and changes in the urban structure. These "political" decisions reflect what is acceptable to those elements in the community who wield influence and make decisions. It is sufficient for present purposes to recognise that the "Political Climate" is a basic consideration in understanding how the general processes common to all cities, can take on a unique aspect. (Chapin 1964, p60-62). This point will be expanded further later in the dissertation when dealing specifically with Johannesburg.

The trends that result from the expanded range of locational and social choice for populations and urban activities, increase the relative attractiveness of suburban locations and reduce the long term demand for central city locations. This social choice trend will continue, except for a small group, unless the central city locations can compete in attractiveness.

Generally speaking, society as a whole has become (and will continue to be) more mobile, both geographically and socially. Social mobility, as Peter Cowen

has suggested, (Cowan, 1970, p3) will result in a diffusion of urban "life styles" due to development in communication technology. A blurring of differences in life-style will occur, but this does not mean that they have disappeared. With higher education and income levels and the increase in social and physical mobility, the more dramatic differences disappear with more people desiring the same things (Greer, 1963, p30).

This social and physical mobility has certain implications. The changes in mobility places a demand on the limited set of resources for leisure and recreation. This demand reflects not only a whole new range of resources needed away from the home, but adds the need for more space for home centred pursuits. This means that the needs and demands of apartment area residents will have to be carefully analyzed as they reflect a specialized set of resources. The continuing and continued rising of standards must be a major factor in ascertaining future demands for urban services (Cowan, 1970, p202). With individuals being less rooted to any one space, the range of activities within grasp becomes larger. Thus, the extent and variety of spaces used should increase and become larger, and also become more functionally specialized.

It must be borne in mind that differences from these theoretical patterns of growth exist. These differences can result from deep-rooted cultural factors, that result from attitudes towards the use of land. (Cowan 1970, p3). These issues of taste and fashion, and peoples behaviour in general, are usually called "life-style".

## 1.3 Planning for Areas of Apartments

Apartment development, in particular, high-rise apartment development has become a prominent addition to the morphology of the city, as an increasing percentage of both new housing construction, and the housing inventory is turned towards apartment units.

Traditionally apartments have concentrated in the city and the inner suburbs; but recently there has been a high proportion of apartments being built in the suburbs. The rate of apartment growth and the spread of apartments to a wide variety of locations, reflects a logical extension of recent trends in housing demand and supply. Changes in family and household size, age structure and personal preferences, combined with increasing mobility and better accessibility and higher land costs have provided the stimulus for this transition. Thus high-density apartment development as it is presently evolving, has shifted both the structure and location of this housing type from traditional patterns.

Concommitant with the population explosion and continuing urbanization, has been the increased demand for a wide variety and location of housing types. One important effect in this, is also the changing age profile of suburban populations. As the populations of the suburbs "mature", large segments of the populations are coming to be comprised of the single young and the old. The greater number of younger and older people have led to a tapering off of the relative rate of demand for home ownership, because the circumstances of the younger and older age groups favour apartment living.

This affects the nature of apartment development because of what these particular age groups need, and will demand, in the suburbs. These growing suburban groups seek such city type facilities such as flats, and the cultural, entertainment and social amenities that they need.

The increasing numbers of apartments appearing in the areas "ripe for redevelopment" in the suburbs, and at the fringe of urban development, and in new suburban areas have not occurred indiscriminately, but are accentuated in their spatial location, as well as in their differentiation (Neutze, 1968, p5). Developers of apartment clusters are "intuitively" sensitive to

variations in accessibility to good roads, shopping centres, recreation and open space. In turn these clusters set up a demand for these aspects of urban amenity. Near the city centres, development is encouraged by nearness to employment areas, good shops and cultural amenities and the general character of the neighbourhood. It is important to note that in the suburban areas accessibility is not necessarily measured in distance from employment, shopping, etc. as such, but more frequently in distance from a good road or good public transport.

The individual apartments in suburban apartment developments tend to have larger floor areas than their city centre counterparts, and because they are built on larger tracts of land, often provide for their own immediate recreational facilities, as well as often supplying enough consumer demand to ensure the establishment of shopping centres nearby. Suburban apartments tend to be relatively less dense than the city central development. Nevertheless, the city centre apartment concentrations make up, for the time being, the largest numbers of apartments.

The various concentrations of apartments, in both city centre and suburban locations tend to be differentiated in respect of population characteristics and physical form and setting. This differentiation is partly catering to special tastes - a taste that may place differing weight on the closeness of recreational parks, open space, etc., that reflect different cultural needs, resulting from different occupational, income and age groups.

The needs of these narrow housing markets in terms of public and private services, both in the City Centre and in the suburbs, cannot simply be added to the existing infrastructure, and thus some fundamental and far reaching structural change will have to precede them. To a large extent, the uncontrolled growth and patterns of apartment development has precluded adequate planning. The result is constant restructuring and redesigning the very few services and amenities

as they have not kept pace with rapid growth.

Consequences of this lack of foresight and understanding, have been, not only a shortage of services and facilities, but a deterioration of those existing public services. Further, even when new apartment area are demarcated, little investigation and provision has been made for the differing and various needs.

With sufficient analysis and consequent foresight it should be possible to anticipate not only the intensification of existing areas and the location of new areas, but the service and facility needs of each apartment area.

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## 2. STUDY PURPOSES, HYPOTHESES AND METHODOLOGY.

### 2.1 Aspects and Focus of Investigation

The prominent addition to city morphology of high density apartment development now comprises a fairly large proportion of the new residential space provided. The increase in the demand for apartments results from changes in the structure of rising land costs, lack of expansion space, increases in the cost of single-family homes, changes in size and age structure of households, and shifting social preferences that reflect rising levels of income and mobility as people become better educated and better trained and consequently more leisured. The interaction of these factors results in the specialization of apartment areas that reflect the characteristics of the particular population-types inhabiting them.

Because of the interdependent interaction of different population groups with alternative housing forms, other dimensions of land-use, such as neighbourhood facilities and services, are associated with particular apartment areas.

This dissertation will attempt to analyze and assess some of the aspects of the complex processes that account for the differentiation and location of apartment development in the city. The principal focus is on the characteristics of the population; the physical characteristics of the residential facilities; and on the nature of facilities and amenities provided and needed in apartment areas.

The main concern of the study is with the factors that account for differentiation among and between apartment areas as they occur within the spatial system of the city and their interrelationships with social facilities and amenities that are to be provided by the public sector. The emphasis, however, on the planning implications that can be derived from the locations and problems vis-a-vis

recreational activities and environmental requirements that occur in existing apartment areas, changes occurring, and those likely to occur in apartment areas. The planning implications involve form of accommodation and residential needs in terms of both the existing situation and possible and probable changes.

These implications will be finally summarized for their importance for both planning theory and Urban Ecological Theory.

## 2.2 Hypotheses and Objectives

The hypotheses of this study are specifically related to the case study of Johannesburg, but have an application (in principle) to other cities.

The Hypotheses of the Study are:

i) That apartment areas occur at specific locations in the city structure, according to their various spatial settings within the city's matrix of social space;

ii) that in turn the particular environments of apartment areas of the city attract particular types of residents;

iii) that differences among and between areas are associated with different amenity facilities, e.g. private open space, public open space, garaging/parking facilities, etc.;

iv) and that as a result, future planning of apartment areas will have to take account of, (a) the spatial setting of the apartment areas and the interrelationships of physical and socio-economic characteristics of dwellings and populations respectively, and (b) the need to create a setting appropriate to these characteristics.

The principal objectives of the study are:

i) To examine and evaluate existing theories of urban growth and spatial patterning in relation to the factors that account for the evolution of the existing spatial structure of Johannesburg for insight into the process and patterns of apart-

ment deve pment in Johannesburg.

ii) to identi y and classify the major types of apartment areas.

iii) to isolate the characteristics of the populations and physical environments of the apartment areas, and to distinguish between them.

iv) to establish the nature of the amenities that must exist and interact interdependently with the population types and dwelling types; and

v) to assess the planning implications of these different types of hi;h density areas and their characteristics for:

a) establishing intensification and new locations of apartment areas,

b) estimating the potential for change within apartment areas, and

c) establishing the physicel form of different apartment areas and the necessary facilities to create appropriate environments.

2.3 Methodology: Outline of Procedures

In order to deal with the subject of the nature of development of apartment areas and their planning implications, it is first necessary for the structure of apartment areas within the city context to be ascertained. To determine the structure it is first necessary to analyze the spatial and social patterns of apartment areas, and then definable sub-units must be ascertained by looking for consistency in contiguous association. Also the association with transportation arteries, topographic features and commercial areas must be borne in mind. This structural aspect of apartment areas must be associated with the more general social and economic processes that account for the pattern.

With the use of empirical data for Johannesburg apartment areas at 1960, it will be possible to describe with statistics, the sub-areas, and the overall pattern. But for urban planning the population characteristics that describe sub-areas

must be analyzed in conjunction with, neighbourhood facilities and neighbourhood services, as well as with the type of apartment development.

Thus the first step is to establish the structure of apartment areas in terms of the population socio-demographic variables, as well as details of the accommodation. For this purpose the technique of factor analysis is used to reduce all these variables to a few independent "factors" that account for basic differences in the structure of apartment areas. It will thus be possible to establish a typology of apartment areas and consequently classify sub-areas with distinct structural type characteristics and subsequently to place each apartment area into the context of the ecology of the city.

In order to explain the differentiation of apartment areas in Johannesburg as established by the empirical analysis, relevan developmental and political factors, as well as relevant theoretical literature will be used. The development of apartments in Johannesburg will be discussed in the context of the evolution of the city, bearing in mind National and Regional influences, political policies, direction of growth and physical settings. The differential apartment patterns that occur will be explained from postulates derived from the generalized models presently available, viz. Social Area Analysis and the work of the city ecologists (Berry, Timms, Johnston etc.); as well as the processes of development implicit in them. This basic analysis of relating empirical analysis to general theoretical concepts of city structure will result in the formulation of some basic concepts to explain the dynamics of apartment development in Johannesburg in order to establish an approach to assess the planning implications inherent in the differentiation of apartment areas.

Following on the basic analysis and the formulation of an approach, will be a comparative analysis

among and between related clusters of apartment areas. The analysis will incorporate an expanded list of population structure variables, accommodation characteristics variables, and an environmental amenity analysis in relation to the clusters established. An examination of the relationships between population structure and environmental function will be entered into preparatory to assessing the planning implications of these differentiated clusters.

The planning implications of the apartment areas, insofar as location of apartment development, form of development, and environmental facilities are concerned, will be undertaken within the concepts previously formulated. Emphasis in this section will be given to the spatial ecological settings of these apartment clusters and the functions they perform.

Bearing in mind that the "formulation" and the apartment clusters identified are based on 1960 data, a truncated and preliminary testing of the hypothesis and the formulated concepts will be undertaken. This assessment of the structural and compositional changes in apartment areas since 1960 will be based on broad changes and trends only.

## 2.4 Data: Nature and Sources

The objectives of the data collection are to form an accurate and as complete a picture as possible to analyze the resident population in apartment areas and their physical environment, including the availability of facilities in 1960.

As the analysis is undertaken in two main sections, the data was collected in that way, i.e.

a) Population and Accommodation characteristics

b) Environmental characteristics.

All information collected for (a) has been in terms of the enumeration sub-districts of Johannesburg of the 1960 Census. Where information in its original form was not by sub-district, the data has been regrouped to conform with them. All socio-economic

information about the population in terms of stage in the family life cycle, household size, number and size of families, occupations, cultural determinants, personal incomes, rental levels, etc., have been obtained from computer tapes of the Census made available by the Forward Planning Branch of the Johannesburg City Council and the Urban and Regional Research Unit of the University of the Witwatersrand. The Research Unit then ran two special programmes to retrieve the requisite data, viz.

1)a programme of census data for the whole of Johannesburg and one for apartment dwellers only, and

2)in a similar way a program to extract detailed data on age and marriage information.

The land-use zones and the physical characteristics of apartments, in particular, were obtained from the Forward Planning Branch's publications and Land Use Inventory computer print-outs respectively. This information is used to ascertain the nature of, and the distribution and location of apartment buildings, and the types, heights and age of buildings as well as availability of parking.

All data on environmental characteristics was collected in terms of the major apartment clusters identified, especially as most facilities and amenities serve areas larger than E.S.D.'s and usually relate to a whole "neighbourhood".

The Forward Planning report on High Density Housing in Johannesburg and the Yellow Pages Directory of the G.P.O. was used to locate the facilities and amenities, in the clusters, viz. creches, nursery schools, sports clubs, and local recreation and were checked by means of a "windscreen" survey.




FIG. 2.1

Areas Zoned for Apartments

(Source: Johannesburg Town Planning Scheme).

## 2.5 Delimitating and Definition of Apartment Areas in Johannesburg.

### Location, Extent and Form of Development of Apartments in Johannesburg.

The term apartments, in the South African context is usually applied to any multi-storeyed multi-dwelling unit building. Apartment development, which occurs, in "General Residential" zoning, can not only vary in density, but in height and site coverage as well. For the most part, apartments have a connotation of being high density high-rise, medium-rise and low-rise.

As yet, low-rise high density development in the form of Duplex, patio house, courtyard house and row house development has not made a large impact in Johannesburg, except for a few newer areas and some isolated developments.

The occurrence of apartments in Johannesburg, as in other cities, is concentrated in certain locations. The Forward Planning Branch of the City Council in a report (C.E.D. 1971) distinguishes between "Flat Complexes" - being townships where the residential lots are all zoned "General Residential" and "Flat Areas" - where only a group of apartments within a township zoned "Special Residential" are zoned "General Residential". (In many instances "Flat Areas" include areas where apartments are built over and with or without shops on General Business zoning.)

The definition "Flat Areas" is useful in identifying concentrations of apartments, but the definition "Flat Complexes" leads to problems as in many cases within large townships zoned General Residential only isolated stands are developed with apartments and so no substantial concentration occurs. As this study is concerned with the concentration of apartment enclaves, the use of "Flat Complexes" becomes an inadequate tool. While the definition of apartment concentrations will be dealt with later in this section, the location of both "Flat Areas" and "Flat Complexes" are outlined as follows, in

order to set the broad context for apartment development. The Flat Complexes are (See Fig. 2.1):- Bellevue, Bellevue East, Berea, Bertrams, Braamfontein, Fairview, Forest Hill, Haddon, Hillbrow, Johannesburg Central, Kenilworth, Killarney, La Rochelle, Mayfair, Regents Park, Rosettenville and Rosettenville Extension, Troyeville, Turfclub, Turffontein, West Turffontein and Yeoville. The Flat Areas are - Cyrildene, Houghton, Illovo, Jeppestown, Linden, Malvern, Orange Grove, Parktown, and Rosebank. It can be seen that apartments occurring in the Complexes are concentrated in localities to the north and south of the railway line, with isolated complexes located towards the east and west. The Flat Areas are more widespread.

In 1960, in the Johannesburg Metropoliton area, apartments comprised 32% of the housing stock. (C.E.D. Report, 1971).

Defirition of Apartment Concentrations

The only complete and detailed data available was the 1960 Census. Moreover, the smallest statistical unit in the Census is the Enumeration Sub-District. (E.S.D.)

The basis of the E.S.D. is that it is supposed to house approximately 1 000 people, though naturally this varies from 600 - 1 200 persons, as a result of natural and functional barriers or due to change in a population within the E.S.D. Also, as a consequence of different densities, the ESD can vary in size from one or two city blocks within the central city, to as large as a whole suburb.

Data related to apartment dwellers only was extracted from the Census tapes, and this was combined with the plotting of apartment development in physical terms on maps using data obtained from the J.C.C. Forward Planning Branch's Land Use Inventory.

A preliminary analysis of all ESD's with apartment dwellers indicated a great variance from those with both a large percentage of apartment dwellers and a

large obsolute number of apartment dwellers to those with low percentages and numbers. With reference to ESD's with a low absolute number of apartment dwellers, the Land Use Inventory indicated that these n numbers usually represented one or two blocks of apartments, which were also not contiguous or near each other. As a result all ESD's with apartment populations of less than 150 people were discarded for the analysis, unless they had more than 3 blocks of apartments close to each other to achieve some measure of apartment size choice (if it existed) or they were contiguous to or surrounded by E.S.D.'s with a large percentage of and/or large number of apartment dwellers.

The 168 E.S.D.'s with apartment dwellers that were not excluded were found to exist by and large in substantial concentrations that fell within the defined Flat Areas and Complexes. Also it was possible to isolate the apartment concentrations that fell within a Flat Complex and ignore the remainder of the townships that had not been developed substantially with apartments.

The apartment concentrations that were identified include: Linden, Emmarentia, Greenside, Rosebank, Illovo, Killarney, Riviera, Parktown, Hillbrow, Johannesburg Central, Braamfontein, Berea, Yeoville, Bellevue, Troyeville, Doornfontein, and some parts of Bertrams, Lorentzville, Judith Paarl, Jeppe, La Rochelle, Rosettenville, Turffontein, Cyrildene, Rouxville, Orange Grove, Cheltondale, Waverley and Bramley.

It is these apartment concentrations that will be studied as they occur within the E.S.D.'s of the 1960 Census.

References:

City of Johannesburg, 1971, High Density Housing - Interim Report, C.E.D., May 1971.




FIG.2.2

E.S.D.'s with Apartments identified for the study.

## 3. LOCATION AND SPATIAL STRUCTURE OF APARTMENT AREAS - 1960

### Apartment Area Locations, Variables and Patterns: Factor Analysis.

#### 3.1 Methods and Use of Factor Analysis

Factor Analysis which includes Principal Component Analysis, has in recent years been increasingly applied to research in urban studies. (Berry, 1970; Murdie 1969, Johnston 1971). Factor Analysis is a method that attempts to bring order to the mass of information, by condensing it and reducing its complexity. The method groups or classifies the interdependent variables (or characteristics) by consolidating this into a useful set of descriptive indicators that reflect separate patterns of relationships between the variables. Each indicator (or Factor) is a single aggregate unit that delineates a distinct cluster of interrelated data. Factor Analysis also portrays the patterns of relationships in a manner suitable for interpretation and analysis. This method also recognizes and takes into account the fact that the variables are not of equal weight and might overlap somewhat in conveying particular information; i.e. the variables used for the classification are not completely independent, as they are, by and large, measuring the same thing to some degree. It is this overlap that is isolated by the analysis and expressed as a composite index of the different variables effects, and which is termed the "principal component" or "factor". Primarily, the factor analysis study produces a basic description of the pattern of social and economic variations in the city. It reveals the principal components of the human environment in such a way that the particular characteristics of sub-areas can be identified by means of a generalized statistical description. Once the generalized patterns are available, areas for more intensive analytical treatment can be recognized.

There are several factor models, (Rummel, 1967) viz. common factor analysis and component factor analysis. This study uses component factor analysis which is concerned with patterning all the variation in a set of variables; whereas the former model is concerned with defining the pattern of common variation only. Further, there are two different factor matrices presented here. The first is the unrotated (or principal axis matrix; and the second is the rotated (or varimax) factor matrix. The unrotated factors successively define the most general patterns of relationships in the data, while the rotated factors delineate distinct clusters of relationships. Because of the interest in defining distinct patterns, emphasis is given to the varimax matrix which has two important properties:- (1) The Factors are not obtained in increasing order of importance, and that very often there are a limited number of them; and (2) the factors are "orthogonal" to each other, i.e. completely independent among themselves in the sense that there is no statistical connection between them. Since in practice the first few factors are the most significant and might together account for as much as 70%, or even more, of total variability established by the original set of variables, they can be taken to represent the basic dimensions or major patterns, of the system being studied.

Before these factors can be effectively used, they must first be interpreted. The definition of their nature can be established in terms of those original variables which are most strongly correlated with each one of them.

From this description of factor Analysis it becomes clear why the method was considered particularly suitable to tackle the problem of the identification of apartment area formation. What was needed was some indicator of apartment development characteristics which could reveal the nature of these characteristics in each enumerator sub-district. Thus, instead

of deciding on an a priori basis which of the variables should be taken to express these characteristics that differ between the areas, it is more realistic to recognize that each of the pertinent variables describes it to a greater or lesser degree.

The application of Factor Analysis in relation to the dynamics of apartment development, followed the approach adopted by Philip Rees in his study "T Factorial Ecology of Metropolition Chicago." (Berry, 1971, p324). The steps in the analysis were as follows: (See Fig. 3-1.)

1) From an original matrix of 45 variables and 168 E.S.D.'s a 45 x 45 matrix of the correlations between variables was calculated.
2) Factors are extracted from the matrix of correlation coefficients by the principal components method, to summarize the common patterns of variation among the 45 variables in a table of "Factor Loadings", correlating between the original variables and the factors.
3) These factors are rotated to the normal varimax position in order to achieve a "simple Structure" in which variables are allocated to mutually exclusive factors.
4) Factors Scores were computed so as to allocate to each observation a value that gives it a position on scales defined by the particular factors.

The basic tool in the interpretation of the results of the factor analysis is the matrix of factor loadings where the rows consist of variables and the columns of factors.

## 3.2 Definitions and Explanations of Variables Employed

The Factor Analysis begins with a calculated set of variables for each enumeration sub-district. Their choice is important, for the output of the whole process is entirely dependent on the input.

The variables that are most usually included are those characteristics which are regarded as important by social scientists. The variables include measures

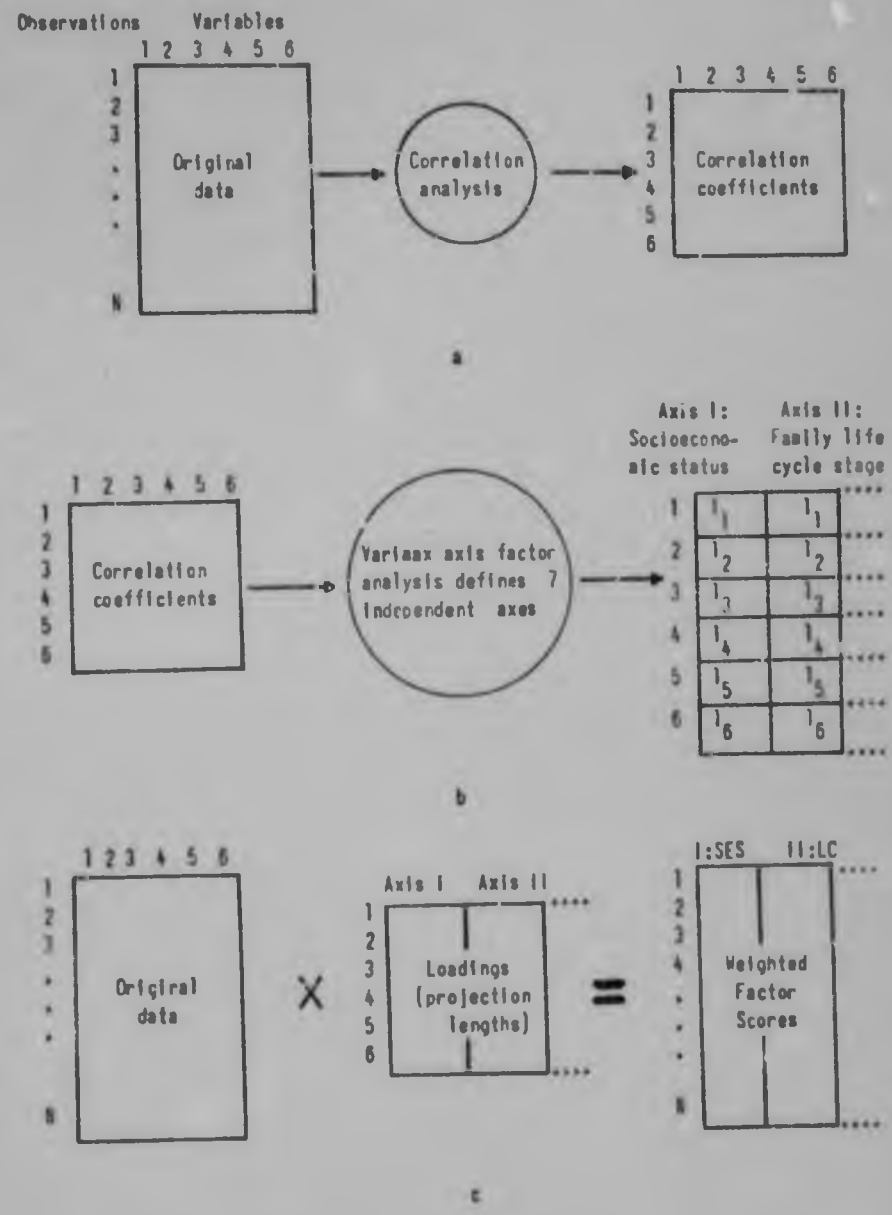



FIG.3.1

Reduction of an original data matrix to a matrix of weighted Factor scores

(Source: Adams, Abler and Gould, "Spatial Organization" 1971, Prentice Hall).

which apply to people themselves and those measures that apply to the dwelling unit, as well as those that are a composite of both. The set of variables reflecting the social and economic characteristics are those such as the age-structure of the population, ethnic status and country of birth, religious affiliation, income, occupation, education, the size and occupancy of dwellings, aspects of household size, rental levels pertaining to the housing stock, and density. All of these indices were considered to be relevant to the final classification and in this context the set of 45 variables almost exhausted the available data.

The majority of the variables chosen were reduced to percentages of their relevant denominators so that E.S.D.'s of different sizes would not be under or overweighted. (See Table 3.1).

3.3 Analysis of the Correlation Matrix

Although the full correlation matrix is usually presented without comment, it does contain useful knowledge, particularly as the patterns discovered by factor analysis consist of those variables highly intercorrelated and thus it can be used to assist in interpreting the factor patterns.

The coefficients of correlation express the degrees of linear relationship between the variables. The closer the zero the coefficient, the less the relationships; the closer to one the greater the relationships.

TABLE 3-1

The Variables used in the Factor Analysis

| Variables | Numerator | Denominator |
|---|---|---|
| | I. Population by age, sex and Marital Status | |
| 1. | Population aged 0-4 yrs. | Total Pop. |
| 2. | Population aged 5-12 yrs. | Total Pop. |
| 3. | Population aged 18-24 yrs. | Total Pop. |
| 4. | Population aged 18-34 yrs., married | Pop. aged 18-34 years |
| 5. | Population aged 25-64 yrs., single | Pop. aged 25-64 yrs. |
| 6. | Population aged 44-64 yrs., married | Total Pop. |
| 7. | Population of age, + 65 yrs. | Total Pop. |
| 8. | Females | Total Pop. |
| | II. Ethnic, natively and Cultural Characteristics | |
| 9. | Population born in S.A. | Total Pop. |
| 10. | Population born in the British Isles | Total Pop. |
| 11. | Population born in Portugal, Spain, Italy and Greece | Total Pop. |
| 12. | Population Affiliated to D.R.C. | Total Pop. |
| 13. | Population Affiliated English Protestant | Total Pop. |
| 14. | Population Affiliated Roman Catholic | Total Pop. |
| 15. | Population Affiliated Jewish | Total Pop. |
| 16. | English Speaking | Total Pop. |
| 17. | Afrikaans Speaking | Total Pop. |
| | III. Education, Occupation and Income | |
| 18. | Population with less than St.7 Education | Total Pop. |
| 19. | Population with post matric Education | Total Pop. |
| 20. | Workers in Professions occupations | Economically Active |
| 21. | Workers in Administration occupations | Economically Active |
| 22. | Workers in Clerical occupations | Economically Active |
| 23. | Workers in Sales occupations | Economically Active |
| 24. | Workers in Production | Economically Active |
| 25. | Workers in Services | Economically Active |
| 26. | Population employed in Manufacturing | Economically Active |

Table 3-1 Continued

| Variables | Numerator | Denominator |
|---|---|---|
| 27. | Population Employed in Commerce and Finance | Economically Active |
| 28. | Population Employers | Total Pop. |
| 29. | Population not economically active | Total Pop. |
| 30. | Persons with income between R400-R199 p.a. | Persons Earning |
| 31. | Persons with income between R1 200-R2 000 p.a. | Persons Earning |
| 32. | Persons in trented accommodation R21 to R40 p.m. | Total Pop. |
| 33. | Unemployed persons with Incomes | Not Economically Active |
| | IV. Households by Size and Accommodation | |
| 34. | Mean Household size | All Households |
| 35. | Households of 1 person | All Households |
| 36. | Households of 4 or more persons | |
| 37. | Occupancy rate (Persons/habitable room | All Households |
| 38. | Car Spaces | Females |
| 39. | Households with 1 and 2 children | All Dwellings |
| 40. | No. of Bachelor Units | All Dwellings |
| 41. | No. of Units with more than 3 rooms | |
| | V. Dwelling by Attributes | |
| 42. | Residential Area | Improved Area |
| 43. | No. of Units built pre-1948 | All Dwelling Units |
| 44. | Rooms per net hectare | |
| 45. | Dwelling per net hectare. | |

A negative sign indicates that the variables are inversely related.

The correlation matrix (Appendix A) of the 45 variables shows an evidently fairly high degree of correlation batween some variables. These correlations (and their negative counterparts) are useful in establishing what are the important relationships among the variables; what variables hang together; and what variables or characteristics will not be found together.

Following an approach used by George Carey, the highest correlation among the 45 variables are summarized in Tables 3.2 and 3.3 (Carey, 1966). The class intervals indicated, range in Table 3.2 from coefficients in excess of + 0.700 to those in excess of +0.900, and in Table 3.3 from coefficients in excess of - 0.700 to those in excess of - 0.900. These are arbitrary chosen levels of significance for interpretion because of the non-linear nature of relationships, but are sufficiently high to warrant inclusion.

There are expected strong relationships between age of the population and household and dwelling unit sizes, and between level of education, occupation groups, and income groups with household size and dwelling unit size. The unexpected correlations were those between ethnic and nativity aspects with occupational and educational aspects, which indicated the importance of cultural characteristics.

The strong correlation between the population age-group variables with household size variables reflect the importance of the stage in the life cycle with housing needs. Similarly, the correlations between occupational groups, ethnic groups and household and dwelling unit sizes, reflect the importance of the class of employment with the cultural differentiation of the population, as well as with their housing needs and use.

Many of the correlations suggest relationships that

are intuitively appreciated; for example, lev . of education, occupation groups, with income at rent paid;cultural groups with occupation groups and income situation with dwelling size. These correla tions suggest that E.S.D.'s where one of the vari- ables is important are the residence of the popula- tions with the other specific related characteristics. All this suggests areas of interrelated class, "caste" and economic situations.

Conversely the high negative correlations reflects the variables that are not found in conjunction with each other, so much so, that Table 3.3 suggests that E.S.D.'s with one of the variables predominating in a class in the total population will not have certain other variables, as indicated, interrelated. In this way too, it is possible to establish the nature of differentiation among apartment dwellers and their environment.

TABLE 3.2

Coeff. + 0.9

Variables DRC and Afrikaans Speaking

Coeff. + 0.8 to + 0.899

Post School Education and Professionals

Coeff. + 0.7 to + 0.799

Children 5-12 yrs. and > 4 person households
Persons 25-64 yrs.(single) and 1 person households
Production Workers and Rental R21-40 p.m.
Not ec. active and > 4 person households
Earning but not ec. active and 1 person households
Mean Household size and 1 br. unit
Mean Household size and dwelling per hectare
Bachelor Units and dwelling per hectare

TABLE 3.3

Coeff. - 0.8 to - 0.899

Variables English Speaking and Afrikaans Speaking

Coeff. - 0.7 to - 0.799

DRC and English Speaking
Post school education and production workers
Mean Household size and 1 person households
Mean household and > 3 habitable rooms units
Bachelor Units and > 3 habitable rooms units.

## 3.4 The Factor Patterns

Before proceeding with an interpretation of the factor analysis for the apartment areas of Johannesburg, it is necessary at this juncture to present the metropation context in spatial ecological terms. A Factorial ecology has been made for Johannesburg (Hart, 1973) which used the same 1960 data and a similar set of variables to that used in this study. In this way it will be possible to set the apartment areas in their total ecological settings.

The major dimensions of this Factorial Ecology study uncovers the basic patterns of the city according to several independent factors which are summarized by: (1) Socio-Economic status, as expressed in statistics on income, education and occupation; (2) family structure and stage in the life cycle, as expressed in statistics about families, age, etc., and, (3) ethnic and immigrant groups status.

The following analysis is the author's interpretation of the maps of Hart's study. The details of this simplified ecological analysis identifies the structure of the city and locates the various "social areas" of the city.

Fig. 3.2 indicates the Socio-Economic Status dimension. The pattern of socio-economic status is primarily sectoral. The communities with populations that have high socio-economic status, viz. with most education, in white collar occupations and with the highest incomes, occupy the sector that encompasses the majority of the northern suburbs from the divide ridge northwards. The middle-class suburbs take in wedges to the north - east, and north - west of the high status sector as well as an area to the south of the high income sector and abutting on the CBD, which is, in the main, the central apartment complex of Hillbrow, Berea, Yeoville and Bellevue. There is a similar small wedge in the Southern Suburbs to the south-west. These are areas containing populations

of medium education, mix of occupations and with medium incomes. The low socio-economic communities of people with the least education, with the low incomes and occupied in blue collar occupations are in the sectors to the east and west that are located in close proximity to the industrial areas that lie alongside the rail route and the mining-land. There is also the large sector of almost the entire southern suburbs that is of low socio-economic status.

The Second major dimension, shown in Fig. 3.3., is the Stage in the Life Cycle, that has a pattern that is primarily zonal. The central city and the inner suburbs are communities of primarily Older couples, childless couples and single persons. [illegible]munities of older families, surround the inner [illegible] in a concentric zone that is distorted by fol[illegible]ing the major arterials; and encompasses the [illegible]rity of the city's suburbs. The younger families [illegible]de, for the most part, in new communities beyond [illegible] boundaries of Johannesburg and in the more recently developed suburbs on the periphery of the city.

The third major dimension is that of Ethnic-Status as seen in Fig. 3.4. This pattern is mainly sectoral, but being related to both socio-economic and life cycle dimensions tends to concentrate only in certain zones and in certain sectors. The southern European immigrants groups have [illegible]ntrated in the older family zones, but predom[illegible]ntly in the low and medium income sectors to the east of the city. The South African born population groups are concentrated in the north and western sectors of the city, with the Afrikaans speaking groups taking up the south-west and western section and the English speaking community predominating in the northern suburbs.

On the 3 figures are the outlines of the major apartment areas of Johannesburg, and it is thus possible to establish their ecological settings. The majority of the smaller apartment areas are located in the high and middle socio-economic status sectors. With the exceptions of the complex in Jeppe and

Troyeville and those in the southern suburbs which are in the low socio-economic status sectors, almost no apartment areas exist in the low status sectors. This supports a hypothesis, to be dealt with later, that apartment dwellers have a relatively high socio-economic status and are consequently more mobile. From a stage in the life cycle point of view, the apartment areas are, almost without exception, seen to be differentiated from their surrounding communities and are older families in the young family zones; the older couples and single persons in the older family zones, and within the central major apartment complex being composed almost entirely of the zone of the older couples, childless couples and single persons. The apartment areas are also located, by and large, outside of the sector dominated by Afrikaans speaking people, but they do indicate a fairly significant concentration of southern European immigrants in the sectors outside of the high socio-economic English speaking sector.

Interpretation of the factor loadings and factor scores

The basic tool in the interpretation of the results of the factor analysis is the matrix of factor loadings and matrix of factor scores. (Appendix B and C). The loadings and factor scores describing the patterning of the data are found by the factor analysis. The dimensions established by the factor loadings are interpreted in terms of the strength of the relationships between each factor score and some of the initial variables. The definition ascribed to the factors are both descriptive, in that the name reflects the nature of the variables concerned; and causal, in that it is a causal explanation of why the pattern involves particular variables. (Rommel, 1967).

The approach to the interpretation of the factor patterns follows a procedure adopted by Rees, (Berry, 1970, p319-389) where only loadings greater than + 0.400 and greater than - 0.400 have been included.

The Table presented is for the varimax situation. (Table 3.4). The rows consist of variables, the columns of factors. Both the Principal axis rotation and the varimax rotation indicate 7 major factors. The percentage trace for the Principal Axis situations, is 71.63% and for the varimax situation is 69.84%. (See Appendix B).

The unrotated factors defined by the principal axis analysis indicates the major patterns of variation, with only two major factors. Factor 1 accounts for 25.07% of the total variation and is primarily a socio-economic dimension. Factor 2 accounts for 21.41% of the total variation and is a Life Style dimension. The remaining dimensions all fall below 7% and are consequently minor dimensions. Thus, the general patterns distinguish the major dimensions that exist in other factorial ecology studies. As this study is concerned with more distinct patterns these broad patterns will be now discarded and the interpretation will concentrate on the varimax rotation situation.

Table 3.4 indicates the factor loadings for the varimax rotation solution. This analytic solution has seven factors, viz:

1) Stage in the Life Cycle
2) Socio Cultural Status
3) Socio Economic Status
4) Single and Small Families
5) English Speaking Communities
6) Immigrant Factor
7) Jewish Population.

Only three of these seven factors will be dealt with in any great detail. These being the three major factors with per cent variation of 15.09, 19.08 and 13.05 respectively. The remaining factors are sub-population factors, to a large extent, and consequently are useful only in that they provide for further distrinctions in the ethnic and stage in the Life Cycle dimensions to be made.

Factor I: Stage in the Life Cycle

The first factor gives greatest weight to the variables related to the age and marital structure of the population, household size structure, dwelling unit size and density measures.

Apartment areas that score highly on this factor contain a population of people who are unmarried and aged 25-64 years (variable 4; loading 0.659); living in single person households (variable 35, loading 0.859); and who consequently occupy Bachelor flats units (variable 41, loading 0.732), which are at high densities (variables 44 and 45, loading 0.752) and 0.859 respectively). To a large extent, people in these communities receive an income, but are not economically active (variable 33, loading 0.149).

In apartment areas which score low on this factor reside the young married families (variable 5, loading - 0.450) who have young children in the 0.4 year age group and 5-12 year age groups, (variables 1 and 2 loading - 0.709 and - 0.611 respectively). It is possible to infer that the men in the populations are occupied in the manufacturing industry (variable 26, loading - 0.403), while the women, being fully occupied by child bearing and rearing, are not economically active (variable 29, loading -0.847). With the women having 1 and 2 children (variable 39, loading - 0.411), the households tend to be the larger families of more than 4 persons (variable 36, loading - 0.879), and who, as a result, tend to live in dwelling units that are larger than 3 habitable rooms.

The indications used here to describe the characteristics of the age pyramid and its concommitant stage in the life cycle by combining it with marital status aspects, give only a crude picture of the age pyramid itself and stage in the life cycle as they act only as surrogates for the mix of family types. But the fact that the variables chosen do load highly on the same factor, suggests that they do isolate out

the differences between populations in terms of stage in the life cycle. The differences are a product of the migration of families in formation and dissolution, as well as a result of the ageing of families in the process of maturation. It is, though important to note that the dissolution of families and pre-formation of families results in the formation of households of all sizes who in turn have different housing requirements. The differential communities of apartment areas attest to the fact that different apartment areas have a relative attractiveness to households and families of different types.

The stage in the Life Cycle or household size factor thus distinguishes apartment areas of larger and younger families in what are usually less densely populated apartment areas, from areas of residence by single people and childless couples. The spatial pattern of Factor 1 is seen in Fig. 3.5. The sub-areas scoring high on this factor are those with high concentations of the older couples and single persons, as well as the young single and young married households. These sub-areas are the older established high-rise high density areas of central Johannesburg, Braamfontein, Hillbrow and parts of Berea that have a proximity to the major arterial routes and bus routes.

However, not all the apartment area are high scoring. Those sub-areas that score low on this factor, and which are the young family households, fall in the areas within the medium socio-economic sector and the mixed family zones of the city, such as Linden, Birdhaven, Rouxville, Norwood, Bellevue, Bertrams, Jeppe, La Rochelle, Rosettenville, and Kenilworth.

Those apartment sub-areas that are of varying status in the factor are those mainly in the high socio-economic status sector and the more recently re-developed apartment areas of Berea and Yeoville and tend to house the older couples and those with families still at home.

The spatial pattern of Factor 1 for apartments is thus primarily zonal and corresponds fairly closely with the zonal pattern established by Hart for the city as a whole. It thus appears that the differentiation of apartment areas reflects their zonal context (as well as its sectoral context) in that they tend to serve a specialized housing market within both its zone and sector. This can be established by noting the structure of the apartment areas within the context of the city from Fig. 3.3 and from the obvious concentric distribution seen in Fig. 3.5.

This distribution of apartment communities by stage in the life cycle reflects, also the variation of apartment buildings by form, i.e. height, density, dwelling unit size and distance from the city centre, where the high intensity use necessitated by the high land values in the inner city requires high-rise high density apartment buildings and the relatively lower land values in the suburban areas allows for medium rise and more spacious apartment development.

Factor 2 - Socio-Cultural Status and Resources

The second Factor to emerge from the analysis isolates the variables that related to ethnic and cultural aspects of the population and some that are related to socio-economic status. Because of the relationship between cultural group status and the ability of people to achieve mobility - this dimension is called Socio-Cultural Status and Resources following an approach used by Rees (Berry 1970, p333).

Apartment areas that score high on this factor contain residents who are predominantly South African born (variable 9, loading 0.580); who are mainly Afrikaans speaking (variable 17, loading 0.953); and who are members of the Dutch Reformed Churches (Variable 12, loading 0.936). The majority of the population has less than a Std. 7 education (variable 18, loading 0.473); which is probably as a result of the effect of larger families with many young children on this variable. The majority of the economically active persons in these communities are occupied in

the production occupations (variable 24, loading 0.490), and consequently can only afford to pay low rents, (variable 32, loading 0.482),which means that they live in dwelling units of smaller sizes with higher occupancy rates (variables 37, loading 0.620).

Apartment sub areas with low scores on this factor are at the opposite pole of this dimension. Their populations tend to be English Speaking (variable 16, loading - 0.807), and are predominantly Jewish (variable 15, loading - 0.654). These residents tend not to work in the manual unskilled or semi-skilled blue collar occupations, but rather more in Sales occupations (variable 23, loading - 0.494), within the Commerce and Financial sector of industrial groups (variable 27, loading .- 0.687); and they tend to be employers of people (variable 28, loading - 0.608). They also tend to be better off financially with sufficient resources to own and demand space for a car (variable 38, loading 0.480).

This factor is not purely one of cultural status, but rather one that identifies the association between cultural status, ethnic origins and the allocations of resources. This factor makes it clear that:-

i) discriminating attitudes within the population helps to develop and sustain spatial patterns,

ii) the community ties within socio-cultural groups lead to continued separation of groups, and

iii) the socio-economic status of the group members will be a strong determinant in locating these groups to specific areas as a result of their differing access to resources (Johnston , 1971, p292).

One of the criteria about the nature of apartment dwellers is that they tend to be more mobile especially in the high income groups, and this is as a result of the interrelationship between their occupation groups and income earning potential. If, then, certain groups are constrained in their ability to

achieve mobility (as pin-pointed in this Factor) then they will be less prone to be apartment dwellers. Consequently, this factor high-lights the fact that the apartment areas have predominantly English speaking residents, and are located in the higher socio-economic English speaking sections. At the same time the pattern of this factor establishes that the Afrikaans dominan. apartment areas are in the low socio-economic sections of the city.

The spatial pattern of scores on Factor II is seen in Fig. 3.6. This pattern is mainly sectoral, being dependent on socio-economic status, but the disposition of these socio-cultural groups are also related to their stage in life cycle and thus have an element of zonality dependent on the household sizes. Thus those with more access to resources have a greater choice and have a pattern that reflects their ability to live in accordance with their requirements; while those with limited resources (and usually with larger families) are pinpointed in overcrowded locations in specific sectors - they, too, are located according to their housing needs in the various zones of family type.

The high scoring areas of predominantly Afrikaans speaking residents with relatively less resources are Braamfontein, Troyeville and Jeppe in the inner suburbs; and Linden, La Rochelle, Rosettenville, Kenilworth and Turffontein in the outer suburbs.

The low scoring apartment areas of wealthier more mobile residents are the apartment areas of the high socio-economic sector of the northern suburbs and include a concentrated wedge in Berea and Yeoville.

This pattern reflects the extremes of this dimension with Afrikaans speaking at one level, and the strong nucleiation of the Jewish group in particular, at the other extreme around the amenities and facilities they require, viz. the synagogues in Berea, Yeoville, Killarney, etc. The remaining apartment areas, essentially Hillbrow, Central Johannesburg and

the southern ridge of Doornfontein and Bertrams reflect mixed cultural areas catering for residents of all kinds whose choice of location there are for reasons other than community ties and family needs, but rather for reasons of accessibility as a result of "career" or "consumer" orientated life style. (Johnston, 1971, p30).

Only broadly speaking, does this factor correspond with Hart's third Factor of Southern European Status. Hart's map does serve to indicate the location of most of the outer suburban apartment areas to be either English or Afrikaans speaking, while the central inner suburban apartment areas show a stronger more cosmopolitan structure.

Factor 3 - Socio-Economic Status

An entirely different set of variables load highly on the third factor. The traditionally regarded, (in contemporary urban sociology) class and social status variables, viz. education, occupation and income variables; have loadings on this factor and is thus an indicator of socio-economic status.

Apartment areas that score highly on this factor contain people who are recent immigrants born in southern Europe. (Variable 11, loading 0.495), and who are predominantly Roman Catholics (variable 14, loading 0.497) The population has generally a less than Std. 7 education (variable 18, loading 0.633), with the consequence that those economically active are primarily blue collar workers, i.e. production workers (variable 24, loading 0.690). These residents tend, as a consequence, to earn low incomes of below R1 200 p.a. (variable 30, loading 0.543), and thus pay low rentals of less than R40 per month (variable 32, loading 0.753); for units which are principally under rent control, i e. built prior to 1948 (variable 43, loading 0.857).

Conversely, the people who live in apartment areas that have low scores on this factor, tend to have more education, viz. post-school education

(variable 19, loading 0.872); and who are therefore in white collar occupations - principally the professional occupations (variable 20, loading - 0.751) and administrative occupations (variable 21, loading - 0.584). Because of their higher socio-economic status they are financially better off, which is indicated by their need for car spaces (variable 38, loading 0.514).

The spatial patterning of this factor is mapped on Fig. 3.7. The highest status apartment areas, as can be expected, are found primarily in the northern suburbs and are generally medium-rise, more spacious and with more ground space around them. Also, these high status apartment areas are found on the northern fringe of Braamfontein, Hillbrow, Parktown and Berea, where the apartments areas fall within the high income sector and for the most part are located within the centre of each zone, within each sector, and have extremely high socio-economic status as a result of providing a market for the more established and mature families within them.

The lowest status apartment areas form a narrow sweep from central Johannesburg through the older inner suburbs of Doornfontein, Troyeville, Jeppe and Bertrams. These tend to be the more run-down apartment areas, with lesser aspects; but which are well located in respect to central work places and transport routes and are, therefore, well placed for the demands of lower-income people. The apartment complex of the southern suburbs is also relatively a low status area,which in turn corresponds to this index for the whole city. Nevertheless, it is necessary to reiterate that the low socio-economic status of apartment dwellers does not mean that they are the lowest socio-economic groups in the city as a whole, but to the contrary with the exception of those apartment flat dwellers in Jeppe and Troyeville, nearly all apartment dwellers have a relative high socio-economic status and are consequently more mobile

than the lowest status sectors of the city.

The middle status apartment dwellers are those of medium education, mix of occupations and with medium income and occupy the remainder of the apartment areas, viz. a central strip running from Braamfontein on the west, through central Hillbrow and southern Berea, and Yeoville to include the whole of Bellevue. This area, which houses a mix of socio-economic groups, does however, indicate a bias on the west of Braamfontein, around Joubert Park and on the extreme east towards a lower socio-economic group, while the central portion is more highly socio-economic status oriented. The nature of this area is related to its medium-rise, medium-sized dwelling units in small buildings that are neither new nor too old. They consequently offer a type of accommodation that is suitable for all, at reasonable rents, and consequently the status of resident population is influenced by the status of apartment areas. This type of apartment area includes similar sub-areas in the southern suburbs and the older apartment areas of the northern suburbs, viz. Rosebank, Rouxville, Norwood, Greenside, and Orange Grove.

The pattern of apartment areas that this factor displays is fairly complex, but is not random. The pattern, is to a large extent, consistent with the socio-economic sectors established by Hart with the northern suburbs apartment areas being mainly in the high and middle socio-economic sectors; the southern suburbs and Troyeville, Jeppe apartment areas being in the low socio-economic sectors; and the inner suburbs apartments being in the middle-status sector. But the inner suburbs apartment complex of Hillbrow, Yeoville, Berea and Bellevue tends to have a zonal pattern of increasing status outward from very high density central city poor environment areas, towards the northern periphery of the complex, which is newer and more spacious.

To a large extent, the apartment areas occur in the zones of differentiated sectors and display the

relationship between apartment area type, age of apartment area, form of apartment development, and the environment. Thus the high-status areas are at locations with better aspects and within suburban locations that offer good amenities away from the high density and congestion of the inner city. The low status apartment areas lie close to place of work or transport routes and in areas of "least or even negative amenity (the most pollution, the greatest mixture of land uses, and the oldest apartment developments)" (Berry, 1971, p328).

The remaining 4 factors are all sub-population factors which add depth to Factor I and II, and they are also relatively minor. Therefore they will be discussed only briefly; as and when they allow for a more specific patterning to be devised and understood.

Factor 4 -

This is the first sub-population factor and in this case is a help to define further both the stage in the life cycle pattern and the socio-cultural pattern. This factor identifies the concentration of the single households, as well as the older population groups and further distinguishes between South African born and British born people.

Communities which score high in this dimension have disproportionate concentrations of people in the 25-64 year old single groups (variable 4, loading 0.562); the 44-64 year old married groups (variable 6, loading 0.813); and the over 65 year old group (variable 7, loading 0.749). A high percentage of these people are of British origin (variable 10, loading 0.584) and who are largely occupied in the professions (variable 20, loading 0.412). The low scoring areas are largely South African born.

The pattern obtained, as seen in Fig. 3.8, serves largely to reinforce the stage in the life cycle pattern and pinpoints those apartment areas where the populations are predominantly the older single and

more mature families in the populations. By inference from the variable loadings and both the pattern of socio-economic status, it is possible to distinguish two main groups. Those communities isolated in the northern suburbs, i.e. Rosebank and Killarney, and the better aspected edge of Hillbrow, houses the more established households by virtue of being both older and being involved in more remunerative occupations. Those communities isolated on the periphery of Central Johannesburg and in Jeppe and Troyeville, as well as in Kenilworth are the seedier and older areas that house the older members of the community who cannot afford higher rents.

This factor, because of its socio-economic tendencies, tends to imply a sectoral quality to the stage in the life cycle pattern, but the zonal pattern is supported, as the areas pinpointed are in older families zone indicated in Fig. 3.3 for Johannesburg as a whole.

Factors 5, 6, 7 - Immigrant and Catholic Population English Protestants and Jewish Population

The remaining 3 Factors measure socio-cultural sub-groups and identify those sub-areas where they predominate. All these patterns tend to enhance the socio-cultural patterns of Fig. 3.6 by specifying more exactly the locations of those ethnic groups. Inherent in these patterns, as there had been with Factor 2, are overtones of both sectorality due to the socio-economic status of these groups, and also zonality as a result of the concommitant family or household sizes that these groups exhibit due to their cultural life styles as well.

Factor 5 is essentially a dimension indicating the white collar English Protestants who have salaries that place them, in general, in the middle-income group. Fig. 3.9 shows these sub-areas to be largely the prestigious apartment areas of Killarney, Illovo, and Parktown, and parts of Linden (where the older and larger and more established families are); the periphery of central Johannesburg that caters

for the lower income, smaller young, and older households; and similarly parts of Doornfontein and Bertrams.

The Sixth Factor is a dimension indicating concentrations of southern European immigrants who are predominantly Catholics. The sub-areas specified in this pattern are the older cheaper accommodation areas of Braamfontein; the older edge of Central Johannesburg, Doornfontein, Bertrams and Jeppe. The slightly better areas included are La Rochelle and Orange Grove and Norwood, all of which lie outside the high income sector.

The Seventh Factor identifies the concentration of Jews who live in apartments. This population group is highly concentrated in the better apartment areas of Killarney and Illovo, and mainly in the newer redeveloped parts of Hillbrow, Berea, Yeoville and Bellevue; as well as in some parts of the older Bertrams. This group concentration in particular, is to some extent, related to older community ties in the areas, besides the strong socio-economic factors maintained previously under Factor 2.

The patterns established by the three major factors and supported by the 4 sub-population factors are essentially supposed to be independent dimensions in the environment, because of the nature of factor analysis as a technique; and each dimension should imply nothing about any other dimension. In theory, each one of the factors are mutually independent and cannot be determined from each other, but inherent in the interpretation has been the overlapping of the dimensional concepts. The next section will fully explore the possibility how these interrelationships work in order to understand the patterns.

Typology of Apartment Areas - Socia' Space and Social Area

The postulates of the urban ecologists are, that like individuals or households are catered for by the housing market to produce a set of communities homogeneous with respect to the characteristics of

the inhabitants, the nature of the housing stock, and by implication with respect to the way people live within them. Similarly, the hypothesis of this study is that the differentiated apartment areas define classes of homogeneous apartment areas that relate a set of household attributes to its housing needs and wants, which vary according to its stage in the life cycle, its social position, and community ties. This differentiation of people of different types living in similar areas produces a community and social space which define the types of areas where the households needs and tastes are produced for, with the appropriate quality, style and price.

Following an approach developed by Rees (Berry, 1971, p375), the structure of apartment areas can be plotted in a "community" or "social space" of two dimensions by arranging appropriate factors on horizontal and vertical axis of a graph. These positions can be subsequently plotted on a map. (See Fig.3.10).

The plotting of the ESD's on the graph allows a simple clustering of similar areas to be made. Because the typology indicates abstract community or social space, the clusters apparently established have to be modified. The criteria used for defining clusters include: 1) the apparent visual clustering of ESD's; 2) the need to take account of having contiguous "social areas"; 3) the recognition that these abstract "social areas" do, to some extent, tend to overlap with each other; and 4) that the sizes of the contiguous apartment areas was contingent on useful size clusters of the configuration of the ESD's because while some smaller abstract clusters appear to exist, they are often not geographically related. This overlap on the Typology diagrams serves to illustrate that the social areas are not necessarily specifically established, but rather that there is a continuum of social areas. Further when the result of the typology is plotted on a map, it indicates the clustering of households of similar life styles and consequent housing needs and uses.

If Factor 1 (Stage in the Life Cycle) scores are plotted on the horizontal axis of a graph, and Factor 2 (Socio-Cultural Status) scores are plotted along the vertical axis, the space so formed can be called a "community space" (See Fig. 3.11). These "community" space clusters are then mapped (Fig.3.12) The Typology and its mapping serves to indicate the predominance of the English-speaking and mature family groups in apartment areas, especially the northern suburban and the majority of the Berea, Yeoville, Bellevue complex, occupying the newer and better aspected and amenitied apartment sub-areas, viz. all the northern suburbs apartment Clusters and and clusters 4 and 5. The older suburbs of run-down apartments in Doornfontein, Bertrams and Judiths Pas.l, make up clusters to house a related community of young families but in this case with larger families and with less a dominance of English speaking persons. Clusters 2 and 3, comprising central Johannesburg and Hillbrow, house the elderly persons, and the single and childless couple households respectively, and who are predominantly of the medium-income English speaking community. Jeppe and Troyaville (cluster 7), is made up of young family households but is an Afrikaans speaking lower-income community. Braamfontein (Cluster 1) stands in isolation as an older and single persons Afrikaans predominant area. The southern suburbs reflect an apartment community of younger and mature family households, who are predominantly Afrikaans speaking.

In a similar manner a community space typology can be constructed by plotting Factor 3 (Socio-Economic Status) scores against Factor (2) (Socio-Cultural Status) scores, as seen in Fig. 3.13. Once again by following a procedure of plotting and adjusting for contiguity, clusters of homogeneous areas can be established (Fig. 3.14). The northern suburbs apartment areas contain high status English

speaking persons. Clusters 4 and 5 (the majority of Hillbrow, Berea, Yeoville, and some Bellevue) house a related community structure, with the new apartment buildings of Hillbrow and Berea having a high status community. The remainder of Hillbrow and the intensely developed parts of Berea (Cluster 3) is a population cluster of fairly high status, but is a fairly well mixed apartment area as far as socio-cultural aspects are concerned. Cluster 4, comprises Central Johannesburg and the older inner suburbs and houses a community of lower socio-economic status and mixed cultural types.

Finally, it is possible to construct by plotting, Socio-Economic Status against Stage in the Life Cycle, a Typological space called "social space" which will indicate the clustering of households with appropriate housing needs and tastes according to their households attributes. Over and above the criteria used to establish these clusters, they have been modified in terms of the clusters established in the previous two typologies, because the fundamental dimensions of spatial patterning are Socio-Economic Status and Stage in the Life Cycle. This last Typology described will be used to assess planning implications.

Note, that the resulting grouping solution is by no means an optimum one, as the procedure to establish cut-off points for various clusters are to some extent, somewhat arbitary. This grouping procedure is useful, only in that it defines a number of social areas, that serves only as some indication of achieving some community typology. The groups are identified by assessing the position of an apartment sub-area in "social space" and combined with the configuration of sub-areas in Fig. 3.4, 3.5 and 3.6, in order to define fairly homogeneous communities.

These apartment sub-areas are plotted in Fig.3.15 and the pattern of social-space serves only to

reiterate the patterns displayed previously. The northern suburbs apartment areas are characterized by a fairly high status population that consists of the young and the mature families with children. In contrast the apartment complex in the southern suburbs is an apartment population that is relatively low in status but mainly young families with children.
Fig. 3.16 exhibits the mapping of the identified clusters.

The first group of the central complex is characterized by relatively high status single people in early adulthood and is found in Braamfontein. Members of the Group two cluster (consisting of middle-status young couples, the single and the elderly) are found outside the city in the high density area of Hillbrow and southern Berea. A group of relatively high status and a mixed family status occupies Parktown and the northern fringe of Hillbrow and Berea in more spacious apartments. A similar group (group 4) but with slightly lower status and with more family people is found in the redeveloped vicinity of Yeoville and Bellevue - with the larger family orientated group (group 5), residing on the edge of Bellevue. The lowest status group (for apartments), with also the youngest family groups, are found in the apartment areas in the older deteriorating suburbs of Doornfontein, Bertrams and Judith Paarl, while the more fixed low status household areas of Jeppe and Troyeville makes up group 7. A contrasting group 8, of low status single person and childless couples (mainly elderly)occupies the centre of the city and the adjacent Joubert Park area.

As far as the northern suburbs apartment clusters are concerned, because of their isolation within the suburban context they will be treated as groups of separate entities, while the clusters identified within the inner suburban and central Johannesburg apartment complex will be utilized to proceed to the

next stage of analysis, i.e. to assess the neighbourhood facilities in order to establish the planning implications for them in apartment areas.

Before proceeding to name the apartment clusters to be included in the next analysis, it is necessary to point out one apartment area type that has not been mapped, viz. type 9, that comprises, with few exceptions, all those sub-areas where apartments occur above shops, particularly in the inner and outer suburban areas. This type takes up a mix of household types and reflects the particular socio-economic groups status of its area. These apartment areas, where they occur in the suburbs, are for the most part fairly small in population and appear to be related to servicing the shops connected to them. For these reasons and the fact that their smallness and relative isolation in the suburbs links them directly to suburban facilities and amenities, these apartment areas will be ignored in the next analysis.

The apartment clusters identified and to be used in the next analysis are:

1) Linden
2) Rosebank
3) Houghton
4) Killarney (and Riviera)
5) Illovo (and Birdhaven)
6) Birnam (Fairways and Waverley)
7) Cheltondale
8) Jeppe (Troyeville and Fairview)
9) Doornfontein (Highlands, Judith Paarl, Lorentzville and Bertrams)
10) Bellevue (and Bellevue East)
11) Yeoville (Bellevue and Bellevue Central)
12) North Hillbrow (north Berea and Parktown)
13) Central Hillbrow (and Central Berea)
14) Central Johannesburg (and Joubert Park)
15) Braamfontein
16) West Turffontein
17) Bellavista
18) Southern Suburbs (incorporating Kenilworth, La

Rochelle and Rosettenville).

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TABLE 3.4 SOCIO-ECONOMIC FACTOR STRUCTURE FOR FLATS IN JOHANNESBURG, 1980

FACTORS AND FACTOR LOADINGS (INTERPRETING BETWEEN + .40 and - .40)

VARIMAX ROTATION

| | VARIABLES | Stage in the Life Cycle | Cultural Status and Resources | Socio-Economic Status | Older & Single People-Mobile | English Protestant | Immigrant & Catholic Status | Jewish Population |
|---|---|---|---|---|---|---|---|---|
| 1. | % Children 0-4 years | -0.7084 | - | - | - | - | - | - |
| 2. | % Children 5-12 years | -0.8117 | - | - | - | - | - | - |
| 3. | % 13-24 years | - | - | - | - | - | - | - |
| 4. | % Single 25-64 years | 0.6593 | - | - | 0.5826 | - | - | - |
| 5. | % Married 18-24 years | -0.4502 | - | - | - | - | - | - |
| 6. | % Married 44-64 years | - | - | - | 0.8132 | - | - | - |
| 7. | % 65 + | - | - | - | 0.7493 | - | - | - |
| 8. | % Female | - | - | - | - | - | -0.7951 | - |
| 9. | % S.A. Born | - | 0.5809 | - | -0.5111 | - | - | - |
| 10. | % British Born | - | - | - | 0.5647 | - | - | - |
| 11. | % Latin Born | - | - | 0.6954 | - | - | 0.8249 | - |
| 12. | % O.B.C. | - | 0.9380 | - | - | - | - | - |
| 13. | % English Protestant | - | - | - | - | -0.4887 | - | -0.8103 |
| 14. | % Roman Catholic | - | - | 0.4975 | - | - | 0.5102 | - |
| 15. | % Jews | - | -0.8545 | - | - | - | - | 0.443 |
| 16. | % English Speaking | - | -0.8079 | - | - | - | - | - |
| 17. | % Afrikaans Speaking | - | 0.9538 | - | - | - | - | - |
| 18. | % Std. 7 Education | - | 0.4790 | 0.8338 | - | - | - | - |
| 19. | % Post School Education | - | - | -0.8725 | - | - | - | - |
| 20. | % Professional | - | - | -0.7511 | 0.4128 | - | - | - |
| 21. | % Administrative | - | - | -0.5841 | - | - | - | - |
| 22. | % Clerical | - | - | - | - | -0.7848 | - | - |
| 23. | % Sales | - | -0.4948 | - | - | - | - | - |
| 24. | % Production | - | 0.4908 | 0.6908 | - | - | - | - |
| 25. | % Services | - | - | - | - | 0.4429 | - | - |
| 26. | % Manufacturing | -0.4035 | - | - | - | - | - | - |
| 27. | % Comm. & Finance | - | -0.6879 | - | - | - | - | - |
| 28. | % Employers | - | -0.6085 | - | - | - | - | - |
| 29. | % Not Economically Active | -0.8475 | - | - | - | - | - | - |
| 30. | % Income R400-R1 199 | - | - | 0.5431 | - | - | - | - |
| 31. | % Income R1 200-R2 000 | - | - | - | - | -0.8715 | - | - |
| 32. | % Rent R21-R40 | - | 0.4624 | 0.7533 | - | - | - | - |
| 33. | % Earning Not Economically Active | 0.7195 | - | - | - | - | - | - |
| 34. | Mean Household Size | -0.7778 | - | - | - | - | - | - |
| 35. | % 1 Person Households | 0.8951 | - | - | - | - | - | - |
| 36 | % >4 Person Households | -0.8797 | - | - | - | - | - | - |
| 37. | Occupancy Rate | - | 0.8208 | - | - | - | - | - |
| 38. | Car Spaces | - | -0.4807 | 0.5148 | - | - | - | - |
| 39. | % 1 - 2 Children | -0.4118 | - | - | - | - | - | 0.7425 |
| 40. | % Res of Improved | - | - | - | - | - | - | - |
| 41. | % Bachelor Units | 0.7323 | - | - | - | - | - | - |
| 42. | % 3 Room Units | -0.7908 | - | - | - | - | - | - |
| 43. | % Pre 48 Units | - | - | 0.6575 | - | - | - | - |
| 44. | Rooms per hectare | 0.7527 | - | - | - | - | - | - |
| 45. | Dwellings per hectare | 0.8574 | - | - | - | - | - | - |
| | % TRACE | 19.88 | 15.08 | 13.05 | 7.10 | 5.90 | 4.01 | 4.01 |




FIG. 3.2
Socio-Economic
Status
Johannesburg.

Source: Hart., T., 1973, Factorial Ecology of Johannesburg, 1960, University of Witwatersrand.




FIG.3.3

Stage in Life Cycle - Johannesburg.

Source: Hart., T., 1973, Factorial Ecology of Johannesburg, 1960, University of Witwatersrand.




FIG.3.4

Ethnic Status

Johannesburg

Source: Hart., T., 1973, Factorial Ecology of Johannesburg, 1960, University of Witwatersrand.

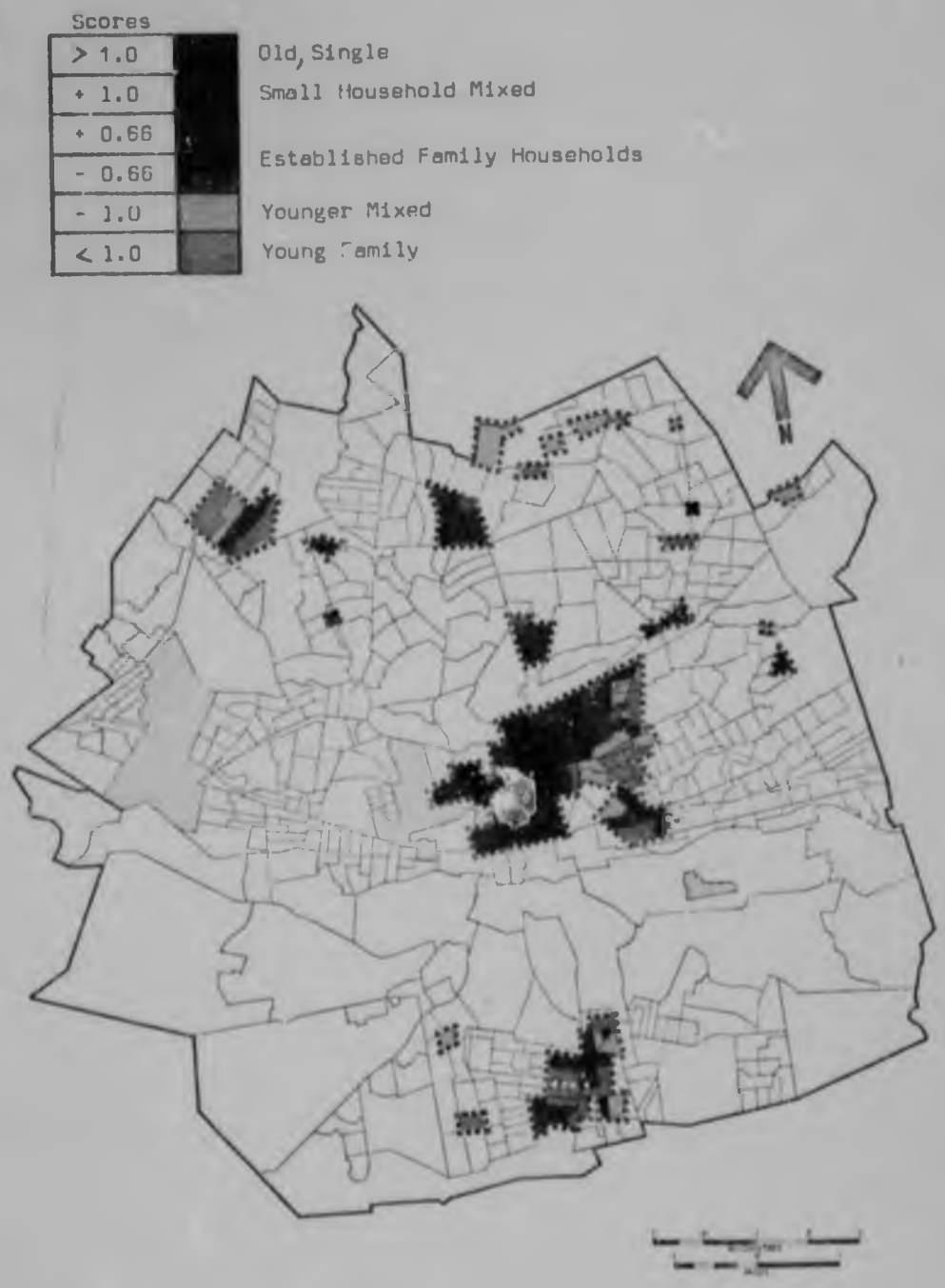



FIG.3.5

Factor 1: Stage in the Life Cycle - Apartments.
(After Rees, P.H., 1968, "The Factorial Ecology of Metropolition Chicago, University of Chicago).

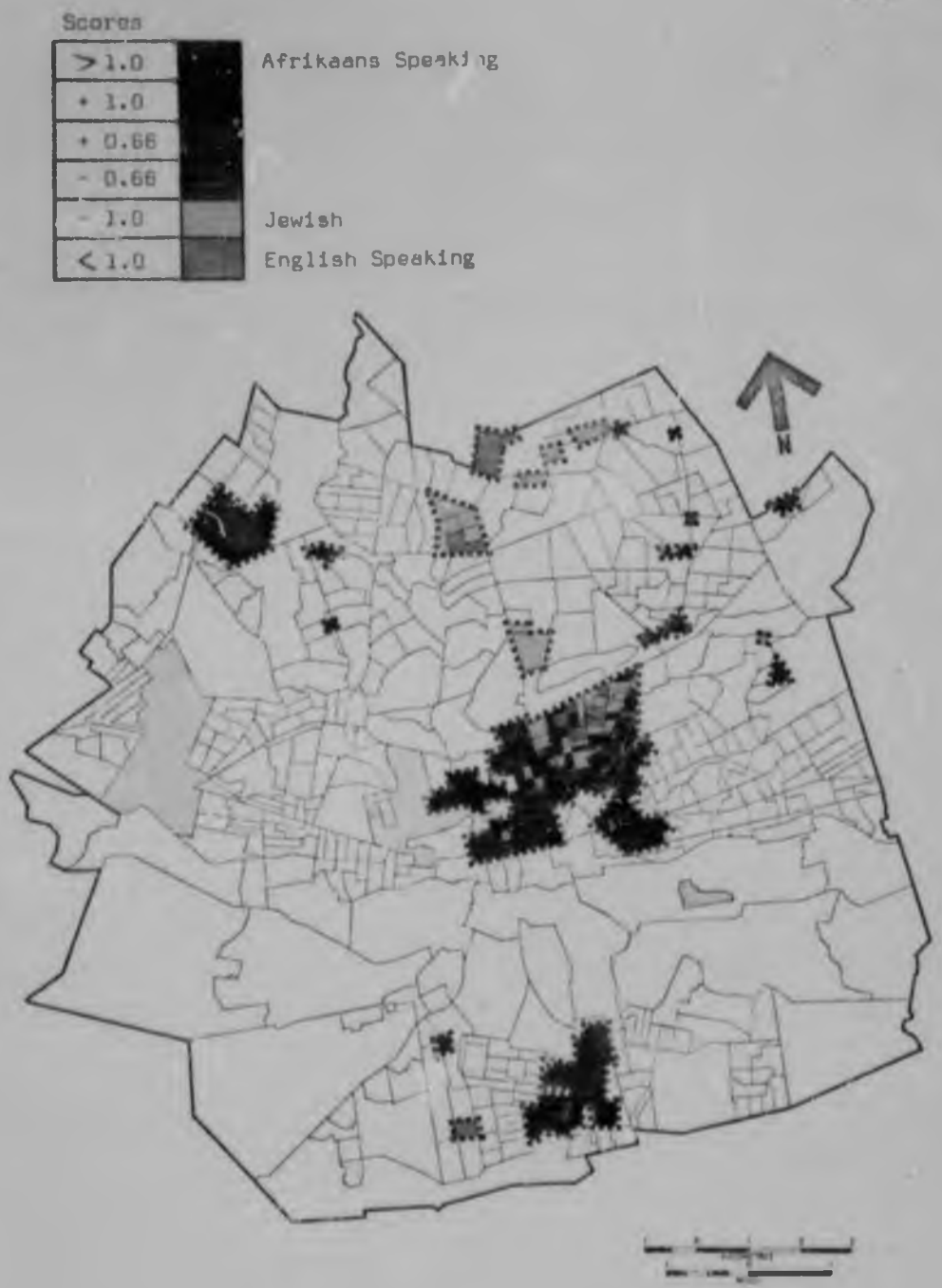



FIG.3.6

Factor 2: Socio-Cultural Status - Apartments

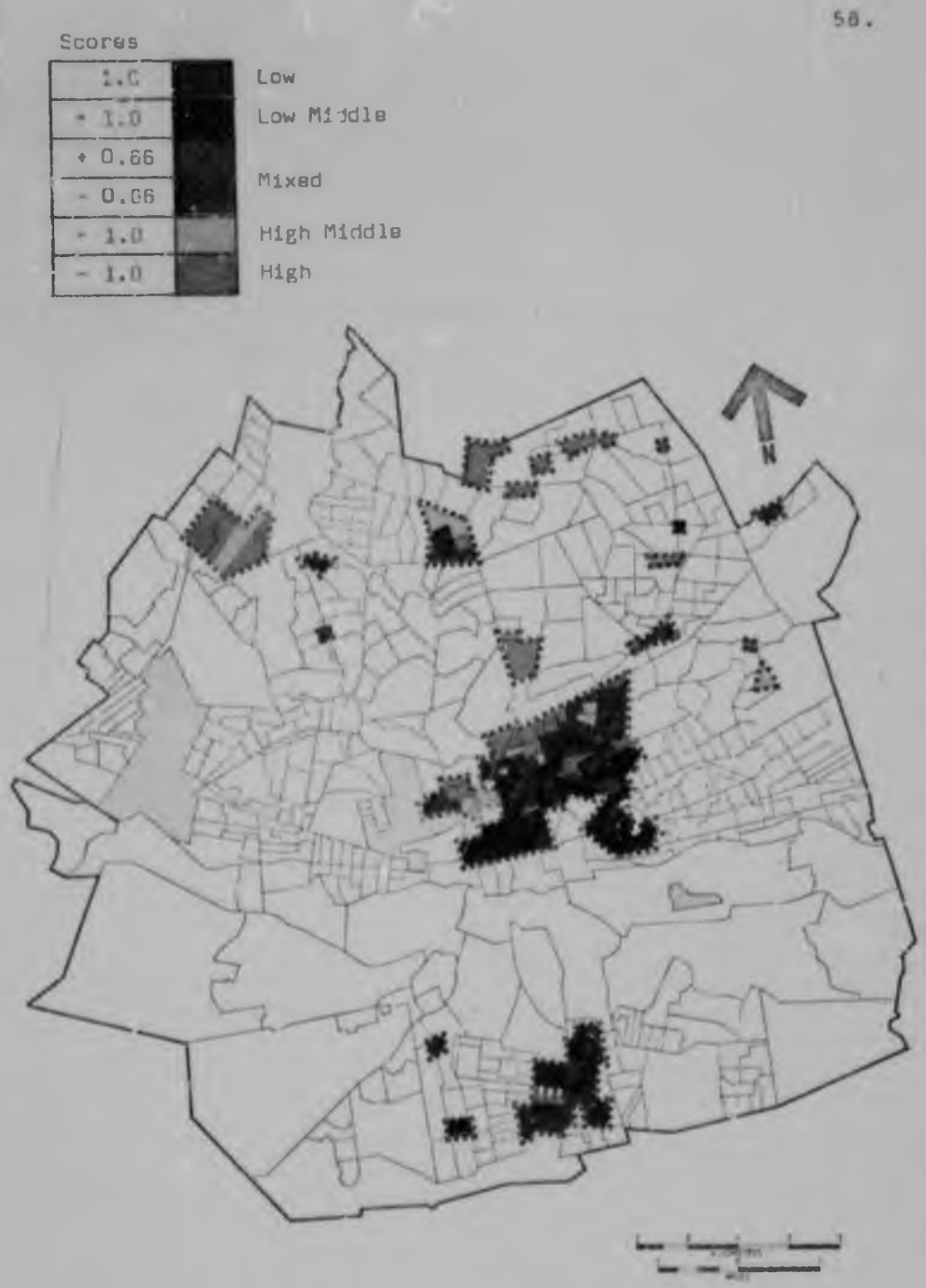



FIG.3.7

Factor 3: Socio-Economic Status - Apartments

(After Rees, P.H., 1968, "The Factorial Ecology of Metropolition Chicago, University of Chicago).




FIG.3.8

Factor 4: Single Elderly Factor - Apartments




FIG.3.8

Factors 5, 6, 7. Ethnic Status - Apartments

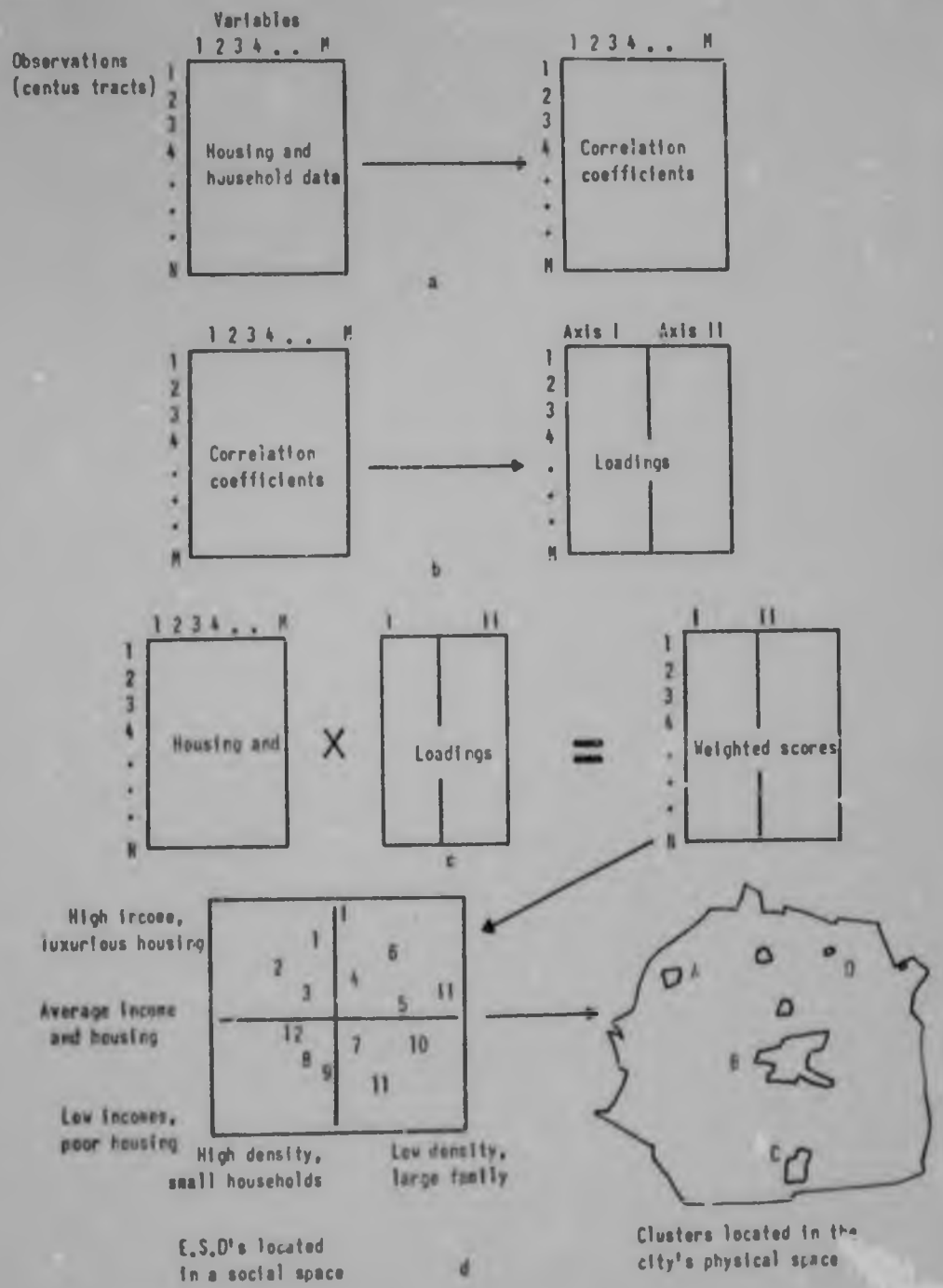



FIG.3.10

Reduction of d ta matrix to position of E.S.D. in Social Space

(Adapted from Abler, Adams & Gould, "Spatial Organization" 1971, Prentice Hall).

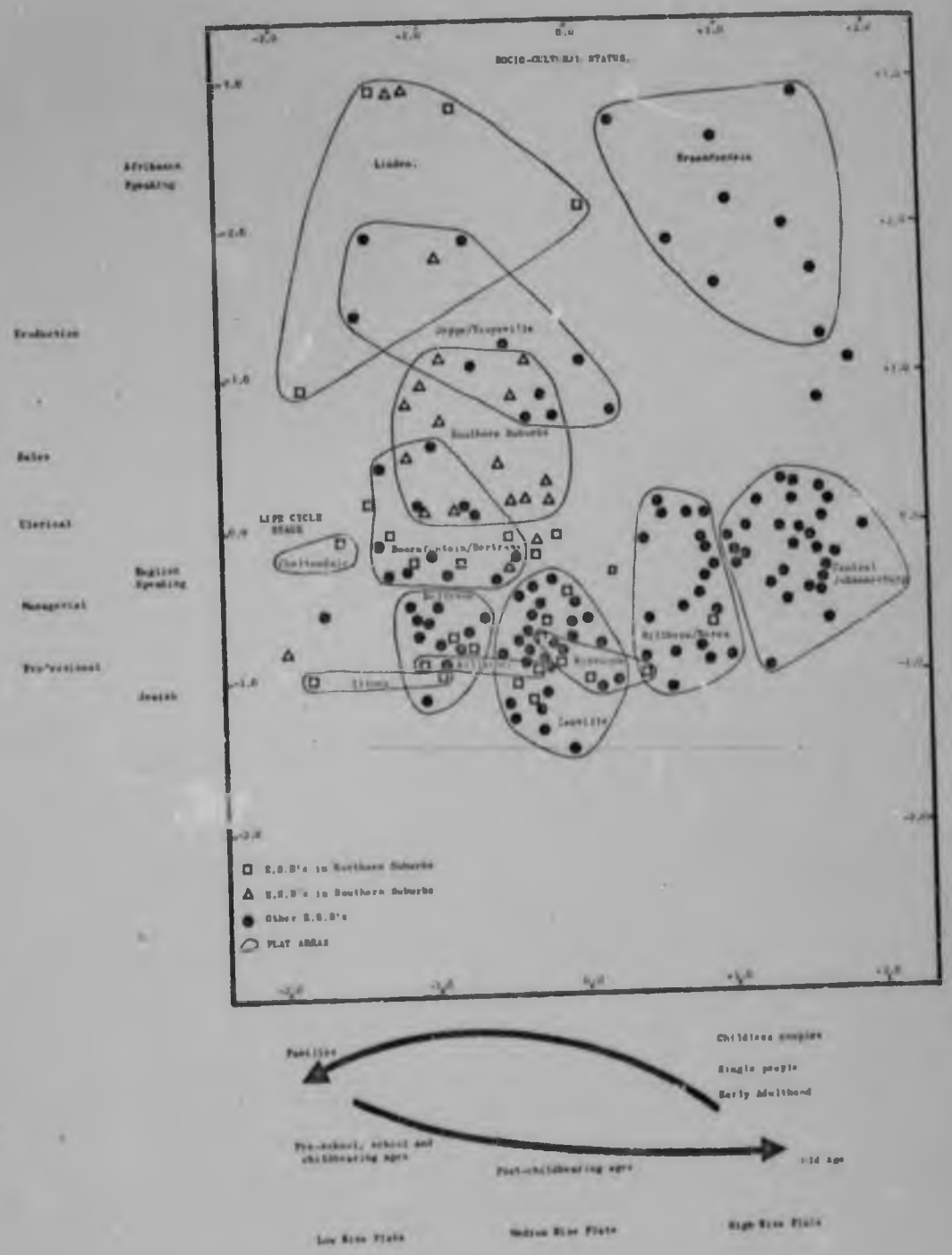



FIG.3.11

A Age-Cultural Space of two dimensions.

(Adapted from Abler, Adams & Gould, "Spatial Organization" 1971, Prentice Hall).



FIG.3.12

Apartment Age Cultural Spaces

Each group is located in physical space.

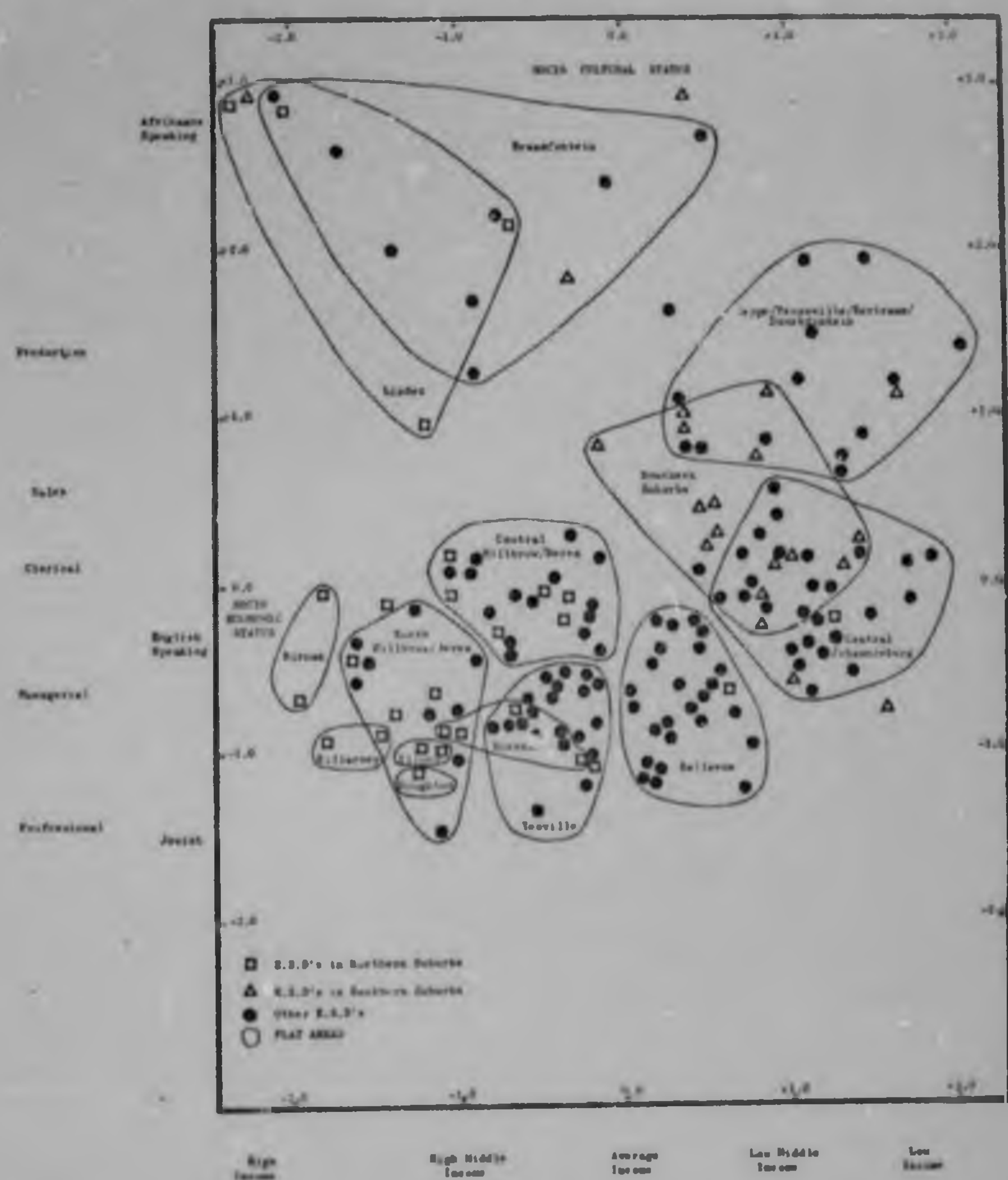



FIG.3.13

A Cultural-Socio-Economic Space of two dimensions.
Each ESD occupies a position inside the "social space"

(Adapted from Abler, Adams & Gould, "Spatial Organization", 1971 Prentice Hall).




FIG.3.14

Apartment Clutural-Socio-Economic Space

Each group is located in physical space.

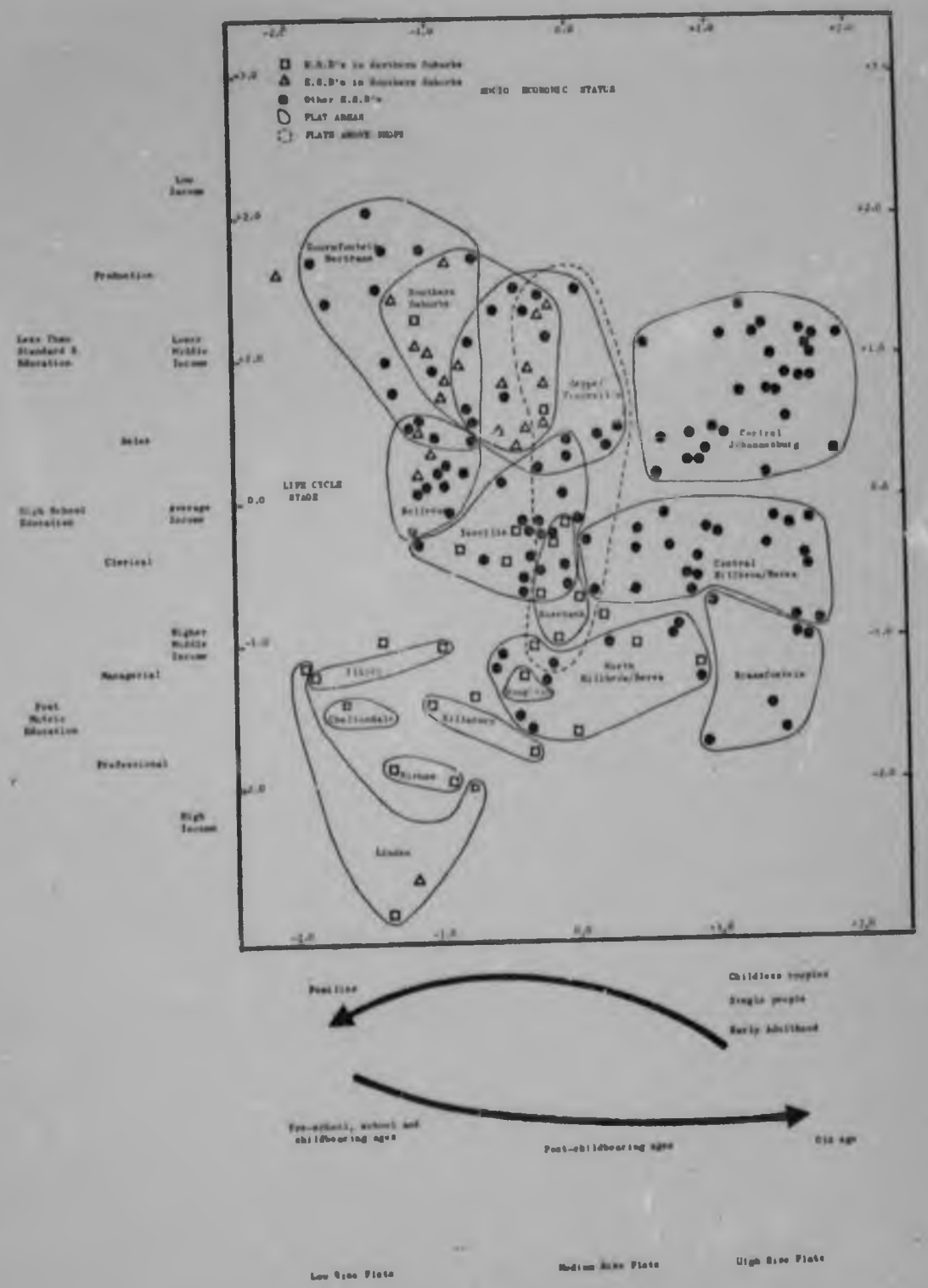



FIG.3.15

A Life Style-Socio-Economic Space of two dimensions.
Each ESD occupies a position inside the 'social space'

(Adapted from Abler, Adams & Gould, "Spatial Organization", 1971 Prentice Hall).




FIG.3.18

Apartment Life Cycle-Socio-Economic Space

Each group is located in physical space.

## 4. EXPLANATION OF THE SPATIAL STRUCTURE OF APARTMENT AREAS

In order to provide an explanatory base to understand the present locational settings and the characteristics of apartment areas in the city, as outlined in the previous chapter, it is necessary to outline those aspects which account for and explain the observed structure of apartments in the context of the city as a whole.

The historical development of the city will be outlined in order to pin-point trends and directions of growth, the age of neighbourhoods, and changes which have occurred to date. The influences of physical features, both natural and man-made, are also dealt with in that they have affected the evolution of the city. The effect of National policy forces and statutory planning considerations have in turn influenced the evolution of the city and have provided a unique structure to the city, which in turn has had an effect on the spatial and social structure of apartment development.

The concepts, theories and processes of urban growth, form and change are dealt with in general terms in order to provide a conceptual framework to understand the urban residential pattern as a whole, and the nature of apartment development in particular.

Having provided the necessary empirical and theoretical background, it is then possible to proceed to synthesise these with the observed structure of apartments in particular and to consequently outline the dynamics of apartment development.

### 4.1. Evolution of the Existing Spatial Structure: Johannesburg.

A brief history of the evolution of the developed city will be discussed - giving emphasis to the development of apartments with changing land-use patterns, in order to understand the present characteristics of apartment development. This history will include the modification to the city form with growth, particularly with the extensions that changes in transport systems have made possible.

The discovery of gold in 1886 was followed by a

rush of people to the gold fields of the Witwatersrand. While privately organized camps were established to house these people, the unsanitary conditions prevailing forced the Transvaal Republican Government to establish a village in some "Uitval" ground, bounded by Commissioner Street, West and Diagonal Street, and End Street. The village laid out on the southern portion of the site, together with the privately-owned townships adjacent to it, became known as Johannesburg.

The growth development and land-use changes in Johannesburg coincided with the growth of its mining, industrial and commercial activities. (See Figs. 4.1 4.2 and 4.3).

The townships which comprised Johannesburg pre 1900, include Johannesburg (1887), Jeppestown (1889), Fordsburg (1888), 1 .rfontein (1890), Mayfair (1897), and Newlands 1(1896).

In this period the town's growth rate was rapidly accelerated as a result of a boom due to the development of the cyanide process and deep level mining operations.

The generalized functional zones of this early period reflects both the scale and early rush of development. The main shopping street (Pritchard Street) connected Von Brandis and Market squares, and was situated at the heart of the fashionable suburbs in the east of the town, while the commercial area was located, for reasons of accessibility, around the Stock Exchange in Commissioner Street. Dwelling units as single family houses, dominated in the northern and north-eastern section of the town, as well as in the suburbs mentioned. But it is the elite who occupied the neighbourhoods immediately adjacent to the shopping and commercial areas, and the lower classes who were organized in small neighbourhoods elsewhere. By 1900 the zone of houses around the core areas, particularly in the north-west and south-west, retreated in the face of growth of

central functions; and redevelopment took place. While most of the housing remained houses; some multi-family dwelling occurred on the fringe of the shopping core and of the office zone, and especially into the Joubert Park area (which resulted from one of the first routes across the railway) in a response to the encouragement for high intensity uses because of accessibility. The mining activities attracted workers to the area east and west of the original settlements, as well as to the southern suburbs of Rosettenville, Turffontein, Kenilworth and La Rochelle.

After an initial post Anglo-Boer War depression, there was a decade of steady development. The Johannesburg - Doornfontein concentration was the centre of development, while the area north of the Berea ridge developed at a phenomenal rate. The upper-income groups moved out of the centre and tended to occupy the higher, better aspected ground of Doornfontein, Parktown and upper Houghton; while the middle and lower classes built their houses below. After WWI there was further expansion and reconstruction, particularly with further growth to the north with the availability of larger stands that attracted the higher income groups.

The period of the twenties was one of slow consolidation generally, as a result of the 1922 Strike and the World Depression retarding development. It was during the 1920's that apartment development became a trend in the centre of Johannesburg and in the Hillbrow complex. Note that these apartment areas were not established as such, but started off as normal residential townships designed for dwelling houses.

The 1930's began with the great economic collapse, but once South Africa left the gold standard (1933), Johannesburg experienced one of its greatest booms and the city's growth rate suddenly accelerated.

The expansion of non-residential uses in the central areas put increasing pressure on the residential area, which retreated; but to a large extent was replaced with the more intense apartment development in the northern and eastern fringe. Concurrent with the increase in higher buildings, came an improvement in transport technology. Improved passenger transport is generally more expensive and thus favoured the upper income groups who could escape to suburban areas where low-density living is encouraged. This resulted in the upper-income groups occupying the outer zones; the lower class the suburbs along the railway route, and adjacent to the mining ground, and industry; with the middle class pinched in between.

The general resultant pattern marked a change in the residential structure, with the high-income groups living in the outer zones and the development of apartments taking place primarily in the older inner sub..bs. Between 1931 and 1940 approximately 10 400 apartment units were built in Hillbrow, Berea and Johannesburg. (C.E.D., 1970). The preparation of the town-planning scheme in the 1930's created zoning conditions that allowed for apartment concentrations in Berea, Yeoville, and Bellevue, as well as the entire southern suburbs. No real demand for apartments existed in the southern suburbs, and only isolated buildings were developed; however, some apartment concentration occurred in the older suburbs of La Rochelle, Rosettenville and Kenilworth, especially around the existing shopping areas and good transport routes.

After WW.II the Transvaal secondary industry came into being, which resulted in continued urban growth. Expansion outward was further encouraged by continued technological development, and the growth of commercial enterprises which led to further outward movement of elite living space. Also, new living styles necessitated a demand for new dwellings as existing homes become obsolete; in mainly the

outer zones, but also in the central apartment areas. The movement outwards of the elite groups initiated a filtering process within the high-status sector with a consequent decreasing status towards the city centre.

Rising incomes and an increasing middle-class, together with improved transport facilities encouraged the outward spread. This, together with the effects of the War, meant that a smaller number of apartments were built between 1941-1950 viz. 5 000 units in Hillbrow and Johannesburg.

Building boom conditions were once again experienced in the 1951-1960 period. Further outward sprawl occurred, but an increase in apartment development took place. Residential facilities retreated, geographically, to the north-east sector of the central area, but had increased in density. Between 1951 to 1960 the construction of apartment buildings increased and began to penetrate into Berea, Yeoville, and Bellevue, which were adjacent to Hillbrow and Johannesburg, to the extent that 12 700 apartment units were built there during the period. In addition, a new trend had begun in older outer suburban areas, particularly those on good transport routes, with extensive apartment development taking place on the periphery of the municipal area. These apartment areas have low densities and the apartment buildings are being built in attractive garden surroundings.

Because the early development followed the mining activities to the east and west along the line of the Reef, and reinforced and encouraged by the easy accessibility of the railway line, the city's older suburbs are located on this axis. But the northward thrust of population growth became evident from the earliest years due to the wealthier citizens building their homes in the north, which in turn attracted the majority of the city's white collar workers. Also new communication routes

northwards supported this movement, especially the main route to Pretoria and the northern Transvaal, via Louis Botha Avenue. The development northwards, and the filtering process operating on the north adjacent to the core, encouraged the inner suburban apartment areas in that direction, while the older adjacent suburbs underwent a slow renewal as a result of obsolescence. Simultaneously, the suburban apartment areas were strongest in the north, especially those at junctions of the good north-south arterial roads and radial routes; as well as those occurring in conjunction with good shopping facilities.

The implications of this history for present purposes rests in the establishment of the basic pattern of land uses and changes, especially for apartment development. Discernible relationships between development patterns, development axes, centres of growth, transportation orientations and quality distinctions between neighbourhoods are quite apparent. There is also a measure of consistency in the areas where pressure for change and new developments are taking place.

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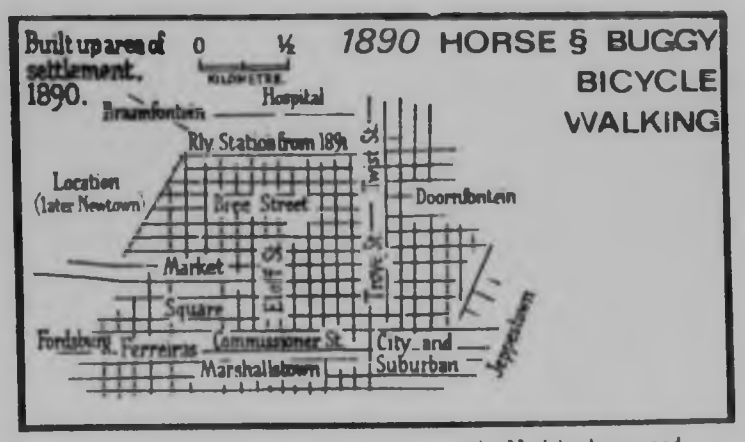
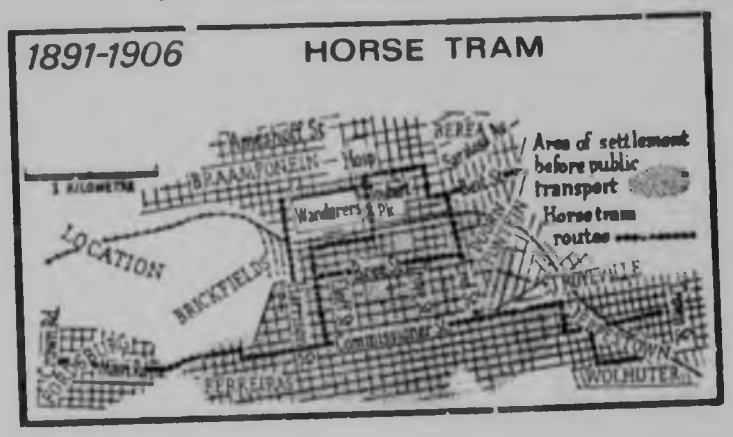



FIG. 4.1 The limit of development controlled by horse and by the horse-drawn tram, 1890-1906.



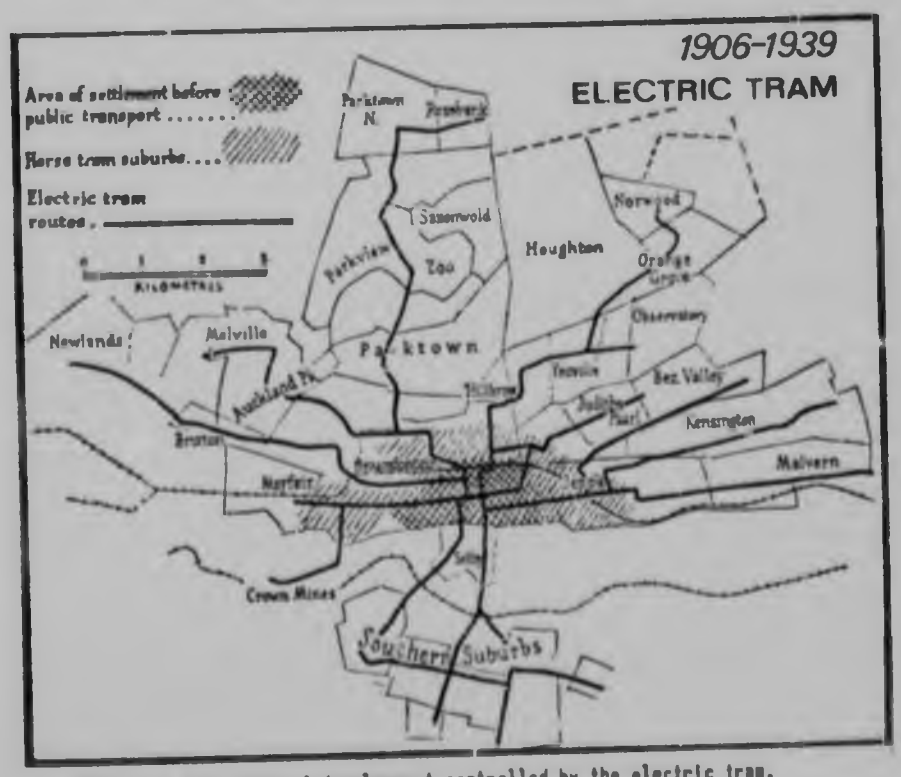




FIG.4.2 The limit of development controlled by the electric tram, 1906-1939.

(Source: G.M.T. Hart, from the RAND DAILY MAIL 1970)

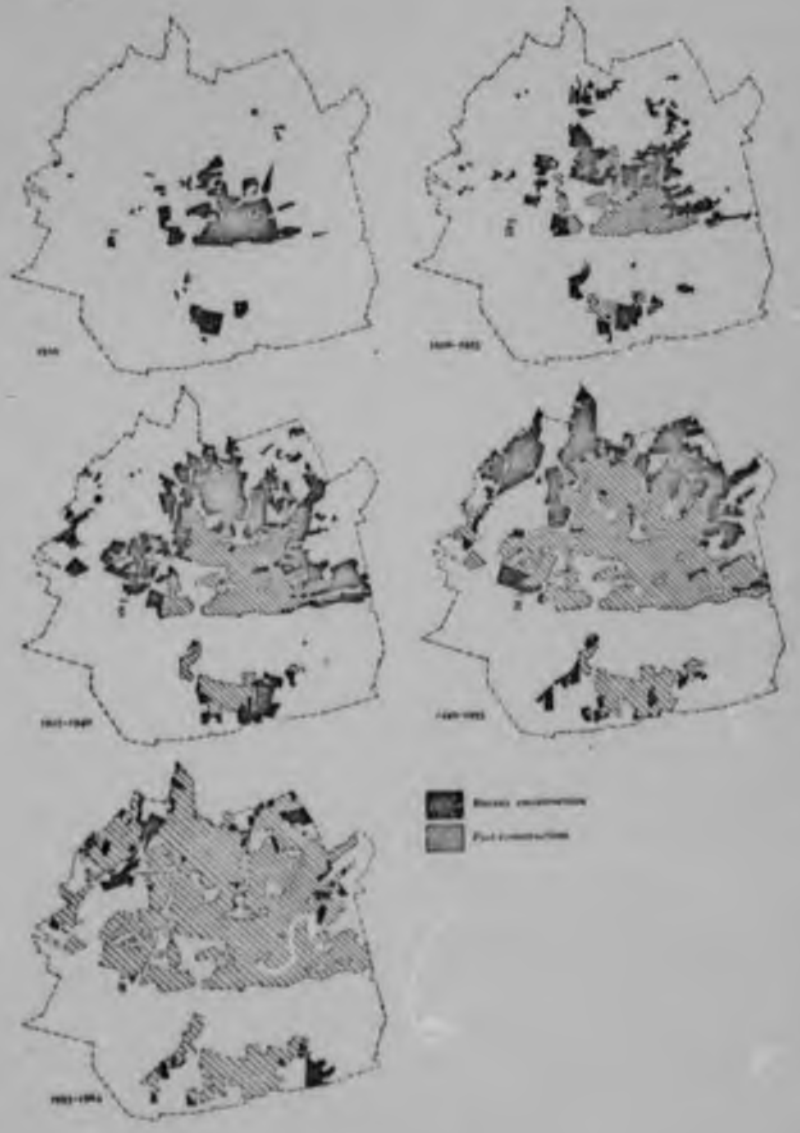


FIG.4.3

Johannesburg Organic Growth

(Source: G.H.T. Hart, from Johannesburg City Council)

## 4.2 Locational Influences of Physical Features

Topographically, Johannesburg is located on a major watershed. (See Fig. 4.4). This ridge runs east - west and lies slightly to the north of the central area, whereupon it falls suddenly to the north with relatively few access routes down to the northern suburbs. The northern suburbs consist mainly of a series of North - south valleys and ridges. The valleys are, by and large, occupied by private and public open space; the crests of the ridge have been utilized by the major arterial routes; and the valley sides have been developed for residential purposes. For the most part, the northern suburbs have northerly sun-oriented aspects. The centre of the city and the older suburbs are located above the ridge which falls gently southwards towards the mining ground. (Fig 4.5).

The incidence of restraints on development and change, result from both natural and man-made barriers. The relative strength of such constraints depend on the size and amount of the barrier. The natural restraints are those resulting from the topography and which influence the possible locations of roads, railways and residential development in particular. It has been implicitly mentioned, in the previous section, that the gold-bearing reef runs east-west, and while this encouraged the location of working class homes adjacent to it, it also led to the reservation of large tracts of mining land. The reef outcrop running to the immediate south of the central area, restricted development because of the height limitation to buildings as well as the requiring of land to the south of it for mine workings, especially for the use of mine dumps. This tract of land effectively cut off the southern suburbs from the heart of the city and prevented both zonal invasion and outward sprawl. This supported the trend to expansion northwards.

≈ Contours at 100 feet (30 metre) intervals



FIG.4.4

Topography




FIG.4.5

Principal Land Use and Transportation System

The railway lines were laid out parallel to the mining ground and industry associated and linked to both, have grown up running both east and west alongside these developments. This too, has encouraged development and redevelopment to take place in a northerly direction and has prohibited, until recent urban renewal schemes, residential development, albeit high rise apartment development, to the east and west of the central area. With relatively level land to the south, east and west of the central area, but steeply rising land to the north, non-residential CBD expansion has not moved north, consequently leaving it free for residential use.

Figs. 4.4 and 4.5 displays the topographic, the mining ground restricted use land, the major arterials major north orientated aspects, and the disposition of the apartment areas. The apartment areas are, for the most part, clearly on favourably aspected sites and with good accessibility to places of work in particular.

The road system of Johannesburg converges, in a radial manner, from all parts of the city onto the central area, but in the outer suburbs this becomes a fairly extensive grid with cross town connections. There is a hierarchy of roads with different functions, which serve to connect all activity areas in a system which consists, in general principals, of a primary network comprising the major arterial and principal roads and a local network of access and service roads. By and large, public transport systems operate on this system and terminii have located the major shopping centres and also consequent apartment development. The railway system operates in a linear manner to bring people from the suburbs adjacent to it and from the East and West Rand, but there is no relationship between this form of transport and any apartment areas - possibly due to the greater time element involved in its use.

## 4.3 Policy and Planning Considerations

### National and Regional Influences

In the introduction to the study it was mentioned that the decisions of politicians (at all levels of government) and the prevailing political climate can affect the process of growth and change. In South Africa, the policies of white-dominated minority governments has had a profound influence on development as a whole. The diverse racial,cultural and economic differences in the population has now evolved into a set of particular social atittudes and the political policies of the government. J.D. Macrone calls apartheid "a radical policy that breaks with laissez faire policies which would lead inevitably to increasing interdependence of the various racial groups in the country". (Macrone, 1970). Basic to apartheid legislation is the classification of the population into racial categories, particularly between white and non-White, and the legislation, clearly and absolutely, between the rights of these two groups.

The policy of apartheid was, in the main, drawn up to arrest the trend of the migration of the African population to the towns. The Government's rejection of a multi-racial community for South Africa, entails not only a territorial division of the country into a "white" state and independent Bantu states, but the clear division of towns and cities into separate white and non-white entities. This interference into the market economy influences processes of development. As far as this study is concerned, only the legislation which affects competition for employment between people and residential segregation will be considered.

In terms of the Group Areas Act of 1950, "Group Areas" are proclaimed for occupation and/or ownership by particular race groups. In the cities this means that segregated residential townships have been set

aside for the non-white groups. As far as Johannesburg is concerned, these areas, which house the lowest economic class of unskilled and semi-skilled workers, are located beyond the periphery of the municipal boundary (some miles away). The consequence of this action is that the process of housing filtering does not continue down through to the lowest-income groups, with the result that no real blighted areas develop, and faster 'recapture" for redevelopment in these inner areas is possible. Also, it means that the large low-income sector of the population is effectively removed from influencing the structural pattern of the city, and consequently reduced the number of sectors and masks the real pattern and size of the scity.

Although colour-bar legislation had existed for some time, Jobs Reservation legislation was introduced in 1956, which reserves specified types of work for workers of particular racial groups. This legislation reserves most skilled jobs for whites and hampers the abilities of manufacturing industry to increase by reducing the labour force pool (Van der Horst, 1971). This restriction on the development of further industry promotes the relative percentage proportion of people involved in the business and financial industrial section. This in turn means that a large percentage of the work force in "white" Johannesburg are white collar workers, where jobs are largely located in the central area and are consequently orientated towards this as a major place of work. Because there are no real blighted areas adjacent to the city centre, apartment areas, which are attractive, can be built close to the centre.

Associated with Jobs Reservation are the measures controlling the entry of Africans to the cities known as "Influx Control". These measures have also served to control the development of the

manufacturing industries by preventing an increase in the labour force from entering the system in general, so that its effect on employment patterns is to orient it towards the white collar central city occupations.

With the Physical Planning and Utilization of Resources Act of 1967, the Government has, by controlling the number of Africans who can be employed in the manufacturing industry, by controlling the further development of new industries and expansion of existing industries, and by attempting to decentralize industries, thrown the emphasis of development on to the non-manufacturing sector. This in turn, has also influenced the demand for housing near the major place of work, viz., the central area, particularly for the people who are "career" or "consumer" orientated (Johnson, 1971, p30.) in their life styles, i.e. the young, single people in early adulthood, young childless couples and the elderly people.

Metropolitan Region Influences.

Johannesburg is the centre of the "core region" of South Africa, and as such has a very strong attraction for those immigrants and in-migrants who seek the "better" life. As a result of the choice of greater opportunity available, particularly for better paid employment opportunities, Johannesburg acts as a focus for the sections of the populations able and prepared to start a new life, i.e. predominantly the young single people in early adulthood and young couples striving for upward social mobility.

This is the population in the 0-19, 20-24, and 25-29 year old age groups. The population in these age groups, for Johannesburg, indicate not only an absolute increase, but also a relative proportional increase, as well as indicating a "bulge" in the population pyramid when compared to the country as a whole; which in turn shows that their age groups

is on the increase as seen in Table 4.1. This also is the population with household characteristics that tend, initially, to favour apartment living - as they are initially "career" and "consumer" orientated in their life styles.

Population Change : Age Groups TABLE 4.1.

| WHITES | SOUTH AFRICA 1960 | | 1970 | | JOHANNESBURG 1960 | | 1970 | |
|---|---|---|---|---|---|---|---|---|
| Age Group | | % | | % | | % | | % |
| 0-4 | 352 539 | 11,4 | 383 800 | 10,34 | 43 102 | 10,5 | 46 050 | 4,7 |
| 5-9 | 327 948 | 10,6 | 376 640 | 10,4 | 38 732 | 9,4 | 43 380 | 9,2 |
| 10-14 | 314 869 | 10,2 | 379 250 | 10,2 | 37 434 | 9,1 | 40 910 | 8,6 |
| 15-19 | 272 010 | 8,8 | 340 160 | 9,1 | 33 511 | 8,1 | 37 615 | 7,8 |
| 20-24 | 234 237 | 7,6 | 318 260 | 8,5 | 33 086 | 8,0 | 44 250 | 9,3 |
| 25-29 | 206 519 | 6,7 | 288 420 | 7,7 | 29 290 | 7,1 | 42 950 | 9,1 |
| 30-34 | 205 345 | 6,7 | 254 920 | 6,8 | 29 104 | 7,1 | 35 500 | 7,5 |
| 35-39 | 196 653 | 6,4 | 226 950 | 6,1 | 28 383 | 6,9 | 30 880 | 6,5 |
| 40-44 | 286 344 | 6,0 | 209 920 | 5,6 | 26 870 | 6,5 | 27 360 | 5,8 |
| 45-49 | 185 720 | 6,0 | 201 090 | 5,4 | 28 753 | 7,0 | 272 240 | 5,7 |
| 50-54 | 168 653 | 5,5 | 176 540 | 4,7 | 25 998 | 6,3 | 243 320 | 5,1 |
| 55-59 | 122 717 | 4,0 | 311 530 | 8,4 | 18 211 | 4,4 | 42 580 | 9,0 |
| 60-64 | 95 698 | 3,1 | | | 13 416 | 3,3 | | |
| 65-69 | 765 535 | 2,5 | 162 920 | 4,4 | 16 744 | 4,1 | 21 060 | 4,4 |
| 70-74 | 57 393 | 1,9 | | | | | | |
| 75-79 | | | | | | | | |
| 80-84 | 72 970 | 2,4 | 86 080 | 2,3 | 8 905 | 2,2 | 9 850 | 2,1 |
| 85-89 | | | | | | | | |
| 90 • | | | | | | | | |
| TOTAL | 3 080 159 | | 3 726 540 | | 411 695 | | 47 350 | |

The general population trend is the source of different housing preferences. With increasing population growth, is a concommitant population concentration. The interlocking and interacting forces of increased transport technology, greater affluence, and increasingly higher living standards, have encouraged a

strong trend towards ownership of individual homes and fenced in gardens that also allow escape from the more congested parts of the city. For most family households in Johannesburg, the detached home in the suburbs is the ultimate housing aim and preference.

Apartment development is seen as fulfilling the role of housing for those households in a transitional and temporary stage, viz. (1) young single people young childless couples, and (2) elderly people. Thus it is clearly seen that the role of apartment development is housing an increasing and stable market that stems from major economic and social trends in the population of the metro region. But families with children carry particularly heavy weight in population totals and it is this group that shows a strong preference for the homes with gardens in the suburbs.

Land Use Control

Control over land-use, and consequently over the physical environment is effected, in the main, through the provisions of Town Planning Schemes administered by the local authority and under the overall control of the Administrator of the Province, through the Provincial Department of Planning. The Town Planning Scheme is a formal and legal enactment and its provisions must be abided by and enforced. There are other controls that operate to control the nature of development, such as Title Deed restrictions, and Building and Health by-laws, but these are not as restrictive as the Townplanning Scheme, in terms of determining the precise form and intensity of development.

The framework for the built environment is controlled by the Town Planning Scheme insofar that it sets the parameters within which development can take place.

These parameters, that appertain to the development of apartment buildings as well, include, inter alia:-

1) Use Zoning
2) Height Control
3) Site Coverage
4) Density of development (or permissible bulk or floor area).
5) Building Lines and Servitudes
6) Provision of parking facilities.

It is worth noting that the latter two parameters, modify the previous parameters.

The basic control over land use is Use Zoning, which defines the use to which buildings erected on a site can be put. For the purposes of this study, only those zoned areas which allow apartment buildings to be constructed will be considered.

"General Residential" zoning permits all types of residential buildings to be erected and implies multi-dwelling as well as multi-storey buildings. Both "General Business" and "General Area" zoning permits the erection of residential buildings, either as single-use entities or as residential development over/or in conjunction with shops and/or offices. Fig. 4.5 indicates the extent of the areas that allow for the development of apartments. These areas have been dealt with in defining the study area.

The height clauses of the Johannesburg Town Planning Scheme (Clause 23) can constrict the physical height of the building above the ground level and can affect the floor space permitted on the site. The city has been divided into five zones for residential purposes and are indicated in Fig.4.5, and are outlined in Table 4.2.

Height Zones

Table 4.2

| Height Zone No. | Height of Building in no of story. |
|---|---|
| 1 | Width of Street (erg ft) $\times\frac{11}{14}$ |
| 2 | Width of Street (erg ft) $\times\frac{11}{14}-1$ |
| 3 | 4 |
| 4 | 3 |
| 5 | 2 |

The consequence of these controls are that in the Central Area where Height Zones 1 and 2 apply, the height of buildings in these zones is determined by the widths of abutting streets and a line drawn from the opposite boundary of the street at an angle of $59^{o}$ to the horizontal. These zones, because of bonus systems (based on keeping a constant floor area but with creating open space and buildings set backs) permit buildings (including apartment blocks) to exceed upwards of 15 storeys.

In the Height Zone 3 "General Residential" areas which include the periphery of the Central Area and Killarney, Height is controlled to four and six storeys respectively.

Height Zone 4 is only applicable to Industrial Areas. Height Zone 5, which applies to all "Special Residential" (single family homes) areas and "General Residential" areas further from the city centre, permits a height of 3 storeys.

The control of coverage of the site (Clause 24 (a)) of the Town Planning Scheme) is determined by both the respective Height Zone and Actual height of the buildings. This Coverage in the Five Height Zones is seen in Table 4.3.

Coverage Controls — Table 4.3

| Height Zone No. | Height of Building | % Coverage | | |
|---|---|---|---|---|
| | | 1 street frontage | 2 strs. | 3 strs |
| 1 and 2 | 30 ft | 80% | 85% | 87½% |
| | 30-60 ft. Over 60ft | min.free space | 500 sq. ft. | |
| 3 | 4 | 60% | | |
| 4 | 3 | 50% | | |
| 5 | i.e. 2 | 50% | | |
| | 3 | 40% | | |

The percentage site coverage can be seen to reduce outwards from the city centre, as does height, so that suburban apartment areas are specified to be lower in density, and to be developed within more spacious facilities.

Density of development or the permitted floor area (built) does not explicitly exist in the Town Planning Scheme, but is controlled in terms of the height and coverage conditions.

The use of building lines which are non-existent in central Johannesburg, minimal in the inner-suburban apartment areas, and fairly extensive in the northern suburban apartment areas, are a feature which controls the positioning of buildings. This determines the privacy of and amenity of the apartments and thus, once again, the suburban apartment blocks can be seen to have more advantageous controls in respect of their inhabitants. Similarly, the condition for providing car spaces on site (or within buildings) is a control that tends to favour the larger suburban sites, and which by its inclusion creates a physical environment with sufficient off-street parking that is attractive to particular population groups.

The structure of Johannesburg as a whole, and the distribution and character of the apartment areas reflect the influences of the historical development of the city, topography and policy considerations.

The older suburbs at the centre of the city have undergone redevelopment in the form of business use in the centre and apartment construction in most of the inner suburbs. The main direction of movement has been to the north along the north facing north-south valleys and ridges. Apartment areas have developed in the main, by means of redevelopment, in the inner suburbs to the north of the C.B.D., taking advantage of the more desirable north-facing slopes. Suburban apartment areas have developed.

due to planning policies, at nodes (usually having been tram or bus terminii); along major arterial routes; and at the periphery of the municipal area where they had formally taken advantage of the open tracts of land.

The character of all the apartment concentrations have been largely determined by planning policy, but in many cases specific demands and tastes have been met, and as a result even lower densities and more open space has been provided than that specified in the Town Planning Scheme. In general though, with increasing distance from the city, apartment concentrations are developed with both lower heights, lower coverages and consequently lower and more preferable densities.

It is worthwhile reiterating that the National policy of "Apartheid" and the various Acts that support it, have given the structure of Johannesburg, in particular the inner areas, a unique aspect when compared to most West European and North American cities, which have all had similar processes and forces influencing their growth and form.

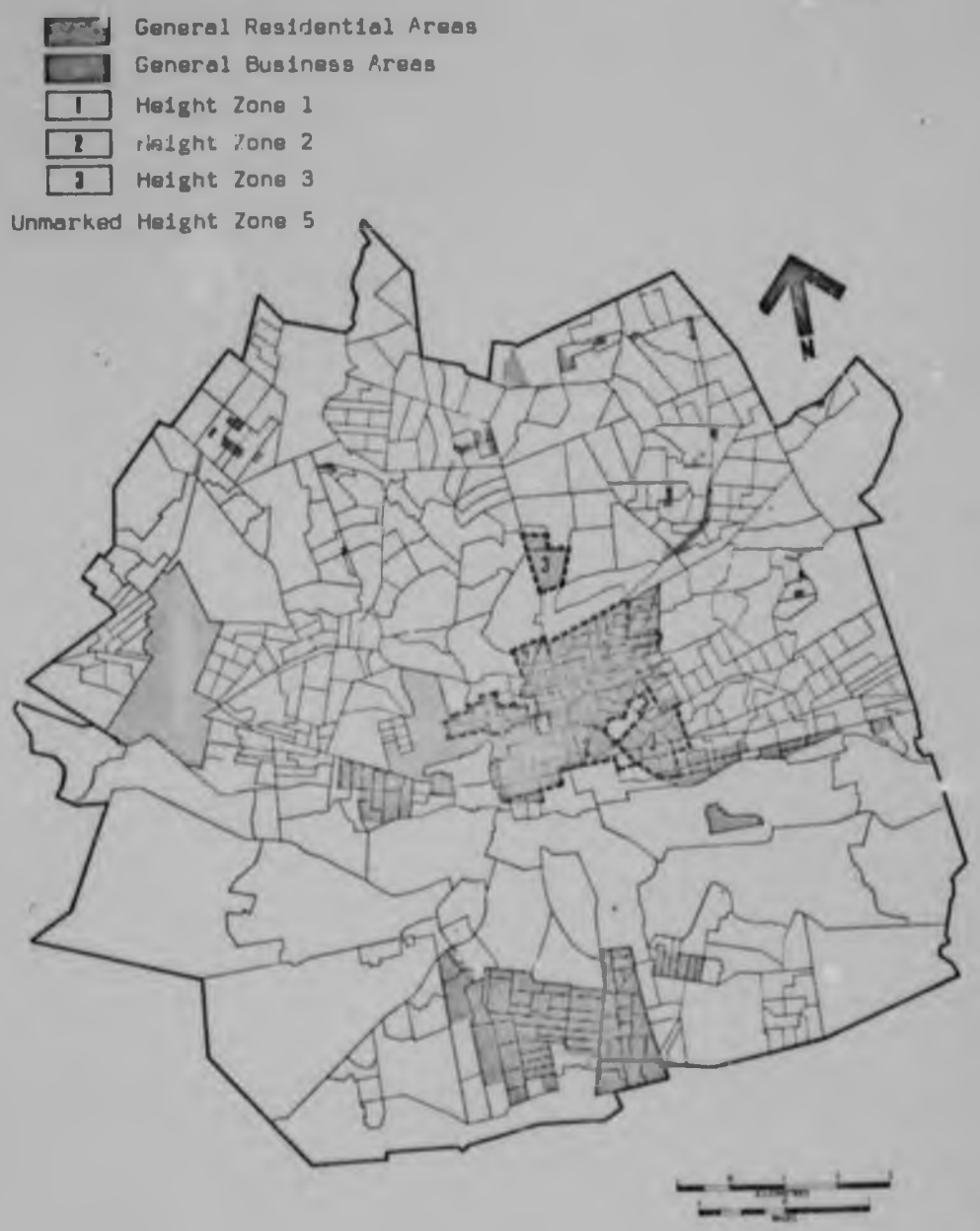



FIG.4.6

Land Use Zones and Height Zoning

## 4.4 Processes and Concepts or Urban Growth: General Considerations

The study up until this stage has presented the physical and social structure of apartment development in terms of the total urban form, as well as the physical and policy restraints on its growth. It is now necessary to attempt to account for and explain how and why this structure of the city (and of apartment development in particular) has taken place. This analysis is necessary not only to fully understand the present structure, but in order to anticipate and plan for change within and beyond it.

The major theories of urban growth and form accounts for the familiar characteristics and patterns in cities. It is necessary to bear in mind that the form of the city has had in the past, and will have in future, certain processes that permeate its growth. It is difficult to derive a single growth theory (or conceptual model) which can account for all phenomena in the development of a city, but the operation of several spatial-ecological processes can be observed in all. Several concepts, and models, all adding to the understanding of the nature of the city are outlined. (See Appendix D for a more detailed outline).

The basic theories and models of urban growth and form, rest on the operations of several urban ecological processes. The traditional list of ecological growth processes that give rise to urban form are outlined in Chapin to be: concentration, centralization, decentralization, segregation, invasion and succession (Chapin 1964, p.114). The structure and form of the urban area is the result of the interaction of these processes, as land uses, functions, institutions and population groups in the urban area compete to fulfil and maximize their requirements.

Implicit in these processes, as a sub-system of competitions, is a housing market, which is expressed in terms of consumption of housing, locations, rent paid and quality of housing. (Alonso, 1960).

From the operation of these forces, a spatial pattern emerges that shows a strong focus on the city centre with a decline in intensity from the centre. The variation of housing prices and land rentals within the city affects the distributions of population through their consumption and production of housing, with the result that higher-income households tend to locate at further distances from the CBD to buy newer and better housing, at the cost of the journey to work.

The ecological processes of urban growth as well as the structural theory of the land economists have implied that as a city develops, typical patterns of differentiation become apparent, as different areas become associated with particular types of population and as certain systematic relationships between geographical and "social space" appear. Several conceptual models have been advanced to account for these familiar and typical characteristics. These models of urban form are: the zonal, the sectoral and the multiple nuclei. Each of these models implies differentiation of the population vis-a-vis their residential location.

The zonal Hypothesis of Burgess which outlines principal land-use patterns implies that the movement of people, in terms of the ecological processes, from one residence to another as the city grows creates zones of successively better residential areas occurring outwards from the city centre.

Hoyt's sectoral hypothesis accounts for the spatial pattern of the city's residential areas being distributed in a sectoral fashion in wedges of similar economic groups radiating outward from the city and being determined by the choice of those who could afford the highest rents as they pre-empt the best land.

The multiple nuclei model is useful in that it accounts for the development of discrete nuclei (consisting of a concentration of any principal land-use) in the city, where like or related activities group together for mutual advantage, i.e. industrial and combined with decentralized shopping areas.

Implied in the processes at work and concepts of urban form, is that change in time affects the urban form because of the ageing and obsolesence of buildings and consequently of whole neighbourhoods. The mechanism by which the character of a residential area changes in terms of population is called "filtering" whereby populations of lower-income groups move to areas abandoned by groups of higher-income populations. But the replacement of obsolescent buildings then forces the low-income population out. This continual process of the shifting patterns of residential areas can be schematically described in the concept of cycles of structural change. The evolution of a neighbourhood (or area) is seen as progressing through six stages of residential development, and concommitant population types and densities, (Birch, 1971) from a rural stage, through first wave developments, a fully developed high quality residential stage, a stage of overcrowding and packing, followed by thinning, and finally of rec[illegible] with more intense redevelopment. (Hoover & Vernon, 1962). This interpretation of the evolution of neighbourhoods is relevant to the redevelopment of the inner areas (and older areas) of a city as apartment areas. The geographical pattern of ageing indicates that the older neighbourhoods are concentrated in the inner city suburbs and consequently the central areas and inner suburbs have seem most cycles of change. Each cycle of change implies a more intense development than the

one before, so that the form of development changes from single dwelling houses, through successive stages of redevelopment of apartments from low- to high-rise. Further, the filtering process that operates simultaneously means that the wealthier population move outwards and are replaced in these redeveloped areas by those whose life styles are more suitable to the new development, particularly those who do not have large households and have relatively large incomes.

The ecological view of the city postulates a process of group competition and mobility that produces the spatial structuring of the city's population. An alternate and complementary view of the process producing the structuring may be proposed to include the behaviour of individuals and institutions in making decisions of where to live. These behavioural decisions revolve around individual characteristics such as income and stage in the life cycle, which implies life style preferences. These characteristics affect housing demands in terms of price, type of home and type of community found attractive.

The affect of income is fundamental, and has been dealt with in the spatial models as the residential location decision is clearly a product of the interaction of the house needed and afforded.

The construction of concepts of life-style and its concommitant, the family life cycle, is to provide a context within which the behaviour of particular population groups can be evaluated with their choice of housing. This difference of choice patterns is suggested by Bell (Johnston 1971, p.30) to offer 3 broad life styles.

1) Familism, in which child rearing is the dominant feature and centre of the household pattern;
2) Career.ism in which the household members are mainly oriented towards the goal of vertical

social mobility and;

3) Consumerism, in which members opt for the good life.

While these three are not mutually exclusive (and most households have a combination) the priority given to anyone accounts for residential mobility, the duration of residence, distance and location from place of work in relation to the life style. That is, family centred households prefer single-family dwellings in the suburbs, while career- and consumer oriented households are likely to choose living in rented flats. Also, within the familism choice of life-style, there are a number of sub-choices depending on the stage in the life cycle and certain of these stages can be similar to those of the other major choices.

Differences in life style and position in the family cycle acts to produce residential separation of households because of the variations in the type of accommodation required.

Differences in life style are also affected by social and economic factors, to the extent that homogeneous population types tend to segregate themselves. Thus, Social Area Analysis used a further approach to determine linkages between social structural and locational spaces in the city. The constructs of social area analysis rests on the basis that any social systems can be assessed in terms of "economic status", "family status" and "ethnic status". By interrelating the concepts of social space and the classical notions of physical space, it is possible to provide a coherent and logical frame of reference to identify the differentiation of the urban structure. This set of constructs and concepts are the basis for the approach undertaken by factorial ecology.

Factorial Ecology is a descriptive model of the ecological structure of the city and its inherent

change, and takes into account social area analysis and the three classic models that complement one another; each describing a separate aspect of social differentiation within the city. Homogeneous districts are recognised by socio-economic, ethnic and family characteristics which take the form of zones and sectors. The patterns that result are that socio-economic status is primarily sectoral. Family status is primarily zonal; and that ethnic status also tends to be sectoral although it has aspects of zonality. Within each sector, therefore, there is a zonal factor of life cycle. This is a simple model, which is then distorted by the distribution of ethnic grouping and the attraction of secondary workplaces.

The character of these identified "Social Areas" in turn influence the housing choice of occupants.

## 4.5 Synthesis: The Dynamics of Apartment Development

### Defining the Basic Concepts

From the ecological processes (which include the interacting of land uses, functions, institutions and the characteristics and tastes of population groups) and the general spatial models (which are derived from the interaction of those processes) discussed, the relationships between the physical and social ecology of the city and apartment development is by no means clear. Reference to apartments (as high density, multi-dwelling units) is only implicit. The process of replacement by apartment blocks in older areas tends to be ignored, as is its direction of growth, overall location, and also the ecology of apartment development. This leaves a gap in urban form theory, especially with the distribution of apartments within the urban areas becoming fairly widespread. Given the emphasis on the differentiation of residential areas into homogeneous "social areas" and the processes of invasion and succession, and filtering, due to the emphasis placed on age and obsolescence, the development of

apartments and their ecological settings should be the concommitant with the differentiation of the city's residential areas, and the spatial pattern should be readily apparent.

We can expect a progression of new apartment development outward from the city centre following the original pattern of growth which relates the tendency for new apartments to concentrate near the city centre, and to the age and obsolescence of the structures that are replaced in the process. This type of apartment development occurs in response to the processes of concentration, centralization and segregation of activities.

On the other hand, the ecological concepts and constructs suggest that with the continuing outward sprawl of the city, good transportation facilities, and the physical and social structuring of the city according to socio-economic status and stage in the life cycle (and its concommitant life style) it will necessitate a demand for suburban development in the context of the zones and sectors hypothesized.

Here, the process at work is primarily decentralization and is related to the concept of multiple nuclei, with apartment areas developing where they have good accessibility (i.e. on good transport routes), mutual advantages in clustering, and where they are only able to afford lower rental areas in order to redevelop at densities not as high as in the inner city. Apartments are not necessarily a decentralized activity only, but also occur spontaneously in response to new tastes and demands as the suburbs mature and the old and the young require this facility.

Furthermore, the nature of most apartment areas is that apartment blocks have replaced older dwellings by replacement. As a growth process, development and redevelopment may be thought of as a spatial continuum (Bourne, 1968, p.40), extending from re-

development in the central areas of the city and specific nuclei to new development on the suburban fringe. In this context central and suburban growth become part of the same process as they are merely a choice between alternatives. It has already been maintained that neighbourhoods can be seen to go through cycles of development; and it is in this context that suburban apartment areas must be seen to possess the potentiality for further filtering of population and change of intensity of use, with a concommitant effect on the population type attracted to it.

The overriding feature of urban structural growth in almost all of the work discussed is accessibility, in some zones it is to the exclusion of all other factors. The notion of accessibility has, to some extent, changed, but it is always valid with accent now on time and not only distance. Evidence suggests that apartment construction does tend to occur in areas with a relative access advantage related to both place of work and particular amenities.

In summary, it appears that the basic processes and patterns can be summarized by the following dynamics which explain the results of the factor analysis.

1. There will be a zonal distinction between the family-oriented suburban apartments areas (mainly young and mature families) and career- and consumer orientated households of central and inner suburban apartment areas, and this will be reflected also in population densities.
2. While life style choice is open to all groups, these zonal patterns will reflect particular socio economic status groups.
3. Within the high socio-economic status sector in particular, apartment development reflects a further zonal and sectoral differentiation of this segment of society according to age

and stage in the family life cycle.

4. Also the population structure of apartment areas will change over the time due to the ageing of the population; changing relative income, and rental levels where redevelopment means higher rentals (and only older apartments have rent control) and changing needs and tastes.
5. The non-familism zone of apartments expands outwards, producing further differentiation of apartment areas for different population groups. (After Johnston, 1971).

The Nature of Apartment Development.

Apartments, by and large, have two distinctive criteria: they are usually high density construction and they represent rental accommodation. Rental accommodation generally allows for greater and easier mobility, because of not being a fixed asset to the inhabitants, generally lower housing costs, built-in convenience, and high accessibility because of either central locations or proximity to transport systems (Bourne 1971, p.325).

Among the factors that account for increasing apartment development, are the rising cost of land, which is augmented by an insufficient supply of reasonably priced land, making it difficult to construct anything other but high density buildings; and on the demand side the changes in family income, family size and age structure, and changing housing and locational preferences, have all combined to alter the market for new housing. Each of these changes in demand and supply is reflected by a shift in the type of residential space provided toward high density rental accommodation.

As primarily rental units catering to small families and non-family households, and consuming less land per unit than more traditional residential areas, apartments, because of their rent paying ability are able to compete for almost all locations, and are not confined to the immediate proximity of

the city centre, although for historical reasons the higher relative concentration remain there. Apartment developers can though, afford to pay a premium for sites that reduce travel time and costs between residence and place of work. Apartment development in central locations encounter high land costs, demolition costs and lost income from existing buildings during new construction, which are not faced in suburban development, so that central area apartment blocks are by necessity high-rise and relatively high rent, while suburbs apartments blocks tend to be low-rise and more spacious with more amenities.

The factors that influence apartment development location according to Bourne are: (1) the distribution and composition of the existing housing, (2) Accessibility to the city centre, to employment opportunities, and to mass transit and expressway facilities, (3) existing clusters of apartment developments and existing directions of growth (4) the immediate physical and social environment (5) the cost and availability of land, and (6) the quality and cost of local services. (Bourne, 1968, p.328). To this extent the nature of apartment development differs in character and type between central area and suburbs. These factors are found to be applicable to the findings of this study as well.

Apartments are, to a large extent, spatially clustered and the reasons are largely ecological, depending on their locations within the city. While the apartment areas of the inner city is within a non-family zone within the city, the apartment areas are to some extent clustered in sections, with a tendency towards locations in higher-income areas. This trend has also been noted by Bourne for the city of Toronto. (Johnston 1971, p.215).

Bourne suggests that this clustered pattern results from a type of chain reaction produced by the operation of factors at two levels. "At the macro-scale there was a general areal demand for apartments related to physical and socio-economic environment and to accessibility within the urban area; at the micro level specific site factors allocated redevelopment among the areas of existing demand according not only to land availability but also the ability to deal with zoning regulations". (Johnston 1971, p.2115).

Apartment development is concentrated into a few areas and reflects the control of zoning on the location of urban land, as well as the tendency for new apartment development to follow existing land use concentrations and previous directions of growth.

At this point it is necessary to draw a distinction between two types of apartment development. First, apartment development may take the form of redevelopment, viz. in the older, central areas; or, secondly, new development on vacant land on the suburban periphery. Also, the relative mix of location factors, changes, since developed urban environments exert a profound effect on the potential for any site to attract new investment. The environment or neighbourhood is also relevant in a new suburban area, but it is not an overriding effect deriving from established physical and social patterns. Suburban areas generally offer newer, more pleasant, and more socially uniform environments, as alternatives to the obvious advantages of centrality. Although apartment development has spread into the suburbs, the high relative concentrations remain in the city and inner suburbs, but it is important to note that high density apartment development is evolving a pattern away from traditional patterns.

Within the higher socio-economic status sectors of the city the six stage evolutionary sequence can

be noted (as these factors interrelate), while in lower socio-economic districts the areas appear to have passed directly from the building up to the downgrading stages.

In assessing the nature of development in suburban apartment areas, Neutze argues that the determinants are a combination of changing demographic structure (an increasing proportion of households - old and young - without children) and rising real incomes which allow the relative freedom of renting rather than purchasing. (Neutze 1960). This point has already been mentioned and pointed out in relation to Johannesburg, especially as this is predisposed to the higher-income sector.

While factorial ecology studies (including this sub-market) indicate life style choice to be independent of socio-economic status, apartment dwellers are not necessarily of all income and occupational groups and certain life styles are apparently restricted to certain socio-economic status groups and their desired dwelling types are similarly restricted. Apartment dwellers are largely unattached individuals or couples without children, and they are, in the main, high income white collar workers who are generally mobile.

Conclusions

It is now possible to return to the apartment clusters identified in the study and explain the complex factors leading to their differentiation, as well as indicating their inherent potential for change.

The Apartment areas of Johannesburg exhibit clusters that are differentiated from each other by both population characteristics and form of development that reflect topographic features, age of neighbourhood, development controls, distance from the CBD (which is the main place of employment), and the historical effect and momentum of the main direction of growth for the city which has been to

the north.

Inner Suburban Apartment Clusters in the High Socio-Economic Status Sector

Those apartment clusters in the suburbs of Central Johannesburg, Hillbrow, Berea, Yeoville, and Bellevue, by being in the higher-income sector have been susceptible to change, and are consequently in different and advanced stages of evolution. Central Johannesburg and Hillbrow are already undergoing the stage of recapture (i.e. the sixth stage in the hypothesized model of Birch); while Berea, Yeoville and Bellevue, are in stages of a fully developed high quality residential stage, and stages of First Wave redevelopments respectively. These stages also reflect density of development, which to a large extent are reproduced and controlled by the development controls imposed. Thus, central Johannesburg, Hillbrow, and Central Berea have high densities which decrease towards the periphery of this part of the inner suburban apartment complex. The zoning controls, especially the Height zoning (which affects density) differentiates between the higher densities more attractive to the single persons, childless couples and the elderly; while medium densities on the periphery in Yeoville and Bellevue reflect the preference of mixed family groups and small families. These better aspected clusters also tend to house the more affluent inner suburban apartment dwellers.

Inner Suburban Apartment Clusters in the Low Socio-Economic Status Sectors

For the most part, the southern edge of the Berea ridge acts as a boundary between the better aspected north-facing slope, (Being more attractive to the relatively higher status population who preempt it), and the less favoured south-facing slopes which houses the relatively lower-status communities. This distribution is further emphasized by the fact that these areas along the south-facing slopes are

also the older areas of Doornfontein, Bertrams, Troyeville and Jeppe. Because these suburbs were not in the high status northward-moving section and do not have favourable slopes, they have not evolved through as many structural stages, and have as a consequence more run-down dwellings and encourage low-income groups (predominantly immigrant family groups) to filter in. Thus this is the adverse situation to the previously mentioned groups of inner suburban apartment clusters. It is these older suburbs with older apartments and sub-quality environments that tend to house the lower status households who concommitantly have larger families.

Suburban Apartment Clusters

Distance from the CBD, affects apartment dwellers preferences. The income differences of the various population groups have the following effect. The slightly better paid populations tend to favour the slightly larger apartments at lower densities away from the noise and congestion of the high-rise development. Generally, the higher income group comprises the slightly older and more established and mature families; whereas the young and elderly groups who inhabit the high-density areas tend to have relatively lower incomes.

Northern Suburbs Apartment Clusters

The apartment areas in the northern suburban areas have developed, in the main, in the higher socio-economic sector, thus reflecting that populations general social and physical mobility. These areas have developed adjacant to or near to major transport arteries to facilitate good access, as well as locating near large tracts of open space, which give actual or perceptual amenity. By and large, these apartment clusters occur on north-facing slopes to take advantage of the sun and views.

Within the high-income sector the locations of apartment concentrations have tended to be mainly on the municipal periphery (i.e. Linden, Illovo,

Waverley, Sandringham, etc.); adjacent to open space reserves (i.e. Killarney, Cheltondale, Houghton, etc.); or at the confluence of arterials or at other congregation nodes (i.e. Rosebank, Norwood, Killarney, Orange Grove, etc.).

Simultaneously, those areas reflect the differing tastes, preferences and mobility of the high socio-economic status groups in the population; and this in turn is related to sub-cultural life styles, family and household size and age factors. The larger families tend to be in the peripheral apartment clusters, while smaller but more established and older households tend to locate in the apartment clusters in the "middle" suburbs. Once again, household needs are reflected by low densities with family groups and medium densities in the middle suburbs. Most of the needs of the larger apartment areas that are better provided with amenities.

Killarney, Illovo, Rosebank and Houghton reflect the high income groups of the surrounding areas, besides the fact that this group tends to comprise the older established mature households. Those apartment areas on the edge of the high income sector, viz. Linden, Gresswold, Sandringham, Cheltondale, and Rouxville, reflect a population comprising the younger and relatively less affluent family households, which are also somewhat larger.

Southern Suburbs Apartment Concentration

The apartment clusters in the Southern Suburbs, are located in the low- to medium-income sector, and as a result are very similar in characteristics to the off-the-centre northern suburbs apartment clusters, in that they house the lower-income, young and larrish family households. Also, the Southern Suburbs are old residential suburbs undergoing first wave redevelopment, but include some older apartment blocks as well. This stage of redevelopment in this particular sector tends to be slow and small in scale. However, because of the income groups being catered

for, these apartment concentration while being low to medium rise, also tend to be less spacious in setting and in size of individual apartments.

Summary

It is quite clear, therefore, that the high density apartment areas of central Johannesburg and portions of the inner suburbs are only attractive to those households who have the appropriate life styles, i.e. "consumerism" and "careerism"; and include the single persons in early adulthood, childless couples and the older small households which have completed the child launching stage. The suburban apartment areas cater, by and large, for those populations which have a "familism" life style and demand more and better amenities. It is of interest that Killarney is to some extent an anomally in that it is a suburban apartment cluster catering for the mature marrieds and the elderly, which could be explained by the fact that it caters to the wealthiest segment of the population likely to live in an apartment, but it is of note that at the same time it is also one of the closest suburban apartment areas to those of Hillbrow and Berea.

Having established the structure and nature of apartment development and its potential for change, it is possible to proceed to the analysis of the community facilities and services that are appropriate to the population types housed in these areas.

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## 5. A COMPARATIVE ANALYSIS OF APARTMENT AREAS - 1960

The previous section (Part 4) has established and identified the apartment clusters by distinguishing between and among them in the general terms as outlined by the factors deduced in the factor analysis. It is now possible to proceed to analyze them, between and within themselves, in greater depth. This analysis is concerned only with those characteristics (or variables) that will have a direct bearing on the later analysis dealing with the form of apartment development and the interrelation between population characteristics and environmental facilities, in order to assess how apartment areas should be planned in terms of what relevant facilities should be included. In this way the planning implications of apartment development can be assessed.

### 5.1 Populatic Characteristics

While the factors of the factor analysis program allow for the total ecological structure to be ascertained in terms of a compilation of variables, it is now necessary to look at the individual variables (for whole clusters) for their use in ascertaining the quantity of the various facilities according to each relevant characteristic.

Thus, the distinction between clusters in terms of Ethnicity, Education, Occupation mix and Income, etc., will be largely ignored. Those population characteristics necessary to analyze the residential environment and the needs of the population include: - Age Structure, Sex, Household Size, Marital Status and Population density; as well as the distribution of dwelling unit sizes.

#### Age Structure

Table 5.1 indicates in absolute numbers and percentages the composition of the population in each apartment cluster to be analyzed. In general terms, it is seen that there are small percentages and absolute numbers of pre-school and primary school children in apartment areas. Of specific interest, and not unexpected, is the very low proportion of

teenagers, which corresponds to the gap in the middle married age groups - these population groups housing themselves in detached homes. Young single people and young marrieds do not make up as large a proportion of apartment dwellers as is normally expected - being represented in approximately the same proportion as for the city as a whole. It is the older single persons, mature marrieds and the elderly who dominate, both in absolute numbers, and percentage-wise, for apartments as a whole.

In dealing with the clusters individually, it becomes apparent that there are some clear distinctions between them.

Linden is dominantly an area of married persons, made up of the young married, middle married, and mature married families, and consequently has a high proportion of young children.

Rosebank, Houghton and Killarney, cater predominantly for the mature marrieds and the elderly; and possess a small number of young children.

Illovo and Birnam have a more even spread of the different married groups, of which the majority are mature marrieds.

Cheltondale is essentially a young married area, with a correspondingly high percentage of young children.

Jeppe/Troyeville, Doornfontein/Bertrams and Bellevue consist predominantly of young-marrieds and mature-marrieds with a high percentage of children.

Yeoville is a community with a similar proportion of young marrieds and mature marrieds, but with a low number of young children and an increase in the number of elderly people - acting as an area of transition between the high-rise young- single people dominated area and the small family areas.

North Hillbrow and Berea and Central Hillbrow and Berea have high percentages of the young marrieds, mature marrieds, and the elderly; with the young single having a higher proportion in Central Hillbrow.

TABLE 5.1 — POPULATION COMPOSITION

| APARTMENT AREA | | Infants 0 - 4 | Primary School 5 - 12 | High School 13 - 17 | Single 18 - 24 | Single 25 - 54 | Young Married 18 - 34 | Middle Married 35 - 44 | Mature Married 45 - 64 | Elderly 65+ | TOTAL | FEMALES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Linden | No | 95 | 93 | 50 | 29 | 21 | 278 | 109 | 101 | 38 | 814 | 451 |
| | % | 11.7 | 11.4 | 6.1 | 3.5 | 2.6 | 34.2 | 13.4 | 12.4 | 4.7 | | 55.5 |
| Rosebank | No | 39 | 49 | 42 | 62 | 100 | 138 | 121 | 357 | 111 | 132 | 898 |
| | % | 5.4 | 4.3 | 3.7 | 5.5 | 8.8 | 12.2 | 10.7 | 31.5 | 19.0 | | 61.7 |
| Houghton | No | 10 | 8 | 9 | 5 | 19 | 19 | 19 | 119 | 59 | 267 | 142 |
| | % | 3.7 | 3.0 | 3.4 | 1.9 | 7.1 | 7.1 | 7.1 | 44.5 | 22.0 | | 53.1 |
| Killarney | No | 71 | 83 | 90 | 97 | 128 | 188 | 152 | 871 | 427 | 1835 | 1013 |
| | % | 3.9 | 4.5 | 4.9 | 5.3 | 7.0 | 9.1 | 8.3 | 36.6 | 23.3 | | 55.2 |
| Illovo | No | 73 | 117 | 94 | 93 | 58 | 153 | 166 | 421 | 134 | 1308 | 700 |
| | % | 5.9 | 8.9 | 7.2 | 7.1 | 4.3 | 11.7 | 12.7 | 32.2 | 10.2 | | 53.5 |
| Bracley | No | 54 | 53 | 38 | 29 | 22 | 108 | 94 | 181 | 30 | 608 | 328 |
| | % | 8.9 | 8.7 | 6.3 | 4.8 | 3.6 | 17.8 | 15.5 | 29.8 | 4.9 | | 53.6 |
| Cheltondale | No | 40 | 34 | 19 | 26 | 8 | 77 | 48 | 82 | 13 | 327 | 169 |
| | % | 12.2 | 10.4 | 5.8 | 8.0 | 2.4 | 23.5 | 14.7 | 19.0 | 5.5 | | 51.7 |
| Joppe/Troyeville | No | 147 | 88 | 77 | 110 | 170 | 370 | 178 | 349 | 166 | 1484 | 894 |
| | % | 10.0 | 5.9 | 5.3 | 7.5 | 7.3 | 25.3 | 12.2 | 23.8 | 11.4 | | 60.3 |
| Observ./Bertrams | No | 407 | 270 | 198 | 215 | 155 | 748 | 381 | 820 | 201 | 3200 | 1684 |
| | % | 12.7 | 8.4 | 6.1 | 6.7 | 4.8 | 23.3 | 11.9 | 19.3 | 6.3 | | 52.6 |
| Bellevue | No | 375 | 245 | 148 | 34 | 138 | 785 | 369 | 538 | 180 | 2991 | 1565 |
| | % | 12.5 | 8.2 | 4.9 | 4.5 | 4.5 | 25.5 | 12.3 | 17.9 | 5.3 | | 52.3 |
| Yeoville | No | 887 | 472 | 387 | 80 | 447 | 1802 | 882 | 1182 | 583 | 7439 | 4012 |
| | % | 9.2 | 6.3 | 5.2 | 7.2 | 6.0 | 24.2 | 11.5 | 23.6 | 7.5 | | 53.9 |
| Parktown/N.Hillbrow N. Berea | No | 151 | 197 | 282 | 348 | 532 | 995 | 632 | 1528 | 556 | 5381 | 3111 |
| | % | 4.7 | 3.7 | 4.9 | 6.5 | 10.9 | 18.5 | 11.8 | 28.5 | 10.4 | | 58.0 |
| Central Hillbrow/ Berea | No | 715 | 480 | 400 | 1198 | 2334 | 4131 | 1501 | 3588 | 1438 | 14403 | 8125 |
| | % | 5.0 | 3.3 | 2.8 | 8.3 | 16.2 | 28.0 | 10.4 | 24.8 | 10.0 | | 56.4 |
| Central Joh. | No | 417 | 388 | 280 | 858 | 2381 | 1808 | 1486 | 3950 | 2391 | 14492 | 8115 |
| | % | 2.9 | 2.7 | 1.9 | 5.9 | 16.3 | 12.4 | 10.2 | 27.2 | 16.4 | | 55.5 |
| Braamfontein | No | 189 | 114 | 88 | 370 | 545 | 684 | 358 | 662 | 311 | 3329 | 1750 |
| | % | 5.6 | 3.4 | 2.6 | 11.1 | 16.4 | 20.6 | 10.8 | 19.9 | 9.3 | | 52.5 |
| Southdale | No | 68 | 55 | 24 | 24 | 12 | 211 | 78 | 58 | 10 | 450 | 232 |
| | % | 15.1 | 12.2 | 5.3 | 5.3 | 2.7 | 26.9 | 17.3 | 12.9 | 2.2 | | 51.5 |
| N. Turffontein | No | 16 | 34 | 18 | 13 | 5 | 27 | 38 | 44 | 4 | 197 | 101 |
| | % | 8.1 | 17.2 | 9.1 | 11.1 | 2.5 | 13.7 | 18.2 | 22.3 | 2.0 | | 51.3 |
| S.Suburbs | No | 431 | 300 | 220 | 237 | 169 | 1158 | 472 | 745 | 285 | 4007 | 2195 |
| | % | 10.8 | 7.5 | 5.5 | 5.9 | 4.2 | 28.9 | 11.8 | 18.5 | 7.1 | | 54.8 |
| Remaining Apartment Areas | No | 170 | 118 | 82 | 91 | 90 | 472 | 218 | 283 | 170 | 1815 | 1017 |
| | % | 9.4 | 6.5 | 4.5 | 5.0 | 5.0 | 26.0 | 12.0 | 21.1 | 9.4 | | 56.0 |
| TOTAL APARTMENTS | No. | 4256 | 3198 | 2524 | 4430 | 7292 | 21230 | 7266 | 17293 | 7170 | 86353 | |
| | % | 4.9 | 3.8 | 2.9 | 5.1 | 8.4 | 24.6 | 8.4 | 20.0 | 8.3 | | |
| JOHANNESBURG TOTAL | No | 37121 | 45467 | 32001 | 30650 | 19858 | 51408 | 44705 | 74397 | 25461 | 361168 | |
| | % | 10.3 | 12.6 | 8.9 | 8.5 | 5.5 | 14.2 | 12.4 | 20.6 | 7.0 | | |
| % APARTMENT DWELLERS WITHIN AGE GROUP | | 11.4 | 7.0 | 7.9 | 14.5 | 36.8 | 23.5 | 16.3 | 21.2 | 28.1 | 18.4 | |
| % OF JOHANNESBURG TOTAL | | 1.2 | 0.9 | 0.7 | 1.2 | 2.0 | 3.4 | 2.0 | 4.4 | 2.0 | 18.4 | |

There is a fair percentage of pre-school children, but low percentages of primary school children and teenagers. But despite low percentages the high densities mean large absolute numbers of population in each age group.

Central Johannesburg is clearly an area for the mature-marrieds, the elderly and the young single, as is Braamfontein. Southdale, West Turffontein and the Southern Suburbs apartment clusters are predominantly young married areas with large numbers of children and smaller proportions of teenagers and the elderly; but with not as large a gap as other apartment areas for the middle-marrieds.

For the most part, females are a large part of each apartment cluster population, being especially high where the elderly are a large proportion of the population.

Household Size

Table 5.2 expresses the distribution of household size, Mean Household size and density. With the exception of the areas where young marrieds with a large number of children dominate, the mean household sizes are far below those for Johannesburg as a whole. The suburban apartment areas have household sizes that average out at approximately 2.5 persons while the inner clusters of Hillbrow, Berea, Braamfontein and Johannesburg have even smaller household sizes.

The northern suburbs apartment areas are predominantly 2 and 3 person households, except for the clusters of the more elderly in Rosebank, Killarney and Houghton, where single person households are fairly extensive, as can be expected.

Illovo, Bramley and Cheltondale also exhibit fairly large percentages of 4 person households, which reflects the relatively larger numbers of middle- and mature-married families.

The two eastern complex apartment clusters of Jeppe and Bertrams are predominantly 2 and 3 person

TABLE 5.2 HOUSEHOLD SIZE

| APARTMENT AREA | | 1 | 2 | 3 | 4 | 5 | 6+ | Total House-Holds | Mean House-Hold Size |
|---|---|---|---|---|---|---|---|---|---|
| Linden | No | 29 | 93 | 86 | 53 | 15 | 6 | 292 | 2.86 |
| | % | 9.9 | 31.8 | 29.5 | 18.2 | 5.1 | 2.1 | | |
| Rosebank | No | 166 | 268 | 97 | 39 | 8 | 3 | 581 | 2.02 |
| | % | 28.5 | 46.1 | 16.7 | 6.7 | 1.4 | 0.5 | | |
| Houghton | No | 18 | 62 | 14 | 12 | 5 | | 111 | 2.49 |
| | % | 16.2 | 55.9 | 12.6 | 10.8 | 4.5 | 0.0 | | |
| Killarney | No | 179 | 390 | 176 | 73 | 25 | 5 | 848 | 2.39 |
| | % | 21.1 | 46.0 | 20.6 | 8.6 | 2.9 | 0.6 | | |
| Illovo | No | 58 | 188 | 132 | 91 | 31 | 8 | 508 | 2.75 |
| | % | 11.4 | 37.0 | 26.0 | 17.9 | 6.1 | 1.6 | | |
| Bramley | No | 29 | 86 | 60 | 47 | 15 | 3 | 240 | 2.75 |
| | % | 12.1 | 35.8 | 25.0 | 19.6 | 6.3 | 1.3 | | |
| Cheltondale | No | 1 | 31 | 34 | 24 | 14 | 3 | 107 | 3.27 |
| | % | 0.9 | 29.0 | 31.8 | 22.4 | 13.1 | 2.8 | | |
| Jeppe/ Troyeville | No | 101 | 171 | 137 | 63 | 25 | 20 | 501 | 2.65 |
| | % | 20.2 | 34.1 | 27.3 | 12.6 | 5.0 | 4.0 | | |
| Doorn./ Bertrams | No | 85 | 363 | 308 | 204 | 78 | 44 | 1072 | 2.99 |
| | % | 7.9 | 33.9 | 28.7 | 19.0 | 7.3 | 4.1 | | |
| Bellevue | No | 242 | 343 | 331 | 219 | 57 | 24 | 1074 | 2.84 |
| | % | 22.5 | 31.9 | 30.8 | 20.4 | 5.3 | 2.2 | | |
| Yeoville | No | 418 | 1145 | 801 | 443 | 135 | 26 | 2948 | 2.55 |
| | % | 14.1 | 38.8 | 27.2 | 15.0 | 4.6 | 0.9 | | |
| P/Town/N. Hillbrow/N. Berea | No | 606 | 1030 | 479 | 216 | 65 | 21 | 2412 | 2.22 |
| | % | 25.1 | 42.7 | 19.9 | 9.0 | 2.7 | 0.9 | | |
| Central | No | 2713 | 3032 | 1117 | 407 | 111 | 32 | 6978 | 1.97 |
| Hillbrow/ Berea | % | 38.9 | 43.5 | 16.0 | 5.8 | 1.6 | 0.5 | | |
| Central | No | 3298 | 2764 | 805 | 253 | 62 | 53 | 7318 | 1.76 |
| Joh. | % | 45.1 | 37.8 | 11.0 | 3.5 | 0.8 | 0.7 | | |
| Braam. | No | 595 | 943 | 182 | 90 | 24 | 25 | 1404 | 1.88 |
| | % | 42.4 | 67.1 | 13.0 | 6.4 | 1.7 | 1.8 | | |
| Southdale | No | 9 | 47 | 46 | 28 | 16 | 5 | 151 | 3.69 |
| | % | 6.0 | 31.1 | 30.4 | 18.5 | 10.6 | 3.3 | | |
| W. Turf. | No | - | 14 | 15 | 14 | 9 | 4 | 56 | 3.58 |
| | % | 0.0 | 25.0 | 26.8 | 25.0 | 16.0 | 7.1 | | |
| S.Suburbs | No | 205 | 588 | 432 | 217 | 84 | 53 | 1560 | 2.73 |
| | % | 13.1 | 37.7 | 27.7 | 13.9 | 5.4 | 3.4 | | |

households, while Bellevue has an surprisingly even mix of household sizes.

Hillbrow, Berea, Braamfontein and Central Johannesburg are predominantly one and two person households, with an exceptionally high percentage of single person households in the centre.

All the southern area apartment clusters are largely 2 and 3 person households, with a fair number of 4 person households, reflecting the young marrieds and large numbers of young children in the population.

## 5.2 Environmental Characteristics

### Dwelling Unit Sizes

Table 5.3 exhibits the distribution of dwelling unit size by number of habitable rooms; as well as the occupancy rate and net density. This Table can be related to the household sizes seen in Table 5.2., in order to see if any correlation exists between them. When those two tables do not appear to correlate well, it usually results (in nearly all cases) in high occupancy rates because of overcrowding. This is a very important variable as it indicates either that the wrong size unit is being provided for those demanding apartments, or that rents are too high for inhabitants to be able to afford what their needs demand.

The accepted standard for occupancy levels is between 0.9 and 1 persons per habitable room. The majority of apartments, in particular the suburban areas, fall below this level. Those clusters such as Rosebank, Killarney and Illovo, which are among the high status apartment developments, are catering for the mature-married and elderly, who, presumably, can afford to live more spaciously. Occupancy levels become excessive in the lower-income areas of the eastern complex, where the larger households live in small units, and where there are many young children. But it is in the inner city areas of Braamfontein, Hillbrow and Central Johannesburg that

TABLE 5.3 DWELLING UNIT SIZES - HABITABLE ROOMS

| APARTMENT AREA | | Of Bachelor | 2 | 3 | 4 | 5+ | Total Units | Occupancy Rate | p.p.ha. |
|---|---|---|---|---|---|---|---|---|---|
| Linden | No | 19 | 66 | 175 | 29 | 3 | 392 | 1.01 | 217.7 |
| | % | 4.8 | 16.8 | 44.6 | 7.4 | 0.8 | | | |
| Rosebank | No | 69 | 242 | 199 | 57 | 12 | 581 | 0.79 | 178.0 |
| | % | 11.8 | 41.7 | 34.3 | 9.8 | 2.1 | | | |
| Houghton | No | 2 | 25 | 48 | 44 | 22 | 141 | 0.55 | 76.8 |
| | % | 1.4 | 17.7 | 34.0 | 31.2 | 15.6 | | | |
| Killarney | No | 27 | 147 | 227 | 264 | 173 | 848 | 0.59 | 148.3 |
| | % | 3.2 | 17.3 | 26.8 | 31.1 | 20.4 | | | |
| Illovo | No | 23 | 98 | 139 | 168 | 80 | 508 | 0.76 | 205.3 |
| | % | 4.5 | 19.3 | 27.4 | 33.1 | 15.7 | | | |
| Bramley | No | 8 | 53 | 54 | 72 | 48 | 235 | 0.75 | 113.4 |
| | % | 3.4 | 22.6 | 23.0 | 30.6 | 20.4 | | | |
| Cheltondale | No | - | 7 | 24 | 57 | 19 | 107 | 0.80 | 302.0 |
| | % | 0.0 | 6.5 | 22.4 | 53.3 | 17.8 | | | |
| Jeppe/ Troyeville | No | 135 | 260 | 115 | 19 | 6 | 535 | 1.32 | 350.9 |
| | % | 25.2 | 48.6 | 21.5 | 3.6 | 1.1 | | | |
| Doorn./ Bertrams | No | 55 | 343 | 392 | 231 | 38 | 1079 | 1.04 | 203.1 |
| | % | 5.1 | 31.8 | 36.3 | 21.4 | 3.5 | | | |
| Bellevue | No | 52 | 274 | 462 | 275 | 19 | 1092 | 0.93 | 219.7 |
| | % | 4.8 | 25.1 | 36.8 | 25.2 | 1.7 | | | |
| Yeoville | No | 299 | 1020 | 1145 | 511 | 100 | 3173 | 0.89 | 293.8 |
| | % | 9.4 | 32.1 | 36.1 | 16.1 | 3.2 | | | |
| Parktown/ N.Hillbrow/ N.Berea | No | 427 | 826 | 683 | 359 | 113 | 2412 | 0.88 | 363.2 |
| | % | 10.1 | 34.2 | 28.3 | 14.9 | 4.7 | | | |
| Central Hillbrow/ Berea | No | 2676 | 2812 | 1395 | 358 | 53 | 7385 | - | 707.7 |
| | % | 36.2 | 38.1 | 18.9 | 4.8 | 0.7 | | | |
| Central Joh. | No | 4820 | 2583 | 801 | 158 | 9 | 8420 | 1.10 | 730.2 |
| | % | 57.2 | 30.4 | 9.5 | 1.9 | 0.1 | | | |
| Braam. | No | 1144 | 396 | 96 | 14 | 6 | 1643 | 1.44 | 933.8 |
| | % | 69.6 | 24.1 | 5.8 | 0.9 | 0.4 | | | |
| Southdale | No | 9 | 60 | 53 | 24 | 5 | 151 | 1.10 | 212.9 |
| | % | 6.0 | 39.7 | 35.1 | 15.9 | 3.3 | | | |
| W. Turf. | No | 5 | 4 | 10 | 26 | 11 | 56 | 0.98 | 96.0 |
| | % | 8.9 | 7.1 | 17.9 | 46.4 | 19.6 | | | |
| S.Suburbs | No | 238 | 658 | 486 | 161 | 33 | 1487 | 1.09 | 232.5 |
| | % | 16.0 | 44.3 | 32.7 | 10.8 | 2.2 | | | |

overcrowding really exists among the young single, elderly, and young marrieds with young children; which reflects both the lack of alternative larger accommodation and the high rentals. It is the overcrowding among the young marrieds with young children that 's most serious and has implications for open space amenities.

By and large, there is a correlation between the size of units and the household sizes; except for the crowded areas where the dominance is on the Bachelor flat and the 1 Bedroom unit, while household sizes are predominantly two persons.

Population Density, also seen in Fig. 5.3, reflects the correspondence between age structure, household size and dwelling unit size, with location in the social space matrix. The larger households, and higher economic status young and mature married groups live at densities of 120-220 persons per net hectare which implies and allows for more spacious living in terms of individual room size, number of rooms, and space around individual apartment blocks. Relatively lower-income and slightly larger households of young marrieds (with children) live at higher densities of 220-300 persons per net hectare.

It is the small households made up of the young and old single persons, and some lower-income mature families, that live not only at high densities, in the order of 750 persons per net hectare, but also in overcrowded conditions.

Development Control Effects

The nature and form of the built environment for apartments can, by and large, be ascertained from the parameters of topography, shape of stands, size of stands and the development control features of Height Zones, permitted floor space, coverage and height, which are modified by building lines, parking requirements, streets widths and building by-laws. These aspects when taken as a whole, permit analysis to indicate the height of development, how much on-site open space (whether as parking or

landscaped) exists, and consequently what facilities could exist or need to be provided.

Table 5.4 has the apartment clusters tabulated to express the suburbs (or part thereof) that they account for, as well as their Height Zones, permissible heights, ground coverage and building line set-backs.

Linden is in Height Zone 5, which permits 3 storeys at 40% coverage, or 2 storeys at 50% coverage. The stands are fairly large (i.e. in excess of 1 000 sq.metres.) The building line set-backs are minimal, because most of the apartment development is in General Business Zoning, and most apartments occur over ground floor shops. Both the largeness of the stands and the Height Zone control permits some on-site open space, which allows for both a sense of spaciousness and amenity, as well for the possibility of on-site playlots.

Rosebank is in a very similar category, but the larger stands (i.e. of 2 000 sq. meters approximately) permit larger accumulations of open space, which can be used for amenity and/or playlots.

Houghton falls into Height Zone 3, which permits 4 storeys at a 60% coverage. Some stands have 4.6m building lines and others 27.4m, all of which are on very large stands which allow, for the most part, large areas of landscaped open space on site.

Killarney and Riviera have 50% coverages and heights of from 5-6 storeys within the Height Zone 3 category. While the individual stands are 16m by 33m, most developed sites are large assemblages and thus accumulate sufficient residual open space to have an amenity value.

Illovo and Birdhaven fall into Height Zone 3, but vary from 3 storeys at 40% and 30% coverages as well as 2 storeys at 30% coverage, and have building lines of 6m and 9.1m respectively. The stands themselves are large, being in the range of 2 000 sq.meters, which together with the other

TABLE 5.4 DEVELOPMENT CONTROLS

| Apartment Area | Suburbs | Height Zone | Permissible Height | Coverage | Building Lines Street Frontage | Sides Space |
|---|---|---|---|---|---|---|
| Linden | Linden | 5 | 3 Storeys<br>2 storeys | 40%<br>50% | Gen.Res. 6m<br>Gen.Bus 1.5m | 1.5m<br>1.5m |
| Rosebank | Rosebank | 5 | 3 Storeys<br>2 storeys | 40%<br>50% | 3 m | 1.5m |
| Houghton | Houghton | 3 | 4 Storeys | 60% | Louis Botha 27m<br>Lloys Ellis 4.6m | 1.5m |
| Killarney | Killarney Riviera | 3 | 6 Storeys | 50% | 3.6m | 1.5m |
| Illovo | Illovo | 5 | 3 Storeys<br>2 storeys | 30% & 40%<br>30% | 6m<br>9.1m | 1.5m |
| | Birdhaven | 5 | 3 storeys | 40% | 6m | 1.5m |
| Birnam | Fairways<br>Birnam<br>Waverly | 5 | 4 Storeys<br>3 storeys<br>3 storeys | 25%<br>40%<br>25% | 15m<br>4.6m<br>15m | 1.5m |
| Cheltondale | Cheltondale | 5 | 3 Storeys | 40% | 15m | 1.5m |
| Jeppe/Troyeville | Jeppe<br>Troyeville<br>Fairview | 3 | 4 Storeys | 60% | 3m | 1.5m |
| Doorn/Bertrass | Doorn )<br>New Doorn.)<br>Highlands<br>Bellevue Central)<br>(Ptn) )<br>Judiths Paarl )<br>Lorentzville )<br>Bertrams | 3<br>3<br>5<br>3 | 4 Storeys<br>4 Storeys<br>3 Storeys<br>4 Storeys | 60%<br>60%<br>40%<br>60% | 3m<br>3m<br>3m<br>3m | 1.5m<br>1.5m<br>1.5m<br>1.5m |
| Bellevue | Bellevue East)<br>Bellevue(Ptn)) | 5 | 3 Storeys | 40% | 3m | 1.5m |
| Yeoville | Bellevue(Ptn) )<br>Bellevue C.(Ptn)}<br>Yeoville | 3 & 5<br>3 | 3 Storeys<br>4 Storeys<br>4 Storeys | 40%<br>60%<br>60% | 3m<br>3m<br>3.6m | 1.5m<br>1.5m<br>1.5m |
| N. Hillbrow | Parktown<br>N.Hillbrow<br>N. Berea | 3<br>2<br>3 | 4 Storeys<br>7 Storeys<br>4 Storeys | 60%<br>30-37%<br>60% | 6m<br>Nil<br>3m | 1.5m<br>Nil<br>Nil |
| Hillbrow | C.Berea )<br>C.Hillbrow) | 2 | 5-7 Storey<br>8 Storeys | 80-87% | Nil | Nil<br>Nil |
| Jhb. Central | Central Jhb.<br>Joubert Park | 1<br>2 | 9 Storeys<br>7 Storeys | 97-98½%<br>80-87% | Nil | Nil<br>Nil |
| Braamfontein | Braamfontein | 2 | 7 Storeys | 80-87% | Nil | Nil |
| W. Turffontein | W. Turffontein | 5 | 3 Storeys | 40% | 3.6m | 1.5m |
| Bellevista | Bellavista | 5 | Scheme | | | |
| S.Suburbs | Kenilworth )<br>La Rochelle )<br>Rosettenville) | 5 | 3 Storeys | 40% | 3m | 1.5m |

controls, makes for an environment of much amenity; as well as having sufficient space for playlots, and even has space large enough for young children to play happily.

The Birnam apartment cluster includes the 1.6 hectares sites of 4 storey development at 25% coverage of Fairways, with its ample open space for many purposes; the apartment blocks of Waverley at 25% coverage and 3 storeys, with its sufficiency of open space; and the apartments over shops in Corlett Drive, that fall in Height Zone 5, which are not so amply endowed with [illegible] space.

Cheltondale has apartment development that falls in the Height Zone 5 category, but the fairly large sites, usually on corners, make for increased amenity; but the lack of landscape controls allows car parking to eliminate most of the open ground.

The Jeppe/Troyeville cluster falls within Height Zone 3, with a 4 storey height limitation, and 60% coverage. These factors, plus the small developments on 233 sq.m. and 465sq. metre sites make for congested development, lacking in any usuable open space; as well as precluding ample on-site parking, which further destroys the environmental setting as large numbers of cars park on the street.

The Doornfontein/Bertrams apartment cluster is an amalgam of Height Zones 3 and 5, mostly on 465 sq.metre sites (15 x 31m) which makes for the same conditions that apply to the previous cluster. Similarly, Yeoville and Bellevue have the same controls with 3.0-3.7 metre building lines; All of which lead to a lack of amenity and usuable open space.

The North Hillbrow cluster includes Parktown and that part of Berea in Height Zone 3; and Hillbrow in Height Zone 2, which has no building lines, heights in excess of 7 storeys and an extremely high coverage of 86-87%. The large sites (greater than 2 000 sq.metres) in Parktown facili-

tate the accumulation of some usuable open space, even at a coverage of 60%. For the remainder of the cluster the small sites and the controls make for, what is considered to be, an inadequate environment for most housing demand groups.

For both Central Hillbrow/Berea in Height Zone 2 and Central Johannesburg in Height Zone 1, permitting heights in excess of 7 and 9 storeys, and coverages of 80-87% and 97-98½%, respectively, the lack of any amenity in terms of light, open space, and view, is acute. Braamfontein in Height Zone 2, has similar environmental characteristics.

With the exception of Bellavista, all the Southern Suburbs falls into Height Zone 5, which, while it has coverage of only 40% the small sites of 15 x 31 metres, leads to no usuable space being accumulated, and the environment is not much different from that of the Yeoville / Bellevue complex. Bellavista, however, is part of a housing estate, so that ample open space and set-backs from the road exist, allowing for playlots and playgrounds.

Parking.

One of the shortcomings of the analysis, due to lack of data that could be integrated with the Census and Land Use Inventory information, is that related either to car ownership or car parking facilities. For the purposes of this study it will thus be necessary to generalize in respect of these.

Motor car ownership is largely effected by income. The ownership figures for the city as a whole are:

| Income Groups | Cars/1 000 population |
|---|---|
| Upper | 520 |
| Upper Middle | 380 |
| Lower Middle | 290 |
| Lower | 182 |

( Source: Greater Johannesburg Population Report, 1970.)

From the ecology of the city, discussed earlier in the study, it can be seen that the majority of apartments are in the Upper, Upper-Middle, and Lower Middle income areas and thus car ownership is generally accepted to be high. These clusters in the suburban areas have a high ownership rate; while the inner city apartment areas can be assumed to be relatively lower than the economic groups would indicate. Nevertheless, however low the car ownership rate might be, the parking of the vehicles is a serious problem, especially for the older apartments built before off-street parking provision was made mandatory. The lack of adequate parking facilities results in on-street parking which further detracts from the environment. The provision of parking space is affected by the size of site, in that small sites could not provide a sufficiency of space. Further, the provision in the Town Planning Scheme allows free floors for parking on ground floor in many instances, which results in car parking podia that remove the apartments themselves from contact with the ground, even in the more spacious developments.

## 6. APARTMENT AREA CHARACTERISTICS: AN ENVIRONMENTAL ANALYSIS - 1960

### 6.1 Desirability and Need for Environmental Facilities

The neighbourhood is still, by and large, the locality in which people live and carry out their various activities, outside of their working time. It is a fundamental premise that human needs are both individual and collectivised and consequently there is a need for a varied range of communal facilities. The facilities that are required (and need to be provided) are those which meet the various needs of a population.

The needs of people fall into the following categories:

1) The need for active exercise. This is felt by all children, and most teenagers and adult males. The more limited the space within a dwelling, the more acute the need.
2) The need for sun and air. This need is felt by children, mothers and babies, old people, and most adults.
3) The need to 'get out'. This need is felt by all household people, especially mothers with pre-school children, all other children and the old. This includes the need for cultural facilities.
4) There is a need to do household chores, such as shopping. (Wood, 1972).
5) There are also needs, dependent on life-style and socio-economic status for medical and educational facilities.

The needs of people for their various activities take place outside of the dwelling unit. The needs can and are fulfilled in many ways, and consequently by many different types of facilities. The development of these facilities and amenities is undertaken mainly by local and statutory authorities or by commercial interests. Commercial interest

will provide shops, halls, cinemas, coffee-bars, etc.; while the local authority will have to provide not only these statutory open spaces, but those social amenities which are neither mandatory, nor profitable, i.e. amenities that are exclusively social services, such as libraries, community centres, etc. (Broady, 1968, p.84).

Throughout this discussion is the underlying assumption that there is a need to provide and plan for the "good life". A better quality of urban life suggests abundant and widespread physical and cultural amenities. Often only the amenities provided by commercial interest exists, to the detriment of the way people live, which can result in social pathologies among inhabitants, which consequently impinges on the total population. It is in terms of satisfying people's needs that the proper facilities are essential.

Commercial interests will naturally provide those facilities that are profitable; thus the concern of this study will be with those public social facilities and amenities, which (albeit by default) must be provided by the local authority. This is not to say that the location, accessibility and provision of other facilities do not have implications for planning.

One of the main tendencies in modern living is the increase in leisure time. This fact, together with an increasingly affluent and educated population will call forth a demand for more adequate provision for leisure time pursuits. The places where leisure time pursuits (or recreation) will take place, will be divided between commercial and local authority facilities. This once again places an emphasis on the desirability of the local authority to provide for the needs of a population.

It is essential that an adequate and suitable range of social facilities is provided at the right time for a given population. It is the purpose of

this study to establish an approach to this problems in existing apartment areas where the matters are more critical, because of limited space within and outside the dwelling to fulfil these needs, by indicating what deficiencies exist and how these deficiencies would be altered by change in the ecological structure of the apartment areas. It is also the purpose to indicate how to plan for these facilities in new apartment areas.

## 5.2 A Planning Introduction to Community Characteristics and Needs

The clusters of apartment areas established in the previous chapter identify distinct communities which are homogeneous and do not require variations in the type and quality of public services and facilities. In each case the "mix" of population types and the appropriate public facilities and services as well as the type of environment would be uniform across the neighbourhood. The environments of the apartment areas are identified by the population characteristics, e.g. Age, sex, household size, etc.; the environmental characteristics, which include percent land covered by buildings, building height, etc. and the facilities themselves.

Fig.6.1 indicates how the three categories of "community characteristics" completely describe a community and also that these categories exist and interact interdependently, viz. the nature of each characteristic influence the nature of the others.

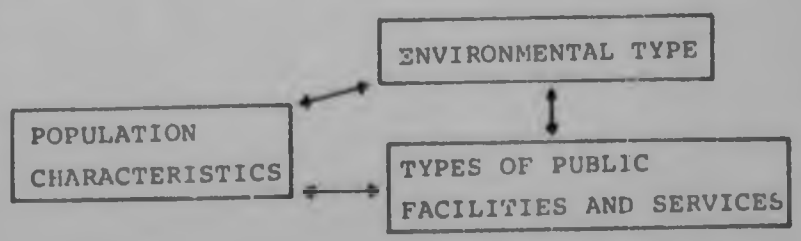



Fig. 6.1. Categories of Community Characteristics (after Passonneau).

It is assumed that for each Community type there is associated an appropriate and typical level and mix of public facilities and services, (Passonneau, 1966). It is this concept that will be used to evolve a total environmental standard for apartment areas, of which the social facilities represent a vital element.

The main issue in planning the provision of facilities concerns the location of amenities, and in particular the criteria which should guide the planner in this in regard to size and type of facilities. A dominant thesis has been that amenities should be sited to fashion a sense of community, i.e. relating amenities systematically to the distribution of population, with some regard to convenience of the users. The level of conveniences nominally accepted (in the U.K., U.S.A. and S.A.)is a walking distance of about 10 minutes (or approximately 400 metres).

In allocating social amenities, it is necessary to consider what number of people are required to make it worth providing. This criterion determines the place of the amenity in a hierarchy of areas (Broady, 1968, p.91).

This section will introduce concepts of social and physical environmental requirements in terms of population needs; and will then proceed to summarize the needs of Demand Groups for the various facilities and open space provision in particular.

Environmental Requirements

In an attempt to define the location criteria of the various facilities in relation to their use and function, it is necessary to assess what amenities an adequate residential environment should include; although this study will ignore those outside the direct orbit of the local authority. In general terms, the criteria for an adequate environment should include at least the following basic amenities and facilities (Pistorius, 1959) :-

(a) In Immediate Proximity to the Dwelling Unit

(i) Facilities for car parking, storage and workshop facilities;

(ii) Gardens and trees for visual amenity and leisure use;

(iii) Play space for small children.

(b) Within Safe Walking Distance of Dwelling Unit

(i) Primary School;

(ii) Playgrounds for informal group activities for children;

(iii) Informal open space with trees and grass for adults' and children's recreation;

(iv) Social facility buildings, such as clubs, recreation centres;

(v) Local shops.

(c) Within Easy Access by Bus or Car

(i) Secondary Schools;

(ii) Playing fields, tennis courts, swimming bath, etc, especially for the use of young adults.

The facilities listed above are shown in Fig. 6.2 below, indicating the intensity of use and implying the locational requirements of the facilities. The facilities listed under (a) above should be provided on the site, those under (b) within the residential area, and those under (c) although they may be outside the residential area, must be near it.

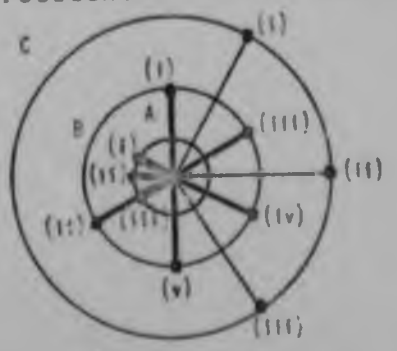



Fig. 6.2. Diagram of Accessibility to Facilities and Intensity of Use.

The provision of the on-site facilities will limit the area of site which can be built on, because the facilities should mostly only be provided on the ground level. On already small stands, never mind blocks, in the apartment areas this is unlikely to occur. Consequently, it is in order to provide these facilities that the local authority must intervene in the development process. This point will be followed up later.

Over and above these basic facilities and amenities, consideration must be given to educational and cultural facilities, some of which must be provided on a local level and some of which, by their very nature, serve larger areas. These facilities include libraries, health clinics and recreation centres.

As this study is involved with planning implications of apartment areas, particularly in regard to their total immediate environment, it is this model that will be used, but only in regard to the immediate and basic elements and public facilities.

Demand Groups for Public Facilities and Open Space

By and large, the approach to the provision of most social facilities has been via the standards evolved from statutory authorities, viz. open spaces. Most of the standards, other than open space, are based on patterns established by economic and social forces; while in still others, policies have been framed after detailed local investigation. Standards have yet to be established for some of the leisure time and welfare services which are either relatively new or cannot be adequately judged on the basis of past experience. The environmental standards relating to community facilities can never be applied as a strict formula, but should be used as a base point for the establishment of facilities, which will be affected by other factors such as density of population, socio-economic status and age structure, the location of the area in relation to such features

as major open space, the city centre, or transport routes and the availability of sites.

The age structure of a community can make differential demands for public facilities and services. For instance, a population containing a high proportion of young married couples with children creates demands for pre-natal, post-natal and child health services; while a high proportion of the elderly can also create a demand for health clinics. Similarly, the age-structure of a community affects the demand for the various forms of open space. But other facilities and services such as Day Nurseries, Nursery Schools, Libraries and Recreation Centres, are provided for in respect of the total population and are relatively not age specific. In establishing a development plan for social facilities for the city as a whole and apartment concentrations, consideration must be given to trends in demand as well as the factors mentioned above.

Naturally enough, over a period of time, the demographic characteristics of a population change and the demand for facilities alters accordingly, so that new facilities might be demanded and older ones might fall away. With a spatial grouping of such facilities, a certain amount of flexibility is built into the welfare service facilities provision, and open space amenities can always be reorganized and laid out. Also a grouping of amenities is more socially desirable; not only is it generally more convenient but it encourages increased use of all facilities as well as offering the possibility of flexibility with possible change in the social characteristics of its operative population. Many facilities are best concentrated at points of public congregation and at the nodal points of the communication patterns. Others, concerned primarily with meeting local needs might be scattered at strategic and central points within residential areas.

Comments on some specific facilities follow:

Health Centres.

Health centres, especially where maternity, child welfare and geriatic services are offered, are age specific, but are in turn related to the socio-economic status characteristics of the population, because the higher status groups tend to use private medical practitioners. Health centres fulfil two roles: firstly, they promote health education, and secondly, they provide preventative services.

Day Nurseries and Nursery Schools.

Creches and nursery schools are discussed together since they both, though to a differing extent, cater for the pre-school child. Creches can be regarded as a supplementary service for the special needs of those children whose mothers are, for some good reason, incapable of undertaking the full care of their children, e.g. where the fundamental strains on a young family necessitate the mother going out to work. While many private nursery schools and play groups exist the local authority should assist by way of the provision of sites and buildings.

Recreation Centres.

Though meeting places, such as recreation centres, serve the needs of only a section of the community, they are important in providing for a wide variety of groups with different interests. A large proportion of the members of such centres come from all parts of the city, (Needs of New Communities, p.44) particularly because of specialist activities like those related to sport, arts and culture, and hobbies. These facilities therefore are not related to any neighbourhood and should be publicly provided in centrally located premises. The type of provision required must be related to the kinds of activities that draw members. Over and above such meeting places is the need for the elderly, particularly if they are without private

transport; mothers whose children restrict them to the locality; and the children themselves.

The growth in demand for urban recreation, has led, in the United Kingdom, to the advent of the Sports Centre. This facility meets a demand, which, because of deficiencies in availability of playing fields, is partic larly applicable in high density areas with large numbers of young adults (Rees, 1972).

Libraries.

The provision of libraries have been established by social demand and relate to the proportion of the population that will require it. The optimum functional size of the building will determine the number of people it will serve, and hence its distribution. The location of libraries are usually at nodal points and are approached in an ad hoc manner.

Open Space.

Variation in the use of open space is found within different sections of the population. The distinctive "demand groups" can be identified, based on age and sex characteristics. (GLC, 1968). Social class has been largely excluded in this presentation as it is felt that the variations in the use of urban space related to social class is generally fewer and smaller than those associated with age and sex. The main exceptions are the cases of participation in sporting activities and activities with children and increasing car ownership rates.

It is generally recognised that the recreation/ open space system has a hierarchy, which can be divided into those groups based on the areas they serve; those that serve one neighbourhood, which would include playlots, playgrounds, and neighbourhood parks; those which serve several neighbourhoods, which take in playing fields and large parks; and those that serve a large part of the city and include major parks, reservations, etc., (GLC, 1968 p.77). Furt ar, the open space system can be seen

in the light of consisting of active recreation facilities (playing fields, etc.) and passive recreation (parks), which cuts across the hierarchy system.

The primary age groups so distinguished and their particular habits and requirements are summarized as follows:

(a) Up to 4 years.

Children travel very short distances and are always accompanied by adults. Their need is for small easily accessible play areas and playground with simple equipment.

(b) 5 to 12 years.

As children get older their range of movement increases and they are less in the company of adults. Their needs include informal areas for ball play; birds and animals to look at; areas to cycle on; and larger and more imaginatively designed play grounds.

(c) 13 to 17 years.

Boys tend to engage more in active pursuits and travel further for sports. The group as a whole likes larger parks with areas for sitting, lying and sun-bathing and plenty of facilities of all kinds.

(d) 17 to 34 years.

The main orientations of this group are either as parents, or among men, towards sports. During the week the needs are for small and accessible parks in which children can play, and at weekends, either for sports areas or for large parks which the whole family can visit.

(e) 35 to 64 years.

This age group does take children of varying ages to parks and is, therefore, concerned with provision for children, but primarily the need is for amenity spaces in which they can

talk and sit. This age group is very mobile and travels further to larger parks and has higher proportions going out of the city at weekends.

(f) Over 65 years.

Old people who visit open spaces like to sit or walk about and watch things and people, with an emphasis on peace and quiet. There are a large number who do not use open spaces and it can be inferred from the reasons given for not going that there is a need, as for children, for small easily accessible spaces for those who are least mobile.

The preceding analysis has shown the specialized requirements of different sections of the populations. In the younger ranges there are high frequency rates and specialist needs. The sporting requirements among young men and among the activities of the marrieds with children, tends to take place further out; while the older age groups tend to fall back upon local open spaces. The open space system is required to provide facilities for children; entertainment facilities and areas for sports; but the dominant requirement is for the amenity in the areas of grass, flowers and trees.

## 6.3 Planning Standards and Allocation of Social Facilities and Amenities

The extent of provision of the various elements in the city must bear a direct relationship to the volume of demand and to the characteristics of the demand groups likely to be concerned with each element. Existing methods of estimating requirements for many social facilities, are either tentative or non-existent; though for a few services, space standards exist in quantifiable form. In some cases the definition of space is measurable, though it might require modification in the context of apartment development.

The distribution pattern of the space (or accommodation) required will vary with each facility. In some instances, space will be required in each neighbourhood; and in others, the optimal functional size of the facility will determine the number of people it will serve and hence its distribution. If the critical factor is the distance people will have to walk to a facility, the distribution will be based on catchment areas of up to that particular size (Amos, F., 1970).

The provision of the social welfare services, such as libraries, recreation centres, health clinics, and nursery schools and creches tend to require optimum populations in order to be operated, and they consequently have catchment areas beyond the boundaries of specified concentrations. Also, as has been pointed out, these facilities have, as yet, no real standards of application. Nevertheless, some comments on the provision of these community facilities can be made:

COMMUNITY FACILITIES

Playing Fields.

The playing field provides varied forms of recreational activity for young people and adults, although a portion may be developed as a childrens playground. The facilities serve as a recreation centre for several neighbourhoods.

Regional Facilities.

Regional facilities make up the remainder of requirements and include community parks, major parks, reservations, etc.

Recreation Centres.

A recreation centre with a full range of facilities should be provided for populations of the order of 15 000 to 20 000 persons; and these centres should be well related to transport facilities and be sited in an area of open space if possible (Marsh, 1972).

Health Centres.

The policy of the Johannesburg City Health

Department is that there should be four major health centres at strategic points to serve the eastern, western, southern, and northern suburbs, as well as one central point, which will offer full health services. This service will be supplemented by subsidiary health clinics (requiring a space of 106 sq. metres which operate in order to offer a neighbourhood service for about 5 - 10 000 persons). These clinics will offer only services once or twice a week and are usually geared to offer child welfare services in the main. While it is hoped that the whole white population of the city will be served, it is expected that priority will be given to the location of health clinics in the lower-economic areas, and the young family areas, especially where they are in the concentrated high density areas.

Libraries.

Branch libraries require a minimum size of 280 - 465 sq. meters of space, and require locations in or adjacent to points of congregation. Branch libraries provision has been a response to demand There is little relationships between need and population size, but is a more socio-economic factor.

Nursery Schools and Creches.

Some standards have been formulated in relation to children's needs in Nursery Schools (T.E.D., 1969). These standards are the minimal requirements. In general, 8.4 square metres per child for indoor and outdoor space is advocated. Also it is suggested that planning for less than 50 children should not be undertaken, while a unit should not exceed 120 children where the minimal site would be 1 670 sq.metres. It should however, be noted that pre-school children are not subject to compulsory attendance of nursery schools, and the standard is merely an indication of demand for areas likely to have working mothers.

The measurement of demand for recreational open

space has always presented planners with a problem. In most cases, there has been a tendency to apply general standards. Most of these standards are derived from those devised in 1925 by the National Playing Fields Association (Lever, 1973). No real improvement has been made on these standards, except to add that the standards provide only a starting point and should be applied critically and discriminantly.

One problem of these general standards is that they do not have an adequate breakdown of types of open space.

Although recreation standards have been subject to criticism, as a measure of recreation needs, with careful use and modifications, the standards can be used, not as hard and fast rules, but rather as a point from which to begin. Emphasis is given to minimum and maximum space requirements, location and size of population served, which are in turn related to the demand groups to be served.

The standards of open space requirements used in Johannesburg consists of a ratio of land quantity per 1 000 population. A total of 2.8 hectares (7 acres) per 1 000 population is accepted by the Johannesburg City Council, as being the overall minimum requirements for parks and recreation grounds (Private sports clubs, golf areas, and waste ground are excluded). (Recreation Survey, 1970, p.77). The standards adopted are sub-divided so as to allocate a proportion of the 2.8 hectares (7 acres) to "regional recreation", "regional parks" and "local amenities". The local amenities consists of childrens playgrounds, local parks and local recreation. For most residential areas the minimum standard adopted is as follows -

| | | |
|---|---|---|
| 1) Children's Playground | 0.2 acres | per 1 000 pop. 810.0m$^2$ |
| 2) Local Parks | 1.4 | 5 665.0m$^2$ |
| 3) Local Recreation | 0.9 | 3 642.0m$^2$ |
| | 2.5 acres per 1 000 | 10 177.0m$^2$/ 1 000. |

In the high density residential areas the standard is reduced to 0.4 hectares(1 acre)per 1 000 population for local amenities, presumably due to the population structure, as well as the availability of space, as follows: (Marsh, 1972).

| | | |
|---|---|---|
| Children's Playground | 0.25 acres | 1 012 |
| Land Parks | 0.25 | 1 012 |
| Local recreation | 0.50 | 2 023 |
| | 1.00 acres | 4 047 sq.m. |

While the City Council does concede that the criterion would have to be adjusted according to income groups and house sizes, there is no indication as to size, serving area, or location. Consequently, in order to more properly assess the requirements for open space at the local amenity level, standards have been adopted from North American criteria where the total allocation for a city's open space system is in the order of 2.8 hectares (7 acres) per 1 000, and local amenities in the order of 1 hectare per 1 000 and so approximate the standards used for Johannesburg (Aspo Report 194, 1965).

Further the criteria used here are related to demand groups at the local amenity level and includes the playlot, which does not feature in the J.C.C.'s criteria, and which is essential in most high density areas.

It can be concluded that open space demands can be related to two broad distance zones, in that a clear distinction must be made between the demand for spaces within easy walking distance about 10 minutes (effectively 400 meters) and the more sophisticated demands relating to distances of 3-8 kilometers and involving travel by mechanical

transport. (G.L.C. Surveys, p.77)

Within the local zone up to 400 metres from each home there are two forms of demand. The first includes the needs of minority groups such as young children and old people where a short distance movement is important. The second form of demand is for spaces to cater for the more specialised needs of weekend users.

NEIGHBOURHOOD FACILITIES

Playlot

Playlots are small areas for children of pre-school age and are essentially a substitute for the individual backyard. Such facilities should be either created within large-scale housing development or by the municipality in high density areas. It is quite common however, to include a playlot as part of a neighbourhood playing ground.

Playground

The neighbourhood playground is an area which serves primarily the needs of the five to 12 year age groups and is the chief centre of outdoor play for children. These areas need a variety of equipment and features because children very quickly tire of fixed equipment and need opportunities for imaginative games, as well as places to kick a ball. Because of the problems of providing to these standards in high density areas,many authorities "junior" playgrounds, which includes many, but not all, of the same types of areas as the normal playgrounds, especially to be omitted are such features as landscaped areas for adults.

Neighbourhood Park

The purpose of the neighbourhood park is to provide an attractive setting and place for passive recreation for people of all ages. The type of neighbourhood is a significant factor in determining needed neighbourhood park space. Several studies recommend that in high density neighbourhoods and in areas with a large proportion of elderly

adults more space will be needed.

TABLE 6.1 OPEN SPACE STANDARDS FOR HIGH DENSITY AREAS.

| Use | Min area per 1000 pop. | Min Area | Age Group Served | Pop. Served | Service Radius |
|---|---|---|---|---|---|
| Playlot | | Min. 140m$^2$ Max. 465m$^2$ | Pre School | 75 children | 200metres (no major streets) |
| Playground | | 0.41ha | 5-12yrs. | 375 children | 400metres |
| Local Park | 100 sq. metres | 0.8 ha | All | 1000 to 5000 | 400metres |
| Playing Field | 5000sq. metres | 8.0ha | young adults | 20 000 | 1.5-2.5 km. |

Source - ASPO Report No. 194, Standards of Outdoor Recreation.

6.4 Social Facility Assessment

The procedure to be followed in this section, will be to analyze the adequacy, or otherwise, of: firstly, the local amenities that interact with the immediate environment; and, secondly, the general facilities that have a role in fulfilling the needs of the population. For the purposes of establishing an approach, the apartment clusters established as at 1960 will be analyzed as a case study. But, it is important to bear in mind that the provisions of these facilities will change over time as the populations increase and change their characteristics. This will make it impossible to be specific about these facilities until more detailed research is done, and all that will be done in this study is to point out the availability and deficiencies,if any, and access to such facilities and later to interpolate the likely directions of change and allude to its effect on the provision of facilities.

The local amenities will be assessed, cluster

by cluster, using the criteria established in the previous section.

In order to analyze the adequacy of the local amenities the amount of acreage given over to both playgrounds and parks, as they are available for use of the cluster, will be totalled and related to the serving population. Secondly, distribution and location of both these facilities, will be assessed in terms of the 400 metres service radius, bearing in mind that these will be distorted by topographic features and barriers to ease and safety of movement created by major roads.

As far as the playlot element of local amenities are concerned, because they do not exist within the Johannesburg context to any extent as yet, they will be ignored in terms of analysis, but the subject will be returned to later. There are, however, certain large open spaces in most areas which can be used by small children for play purposes, and it is probably more realistic therefore to consider the requirements for open space purposes generally, rather than endeavour to meet specific requirements for children in playlots. Therefore, the suggestion for playlots will allow for their incorporation, when they meet the service radius requirements, in existing playgrounds and local parks. If existing parks (or where there is a lack of them) do not meet the service radius criteria, then separate "vest pocket" playlots must be established independently.

The General Facilities, consisting of Playing fields, major parks, recreation centres, Libraries and health clinics will be assessed in more general terms, as these facilities will not necessarily serve one cluster only, but usually serve several clusters, as well as surrounding detached dwelling house areas further afield.

This approach for the assessing and provision of social amenities and facilities is superior to

the traditional application of generalized standards. In this case the amenities and facilities are handled in a comprehensive and systematic way for differentiated homogeneous clusters and provisions is made appropriate to the characteristics of each cluster. Further, this approach attempts to disaggregate the types of social amenities and facilities and applies standards according to the nature of each, viz. playlots related to number of children, playgrounds related to number of children, parks according to total population, libraries and health clinics according to total population and income groups, etc. The traditional approach tends to take no account of the finite differences between apartment areas and merely adjusts the general standards in an arbitrary manner without substantiating how and why the adjustment should be made except to state that space for the total allocation is not available.

The method of assessment follows the criteria established in the standards in Chapter Five, viz.:-

1) The presence or lack of each type of local facility is established for each cluster;
2) the applicable serving radius is demarcated to establish the adequacy and location of each facility vis-a-vis the cluster as a whole;
3) the numbers in each age specific population demand group is utilized to establish the total space allocation necessary for that facility;
4) the total space required is then disaggregated according to the maximum and minimum size standards;
5) the necessity of providing such facilities are assessed against the ability of each cluster to support them, depending on the attaining of the required minimum size, (this is dependent on the numbers of persons within each demand group, which will vary from

cluster to cluster for the different facilities and amenities); and

6) the required numbers of each type of facility are then assessed for distribution and location within or adjacent to the cluster according to the locational and serving radii criteria.

7) the general facilities, are assessed in terms of existing provision, and accessibility to them and related to the relevant demand groups;

8) the necessity, for the provision of these facilities and relative accessibility to them, is also assessed in relation to the socio-economic status and the consequent need for them, as higher income persons, for instance, are unlikely to require, to the same extent, a facility such as a health clinic, while they are more likely to have their recreational needs met in private clubs much further afield and would not be as dependant on publicly provided playing fields.

The Distribution of and Assessment of Local Amenities within each cluster

Figures 6.3 to 6.9 show, diagrammatically, the existing playgrounds and parks and the areas served by them in relation to each cluster. Four hundred metre radii, which corresponds roughly to a walking time of 10 minutes along likely routes, are drawn around the boundaries of all open space to give an indication of the adequacy of areas served (obviously these have been distorted to take account of barriers to pedestrians).

The provision of the other more general facilities such as creches, libraries, recreation centres and health clinics are also shown.

Each figure is related to Table 6.2 which indicates the amount of open space available as at 1960.

and the use to which it is put; to Table 5.1 which indicates the numbers of people according to age structure; and follows the methodology outlined in the previous section.

The assessment of the 1960 situation, as an example, is descriptively assessed as follows:

Linden.

There is only one open space within or adjacent to this apartment cluster, and that is Pistorius Place. Not only is this a shared facility (with the remainder of the suburb) but it is so eccentrically located that for the most part it does not serve most of the apartments of this cluster. Nevertheless, the allocation to general purposes parkspace is within being acceptable. While there is an apparent lack of a playground for an apartment area of young children there are insufficient children to warrant such a facility at the present stage of development. Similarly, while there are sufficient pre-school children to warrant a playlot, the apartments in this cluster can in some instances provide for this on-site. Also the apartment blocks are too far spread from each other to warrant such a facility.

In regard to General facilities, Linden has close and sufficient access to playing fields (including a swimming bath) in Emma Park and one private sports club. This is quite ample for the demand groups of the young middle married. Further, the area has reasonably close and easy access to a major park (Emmarentia Dam), but is some distance and not linked transport-wise to the nearest Recreation Centre. There are two creches, but no Nursery Schooling in the vicinity. No library exists to serve the area as a whole.

Rosebank.

The two parks in Rosebank, while not ideally located to the apartment developments, are well

related and are within the service radius. Also, they have a more than adequate amount of total open space. There is no demand for either playlots or playgrounds. The playing fields associated with the parks contain l ing greens, which is ideally suited to the elderly nature of the population. There is little need for a health clinic or recreation centre to be located in the area, as it is a high status area where the population is most probably highly mobile. There is however, a large library, which is well suited for an area of high socio-economic status.

Houghton.

There are no local facilities of any type in or around this apartment cluster. While some of the apartment development has large landscaped open space, the cluster should require a local park for the more elderly population to walk and relax in. As this cluster of apartments overlooks Houghton Golf Club, it does achieve some amenity and the club itself offers facilities, such as bowls, to the inhabitants, who being more affluent, see to their own needs.

General facilities are also not well related to this cluster; but a library in Orange Grove is on the bus route, and a Recreation Centre in Patterson Park lies just beyond the 400 metre serving radius. Because of the smallness of such a cluster it is impossible to have social facilities for its specific use, and consequently such a cluster is best located near such facilities.

Killarney.

Killarney, being an area for mature and older persons, has no need of playlots or playgrounds, but as has been mentioned, most developments have sufficient open space to accommodate these needs. Killarney has a small park to serve the entire cluster, but its population requires a park of at least 1.8 hectares. But it could be argued that in an

area that has sufficient on-site open space for the most part, this park is ample for its use. In 1960, a private club provided golf and bowling greens within the cluster, which in turn are facilities ideally suited to the demand groups predominating

No other general facilities exist anywhere near this cluster, which could do with a library, (later provided). The other public facilities such as Recreation Centres and Health Clinics are not prerequisites in a high status area.

Illovo.

Illovo has no local amenities, but it could be argued that to some extent this is eased by the on-site open space. Nevertheless, its population would demand a minimum of 1.2 hectare park, for walking and sitting in, despite the affluence of such an area. This cluster could be provided with one nursery school. This cluster is well related to the Wanderers Club, which offers many of the general facilities that this population would need, and, being higher income status, could afford. Notwithstanding the ability of the more mobile and high-income status of the population and their ability to provide for their needs, certain public facilities such as libraries are necessary.

Birnam.

This area caters for the mature married groups, and has a need for only a local park. The acreage of local park serving most of the area is in excess of the specific requirements of the apartments, and the large sites of Fairways caters amply for all their local amenity needs. As far as General facilities are concerned, this cluster has the same access to Wanderers Club, as has Illovo, and the other needs can be fulfilled on a shared basis, the two clusters being adjacent.

Cheltondale.

The local facilities in this cluster are excep-

tionally good. There is a playground at Hilson Park for the younger children, and the adequacy of local parks in close proximity to all the apartments can double for playlots as well. This with the proximity of Hilson Park, is ideal for an area of young marrieds with children.

Though a small cluster, this apartment type population has a need for nursery schools or creches, which is lacking. Other general facilities would have to be shared with the surrounding suburban areas, where they are also lacking.

Jeppe/Troyeville.

The apartments in this cluster are fairly well spread, but the facilities in general give adequate coverage as well as having sufficient space. This apartment cluster, due to its concentrated nature of development, needs playlots, which in this case would be located in the playgrounds. For the most part the playgrounds are well sized and located, except the one in Fairview which is too small for ball games to be played in. The apartment dwellings alone, whose population needs it more than other housing types, require 1.4 hectares of local parks space. This is a serious shortfall for this type of development. There is a sufficiency of playing fields both in and adjacent to the apartment cluster, which is needed in an area of young married persons.

A recreation centre and a creche exist in this area, but a lower income area such as this, probably requires a full health clinic. The lower education attainment of this area, plus its immigrant characteristics might mitigate the need for a branch library. Two child-welfare health clinics exist in this cluster.

Doornfontein/Bertrams.

This apartment cluster has a high proportion of children in an environmental area of congested development, and thus has a need for playlots (i.e.

at least 5). There are a number of playgrounds in and adjecent to this cluster, but the one at Fuller Park is inadequate in size. Despite a sufficiency in acreage there is not a full coverage for this cluster. There is 2.2 hectares of park for an area requiring at least 3.2 hectares, as well as the coverage being poor, and this is a cluster requiring park space for its less mobile lower income population.

While some nursery schools (but no creches) exist, this cluster, made up of young married persons, where both parents probably need to work, needs to be supplemented for this facility by approximately 3 units. A recreation centre is centrally located to the cluster, and a children's recreation centre exists at Ellis Park, which is within walking distance to most of the cluster. This area has access to a child welfare clinic, but should have an access to a full scale clinic, that would serve all the eastern areas.

Bellevue.

Bellevue has no local amenities within it or adjacent to it. Bearing in mind it is a young family relatively lower-income area, the shortfall is in the region of 5 playlots, 1 minimum playground and 3 hectares of local park. This cluster is also distant from any substantial playing fields, but the population is assumed to be more mobile than those just discussed, and it should be possible for inhabitants to gain easy access by car or bus. There is a clinic in this area.

The area could also do with 3 creches or nursery schools. The Yeoville Recreation Centre is close enough to serve this cluster in this respect.

Yeoville.

Yeoville has a fairly large proportion and number of pre-school and primary school children and would require, if possible, 9 playlots. The playground is almost the right size for the population and manages to serve most of the cluster, but the

southern section is completely unserved. The population is similarly well served in terms of local park space. While playing fields are non existent in or near the cluster it is assumed that this more mobile population can find the facilities to fulfil this need.

The area is served by a Recreation Centre and a library, but could house more creches and nursery schools, (about 5 units required), which is required by apartment dwellers where the women are usually required to work. There are two child welfare clinics in this cluster, serving the large numbers of young children.

North Hillbrow/Berea.

While this is mainly a young married and mature married apartment area, there are sufficient pre-school children to warrant 3 playlots for this high density area, as well as one minimum playground. The local park is of sufficient size, but is not well located, leaving most of the area unserved. Playing fields are, as for the previous two clusters, but there is a swimming-bath in Hillbrow. As this is predominantly a mature married high status apartment area there is little need for recreation centres or health clinics. A library is easily accessible in Hillbrow, but this could be supplemented. But the area lacks both creches and nursery schools, for its large absolute number of pre-school children and should be provided with two units. Access to a child welfare clinic could be required for the area as well.

Central Hillbrow/Berea.

This apartment cluster serves a high proportion of the mature marrieds, elderly and young marrieds, in that order, and there is consequently a greater need for well located local parks for the non-mobile elderly especially. While there appears to be an over supply of park space, most of it is either unusuable (due to the topography) or not easily

accessible. The coverage is also poor - leaving most of the area unserved. Similarly, although one minimum playground is needed, the one that does exist is not well located. Approximately 9 playlots, whether combined with other facilities or not, would be required.

General facilities apply as for the previous section, i.e. no playing fields, but with a library centrally located. In the order of six nursery school units would be required for the area. There is a children's recreation centre in Joubert Park and a child welfare clinic.

Central Johannesburg

While pre-school and primary school children are a small proportion of the population in this cluster, they are significant in absolute numbers, to the extent that some five playlots would be required. The playgrounds are ample, and while not ideally located from an accessibility point of view, they serve the major part of this apartment cluster, especially where the children are concentrated. Local parks are well and amply distributed and are ideal "vest pocket" parks suited for the needs of the elderly, viz they can watch the passing parade. Being predominantly an older population the lack of playing fields is not vital, particular with good transport routes to any part of the city.

General facilities include two creches (which is inadequate, as the area requires four units), libraries, a recreational centre and children's recreational centre, as well as some tennis courts in the End Street Park for those young people in the population. The elderly members of the population have fairly easy access to out-patient facilities at the Hospital, as do those in Central Hillbrow, and to the Central Health Centre.

Braamfontein.

Braamfontein has no local facilities or general facilities. Once again, the nature of the development would mean two playlots to be provided,

one playground, and approximately 0.4 hectares of local park. The area is largely a young peoples area, with some mature marrieds. This population is likely to be mobile enough to reach all necessary play fields.

There is, however, a recreation centre, fairly eccentrically located in the area. It is doubtful whether this isolated enclave would warrant either a library or health clinic, especially with the Hospital close enough. There is a child welfare clinic at Happiness House to serve the young population.

West Turffontein.

This small cluster has easy access to a local park, with playground facilities, and due to its location in a detached dwelling location has sufficient amenity not to have undue deficiencies environmently.

Bellavista.

Bellavista (in 1960 anyway) is a small cluster with access to parks, playgrounds and playing fields, but lacks creches, nursery schools and the probable need for a health clinic.

Southern Suburbs.

This major cluster of apartments in the Southern Suburbs is predominantly a young marrieds cluster with a substantial amount of pre-school and primary school children. Consequently there is a need for approximately five playlots, because of the nature of development in this area. There is ample playground and local park space, which is well distributed to serve the entire area. Playing fields exist in areas adjacent to the cluster.

There are several nursery schools in the area, a childrens recreational centre, as well as a library. Due to the lower economic status of the cluster there is a demand for a health clinic, particularly for maternity and child welfare purposes.

It is now possible to proceed to the planning implications of apartment areas, having analyzed all the characteristics of apartment areas.

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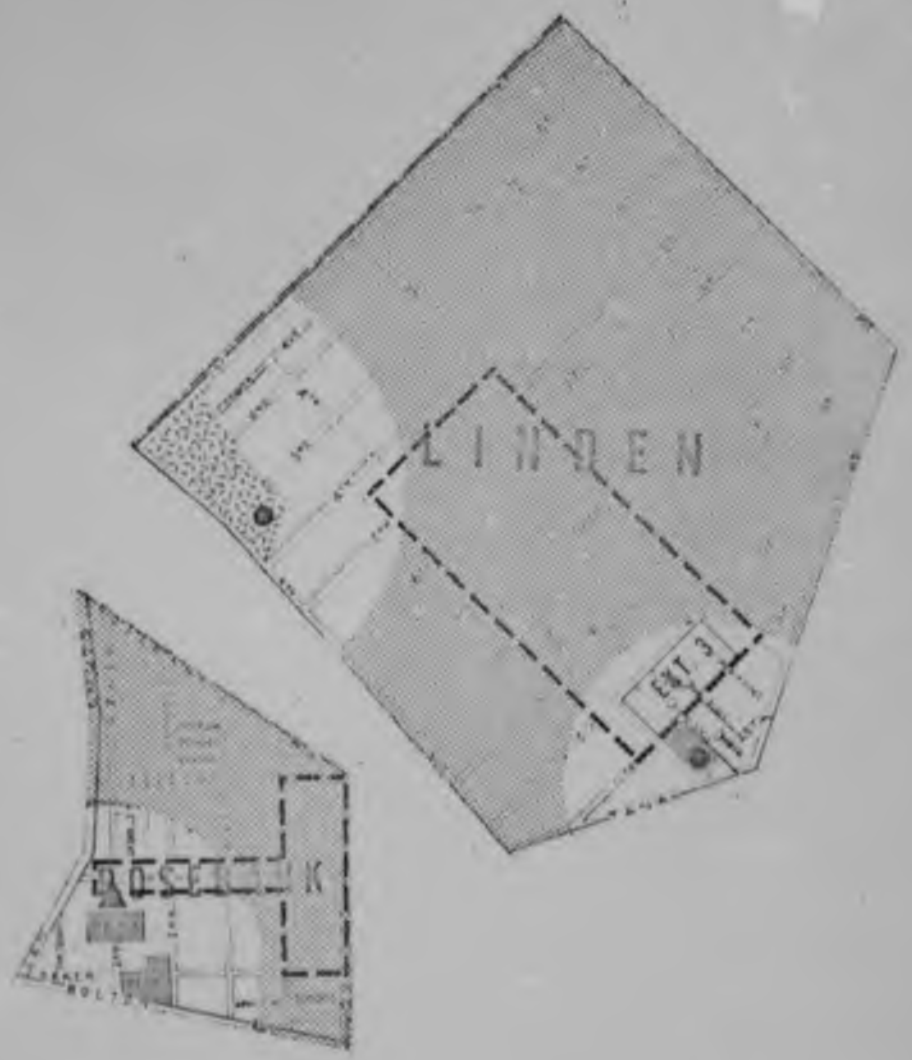
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TABLE 6.2 OPEN SPACE WITHIN APARTMENT CLUSTERS (OR ADJACENT)

| APARTMENT AREA | NAME OF PARK | TOTAL AREA HA. | AREAS USED FOR: Playfields Swimming Baths | Childrens Play-ground | General Purposes Local Park | REMARKS |
|---|---|---|---|---|---|---|
| Linden | Pistorius Place | 1.350 | 0.80 | - | 0.54 | Swimming Pool |
| Rosebank | Rosebank Park N. | 1.600 | | - | 1.16 | |
| | Rosebank Park S. | 1.78 | 1.01 | - | 0.76 | Bowling Greens |
| | | | 1.01 | | 1.93 | |
| Houghton | - | - | - | - | - | - |
| Killarney | Killarney Park | 0.73 | - | - | 0.73 | - |
| Illovo | | | | | | |
| Birnam | Stand 04 & 65 | 2.42 | - | - | 2.43 | - |
| Cheltondale | Stand 88 | 0.68 | | | 0.68 | |
| | Hilson Park | 5.67 | 4.05 | 0.81 | 0.81 | |
| | Re. of Ptn. 1 | 4.43 | | | 4.43 | |
| Jeppe/Troyeville | Jeppe Oval | 0.77 | 0.76 | | | |
| | Fairview Park | 0.16 | | 0.16 | | |
| | Troyeville Park | 0.91 | 0.40 | 0.30 | 0.20 | Paddling Pool |
| | Murray Park | 2.00 | 1.41 | 0.59 | | Swimming Pool |
| | | | 2.58 | 1.06 | 0.20 | |
| Doorn/Bertrams | Tenger Square | 0.44 | 0.40 | | 0.04 | |
| | Fuller Park | 3.28 | 3.12 | 0.16 | | |
| | Ellis Park | 13.15 | 10.31 | 0.81 | 2.02 | Swim Pool, Paddling Pool |
| | Mackie Niven Park | 0.80 | | .30 | 0.51 | Mostly undeveloped and steep hillside |
| | | | 13.83 | 1.27 | 2.57 | |
| Bellevue | | | | | | |
| Yeoville | Yeoville Sq. | 2.22 | 0.60 | 0.40 | 1.21 | Swim.Bath,Paddling Pool |
| N.Hillbrow | Mitchel Park | 0.89 | - | 0.11 | 0.78 | |
| | Stand 685 | 0.31 | - | 0.11 | 1.09 | |
| C.Hillbrow/Berea | Clarendon Place | 0.12 | - | - | 0.12 | |
| | Pollinger Kop | 2.08 | - | 0.07 | 2.02 | Paddling pool,rocky hill |
| | Donald McKay Park | 2.20 | - | 0.28 | 1.92 | Paddling pool |
| | | | | 0.35 | 4.06 | |
| Central Jhb. | End Street Park | 2.24 | 0.24 | 1.19 | 0.81 | Paddling Pool, Tennis Crt |
| | Joubert Park | 6.82 | - | 0.53 | 6.29 | |
| | Union Ground | 2.33 | - | - | 1.22 | |
| | Von Brandis Park | 0.17 | - | - | 0.17 | |
| | Attwell Gardens | 0.49 | - | - | 0.49 | |
| | Library Gardens | 0.61 | - | - | 0.61 | |
| | Oppenheimer Gardens | 0.38 | - | - | 0.38 | |
| | | | 0.24 | 1.72 | 9.57 | |
| Braamfontein | | | | | | |
| W.Turffontein | Bowden Park | 2.33 | 0.30 | 0.40 | 1.62 | |
| Bellavista | Charles Freddy Park | 1.68 | 1.48 | 0.20 | | |
| | Lindbergh Park | 0.89 | | | | Undeveloped |
| S. Suburbs | Cornelia Park | 1.17 | 0.60 | 0.36 | 0.20 | |
| | Alletta Park | 1.17 | 0.36 | 0.20 | 0.61 | |
| | Boyton Park | 0.69 | - | 0.29 | 0.40 | |
| | Reserves | 10.19 | 0.40 | 0- | 9.79 | |
| | Lucas Park | 1.86 | 0.40 | 0.40 | 1.06 | Pedaling Pool |
| | | | 1.78 | 1.26 | 12.06 | |

SOURCE: Parks and Recreation Department




Local Park

Playground

Major Park or Sportsfield

Private Clubs

Boundary of Cluster

Areas not served

Creches & Nursery Schools

Libraries

Recreation Centre (Children)

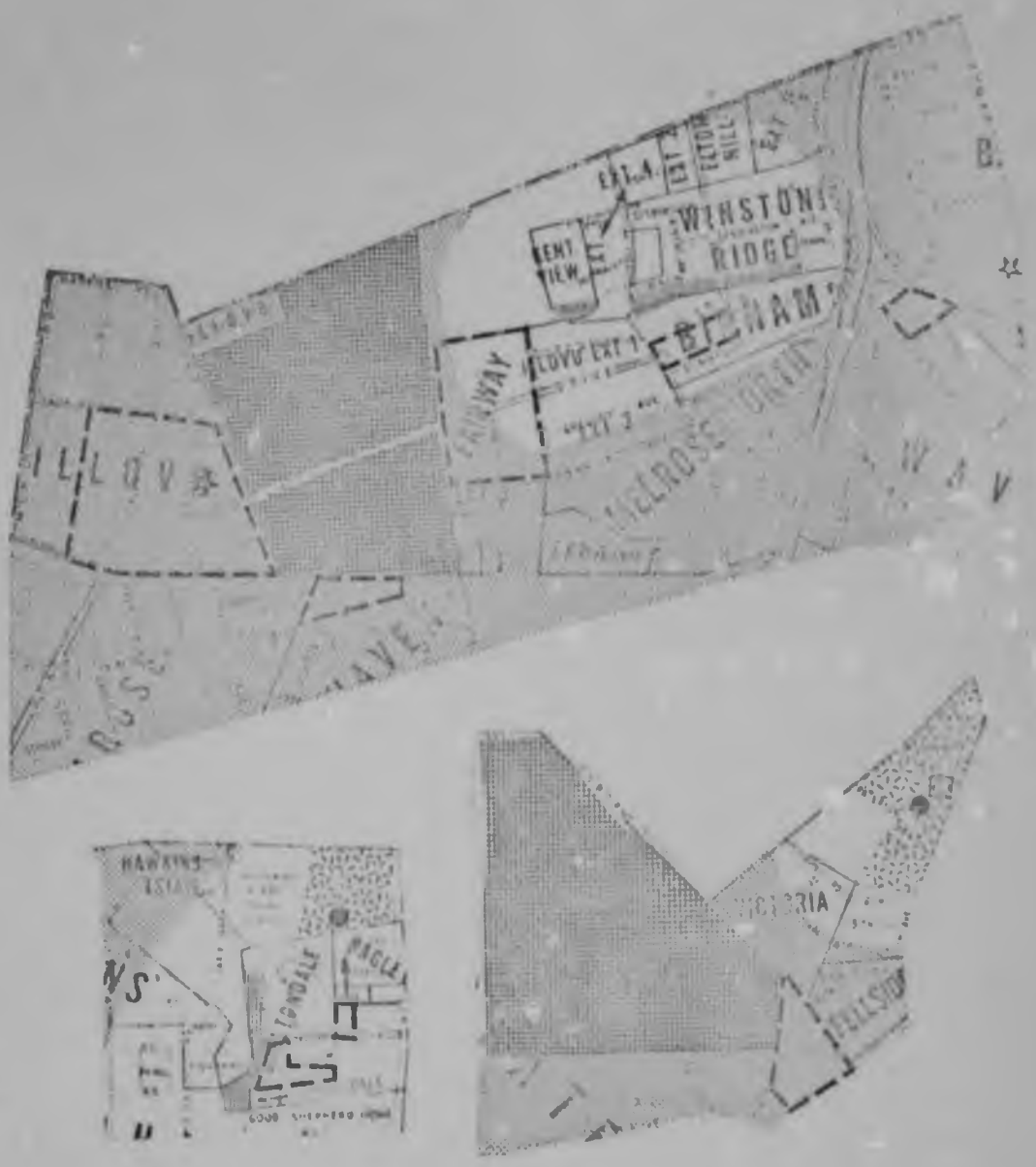
Recreation Centre (Adults)

Health Clinic (Children)

Health Clinic (Adults)

FIG. 6.3

Provision of Facilities - Rosebank, Linden




- Local Park
- Playground
- Major Park or Sportsfield
- Private Clubs
- Boundary of Cluster
- Areas not served
- ☆ Creches & Nursery Schools
- ▲ Libraries
- □ Recreation Centre (Children)
- □ Recreation Centre (Adults)
- ○ Health Clinic (Children)
- ○ Health Clinic (Adults)

FIG. 6.4

Provision of Facilities - Illovo, Houghton, Birnam, Cheltondale




- Local Park
- Playground
- Major Park or Sportsfield
- Private Clubs
- Boundary of Cluster
- Areas not served
- ☆ Creches and Nursery Schools
- ▲ Libraries
- □ Recreation Centre (Children)
- □ Recreation Centre (Adults)
- ○ Health Clinic (Children)
- ○ Health Clinic (Adults)

FIG. 6.5

Provision of Facilities - Jeppe, Troyeville

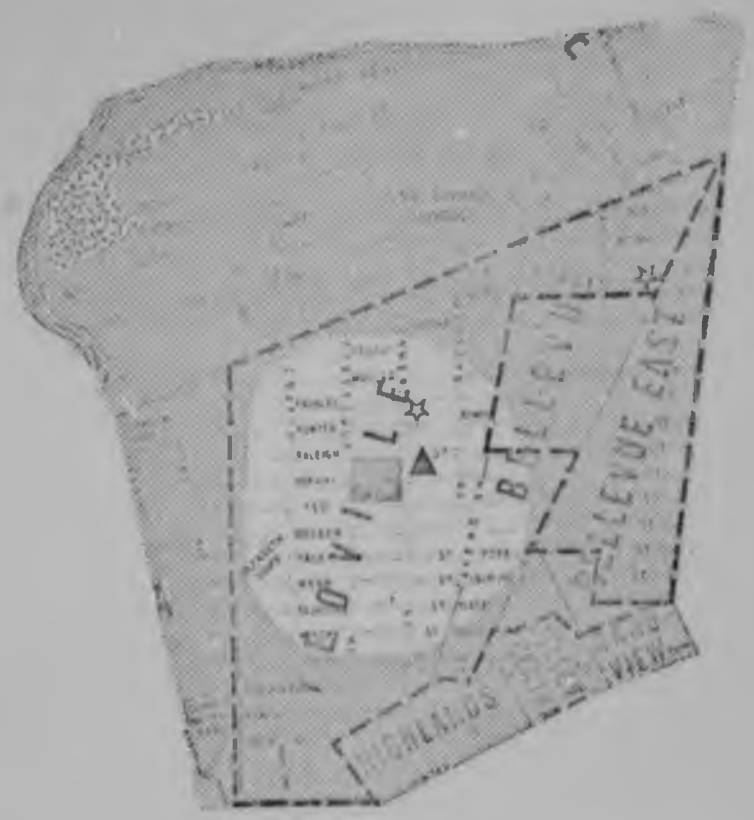



FIG. 6.6

Provision of Facilities - Yeoville, Bellevue




- Local Park
- Playground
- Major Park or Sportsfield
- Private Clubs
- Boundary of Cluster
- Areas not served
- ☆ Creches and Nursery Schools
- ▲ Libraries
- □ Recreation Centre (Children)
- □ Recreation Centre (Adults)
- ○ Health Clinic (Children)
- ○ Health Clinic (Adults)

FIG. 6.7

Provision of Facilities - Berea, Hillbrow, Killarney

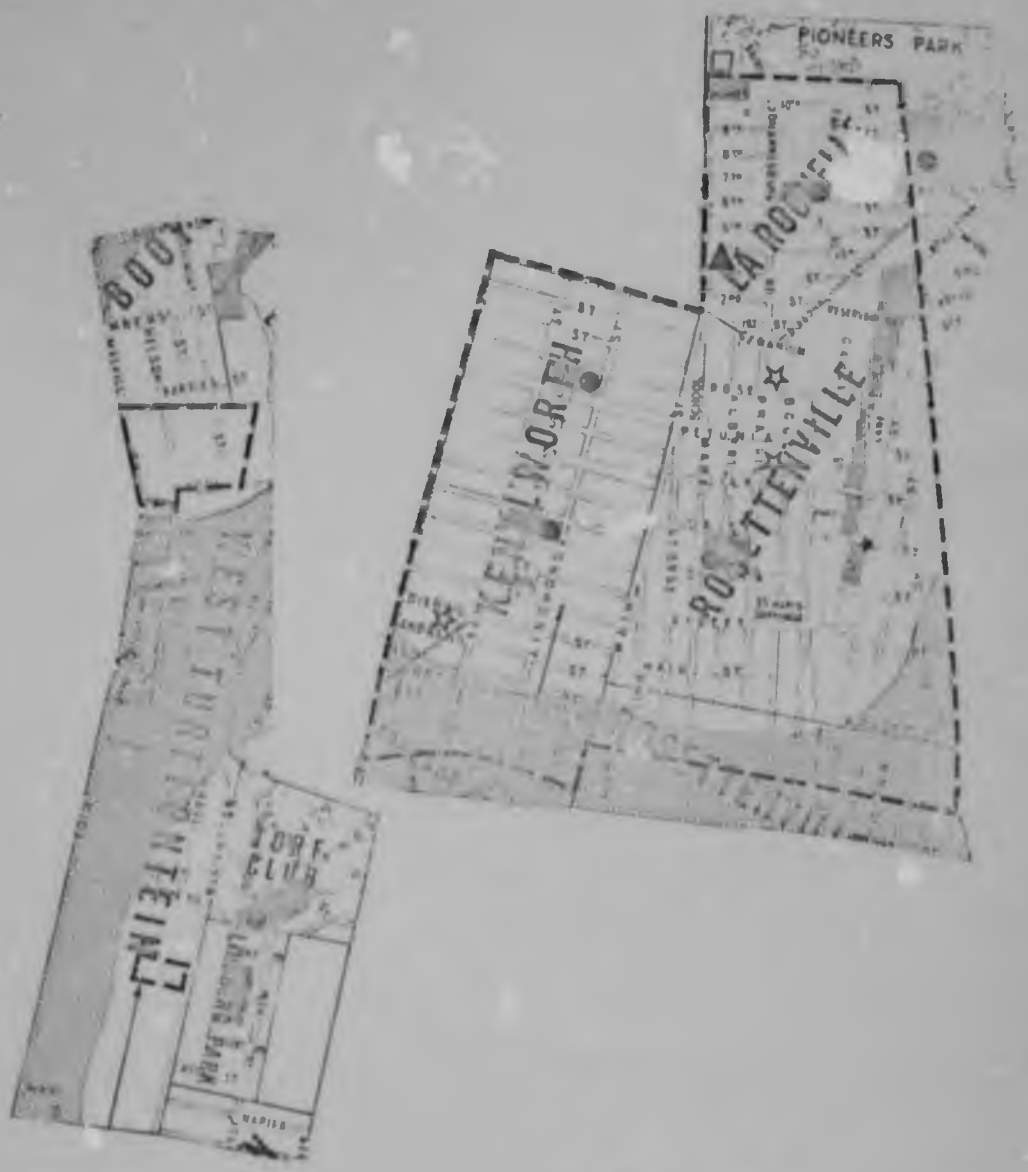


Local Park
Playground
Major Park or Sportsfield
Private Clubs
Boundery of Cluster
Areas not served

Creches and Nursery Schools
Libraries
Recreation Centre (Children)
Recreation Centre (Adults)
Health Clinic (Children)
Health Clinic (Adults)

FIG. 6.8

Provision of Facilities - Central Johannesburg




- Local Park
- Playground
- Major Park or Sportsfield
- Private Clubs
- Boundary of Cluster
- Areas not served
- ☆ Creches and Nursery Schools
- ▲ Libraries
- □ Recreation Centre (Children)
- □ Recreation Centre (Adults)
- ○ Health Clinic (Children)
- ○ Health Clinic (Adults)

FIG. 6.9

Provision of Facilities - West Turffontein, Rosettenville

## 7. ASPECTS OF CHANGE IN APARTMENT AREAS 1960 - 1970.

### 7.1 Structural Change in Johannesburg since 1960.

Before proceeding to assess the Planning implications of apartment areas, some general aspects of changes in the structure and characteristics of apartment areas since 1960 will be dealt with, in order to introduce a dynamic aspect into the study.

No Census data for 1970 is yet available in sufficient detail, and thus this is a general statement.

With increasing movement of the rural population to the urban area, and increased foreign migration, (the majority of which has located in the urban area), urbanization has accelerated. The areas of the city which received the greatest impact of growth and development, were the relatively undeveloped areas to the north and south, while the older townships on the east-west axis tended to have a static growth, which urban renewal programs are likely to change.

A limited amount of residential development occurred beyond the city's northern boundaries in the 1950's (JCC 1970 Pop. Report p.17). After 1960, there was a very rapid development on smaller stands. The residential development to the north represents a continuation of the sector of high income townships extending from Houghton in the south.

The growth and spread of the metropolitan area has led to new manifestations in the structure of the city. New nodes of development have occurred on the periphery of the city. These nodes were initially shopping nodes or nascent town centres, but have in recent years, become the focus for functional decentralization of shops and some office development. In turn, these nodes are associated with, and have encouraged apartment development, in many cases above shops; but in some areas adjacent to the facilities offered. Further, the opportunities to optimise land use and to take advantage of

large tracts of open space have encouraged clustering of apartment development on the periphery of the city.

In 1960 in the Johannesburg Metropolition area apartments comprised 32% of the housing stock. Since then, a number of factors have influenced the rate of development of apartments to the extent that they now (1970) represent approximately 40% (JCC, High Density Housing, p.3). The factors cited for influencing increased apartment development are urban sprawl and long distances from places of work; escalating land and building costs, placing home-ownership beyond the reach of an increasing proportion of the population; and increasing values and rates forcing owners in general residential suburbs to develop or to sell out to developers. To these factors should be added the appeal that apartment living has for an increasingly sophisticated population with specialized housing demands, viz. those who have consumerism or careerism lifestyles - the single working adults and newly married couples as well as the older couples whose children have grown up and left home.

The ecological processes of concentration, centralization, decentralization, segregation, invasion and succession, have influenced the location and magnitude of apartment development, in that the central apartment areas have had an intensification of development; some suburban apartment areas have reaped the advantage of decentralization of apartment development for certain population groups which have become distinct enclaves in suburban detached home areas; others have invaded into older suburban areas; while yet other apartment complexes have undergone redevelopment with an increased intensity of building development.

Concommitantly, the ageing of buildings and consequently the apartment areas, has led to change

of some apartment areas via the filtering process and/or the regeneration of new development which entices and encourages a different population type. Despite all the changes in the structure of apartment development there appears to be no fundamental alteration to population structure of flat areas in ecological terms, i.e. the flat areas continue to reflect socio-economic stage in the life cycle and socio-cultural dimension that relate to the concepts of consumerism, careerism and familism.

Fig. 7.1 exhibits the number of apartment units existing in each cluster for 1960, the number of apartment units built 1961-1969, and consequently the percentage increase in units.

To a large extent, many suburban apartment clusters were small areas zoned General Residential or apartments built over shops in similarly small areas zoned General Business. Consequently, there was limited possibility for expansion.

The major apartment complexes of Hillbrow-Bellevue, Doornfontein-Jeppe, and the Southern Suburbs, had ample room for intensification in large areas zoned General Residential.

Suburban located apartment clusters with minimum infilling possibilities such as Rosebank, Birnam and Cheltondale showed very small absolute or percentage increases in development. The northern suburbs apartment clusters, catering for the more affluent and consisting particularly of mature marrieds and the elderly and having undeveloped zoned areas, increased by large proportions, viz. Houghton (46.8%), Killarney (68.5%), and Illovo (53.5%). Linden, catering for the higher socio-economic status Afrikaans speaking community also increased substantially (45.7%), despite not being in the high socio-economic status sector.

The old, congested low status apartment clusters of Jeppe/Troyeville, and Doornfontein/Bertrams had very small increases despite zoned land opportunities. Note, though, that the majority of the Jeppe/Troyeville apartment cluster was designated in urban renewal area and was 'frozen' for development.

While Bellevue experienced a large increase (32.6%), Yeoville, despite possibility for intensification only increased a small amount (16.4%), which is possibly due to the township owners making development difficult.

It is the Hillbrow and Berea apartment areas that have the largest absolute and percentage increases, possibly reflecting demand and land value. Despite experiencing pressure from competing and more profitable land use in the C.B.D., the central Johannesburg apartment cluster experienced an increase of 22.8%, mainly in new, very high-rise developments in the "frame" and "periphery" of the CBD. Braamfontein reflects no increase during this period and indicates the trend to office development.

West Turffontein and the Southern Suburbs have small increases (21.2% and 25.1%, respectively) despite ample zoned areas. Bellavista is unique, in that it was developed as a Council Housing Scheme, and thus does not reflect market demand.

New apartment clusters have developed in areas beyond the Johannesburg municipal boundaries. High quality exclusive duplex developments on large attractively landscaped sites at densities of approximately 75 person per net hectare, were developed in Sandown, which is at the heart of the extension of the high socio-economic status sector. Lower quality duplex development also occurred on the north west boundary in Windsor Park and tends to serve a middle-income young family immigrant population.

## 7.2 Changes in the Population Composition of Apartment Areas.

While no detailed information exists to support the statements to be made, indications of changes have been obtained from discussions with the major rental agencies and from a pilot study conducted in Central Johannesburg by the author. (Kahn, 1970). It is thus possible to make rough predictions as to the change, if any, of population types in apartment areas.

Several reasons can be cited to account for the change occurring. Firstly, the ageing and redevelopment of an area means that new apartment units have high rentals that can only be afforded by those with occupations paying relatively high salaries, or in the case of young couples, where both parties work. This factor can also lead to overcrowding in order to afford the rentals, either by shared facilities or by living in units too small for real needs. Secondly, all buildings built prior to 1966 were placed under rent control, which made larger apartments in suburban areas (in the later years of the decade) more reasonable in relation to new and small apartments in more central locations. These apartment areas were also more suitable for young couples with young children who were not able to afford their own homes. Thirdly, an increasing sophistication among apartment dwellers in regard to their housing needs created a situation, among those who could afford it, to opt for apartment areas of greater amenity in the suburbs.

The high rentals of new apartment developments in the high land value areas of central Johannesburg and Hillbrow has attracted those young single and married adults whose salaries made it possible to pay such rentals. These people also tended to be more highly qualified than the prevailing existing population, i.e. they were career and consumer orientated. Also the redevelopment has meant the demolition of older apartment units and the consequent

forcing out of the area entirely of the elderly (particularly pensioners with small resources). This has resulted in a percentage and absolute drop of people over 50 years from 42.3% in 1960 to 32.3% in 1970, which reflects a percentage of this age group of 12.4% in new units. (Kahn, 1970 p.43-45). There has been a corresponding rise in the numbers of young couples, especially with pre-school children.

According to the rental agencies, the apartments that fall under rent control in Rosebank, Birnam and Cheltondale ware in great demand by young married persons with young children. In 1970 real money terms, the rentals in rent control apartments in these areas are now in the price range of these young people, who would be paying similar rentals in new Bachelor and one Bedroom units in Hillbrow and Berea. The environmental amenities of these areas, with their on-site open space so suitable for children, have an obvious attraction for young couples who now filter in; while the original slightly older population demand group appears to have moved further north to Sandown. Killarney has rents that continue to price most young couples out of the area.

Also, with increasing affluence and greater mobility, young single people and young marrieds without children are moving into areas such as Yeoville and Bellevue to take advantage of larger flats (also rent controlled). But at the same time, those young couples with children who are not affluent enough to move to the northern suburbs, continue to enter these areas in preference to Hillbrow and Berea, which remains strictly orientated to those whose life styles are not family oriented.

7.3 Changes in the Provision of Social Facilities

Land for two new parks was expropriated during the period 1960-1970. These are the New Berea Park (2.19 hectares), and the New Hillbrow Park (greater than 4.01 hectares). The new Berea Park provides for a serving area not previously covered in both

the Hillbrow and Berea clusters, but it cannot be estimated whether this would be sufficient space for the increased population. The Berea park includes a playground for children. The New Hillbrow Park is primarily a large park for walking and sitting and has proximity to the core of the highest density clusters of the city, but it tends to be isolated from the serving area by high capacity roads acting as barriers to pedestrians.

The Killarney cluster has lost its private club to the motorway, which in turn further reduces any amenity in the area. But during this period a shopping centre has been developed which provides a library amongst other facilities.

Little other change has occurred in regard to social facilities in the apartment clusters as a whole.

The methodology for establishing the provision of social facilities and amenities, as utilized as a case study for the situation as at 1960, could therefore be easily adapted and utilized to assess the needs of the population in 1970 and constantly updated with periodic monitoring of the system for any change.

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GROWTH OF APARTMENT UNITS - 1960-1970 TABLE 7.1

| FLAT AREA | NO. OF UNITS 1960 | NO. OF UNITS BUILT 1961-1969 | PERCENTAGE INCREASE |
|---|---|---|---|
| Linden | 392 | 179 | 45.7% |
| Rosebank | 581 | 22 | 3.8% |
| Houghton | 141 | 66 | 46.8% |
| Killarney | 848 | 581 | 68.5% |
| Illovo | 508 | 323 | 63.5% |
| Birnam | 235 | 20 | 8.5% |
| Cheltondale | 107 | - | - |
| Jeppe/Troyeville | 535 | 83 | 15.5% |
| Doornfontein/Bertrams | 1 079 | 72 | 6.7% |
| Bellevue | 1 092 | 356 | 32.6% |
| Yeoville | 3 173 | 520 | 16.4% |
| N.Hillbrow/Berea | 2 412 | 2 061 | 85.4% |
| C.Hillbrow | 7 385 | 3 725 | 50.4% |
| Johannesburg Central | 8 420 | 1 922 | 22.8% |
| Braamfontein | 1 643 | - | - |
| West Turffontei | 151 | 32 | 21.2% |
| Bellavista | 56 | Housing Scheme | - |
| Southern Suburbs | 1 487 | 388 | 25.1% |

Source: A.I. Cohen, Building Plans Approved.

## B. PLANNING IMPLICATIONS OF STRUCTURAL DIFFERENTIATION OF APARTMENT AREAS.

The approach followed in this study has been to establish a comprehensive and systematic procedure for assessing the planning implications that result from apartment development as it occurs in distinct concentrations in the city.

The methodology established identifies the characteristics of apartment areas in terms of the type of populations inhabiting them and attracted to them; the form of the development; and the locational setting of each cluster. The differing characteristics of these apartment areas then permit the identification of a spatial structure for apartment development within the context of the total residential pattern. Once having established the structure and characteristics of apartment areas it is possible to isolate the distinct clusters of similar apartment characteristics. A further and more detailed analysis of each cluster is then followed by applying accepted planning standards for the provision of social facilities and amenities. The most serious problem resulting from apartment development, the deficiencies of these facilities in relative terms, is then established.

The study thus enables the planning implications, on several aspects, to be established. The aspects of planning that follow from the differing characteristics of apartment development that are outlined in this study are:-

1) The location and distribution of apartment concentrations in the city.
2) The structure of that distribution, in terms of their characteristics, that permits both an understanding of this residential sub-system and the ability to predict change and growth.
3) The specific social facilities and amenities that are necessary and appropriate to the various types of apartment clusters, and the consequent need to plan for the modification of existing

areas, the requirements in extensions to existing areas, and the necessity to plan appropriate total environments in new apartment areas.

Bearing this framework in mind, it is now possible to proceed to specify and clarify the planning implications of apartment development in terms of the total urban system and in terms of the apartment concentrations themselves, and their effect on the achievement of human needs and include all physical features that are significant at the micro-scale. (Michelson, 1966).

This schematic approach has been implied throughout the discussion in attempting to clarify the nature and range of phenomena in flat development. In this way both the macroscopic and micro-scopic elements are accounted for.

8.2 Population Tendencies: A Typology.

Continuing population growth may intensify population concentration and urban crowding in two ways. First, it may simply add to the population; and, Secondly, should the population attracting power of the city increase more than in proportion to its size, the large city will have an increased concentration. While the nation's population is becoming more concentrated within the large areas of concentration, i.e. in the main Johannesburg; a redistribution of population is taking place and thus changing (or threatening to change) many of the ecological sub-areas within which housing is located. This redistributive process reflects processes affecting both concentration and congestion.

The population outside of the municipal area has been growing much faster than that inside it. The population growth outside the city has taken place in the form of single-family low density housing, while the growth inside has taken place in terms of high density, high-rise and low-rise.

The effects of the population trends are of two sorts, therefore, as a consequence to population

growth and as a consequence to population concentration.

Four general consequences to population growth may be noted. (Spengler, 1970). The first of these is the accentuation of population concentrations (or density); the second is the increase of overall population and population concentration; the third effect of population growth is the absorption of inputs, which might be used to improve amenities; and the fourth effect, is associated with the continual change in city size produced by population growth.

Population concentration and density produce a number of somewhat distinct effects, which are incident on some or all the sub-areas constituting the city by reducing the amenity of housing areas. Some of the effects associated with population concentration is contraction of space, which reduces the ratio of space available for household and other activities and thus diminishes the contribution of space to an individual's standard of life. Second, population concentration increases the exposure of housing and particular sub-areas to pollution of all sorts. Most of it is ultimately of human origin and therefore is in greatest amount where men are concentrated and live and consume, and hence manufacture debris, pollutants and contaminants of all forms. Third, congestion of channels for the conveyance of people increases to the detriment of each sub-area. The fact that population tends to cluster, only adds to these congestion problems. Fourth, a further concommitant of population concentration may be noted, which may affect the macro-scale adversely; because a population and its activities may become sub-optimally dispersed within a metropolitan region, and then perpetuated because to render modifications is very expensive. This distribution can make for a high consumption of man's time, which might otherwise be used to the advantage of his well-being.

These general trends of population growth and concentration in Johannesburg have certain implications. With Johannesburg being the "primate" city in South Africa; the overall growth in population, which has been enhanced by immigration, has affected Johannesburg most. There has been a continued sprawl of suburbs peripheral to the municipal area, particularly to the north, viz. Randburg and Sandton, and a continuing concentration of development in and adjacent to the city centre in existing apartment areas. Furthermore, clusters of concentrated development in suburban areas and the municipal periphery have also continued to increase, while new developments have occurred and will continue to occur.

The major affect of continuing concentration occurs in the older more congested apartment areas, where increased density, by reducing available open space ratios, has led to amenity deficiencies, i.e. traffic and parking congestion, lack of usuable open space, etc. The sub-optimal distribution of apartment areas can be noted by the result that many zoned areas have not developed, viz. Mayfair and the Southern Suburbs.

The existing population trends, with changes in the upper and lower ranges of the age structure, will create a new market for different types of housing accommodation. Young single and young married households (with and without young children) will increase relatively and absolutely in the population; as will the numbers of elderly persons. Not only are changes occurring in the chararteristics of the population, but in the distribution as well. While a large number of the young, single and married, single and older persons, will continue to concentrate in the inner apartment areas, the process of the "flight to the suburbs" including apartments will continue for the family households especially among the more affluent and mobile.

It is now possible to proceed to some of the more specific trends in the population tendencies.

From the scale of development in existing apartment areas, the occurrence of new apartment areas in the northern suburbs, and the lack of substantial development in the eastern, western and southern suburbs of Johannesburg, it can be seen that at the macro-scale there is a general tendency for apartments to be clustered in particularly sectors, with a concentration towards location in high-income areas. The demand for apartments is related to the physical and socio-economic environment and to accessibility within the urban area.

The intra-urban locations of apartment development, are, to a large extent, affected by the existing spatial structure of land uses, i.e. the earlier growth patterns, the accessibility to all parts of the city, the condition of buildings, the socio-economic characteristics of the populations, and the nature of site-size, cost and availability. Thus apartment development is concentrated into a few areas, which reflects the "channelling effects of zoning" in existing apartment areas especially in the inner areas, as well as the tendency for construction to follow existing land use concentrations and in new areas to follow the directions of growth. This pattern is shown to be largely sectoral. Within the higher socio-economic sector the six-stage evolutionary sequence may be noted; while in the lower socio-economic districts little growth has occurred and in the instance of Jeppe/ Troyeville, the area has passed directly to down-grading that has required an urban renewal programme.

In suburban areas the apartments have developed along major transport routes, while the clustering has resulted more from the intervention into the market by the local authority through zoning controls. The development of suburban apartment areas

has established a zonal distinction between the family orientated suburban apartments and the career and consumer orientated households of the inner suburban apartment areas. This pattern reflects the changing demographic structure (of an increasing proportion of households of the old and young couples without children) and rising real incomes or sufficient income which allow the relative freedom of moving. These populations include those who have chosen familism, but to some extent are not in the family-cycle stages, in which welfare of the children significantly affects the choice of residences. Further, apartments have followed houses, and offices to the suburbs, where amenity is greater.

Certain life styles are apparently restricted to certain socio-economic status groups, and therefore their desired dwelling types are similarly limited, viz. to apartments (except where the apartments are built by the public sector for those who would desire houses).

For the most part, and especially in the inner suburban areas, there is a stable market for apartments, in the fast turnover groups made up of young unmarried people, originally from out of town and suburbs, who have gone to work in the city center; also, for the childless couple, staying in apartments makes sense, as they do not need the room that suburbia offers, and it gives them time to anticipate their housing needs. There are also many kinds of "atypical" households, which while each is statistically a small fraction of the total, together they form a disproportionately large part of the city market, viz. widows, divorcees, spinsters, and bachelors, who find apartment living more suited to their needs.

The tendency towards differentiation of apartment development has specific implications at the micro-scale.

The sectoral aspect of apartment development

indicates that it is within the higher-socio economic sector that apartment development predominates and that this in turn caters for the higher-income groups, who are consequently more mobile and who are more able to choosing housing according to the needs of their life styles at particular times. Further, while zoning is an intervention into the housing market, it appears that when apartment clusters are defined by it, there are distinct advantages of concentration and segregation achieved (when zoning is not expansive). The advantages of this clustering is affected at the micro-scale in respect of open space requirements, and the provision of social facilities that is specific to each kind of apartment development; but need not, or cannot be shared with the surrounding traditional suburban areas.

Consequently, the implications regarding these aspects are that apartment areas in this sector will continue to intensify, in the inner suburbs areas, in the suburbs and on the urban fringe. Also, it is within this sector that further extensions of the zonal areas can be expected, as well as new developments occurring; related to existing and new nuclei and transport routes.

The major implications that can be ascertained from the sectoral differentiation is that of the locations of apartment development within the social space matrix of the city. The amount and nature of these apartment areas are also related to the zones in which they are located. Thus Killarney and Houghton will continue to cater for the older and wealthy population of the economically substantial suburbs surrounding it. Rosebank, Illovo, and Birnam will continue to reflect the slightly younger and slightly less affluent households of its environs; while new developments in Sandton will cater for the more sophisticated and even wealthier element in its population.

Off-centre (and to either side) of the north orientated high socio-economic status sector are apartment clusters, in what could be called the upper-middle and middle socio-economic status sectors. These apartment clusters are not only less developed, because the young marrieds, mature marrieds and the elderly who aspire to apartment dwelling have usually acquired the necessary finance to live in the high socio-economic status apartment areas, but have a smaller population with those housing preferences and the ability to achieve them. These apartment clusters, thus, are more orientated towards the young marrieds with young children, viz. Cheltondale, Linden (which has an ethnic bias), Bellevue and to some extent Yeoville.

In this context, though, the needs for housing of the middle socio-economic status sector inhabitants has been affected by rising housing costs and consequently there is a demand for rented and apartment accommodation before achieving the aspirations of an owned dwelling. The demand is met by the low-rise high density duplex complex such as Windsor Park. Not only do those complexes play an important role, but will continue to expand, and provide the precedence for further low-rise apartment areas in the middle socio-economic status sectors.

The apartment areas falling in the low socio-economic status sectors, i.e. Doornfontein/Bertrams, Jeppe/Troyeville and to some extent, the Southern Suburbs, are not very extensive for the reasons outlined before. But in this case a major difference can be presumed that these young marrieds with children are living in apartment areas through lack of choice, because they are unable to afford alternative accommodation. These are problem areas, in that they do not possess the potential for redevelopment, because of the lack of a sufficient market for entrepreneurs; and at the same time the

facilities offered are inadequate for the population housed. It is also possible to argue that these apartment areas are important for the city as they provide a well situated location for those unable to afford large transport costs, and that these areas should, as a consequence, be preserved and protected for the use of low-income populations. To some extent this has been anticipated by the proclamation of the Jeppe/Fairview/Troyeville Urban Renewal Scheme. Urban renewal programmes not only protect these populations, but they are also one of the few means to redevelopment in a downgraded area such as these, where the six-stage redevelopment process has not operated for residential development in particular.

The zonal influence of apartment differentiation reflects broadly, the distinction between the familism orientated suburbs and the career- and consumer-orientated inner suburban apartment areas. The implication of this aspect has meaning for the macro-scale in that it indicates the nature and the form that apartment development should take within the physical space matrix of the city. The non-family and mature small family population types dominate and will continue to dominate, in the more centralized apartment areas, while young and slightly larger families tend to favour the suburban apartment areas. The further from the city centre the apartment areas are, the more predisposed they become to be favoured by the family households. There are however exceptions, where the suburban apartment areas, because of their relationships to older and more established suburbs, such as Killarney, Rosebank and Illovo, tend to attract the mature, small family households of greater affluence. It is of interest that it is Killarney, and Houghton which are predominantly mature families and the elderly persons, that are suburban clusters closest to the centre of the city. It is likely that the

older areas of Upper Houghton could undergo a first stage phase of redevelopment, which in its case, would be townhouse development that would reflect its ecological setting for the affluent mature families.

Noteworthy, too, is that with ageing and obsolescence of some apartment areas and the concommitant change as a result of new development in some instances, is the fact that only the age categories change but not the fundamental structure - the amount of the elderly decline proportionately in the central apartment areas and are replaced by the young single and young childless couples. Both categories are nevertheless consumer or career orientated, with young couples predominantly the latter. Similarly, the consequence of ageing of apartment buildings and the advent of rent control in suburban apartment areas has meant that young couples with young children(if any) favour these areas and replace the mature marrieds. These areas are favoured because of the increased amenity that they offer and not only the suburban context that appeals, to the more sophisticated apartment dweller. The suburban apartment areas with the most amenities, and thus with the greatest appeal are Illovo, Birnam, Rosebank and Cheltondale. To some extent the lower-rise developments, with its increased amenity of Bellevue and Yeoville, as well as the perceptual amenity of Parktown, North Hillbrow and North Berea (achieved by the relationships to the edge of this apartment development with their views over the city), also appeal to the young marrieds who might have a young child.

As far as the apartment developments in lower-income areas are concerned, zonal differences have no influence. To some extent this might be due to the nature of development controls and stand sizes being similar in all zones. But it is more likely that this category of apartment dweller has no choice of accommodation and both cater for family types.

Thus, it becomes clear that the type of housing in the more central locations can and must be orientated to the small households, i.e. Bachelor and one Bedroom units can and do allow for the high-rise and high density type development. Conversely, the further into the suburbs, the larger the size the apartment units should be, as well as offering on-site amenities, particularly if they are to be adapted at a later stage to young family types with different needs, e.g. playlot space. The change from elderly to younger persons in the central areas does not affect the amount of local park space, but it may affect its form, viz. instead of small parks that allow the elderly to feel part of the crowd, larger space might be required to sit on grassed areas, etc.

Another aspect that may be argued is that the nature of the developmental process to force the elderly (who are on minimum incomes) out of the central areas, where they have good access to their needs, (such as shops, parks and out-patient facilities) at minimum transport cost, is not acceptable in a welfare orientated society. Thus these people, like the poorer lower-income family people, should be protected, either by rent subsidy, public housing or bonus incentive to developers to provide cheap accommodation.

A question that requires to be raised, but for which only indications can be given in reply, is what should be the size of apartment clusters, of whatever type and location, if large townships are not to be zoned as in the Southern Suburbs? To a large extent, this answer will require details of each demand groups preferences which is beyond the scope of this study. But it is possible to suggest that particularly for suburban clusters, they should be large enough to be able to provide for their own requisite facilities, viz. Playlots, playgrounds,

local park, etc., and not have to share or impose on the facilities of surrounding traditional development which will also reduce its efficacy. This aspect is clearly indicated in such apartment clusters as Linden, Birnam, Cheltondale and West Turffontein.

A further aspect not treated in this section of the study, is the problem that exists where apartments occur above shops, especially in suburban areas. These clusters were ignored in the latter analysis because of the smallness of the clusters. In many instances, these apartment areas are fairly substantial, viz. Emmarentia, Greenside, Norwood, Orange Grove, Cresswold, Rouxville and Cyrildene, but the nature of development means that they have street frontages, with no setbacks and no open spaces. In larger shopping areas, especially if of the ribbon type , some accumulation of space should be achieved to circumvent this problem, or additional apartment zoning given so that they generate sufficient need for facilities; or new development controls should be established.

If one of the general goals of planning is to provide for a diversity of environments, then apartment clusters should be allowed and encouraged to develop in various locations within the city. The locations of these clusters will have to be planned in accordance with the ecological structure of the city, and furthermore should not be as extensive as the Hillbrow/Bellevue, complex where a monotonous development has further worsened the form of development.

The locations for these apartment clusters will naturally enough, be within the high and middle-income sectors, some of which will be totally new development in the urban fringe and others of which will occur as first stage redevelopment.

Fringe area locations will tend to duplicate the duplex type of development, such as Windsor

Park, and will be likely to occur in a similar location on the eastern periphery of the city, viz. Senderwood, Glendower and Glenhazel; as well as to the south in new middle-income areas in the Glenanda area. Lower density and more sophisticated townhouse development will continue to occur in Sandton.

The older areas most likely to undergo redevelopment will be those vacated by the upper-income groups as their dwellings fail to meet present day standards. These areas are likely to be parts of Parktown and Upper Houghton, which will best be developed for residents similar to Killarney, and will most likely take the form of townhouses, taking advantage of good aspects. Similarly, parts of Rosebank will be encouraged to redevelop with medium-rise but spaciously spaced apartment blocks, particularly in response to proposed shop and office redevelopment, so as to create nodes of more intensive development.

In each case, these clusters should have appropriate zoning controls, in terms of height and coverages, as well as setback of blocks from roads and adjacent buildings. Furthermore, the development of small clusters can either be associated with other facilities such as major shopping centres and/or future proposed mass transit terminii and stations, or in small clusters within existing traditional family dwelling areas so as not to be obtrusive. In this case the control of development will have to change from the normal 'blanket' approach, to one which will ensure either buffers to the development, or a blending in of development, so that surrounding single-family areas are not encouraged to develop in a similar way.

8.3 Nature and Form of Development.

The various parameters of development control and size of site, indicates the nature of the various apartment areas environments. In many

instances, especially in the suburban apartment areas, the built development does not fully utilize that is allowable under the zoning controls, such as coverage and the permissible bulk. To this extent it can thus be argued that despite the more spacious and amenity orientated controls in the suburban areas, the entrepreneurs are developing to meet the specific needs, in the way of accommodation, of specific demand groups. The entrepreneurs response to provide the size of units built (in terms of both number of habitable rooms and square footage of the individual rooms) and the amenity factors, such as landscaped open space and parking facilities, is directly related to demand. Thus, while the development controls provide an envelope in which development takes place, to a large extent, the nature and form of development in suburban areas would have taken that form in a response to demand anyway. Nevertheless, in some instances, such as in the Height Zones 1 and 2, the envelope provided is inadequate in its controls; that is, that the controls not only do not provide for on-site amenity, but they control neither density, nor size of units that may be demanded.

Traditionally, space about housing has been a result of planning recommendations and legislation based on three fundamental criteria: (1) rules for reason of health and access; (2) density strategy (variously phrased in terms of permissible building bulk (i.e. plot ratios) or persons (or bedspaces) per hectare; and (3) physical requirements, mainly of sunshine adequacy and of "daylight" standards, within the dwellings. However, these controls for the design of block spacing and land-use have tended to be given isolated and absolute status, often independent of an analysis of the real needs of the people who will occupy the schemes. It is the shortcomings of development control in

this respect that indicates implications for the nature and form of housing in the various clusters and raises the suggestion of more flexible "performance standards" to be achieved, other than controls to be imposed. Needless to say, the form of development reflects the size of units and population types. High-rise high density of small units exist in the centralized apartment areas. With progression outward and then into the suburbs, development becomes less intense, and more spacious both in terms of unit size and on-site open space. This pattern continues to the extent that new apartment developments on the urban fringes are of the low-rise form, viz. duplex development in spacious surroundings.

The Controls in Height Zones 1 and 2 facilitates high-rise high density development. This is further aggravated by the fact that the small stands and small blocks have no building line setbacks, side-line setbacks, and have high coverages of their sites. The consequences of these factors are that high dwellings form a wall of development around the periphery of the block fronting directly onto congested streets and have no open space on site.

Further, with an escalation of land values and building costs, entrepreneurs, in attempting to meet the demand in these areas for Bachelor and one bedroomed units, have cut down on the size of units in terms of area and number of rooms. An analysis carried out by the Forward Planning Department of the Johannesburg City Council indicates that

> "a comparison of flats in the Hillbrow-Bellevue East complex in Johannesburg erected in the 1946-1955 period and those erected in the 1966-1970 period shows a decrease of about 10 per cent in the size of three-roomed flats and about 20 per cent in the size of four-roomed flats.
>
> Sizes of bedrooms have decreased by

approximately 10 per cent for the bachelor and two-roomed flats and in the case of two-bedroomed flats and the master bedroom has decreased by 10 per cent and the second bedroom by as much as 14 per cent. Entrance halls and passages have been eliminated to a high degree and the result has been an even greater lack of privacy in the modern flat, although such elimination has sometimes resulted in an enlargement of the living-room space." (Marsh, 1970).

While the large number of bachelor apartments in and around the central area are fairly compatible with the size of households, the occupancy rates indicate that there is overcrowding over and above the smallness of such units. It is obvious that the incorrect size unit is being provided that in turn pushes up the density. Not only are more direct density controls, such as people per net hectare or bed-spaces per net hectare needed, (especially if there is to be a relation to open space needs), but a minimum area size should be set to the smaller roomed units, especially where overcrowded conditions can be expected. If these conditions cannot be ameliorated, then the implications are that facilities to meet the needs and desires of the population in this regard would have to be provided elsewhere and at the expense of the public sector.

The housing of large numbers of people in the intensely used areas of the city is always a problem and which is becoming acute with continued population growth. Various alternative approaches are implied from the needs that require to be fulfilled. Firstly, it is necessary in these height zones to distinguish between areas within which housing and associated social facilities form the major land use, as in Hillbrow and Berea, and those where

housing exists in addition to other land use, as in Central Johannesburg.

The central area being a mixed-use area offers the opportunity to integrate a number of uses on several blocks through the use of the "mixed use" principle of development (G.L.C., Covent Garden Area Draft Plan), where the interdependence of activities and requirements is recognized and catered for.

For both central Johannesburg and the remainder of height zone 2, it should be possible to close off streets and incorporate them with development so that this space can be used for the various facilities, i.e. green space where children can play safe from traffic, parking areas, as well as acting as a focus for all activities. Because of the smallness of the blocks in these areas, this closing off of roads requires little modification of the road infrastructure, and the closing off of certain cross streets should not adversely affect traffic flow.

In this way a more satisfactory environment can be created, with the residential area being divided into precincts through which no traffic can pass and in which the parks, playgrounds, and car parking can become a more integral part of the environment in which they are located. Thus the blocks of development would not be merely islands in a sea of traffic. The major implications of these areas are, therefore, that units more consistent with household size demands should be built (and they should be larger in size); and that in order to provide for the needs of the population some modification is necessary to the infrastructure of the areas.

Those apartment areas that fall within the Height Zone 3 controls, viz. Berea and Yeoville in the main, Doornfontein/Bertrams and Jeppe/Troyeville area, to some extent, better off. But although buildings are set back from street boundaries, it

is seen that such space is in most cases either too small or occupied by motor cars and no space is available for children, who exist in fairly large numbers, to play in. It is only on large (assembled) sites that any amenity acrues from the lower coverages, i.e. mainly in Parktown, Houghton and Killarney. This environmental setting for the middle densities indicates that it is not so much a case of how dense the development is, but how it is made dense. There is a need to apply not only density controls, but performance standards as well.

These apartment areas generally cater for a mix of population types, viz. the young marrieds, both childless and with young children; and the older mature households, some of whom still have families at home. The implication of these characteristics implies solutions that could make for more open space and low-rise development, and at the same time can have tower blocks to provide for other facilities. In such a layout the economics of development need not suffer, as the two forms borrow room from each other. Low-rise development provides air, light and open space, and the towers complement it by mixing the over-all density (to complete the necessary bulk). But these combination type developments in turn requires that large sites be assembled. It is only likely that playlots or small amounts of sitting-around space could be provided, and there would still be a need to provide for playgrounds and local parks. This raises an alternative approach where road closing is not possible because of large blocks; but mid-block "vest pocket" parks can be created which are integrated with residential development.

While the apartment areas of Berea and Yeoville have a good correspondence between household size and the provision of apartment unit size, the lower-economic apartment areas in this category, of Doornfontein/Bertrams and Jeppe/Troyeville, indicate

that although there are high percentages of one-bedroomed and two-bedroomed apartments, there are evident instances of overcrowding when the reasonably high instances of children are taken into account. In this case overcrowding stems not so much from a lack of suitable alternative accommodation but rather from lack of finance to afford larger facilities. Without the ability to subsidize rents for these population types, only public housing, via urban renewal programmes (as in Jeppe/Troyeville), can hopefully provide these people with adequate environments. But these developments must provide for the larger household sizes of family groups and this necessitates low-rise high density development with sufficient provision of open space.

The remaining apartment areas fall under Height Zone 5 controls, but in many instances special further controls are superimposed. For the most part these developments are low- and medium-rise developments and where the site size is sufficient ample amenity is obtained and pleasant environments created. It might be possible to lay down that a minimum size open space (say, sufficient for a play-lot) be provided in order to establish the minimum size land parcel for development. The only implication of the form of development is that it is fairly well suited for suburban development and by and large, blends in with its surrounds. But it might be necessary to expect that two storey development on the edge of such clusters might cause less jarring between apartment blocks and traditional development. In this regard, it bears repeating that suburban apartment clusters should be of such a size that they can generate sufficient demand for social facilities to warrant these facilities to be provided within the cluster; and if possible to be integrated with the development so that playgrounds and parks are neither isolated from the development that it serves, nor cut off by roads carrying heavy

traffic.

There is no need in the instance of the northern suburbs apartment clusters, to comment on these unit sizes and their provision, as they have sufficient mix, and are large enough to satisfy all groups attracted to apartment development. Suffice it to say that the larger sized units should be encouraged to allow for adaption to other population groups, as well as making allowance for more leisure time pursuits in the home with the increased leisure time expected in the future.

The decreasing intensity in development outwards from the city centre, reflects both the zonal influence on development and the increased sophistication that apartment dwellers demand in the suburbs.

Despite the need for low-rise developments and larger units, those apartment clusters that cater for the elderly and which are located adjacent to or within major shopping facilities, as well as being close to social facilities (such as Rosebank, Illovo and Rosettenville), might well set up a demand for a modicum of smaller units and some that are in high-rise development. This idea of combination development has been mentioned previously and will be discussed in another context in the following paragraph.

The new apartment developments reflect a departure in apartment developments, i.e. the advent of low-rise duplex development. This varies from the spacious developments of Sandown and Senderwood to the tighter schemes (that is at 30% coverage) of Windsor Park. It is possible to anticipate that this type of development will be preferred by many who contemplate apartment living for whatever reason. A further stage in this type of development is that of dwelling clusters, which encourages a more efficient and creative approach to land planning and can be limited to sites of four acres or less (Patter, 1971). A variation of this is "Planned

Unit Development", which allows for a diversification in the relationships of various buildings, structures and open spaces in planned building groups. This type of development can occur in all zoning districts where the dwelling unit density is no greater than previously allowed and this type of development requires minimum parcel sizes of four acres or more. These types of development are consequently largely relegated to occur in new areas on the urban fringe.

8.4 Apartment Areas: Environmental Needs

The section on the provision of social facilities has already examined the correspondence between the population structure of apartment areas and the patterns and accessibility requirements for social facilities within or adjacent to each apartment cluster. From the indication of the various life styles prevalent in different apartment clusters the analysis had made it possible to outline the major needs of the populations in apartment clusters in terms of social facilities, and the results can consequently be used to indicate the form of provision, which, under optimum conditions, might meet those needs. Thus, the demand groups analysis has been used to describe and classify the particular needs of sub-sets of the population.

Standards have been developed and used as guidelines to minimize the role of intuition, but these standards have been questioned in the study, and replaced with other standards and require further and more detailed investigation in order to question the premises of the standards. The standards advocated and used in this study are merely more refined standards and still possess ambiguity of use and inflexibility of application. Standards cannot cover all possible location and site situations, but if they become too specific they also become too rigid. The major problem facing the application of standards is the site-size standard, as often

the availability of a site is directly related to its size - the larger the site required, the more difficult it is to acquire. Similarly, the standard of accessibility is also difficult to achieve as it is often normatively specified in terms of walking distances, and not always applicable to conditions in congested and heavily trafficked areas.

Further, it is important to distinguish between two types of standards: minimum standards and planning standards. Minimum standards are those such as in Health Codes and building regulations and are ones accepted and adhered to without compromise. On the other hand, planning standards, such as those used for open space provision and other social facility site selections are open to compromise or revision as conditions change. In many instances planning standards are sometimes viewed in the same strict sense as minimum standards. In assessing the implications of social facilities it is necessary that planning standards be redefined to permit flexibility. Thus in order to be operational these standards should be accompanied by a statement of goals and objectives.

The following goals and objectives should be achieved in areas of apartment development:

Goals

(a) To provide for a desirable living environment for people wishing to live in multi-storey dwelling units.

(b) To encourage heretogeneity rather than homogeneity in the spatial and physical patterns and thus discourage 'look-alike' buildings.

(c) To provide, through zoning, adequate amenities in accordance with localised needs and desires.

(d) To encourage a high standard of development.

(e) To encourage the provision of a variety of housing types in order to meet the specific

age and income demands of various population types.

Specific Objectives.

(a) To determine the character of various districts by means of density controls, which could include, inter alia, control of bulk, coverage, height, minimum on site open space, number of units/area, and parking requirements.

(b) To achieve landscaped open space (excluding vehicular use areas) in order to provide for usable open space, a pleasing setting, and a relation with building accommodation.

(c) To ensure the siting of buildings with consideration given to the relationships of adjacent development in terms of height, mass and pattern, so as to permit sunlight penetration in, and air circulation over and around structures, and to ensure satisfactory views and privacy by imposing minimum setback controls.

(d) To ensure on-site parking areas with the intent of providing adequately for tenants and visitors to keep parked cars from congesting public roads, and to provide for anticipated future needs.

(e) To achieve the provision of a choice of housing in terms of type and size of unit, site design and grouping of units, viz. clusters, duplexes, townhouses, etc.

(f) To allow for new approaches to land ownership, vis. sectional titles.

(g) To provide an overall pattern of open spaces, viz. playgrounds and local parks.

It is in terms of the goals implied in the analysis that it is possible to proceed to assessing the planning implications of social facilities, because there are alternative solutions to the provision of some social facilities.

The provision of playlots in apartment clusters are probably the most difficult to comply with, because of the need to be either on site or easily and safely accessible. Also in those apartment clusters where children make up a small proportion of the population it is often

not feasible to provide this facility within the guidelines of the planning standards. In the suburban apartment clusters, where there are sufficient children, on-site playlots can often be accommodated within the landscaped open space provided, especially as the developed sites are fairly large. A minimum amount of landscaped open space free of cars should be mandatory in these areas.

It is in the more intensely developed Height Zone 1, 2 and 3 areas that this on-site provision becomes more difficult. In Height Zones 1 and 2, viz. Hillbrow, Berea and Central Johannesburg, the suggestion of road closing between small blocks has already been mooted. This possibility allows for common playlots between several fronting developments, each of which could neither generate enough children nor provide sufficient open space. In this way safe contained playlots could be achieved, which could in turn be integrated with or accommodated with either playgrounds or local parks created in the same manner. In some areas such as Berea, Yeoville, Bellevue, Doornfontein/Bertrams, Jeppe/Troyeville and the Southern Suburbs the large blocks preclude road closing, but "vest pocket" playlots could be created mid-block on one stand (15 x 30 metres) at the end of a block, or in a potential road closing where the road becomes a cul-de-sac (which benefits the areas environmentally by keeping fast flowing traffic out),so that no major streets need to be crossed. A further solution is that individual developments on large assembled sites can provide this facility above a parking podium, but this is considered to be unsatisfactory, as children should have access at ground level, and is a compromise solution. If "combination" development on large sites can be encourages, then on-site provision becomes feasible.

To a large extent, the provision of playgrounds and local parks have similar implications except that they require larger spaces and they serve larger areas. While playgrounds are not that essential in the more central apartment areas, they can co-exist with local parks. "Vest pocket" parks might be acceptable in the more elderly person dominated areas, if they have movement and

excitement near them; but the more general purpose parks in areas such as Berea, Yeoville, Bellevue, etc. must be more expensive and cannot take the form of the odd stand in a block. Thus, the provision of such park space is more difficult to achieve. As far as parkspace and playgrounds are concerned in the suburban apartment clusters, the point is reiterated that they should be integrated with the development of the cluster as a whole. If they are not close to the cluster or in a shared situation, the cluster itself should be large enough to warrant the provision of these facilities for itself.

With an increasingly more mobile population the provision of, and accessibility to major parks and playing fields is not an essential element either in or adjacent to an apartment cluster, especially for the higher income apartment areas where the population will tend to be members of private clubs. These facilities can be handled on a general relationships to a total population for the city as a whole.

The provision and siting of the social facilities such as recreation centres, libraries, health clinics and creches and nursery schools have yet other implications for apartment development in the various clusters. Once again, the apartment clusters in suburban areas do not warrant, in most cases, the provision of any of these facilities for the sole use of inhabitants in the cluster, but must be shared with the surrounding traditional single dwelling suburbs. But it is an advantage if the apartment cluster is at the node of development, i.e. shopping centres or major arterial systems, then these facilities can be located within or adjacent to the apartment cluster and thus facilitate the better general functioning of the development. It has also been pointed out that the high socio-economic status apartment clusters are unlikely to need health clinics or good accessibility to recreation facilities, so that the previous statement applies, in this case, to libraries and nursery schools only.

In the medium-rise and high-rise high density areas, the provision of sites for these facilities becomes more difficult. Health clinics and Libraries can be located in and adjacent to shopping nodes, especially where they are on good transport routes; and in Central Johannesburg, Hillbrow and Braamfontein they could be located within other municipal facilities such as parking garages or bus and other mass transit terminii. It is the provision of sites for nursery schools and creches that are most difficult to apply in the intensely developed areas, because the cost of providing the requisite ground is prohibitive. Several alternatives offer themselves. Once again closed off streets could be utilized; but the best solution is to offer bonus incentives to developers to provide such facilities within buildings at strategic points, particularly where the developments are fairly large.

8.5 Apartment Areas and their Functions re: Urban Form
Adequacy and inadequacy of Amenity Factors.

The analysis of the provision of social services and facilities were related to the apartment population as at 1960. This analysis was undertaken to indicate a particular approach to the implications of apartment development vis-a-vis its population structure and the interrelated provision of facilities. In nearly every instance the apartment areas were shown to have deficiencies in the provision of certain social facilities; as well as having problems related to the nature and form of housing. The section of this study on change in apartment development had indicated that most apartment areas have had an increase of upwards of 50% in the number of units built between 1960 and 1970 and it can be expected that they will continue to increase. For many of the clusters this increase of over 50% in number of units means corresponding increases in population according to the mean household sizes of

those clusters. Despite change in the age structure in areas such as Central Johannesburg and Hillbrow; and Rosebank and Killarney; the household size structure can be presumed to have remained basically the same, as has the relationship to the provision of social facilities.

This increase in population particularly for Central Johannesburg, Hillbrow and Berea is very large and implies that the amenity deficiencies are even worse than indicated in the analysis, requiring upwards of a 75% increase in provision of facilities over that even recommended for 1960. The consequence of these increases indicates the large shortfalls, particularly for most of the intensely developed areas and implies that immediate and remedial action must be taken before it is too late to provide any of the facilities.

A study of family life in Hillbrow, has indicated that no substantial amount of social pathologies stem from living in high-rise apartments, in respect of the socialization of children in particular; but these children were bound to their respective apartments because of a lack of facilities and this affected their socialization (Unterhalter 1968). The neighbourhood (and the commercial meeting places in particular) are the places where children encounter and are brought up to be members of their own society and also where they encounter an adult world to learn from (Mead, 1966). Thus it is essential to provide the facilities in which this interaction can take place, particularly in those clusters where large numbers of children occur. Even in areas, such as Hillbrow and Berea, where the percentage of children is very low, there are now (1970), likely to be sufficient absolute numbers of children to warrant the provision of most facilities.

The large increases in population in areas such as Killarney and Illovo have equally drastic

implications; especially with the removal of a private club in Killarney. The need for the provision of general purpose local parks and playgrounds are vital in such areas, and could necessitate the acquisition of property peripheral to these apartment clusters, which could in turn act as buffers between apartment and traditional housing development. It becomes quite clear therefore, that the deficiencies of amenity factors in apartment areas are quite serious. It also follows that before extensions to existing apartment developments are allowed, planning must be undertaken to ensure the provision of land for the development of the necessary facilities, as well as attempting to make up the shortfall. Further, new developments should not be allowed unless sufficient space is made available to service any cluster, which should be of sufficient size to warrant such facilities anyway. This applies particularly to areas which have previously been "Special Residential" and have become "General Residential", as the open space provision in these areas differs fundamentally and a new and specific system of open space standards should be applied when such conversion takes place.

Affect on Urban Form.

Apartment development is becoming a prominent addition to the contemporary urban landscape. Not only is apartment development intensifying in the central areas but it is becoming more widespread and variable as its dominance expands. This change in the housing market has implication for the evolving form of and spatial structure of the city. In general terms, as distance from the centre increases the development shifts from high-rise, to medium-rise, to low-rise, and finally, to duplexes. High-rise apartments, however, are not confined to the immediate proximity of the city centre, but are increasingly found throughout the urban area, including the urban fringe.

Also, most new units are added in the upper

levels of the households income profile, and since simil · social and income groups have been shown to segregate themselves, new apartments tend to be concentrated in existing high-income sectors. Further, suburban areas gen rally offer newer, more pleasant, and more socially uniform environments, as alternatives to the obvious advantages of centrality and this will begin to be more important for some types of apartment development.

Differentiation in apartment development indicates the desire and demand for a diversity of high density developme 's in regard to differences in height, density, and form. This diversity has been shown to relate to differences in household sizes, structure and personal preferences, all of which relate to differences in socio-economic status.

Although apartment development has spread into the suburbs the higher relative concentration remains in central Johannesburg, Hillbrow and the inner suburbs. Nevertheless apartment development as it is evolving, has shifted the structure and locations of this form of housing away from traditional patterns.

The existing high rise apartment clusters of central Johannesburg, Hillbrow, Berea, Yeoville and Bellevue can be expected to intensify and even to put pressure on surrounding older areas in an attempt to expand.

Assisted by zoning, distinct apartment clusters in suburban areas, related to existing and proposed nodes can be expected. These clusters will also tend to spill over into adjacent suburban areas if new clusters catering for similar households are not established. By and large, these clusters will be found in the northward bound high-income sector, and to some extent in adjacent upper-middle and middle income sectors, as well as in a zonal belt along the northern municipal boundary where they will take

(and have taken) advantage of the more freely available large sites. There will be limited demand for the development of apartment clusters in the lower income areas of the eastern, western and southern suburbs, viz. Doornfontein/Bertrams, Jeppe/Troyeville and the Southern Suburbs.

It can therefore be expected that the urban form will be altered, especially in the northern suburbs, with the addition of nodes of high density development at suitable and strategic points.

The need for differentiation in apartment development, and its need for a diversity of environments will encourage various forms of high density developments in the various locations in the spatial matrix of the city. Some clusters, such as Killarney and Houghton will remain as one type of development; whereas clusters in Rosebank, Illovo, Cheltondale, Greswold, Linden and others, might develop as "combination" developments. Similarly, Hillbrow and Berea are almost developed in their respective types, but Yeoville could also be encouraged to develop as "combination" developments. The new forms of development, viz. cluster and planned unit development could be expected initially in the large sites in the upper-income urban fringe, while a modification of cluster development - group housing, where no communal open space exists, could be expected to occur in lower-middle income areas as a solution to the high costs of housing.

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## 9. CONCLUSIONS

The general aim of this study was to establish, from a planning perspective, some of the processes and principles for diagnosing and understanding the development of apartments and associated problems in regard to the provision of social facilities and amenities. The study attempts to define an effective approach to analysis.

Analysis of housing needs, problems and policies has proved to be deficient in the past. Firstly, analysis has tended to be partial and not comprehensive and has failed to deal selectively with sub-problems, as they affect certain groups or communities. Secondly, there is a tendency to miss important causal relationships, often as a result of partial analysis. Further, analysis extrapolates future conditions from current symptoms without acknowledging the changing nature of causes and problems. Third, policies designed to deal with problems that are only partially defined and understood, are inevitably ineffective, with little tradition of active and creative interest in the analysis of alternative policy options. Thus, comprehensive analysis of problems and policy is required. (Mac Murray, 1973).

This study attempts to make a more comprehensive diagnosis of apartment development in particular, and moves from considerations of urban development processes and behaviour en masse, to the more particular level of sub-group pattern and behaviour.

### 9.1 Apartment Development: Processes, Patterns and Trends

The general processes of urban growth, which in turn gives rise to urban form, are at work in the development of the structuring of apartment areas. Firstly, apartments cluster and are concentrated at specific locations within the city in response to differing needs and changing circumstances. Thus the ageing and obsolescence in older neighbourhoods in the high-income sector of the inner areas of the city encourages redevelopment with apartment blocks. Further, apartments cluster along major arterial systems and around major shopping nodes to take

advantage of accessibility and convenience respectively. Secondly, apartments tend to centralize in and around the city, as well as decentralizing to the suburbs and urban fringe in order to provide for specific populations, as these suburban populations mature. Thirdly, apartment development allows for the tendency for all like activities to segregate themselves. Thus, each cluster of apartments is differentiated from the others.

The form of apartment development reflects not only what stage in the cycle of structural change the apartment area has reached, but also the characteristics of the populations who inhabit them. Also, the various apartment areas differences, exhibit characteristics that relate them to their ecological settings in the social space matrix of the city as a whole.

The basic processes and patterns of apartment development, lead to zonal distinctions between the family orientated suburban apartment areas (catering for young and mature families), and the consumer orientated small households (catering for young single, older single, childless young couples, mature families and the elderly) of the central and inner suburban apartment areas. In this way the zonal patterning of apartment areas reflects life style choice, which in turn is related to particular socio-economic status groups. In particular, apartment living is attractive to those who are physically, and socially mobile, i.e. the higher socio-economic groups. By far the majority of apartment clusters occur in the high status sector and thus apartment dwellers reflect related socio-economic characteristics. Thus, it is within the high-status sector of the city that more apartments are likely to be demanded and anticipated. However, the ageing of populations together with the ageing and obsolescence of the apartment units, implies redevelopment and also a concommitant change in the population structure of

apartment areas. In addition, changing tastes and preferences (even within the housing market for apartments) has implications for the further extension and development of new apartment areas.

The trends for apartment development reflect the changing age structure of the population, changing income levels, and changes in the cost and supply of alternative housing. These variables all affect the changing tastes and preferences for various types of apartment development. The increasing demand of those who are career and consumer orientated will lead to a higher density of population, in the more central apartment areas and a demand for a larger number of smaller units, which can be satisfactorily provided by high rise development. Families with young children are likely to demand larger sized units that are lower rise, in apartment areas that have a certain amount of actual or perceptual amenity and are thus likely to be in suburban locations. Mature households and the elderly persons, especially in the high-income sector are also likely to demand apartment areas with amenity. Conversely the lower-income dwellers do not make so definite a choice, vis-a-vis their living in apartments. Thus while apartment dwelling fulfils a need for them, they do not set up a demand sufficient for entrepreneurs, to be willing to meet, and their demand will have to be met by the public sector.

It can be predicted and anticipated that new apartment development will take place in the northern suburbs' high-socio economic sector, on larger sites with a certain amount of on-site amenity and in the form of low-rise development. This development can also be expected to respond to a more sophisticated demand in the form of 'cluster' and 'planned unit' development. Thus four types of apartment development are possible: Redevelopment of substantial areas, as land in the central parts

of the city, requiring some restructuring of size, street patterns and to some extent the housing pattern itself becomes suitable for redevelopment; continued development of suburban apartment areas on vacant land contiguous to the edge of existing development; as well as the restructuring of land use, in some instances, around shopping centres and new transportation patterns; and the construction of new development at or beyond the fringe of the urban area. Further, it should be expected and made mandatory through legislation that new (large scale) developments have a degree of self-sufficiency in terms of the provision of community facilities and services, viz. recreation, shopping, education, etc.

Interrelated with the location and form of apartment development and the characteristics of their inhabitants, is the need for certain social facilities. The number, amount and type of the various facilities needed is dependent on the nature of each apartment area. Some areas need playlots and playgrounds; all areas require local parks, but in different forms; while the provision of social facilities such as recreation centres, libraries, health clinics, and nursery schools are dependent on specific age and family characteristics as well as socio-economic status.

Important in planning for the provision for a diversity of environments is the question of scale, - the smaller the scale the more limited the opportunities for planning total environments; while the larger the scale the greater the potentialities.

9.2 Implication for Theory.

None of theories or models of urban growth and development deal explicitly with apartment development within the context of their concepts. While the later work of the social area analysts and the work of factorial ecology make it possible (if the

data is suitable) to pinpoint small sub-areas, this is usually only done within the context of population variables and does not include the nature of the environments that people live in, and thus an area is not necessarily distinguished in terms of housing type.

Because apartment development has a distinct nature and form, in that it is both high-density and rented accommodation, it cannot be considered in the same light (as far as ecological structure is concerned) as the more traditional single family housing developments.

Furthermore, with the distinct changes in the demand and supply side of the housing market leading to apartments becoming more widespread in the urban scene, and even altering the form of the city, it is necessary to ascertain the role of apartment development in the housing market as well as the nature of people attracted to various apartment developments.

Firstly, the structural theories of and approaches towards the form and growth of the urban landscape will have to be modified to deal with the aspect of subsidiary nodes of high density development outside of the central area. Traditionally, residential location has been examined in terms of theories of land-use and land value where the price of land at any location is considered to be a function of accessibility to the city centre with land-uses sorting themselves out in accordance with their ability to pay for a site. Thus uses which cannot compete are forced to the periphery. But apartments are able to compete for all locations, and will merely change their density structure. Thus, these theories, which have erroneously asserted that apartments will be confined to the city centres will have to be modified, particularly as one of the forces at work is not economic, but behavioural and

is due to its relationship of population characteristics and housing preferences.

Neither the zonal model, nor the sectoral model can fully account for the location of apartment development, especially in suburban areas. To some extent though, the sectoral model is more useful as most new units (of whatever form) are added in the upper levels of household income groups. It is thus possible to incorporate the approach that the changing circumstances promoting apartment development will encourage apartment development to occur and be concentrated in the high-income sector. Furthermore, the processes of filtering and the redevelopment of neighbourhoods via the cycle of structural change are more likely to occur in the high-income sector, as this is the most dynamic sector with the most mobile population, and is thus more susceptible to change.

The more complex model of the factorial ecologists offers the best opportunity for understanding the development of apartments; but this model too requires modification to deal with this aspect. Each factor makes it possible to isolate sub-areas in the social space matrix and thus examine the role played by apartment clusters in providing for populations in different stages in the life cycle, with various life styles and belonging to specific socio-economic status groups.

## 9.3 Implications for Policy

The impact of growth, unless carefully planned for, will cause continual decay and change in parts of the city and in its ecological sub-areas. Not only central cities, but suburbs as well will be subject to this process of ageing and obsolescence. Several implications follow from the irreversible character of decisions or processes determining urban growth. Thus the forces currently shaping the city's growth should be brought under more effective control.

The effective planning and provision of apartment units and social facilities is dependant, to a large extent, on the socio-economic level of the apartment dwelling population, which refers inter alia to aspects such as the average number of persons per apartment, the age structure of households, their cultural affinities and income structure, the occupational structure of the economically active members and their place of employment.

With an increasing number of apartments in the housing stock, families with children are increasingly being introduced to such living. While no clear concensus emerges on the merits and demerits of such housing, there is a strong body of opinion which feels that it has very significant disadvantages for children. Most opinion suggests that this form of development must therefore provide the ancilliary features necessary to sustain a properly fulfilled life. Thus suitable adjustments in housing policy and flexibility in design will be essential if a proper housing environment for such families is to be created and maintained. With recognition of the problem, the question of how to achieve these objectives still remains.

Consequently there is an urgent need for performance standards to be applied to development, in order to meet planning objectives. These performance standards need to be applied to both intensity of use and layout, because what is apparent is that it is not how dense a development is, but how it is made dense. Although performance standards might not always produce the ultimate in design and layout, the liveability of environments should be greatly improved. Thus emphasis is placed on providing not only an attractive dwelling, but is also concerned with outdoor space, and with the larger residential environmental setting in which dwellings are located, and therefore with the provision of all neighbourhood services and facilities.

Policies should be framed to provide a design guide and can be divided into two sections:

1) Physical criteria dealing with the requirements of the development envelope, curtilages, and on-site open space.
2) Visual Criteria: concerning the appearance and form of apartment blocks and the quality to be expected.

Recommendations regarding the physical criteria would include the level of privacy on both the "public zone" side and "private zone" side of the development, safe convenient and pleasant pedestrian movement, the segregation of through traffic within the residential areas, an improved approach to car parking, and a more flexible approach to the adoption of open space standards and provision. Recommendations regarding visual criteria would be those necessary to create a visually satisfactory environment. This would include principles for the design of buildings in connection with formal and informal landscaping, principles of urban space and consideration of factors of human scale, contrasting spaces, height, width, and length of spaces, use of trees, etc.

The increasing density of the central and inner suburban areas has two implications. Firstly there is the immediate and apparent need to provide social facilities which require modification to the infrastructure; and secondly, the implication that over the long term, the ageing and obsolescence of areas will require their replacement by more intense development, either higher high-rise which is even more unacceptable, or, with business uses, which would lead to a certain amount of blight.

Existing suburban apartment areas can be expected to intensify and expand. These areas can easily accept more intensive development at a later stage, as long as the social facilities are provided.

In order to provide housing accommodation conducive to both individual or community health ir

the broadest sense of the term, new apartment areas will need to be established with the requisite amount of social facilities provided for, initially, in terms of their ecological settings. To meet the demand for housing, these new apartment developments will need to occur in the outer suburban areas, as well as in older established suburbs close to existing apartment developments.

A further aspect that bears emphasis is that of protecting certain sections of the community as far as accommodation is concerned. Most notable are the elderly in the central areas and the lower-income groups in fairly central positions.

Changing economic circumstances and the redevelopment of certain areas will affect social changes in apartment areas, which in turn will create a demand for a change in the provision of social facilities. These structural and social changes should be anticipated and planned for according to their various characteristics.

The nature and form of apartment development will reflect the demand for a diversity of environments in different settings. Not only must the performance standards be altered accordingly, to anticipate this, but flexibility for change must be allowed, taking into consideration the effect of structural change.

The results of this study that deals with the interrelationships between the role of detached housing and apartment dwellings in relation to mobility and stage in the family life cycle, indicate a further implication for both theory and policy. The writer feels that these aspects requires further investigation, and suggests the following possible hypotheses:

1) young single and young childless couples leave their family homes in the "middle" suburbs of the high and middle socio-economic sectors and locate in the central apartment areas.

2) with the growth of their households they move to detached houses in the urban fringe, beyond their original family homes,

3) when their children leave home, they return to apartments but now prefer those apartment clusters located in the suburban areas which are notably related to their particular income groups, and

4) slightly less affluent elderly couples are likely to locate in the apartment clusters on the periphery of the inner suburbs apartment areas,

5) the movement pattern for the lower socio-economic status groups is far more circumscribed, in that the young singles are unlikely to leave home until they are married, while young couples will move into the more sporadically occurring apartment blocks or small houses close to their immediate families, and

6) elderly couples of lower socio-economic status groups, whose children have left home are likely to remain in their homes(because of limited ability to afford rents and having at this stage paid off their house bonds) or in some instances move into apartments close to their original homes.

What is being hypothesized is that the more affluent groups exhibit large movements outwards and inwards within a few sectors of the city; while the less affluent population groups tend to move in fairly circumscribed neighbourhoods or cells. The consequence of this pattern of residential behaviour is that apartments can be constructed in substantial concentrations in the higher socio-economic status sectors; while in the lower socio-economic sectors and strongly ethnic areas, apartment blocks cannot and should not develop in any concentrations, but should be fairly well interspersed with detached housing.

## 9.4 Main Conclusions

### Assessment of Hypotheses and Conceptual Framework.

A number of hypotheses were formulated at the outset of the study. Hypothesis (1) and (2) were based on the interaction of population type, housing type and city location associated with particular apartment areas. It was anticipated in hypothesis (1) that apartment areas occur at specific locations within the city's structure and that these apartments areas reflect the ecological structure of the city. Hypothesis (1) was found to be valid. The apartment areas in the city are not only diverse in population character and form, but apartments occur in what can be considered to be almost predetermined locations within the city structure, that reflect the needs and demands of their specific populations vis a-vis-, socio-economic status, stage in the life cycle, and ethnic status.

Hypothesis (2) which had anticipated that particular differentiated apartment areas would attract particular types of residents, was also found to be valid. The differing physical characteristics, in terms of height, coverage and spacious setting of the apartment blocks were found to attract populations in accordance with their specific housing needs. Thus the young single, older single and childless couples were found in the high density central areas, while the family orientated residents were found in the suburban apartment areas, but sectorily distinguished according to socio-economic status.

Hypothesis (3) which had anticipated that the provision of social facilities and amenities would reflect the characteristics of the populations proved to be partially valid. However, results indicated serious deficiencies in the provision of these associated amenities and facilities. Generally there was a correspondence between each differentiated apartment area and the type and forms of facilities found in them.

Hypothesis (4) had anticipated that as a result of the differentiation of apartment areas and their interaction with the relevant associated facilities, future planning of and for apartment areas would have to take account of both the ecological settings of the apartment areas with provision of social facilities and amenities, and the need to create an environment appropriate to these ecological settings. The result of the study also substantiated this hypothesis. Thus, if apartment areas are to be more carefully planned, a knowledge of the reasons for the ecological settings of apartment areas is needed, as well as an understanding of the characteristics of the populations, their specific needs and the potential for change in each area.

The conceptual framework of the dynamics of apartment development can indicate how and where apartment development is likely to occur, as well as what the characteristics of the apartment clusters are likely and ought to be, specifically in relation to the nature and form of the development and its associated access to amenities.

The approach used in this study is merely a guidline that would require further investigation of many aspects. Nevertheless, it is a useful planning "tool" not only to predict further change in apartment development, but also to assess the specific requirements of the identified clusters. (In this study only the provision of facilities to be provided (or allowed for) by the local authority has been considered, but the approach could be extended to include other neighbourhood facilities such as shopping and commercial leisure time pursuits.

References:

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# APPENDICES

APPENDIX A

CORRELATION COEFFICIENTS MATRIX

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 1. 0-4 yrs. | 1.0000 | | | | | | | | |
| 2. 5-12 yrs. | 0.6151 | 1.0000 | | | | | | | |
| 3. 18-24 yrs. | 0.3324 | 0.1422 | 1.0000 | | | | | | |
| 4. 25-64 yrs. Single | 0.4930 | -0.5287 | -0.0430 | 1.0000 | | | | | |
| 5. 18-34 yrs. Married | 0.6413 | 0.2949 | 0.1624 | -0.4357 | 1.0000 | | | | |
| 6. 45-69 yrs. Married | -0.3669 | -0.1945 | -0.1595 | 0.4859 | -0.2458 | 1.0000 | | | |
| 7. 65+ | -0.4000 | -0.3126 | -0.2058 | 0.5872 | -0.2983 | 0.6752 | 1.0000 | | |
| 8. Females | -0.2437 | -0.1975 | -0.2365 | 0.0852 | 0.0045 | 0.1596 | 0.2741 | 1.0000 | |
| 9. S.A. born | 0.3236 | 0.2207 | 0.4020 | -0.3185 | 0.1652 | -0.4261 | -0.2661 | -0.0079 | 1.0000 |
| 10. British Born | -0.1391 | -0.0912 | -0.3046 | 0.2297 | -0.0125 | 0.4023 | 0.3437 | 0.1951 | -0.5758 |
| 11. Latin Born | 0.1254 | 0.1235 | 0.0672 | 0.0329 | 0.0222 | -0.0380 | -0.0276 | -0.3237 | -0.1201 |
| 12. D.R.C. | 0.1473 | 0.0410 | 0.2365 | 0.2007 | 0.0309 | -0.1013 | 0.1001 | -0.0487 | 0.4359 |
| 13. English Protestant | 0.0091 | 0.0399 | -0.0291 | 0.1698 | 0.0338 | 0.1843 | 0.2366 | 0.2119 | 0.0295 |
| 14. Roman Catholic | 0.1692 | 0.0711 | 0.2084 | 0.1660 | 0.0647 | 0.0232 | 0.0411 | -0.2520 | 0.0131 |
| 15. Jewish | -0.1387 | -0.0499 | -0.2694 | -0.1625 | -0.0172 | 0.1571 | -0.0919 | 0.0725 | -0.4244 |
| 16. English | -0.1780 | -0.0134 | -0.3041 | -0.1917 | 0.0072 | 0.1663 | 0.0104 | 0.2792 | -0.3712 |
| 17. Afrikaans | 0.1955 | 0.0433 | 0.3109 | 0.1838 | 0.0625 | -0.1436 | 0.0582 | -0.0901 | 0.5677 |
| 18. >Std. 7 Education | 0.3695 | 0.3431 | 0.1911 | -0.1502 | 0.1050 | -0.1567 | 0.0007 | -0.2388 | 0.3672 |
| 19. Post School | -0.2101 | -0.1596 | -0.1755 | 0.1900 | -0.0242 | 0.2470 | 0.0813 | 0.1409 | -0.3038 |
| 20. Prof. | -0.1679 | -0.2254 | -0.1346 | 0.3315 | 0.0494 | 0.3505 | 0.2206 | 0.2222 | -0.3295 |
| 21. Admin. | -0.1968 | -0.0212 | -0.3769 | 0.0235 | -0.1067 | 0.3628 | 0.1624 | 0.1218 | -0.4338 |
| 22. Clerical | -0.1553 | -0.1842 | 0.1480 | 0.2652 | 0.0351 | 0.1760 | 0.1398 | 0.2879 | -0.0709 |
| 23. Sales | -0.1010 | 0.0230 | -0.2825 | 0.1209 | 0.0223 | 0.3596 | 0.1446 | -0.0266 | -0.5007 |
| 24. Production | 0.3900 | 0.2648 | 0.3315 | -0.0555 | 0.1715 | -0.1532 | -0.0180 | -0.2528 | 0.3856 |
| 25. Services | -0.1981 | -0.2077 | -0.0344 | 0.2401 | -0.2445 | 0.1158 | 0.2493 | -0.2577 | 0.0644 |
| 26. Manufacturing | 0.3925 | 0.2630 | 0.2933 | -0.3004 | 0.3104 | -0.1959 | -0.2442 | -0.1256 | 0.1870 |
| 27. Comm. & Finance | -0.2435 | -0.0555 | -0.3103 | -0.0615 | -0.1264 | 0.1876 | 0.0513 | 0.1510 | -0.4067 |
| 28. Employers | -0.4109 | -0.3115 | -0.4269 | 0.0189 | -0.1838 | 0.2344 | 0.0716 | 0.1084 | -0.5202 |
| 29. Not Econ. Active | 0.5726 | 0.6827 | -0.0547 | -0.5571 | 0.3483 | -0.1449 | -0.1426 | -0.0478 | 0.2147 |
| 30. Income R400-R1199 | 0.1262 | 0.1109 | 0.3155 | 0.1215 | -0.1097 | -0.0737 | 0.0140 | -0.0587 | 0.2584 |
| 31. Income R1200-R2000 | 0.2273 | -0.0174 | 0.2484 | 0.0735 | 0.2618 | -0.2543 | -0.1898 | -0.1397 | 0.1090 |
| 32. Rent R21-40 | 0.0647 | -0.0783 | 0.1569 | 0.2654 | -0.0432 | 0.0158 | 0.2511 | -0.0545 | 0.2480 |
| 33. Earning Not Econ.Active | -0.6499 | -0.5617 | -0.1519 | 0.5595 | -0.5916 | 0.3438 | 0.5235 | 0.1761 | -0.0613 |
| 34. Mean Household Size | 0.5207 | 0.5675 | 0.1298 | -0.5415 | 0.3245 | -0.1861 | -0.3164 | -0.2483 | 0.1689 |
| 35. 1 Person Households | -0.6631 | -0.6538 | -0.2003 | 0.7150 | -0.5134 | 0.2729 | 0.4501 | 0.2034 | -0.1698 |
| 36. >4 Person Households | 0.6271 | 0.7937 | 0.1314 | -0.5762 | 0.3052 | -0.2870 | -0.3609 | -0.2536 | 0.2433 |
| 37. Occupancy Rate | 0.0450 | -0.1137 | 0.3322 | 0.2778 | 0.0099 | -0.1830 | 0.0500 | -0.2848 | 0.3267 |
| 38. Car Spaces | -0.0350 | 0.0293 | -0.0906 | -0.2138 | 0.0251 | 0.0892 | -0.1418 | -0.0020 | -0.2128 |
| 39. 1-2 Children | 0.2637 | 0.1724 | -0.1728 | -0.4201 | 0.3169 | -0.0361 | -0.1575 | -0.1245 | -0.1339 |
| 40. % Res. of Improved | 0.3150 | 0.2317 | 0.2236 | -0.1513 | 0.2438 | -0.1072 | -0.2486 | 0.0121 | 0.0418 |
| 41. Bachelor | -0.4371 | -0.4079 | 0.0153 | 0.5935 | -0.3844 | 0.0998 | 0.2802 | -0.0560 | 0.0560 |
| 42. >3 Room Units | 0.3886 | 0.5607 | -0.1293 | -0.6139 | 0.2891 | -0.1472 | -0.3297 | -0.0253 | -0.0382 |
| 43. Pre 48 Units | -0.2252 | -0.2095 | -0.2513 | 0.2756 | -0.2340 | 0.2288 | 0.3804 | 0.0029 | -0.1324 |
| 44. Rooms per hectare | -0.5511 | -0.5015 | -0.0718 | 0.4581 | -0.4078 | 0.2790 | 0.2615 | 0.2062 | -0.1657 |
| 45. Dwellings per hectare | -0.5757 | -0.5581 | -0.0643 | 0.5812 | -0.4532 | 0.2454 | 0.3013 | 0.1393 | -0.1005 |

| | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
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| 1. | | | | | | | | | | | | |
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| 10. | | | | | | | | | | | | |
| 11. | -0.2274 | 1.0000 | | | | | | | | | | |
| 12. | -0.2592 | 0.0548 | 1.0000 | | | | | | | | | |
| 13. | 0.3422 | -0.1331 | 0.0625 | 1.0000 | | | | | | | | |
| 14. | -0.1439 | 0.5786 | 0.1009 | 0.1391 | 1.0000 | | | | | | | |
| 15. | 0.1251 | -0.2808 | -0.6209 | -0.5246 | -0.4585 | 1.0000 | | | | | | |
| 16. | 0.4109 | -0.3321 | -0.7950 | 0.1114 | -0.2973 | 0.5926 | 1.0000 | | | | | |
| 17. | -0.3042 | 0.0534 | 0.9320 | 0.0507 | 0.1167 | -0.6387 | -0.8742 | 1.0000 | | | | |
| 18. | -0.3343 | 0.3876 | 0.4341 | -0.0189 | 0.4374 | -0.4436 | -0.5513 | 0.5018 | 1.0000 | | | |
| 19. | 0.3519 | -0.4039 | -0.1419 | 0.0192 | -0.4185 | 0.4056 | 0.3845 | -0.2413 | -0.6504 | 1.0000 | | |
| 20. | 0.3935 | -0.3751 | -0.0431 | 0.1033 | -0.2784 | 0.3167 | 0.2968 | -0.1589 | -0.5659 | 0.8054 | 1.0000 | |
| 21. | 0.4274 | -0.2996 | -0.3634 | 0.0013 | -0.3325 | 0.5402 | 0.5087 | -0.4195 | -0.4521 | -0.6682 | 0.5223 | 1.0000 |
| 22. | 0.2030 | -0.2750 | -0.0873 | 0.3261 | -0.1243 | -0.0472 | 0.1983 | -0.1039 | -0.4301 | 0.1653 | 0.2481 | -0.0960 |
| 23. | 0.2788 | -0.1657 | -0.4175 | -0.1674 | -0.2213 | 0.6018 | 0.3934 | -0.4638 | -0.3522 | 0.3481 | 0.3557 | 0.4442 |
| 24. | -0.3124 | 0.4288 | 0.4580 | 0.0441 | 0.5787 | -0.5487 | -0.5998 | 0.5236 | 0.8008 | -0.7193 | -0.5874 | -0.5614 |
| 25. | -0.1753 | 0.3093 | 0.2691 | -0.0539 | 0.3340 | -0.2911 | -0.4166 | 0.3149 | 0.4026 | -0.3668 | -0.3272 | -0.2375 |
| 26. | -0.1124 | 0.0657 | 0.0527 | 0.0496 | 0.2671 | -0.1355 | -0.1080 | 0.0701 | 0.2533 | -0.3213 | -0.3063 | -0.1597 |
| 27. | 0.2610 | -0.2292 | -0.5564 | -0.0316 | -0.3305 | 0.5358 | 0.6022 | -0.6190 | -0.5300 | 0.3311 | 0.2419 | 0.4399 |
| 28. | 0.2451 | -0.1192 | -0.5125 | -0.3154 | -0.3521 | 0.6852 | 0.5053 | -0.5788 | -0.4998 | 0.4853 | 0.3295 | 0.5740 |
| 29. | -0.0763 | -0.0005 | 0.0855 | -0.0509 | 0.0828 | 0.0749 | -0.0048 | 0.0777 | 0.4659 | -0.1402 | -0.1348 | 0.1616 |
| 30. | -0.2437 | 0.3097 | 0.2728 | 0.0574 | 0.3708 | -0.4142 | -0.4512 | 0.3882 | 0.4220 | -0.4401 | -0.3694 | -0.5299 |
| 31. | -0.1079 | 0.1839 | 0.1049 | 0.1444 | 0.2116 | -0.3121 | -0.2064 | 0.1638 | 0.0529 | -0.2890 | -0.1615 | -0.4963 |
| 32. | -0.1743 | 0.3985 | 0.4624 | 0.1957 | 0.4935 | -0.6347 | -0.5705 | 0.5271 | 0.6160 | -0.6706 | -0.4886 | -0.6011 |
| 33. | 0.0339 | 0.0658 | 0.1205 | 0.0201 | 0.0320 | -0.1679 | -0.1405 | 0.1601 | 0.0245 | -0.0515 | -0.0609 | -0.0943 |
| 34. | -0.0805 | -0.0388 | -0.0652 | -0.0303 | 0.0731 | 0.0742 | 0.0462 | -0.0685 | 0.2994 | -0.1358 | -0.1817 | 0.0237 |
| 35. | 0.0738 | 0.0857 | 0.1286 | 0.0292 | 0.0303 | -0.1594 | -0.1186 | 0.1045 | -0.1653 | 0.0135 | 0.0920 | -0.1099 |
| 36. | -0.1165 | 0.0095 | 0.0460 | -0.0351 | 0.1055 | 0.0081 | -0.0359 | 0.0549 | 0.3888 | -0.1959 | -0.2361 | -0.0277 |
| 37. | -0.3218 | 0.3825 | 0.5576 | 0.0029 | 0.4055 | -0.5517 | -0.6607 | 0.6077 | 0.4922 | -0.4186 | -0.3310 | -0.6034 |
| 38. | 0.1403 | -0.2970 | -0.4601 | -0.1791 | -0.4041 | 0.6059 | 0.5377 | -0.4859 | -0.4397 | 0.4651 | 0.3333 | 0.4979 |
| 39. | 0.0948 | -0.0610 | -0.3163 | -0.1141 | -0.1744 | 0.3796 | 0.3350 | -0.3410 | -0.1658 | 0.1652 | 0.1261 | 0.3512 |
| 40. | -0.0673 | -0.1115 | -0.0605 | -0.1644 | -0.1330 | 0.2294 | 0.0996 | -0.0510 | -0.1382 | 0.1019 | 0.1223 | 0.0595 |
| 41. | -0.1216 | 0.2093 | 0.3984 | 0.0099 | 0.2119 | -0.3976 | -0.4368 | 0.3947 | 0.1204 | -0.1454 | -0.0378 | -0.3101 |
| 42. | 0.0529 | -0.2647 | -0.3115 | -0.1294 | -0.3029 | 0.4599 | 0.4063 | -0.3589 | -0.1326 | 0.2560 | 0.1261 | 0.4041 |
| 43. | 0.0406 | 0.2641 | 0.1477 | 0.0274 | 0.2541 | -0.2253 | -0.2757 | 0.1640 | 0.3799 | -0.4146 | -0.2983 | -0.2330 |
| 44. | 0.0421 | -0.0019 | -0.0355 | -0.0441 | -0.1303 | 0.0335 | -0.0131 | -0.0169 | -0.3157 | 0.0547 | 0.1159 | -0.0923 |
| 45. | -0.0083 | 0.1113 | 0.1264 | -0.0135 | 0.0045 | -0.1601 | -0.1811 | 0.1425 | -0.1840 | -0.0329 | 0.0325 | -0.1898 |

| | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
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| 1. | | | | | | | | | | | | |
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| 17. | | | | | | | | | | | | |
| 18. | | | | | | | | | | | | |
| 19. | | | | | | | | | | | | |
| 20. | | | | | | | | | | | | |
| 21. | | | | | | | | | | | | |
| 22. | 1.0000 | | | | | | | | | | | |
| 23. | 0.1141 | 1.0000 | | | | | | | | | | |
| 24. | -0.3296 | -0.4601 | 1.0000 | | | | | | | | | |
| 25. | -0.4098 | -0.2877 | 0.3855 | 1.0000 | | | | | | | | |
| 26. | -0.0399 | -0.2181 | 0.5389 | -0.0500 | 1.0000 | | | | | | | |
| 27. | 0.3369 | 0.5249 | -0.6321 | -0.3510 | -0.2920 | 1.0000 | | | | | | |
| 28. | -0.1397 | 0.5490 | -0.6425 | -0.1084 | -0.3809 | 0.5375 | 1.0000 | | | | | |
| 29. | -0.4205 | 0.0392 | 0.3226 | -0.0974 | 0.2820 | -0.1271 | -0.1937 | 1.0000 | | | | |
| 30. | 0.0681 | -0.3174 | 0.4373 | 0.1787 | 0.0397 | -0.3081 | -0.3915 | -0.0275 | 1.0000 | | | |
| 31. | 0.3023 | -0.1698 | 0.1977 | -0.0527 | 0.0150 | -0.1757 | -0.3522 | -0.2519 | 0.4041 | 1.0000 | | |
| 32. | -0.0686 | -0.5084 | 0.7367 | 0.4800 | 0.1785 | -0.5122 | -0.5457 | -0.0438 | 0.5358 | 0.3337 | 1.0000 | |
| 33. | -0.0249 | -0.1678 | -0.0286 | 0.4089 | -0.3814 | -0.1558 | 0.1459 | -0.4654 | 0.1537 | -0.1874 | 0.3058 | 1.0000 |
| 34. | -0.2253 | 0.0445 | 0.3064 | -0.0412 | 0.4962 | -0.0954 | -0.2317 | 0.6146 | -0.1299 | -0.1866 | -0.1250 | -0.5291 |
| 35. | 0.1144 | -0.1393 | -0.1561 | 0.3654 | -0.4743 | -0.0339 | 0.1701 | -0.6666 | 0.1169 | 0.0509 | 0.2996 | 0.7391 |
| 36. | -0.2255 | 0.0487 | 0.3135 | -0.2160 | 0.3285 | -0.0759 | -0.3165 | 0.7668 | 0.0884 | 0.0028 | -0.0733 | -0.5251 |
| 37. | -0.1316 | -0.4981 | 0.5612 | 0.4915 | 0.1154 | -0.6264 | -0.5063 | -0.1664 | 0.4079 | 0.2838 | 0.6403 | 0.2519 |
| 38. | 0.0109 | 0.3987 | -0.5228 | -0.3258 | -0.0556 | 0.4524 | 0.4410 | 0.0570 | -0.4604 | -0.2845 | -0.6346 | -0.2831 |
| 39. | -0.0429 | 0.3254 | -0.2893 | -0.2731 | -0.0733 | 0.3424 | 0.2424 | 0.3515 | -0.2908 | -0.0617 | -0.3718 | -0.4231 |
| 40. | 0.0905 | 0.0740 | -0.0810 | -0.4005 | 0.0236 | 0.0678 | -0.0641 | 0.1549 | 0.0108 | 0.1359 | -0.1673 | -0.3806 |
| 41. | -0.0537 | -0.3135 | 0.1390 | 0.5263 | -0.2458 | -0.3468 | -0.0984 | -0.5289 | 0.1966 | 0.0393 | 0.4174 | 0.6947 |
| 42. | -0.1004 | 0.3767 | -0.2297 | -0.5055 | 0.1546 | 0.3475 | 0.1719 | 0.6303 | -0.3149 | -0.2565 | -0.5695 | -0.6125 |
| 43. | -0.2500 | -0.1722 | 0.4177 | 0.4559 | -0.0445 | -0.2555 | -0.0553 | -0.0526 | 0.2615 | 0.0673 | 0.6287 | 0.4804 |
| 44. | 0.2859 | 0.0089 | -0.3006 | 0.1242 | -0.4421 | 0.1478 | 0.2316 | -0.6162 | 0.0725 | 0.0838 | 0.0383 | 0.4891 |
| 45. | 0.2061 | -0.1308 | -0.1511 | 0.2590 | -0.4266 | -0.0448 | 0.1213 | -0.6712 | 0.1672 | 0.1366 | 0.2423 | 0.6000 |

| | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 34. | 1.0000 | | | | | | | | | | | |
| 35. | -0.7691 | 1.0000 | | | | | | | | | | |
| 36. | 0.7110 | -0.7539 | 1.0000 | | | | | | | | | |
| 37. | -0.1001 | 0.2848 | -0.0783 | 1.0000 | | | | | | | | |
| 38. | 0.1291 | -0.2650 | 0.0455 | -0.5003 | 1.0000 | | | | | | | |
| 39. | 0.1823 | -0.3911 | 0.1964 | -0.4611 | 0.3531 | 1.0000 | | | | | | |
| 40. | 0.0867 | -0.2722 | [illegible] | -0.1357 | 0.2052 | 0.1218 | 1.0000 | | | | | |
| 41. | -0.4995 | 0.7777 | [illegible] | 0.5955 | -0.4168 | -0.5233 | -0.2497 | 1.0000 | | | | |
| 42. | 0.6050 | -0.7547 | [illegible] | -0.6074 | 0.4627 | 0.4923 | 0.2773 | -0.7741 | 1.0000 | | | |
| 43. | -0.1049 | 0.3389 | -0.1455 | 0.2372 | -0.3613 | -0.2027 | -0.1354 | 0.3429 | -0.3514 | 1.0000 | | |
| 44. | -0.6008 | 0.6307 | -0.5707 | 0.1228 | -0.0192 | -0.3182 | 0.0906 | 0.4746 | -0.5081 | 0.0970 | 1.0000 | |
| 45. | -0.6794 | 0.7981 | -0.6437 | 0.3112 | -0.2234 | -0.4240 | -0.0145 | 0.7206 | -0.6963 | 0.2455 | 0.8133 | 1.0000 |

APPENDIX B — VARIMAX ROTATION ANALYSIS — FACTOR LOADINGS

| | | | FACTOR 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|---|
| 1. | % | Children 0-4 years | -0.7084 | 0.2529 | 0.0967 | -0.1865 | -0.1089 | 0.1492 | 0.1276 |
| 2. | % | Children 5-12 years | -0.8117 | 0.0989 | 0.1051 | -0.0495 | -0.1178 | 0.1038 | 0.0703 |
| 3. | % | 18-24 years | -0.0901 | 0.3395 | -0.0073 | -0.1896 | -0.3507 | 0.2209 | 0.2546 |
| 4. | % | Single 25-64 years | 0.6593 | 0.1882 | -0.0676 | 0.5624 | -0.1338 | 0.1525 | -0.2083 |
| 5. | % | Married 18-24 years | -0.4502 | 0.1245 | -0.0461 | -0.1242 | -0.1450 | -0.0225 | 0.1242 |
| 6. | % | Married 44-64 years | 0.2041 | 0.1453 | -0.0596 | 0.8132 | 0.0335 | -0.0304 | 0.1492 |
| 7. | % | 65+ | 0.3235 | 0.0646 | 0.1087 | 0.7493 | 0.0760 | -0.1687 | -0.1189 |
| 8. | % | Female | -0.1779 | -0.0890 | 0.0026 | 0.1531 | -0.0964 | -0.7951 | -0.0024 |
| 9. | % | S.A. Born | -0.1837 | 0.5808 | 0.1068 | -0.5111 | -0.0650 | -0.2506 | -0.0358 |
| 10. | % | British Born | 0.0139 | -0.2875 | -0.2058 | 0.5847 | -0.1254 | -0.1345 | -0.2541 |
| 11. | % | Latin Born | 0.0520 | 0.0255 | 0.4854 | -0.0071 | 0.0455 | 0.6249 | -0.0023 |
| 12. | % | O.R.C. | 0.0477 | 0.9360 | 0.0252 | 0.0246 | 0.0257 | -0.0263 | 0.0104 |
| 13. | % | English Protestant | -0.0590 | 0.1133 | 0.0313 | 0.3050 | -0.4987 | -0.2094 | -0.6102 |
| 14. | % | Roman Catholic | -0.0383 | 0.1386 | 0.4975 | 0.1889 | -0.1145 | 0.5102 | -0.1769 |
| 15. | % | Jews | -0.0774 | -0.6545 | -0.3503 | 0.0250 | 0.3235 | -0.0765 | 0.4443 |
| 16. | % | English Speaking | -0.1021 | -0.8079 | -0.2657 | 0.0709 | -0.0559 | -0.2740 | -0.1879 |
| 17. | % | Afrikaans Speaking | 0.0610 | 0.9536 | 0.1070 | -0.0341 | 0.0040 | -0.0159 | 0.0437 |
| 18. | % | St. 7 Education | -0.3116 | 0.4790 | 0.6336 | -0.0031 | 0.2296 | 0.1532 | -0.0232 |
| 19. | % | Post School Education | 0.0691 | -0.1206 | -0.8725 | 0.2342 | 0.0170 | -0.0539 | 0.0159 |
| 20. | % | Professional | 0.1149 | -0.0220 | -0.7511 | 0.4128 | -0.0864 | -0.0804 | 0.0264 |
| 21. | % | Administrative | -0.1464 | -0.3723 | -0.5841 | 0.3736 | 0.3024 | -0.0930 | -0.0445 |
| 22. | % | Clerical | 0.2053 | -0.1379 | -0.1673 | 0.1215 | -0.7648 | -0.2378 | 0.0140 |
| 23. | % | Sales | -0.1397 | -0.4948 | -0.3193 | 0.3704 | 0.0223 | 0.1531 | 0.2576 |
| 24. | % | Production | -0.2374 | 0.4908 | 0.6958 | 0.0226 | 0.0992 | 0.1673 | -0.0146 |
| 25. | % | Services | 0.3107 | 0.2748 | 0.3656 | 0.0616 | 0.4429 | 0.3067 | -0.2547 |
| 26. | % | Manufacturing | -0.4035 | 0.0469 | 0.2319 | -0.0717 | 0.0215 | -0.0157 | -0.1177 |
| 27. | % | Comm. & Finance | -0.0239 | -0.6879 | -0.2793 | 0.0772 | -0.1738 | -0.0867 | 0.1807 |
| 28. | % | Employers | 0.2431 | -0.6085 | -0.3541 | 0.0746 | 0.3831 | 0.0193 | 0.1274 |
| 29. | % | Not Economically Active | -0.8475 | 0.1361 | 0.1284 | 0.0775 | 0.2835 | -0.1086 | 0.0576 |
| 30. | % | Income R400-R1 199 | 0.0522 | 0.3188 | 0.5431 | -0.0233 | -0.3595 | 0.1383 | 0.1258 |
| 31. | % | Income R1200-R2000 | 0.1141 | 0.1229 | 0.2900 | -0.2088 | -0.6215 | 0.2059 | 0.0971 |
| 32. | % | Rent R21-R40 | 0.1980 | 0.4624 | 0.7533 | 0.1916 | -0.0623 | 0.0317 | -0.1025 |
| 33. | % | Earning Not Economically Active | 0.7195 | 0.1106 | 0.1870 | 0.2053 | 0.2460 | -0.1163 | -0.1186 |
| 34. | | Mean Household Size | -0.7779 | -0.0191 | 0.0472 | -0.0462 | 0.1741 | 0.0545 | -0.0389 |
| 35. | % | 1 Person Households | 0.8951 | 0.0798 | 0.0933 | 0.1452 | 0.0359 | -0.0140 | -0.1010 |
| 36. | % | >4 Person Households | -0.8797 | 0.0949 | 0.1261 | -0.0724 | -0.0384 | 0.0710 | 0.1287 |
| 37. | | Occupancy Rate | 0.2960 | 0.6205 | 0.3573 | -0.1050 | 0.0001 | 0.3212 | -0.0111 |
| 38. | | Car Spaces | -0.1678 | -0.4907 | -0.5146 | -0.0383 | 0.1411 | -0.0530 | 0.2112 |
| 39. | % | 1 - 2 Children | -0.4110 | -0.3401 | -0.2002 | -0.0712 | 0.0758 | 0.0590 | 0.0343 |
| 40. | % | Res of Improved | -0.2088 | -0.0168 | -0.0793 | -0.0192 | -0.2393 | -0.1246 | 0.0425 |
| 41. | % | Bachelor Units | 0.7323 | 0.3953 | 0.1477 | 0.0340 | 0.1116 | 0.1859 | -0.1043 |
| 42. | % | 3 Room Units | -0.7908 | -0.3204 | -0.2876 | -0.0641 | 0.0822 | -0.1477 | 0.1205 |
| 43. | % | Pre 48 Units | 0.2498 | 0.0917 | 0.6575 | 0.3319 | 0.3044 | -0.0569 | -0.0113 |
| 44. | | Rooms per hectare | 0.7527 | -0.0854 | 0.0038 | 0.0527 | -0.1729 | -0.0861 | 0.2344 |
| 45. | | Dwellings per hectare | 0.8574 | 0.0871 | 0.1063 | 0.0577 | -0.1218 | -0.0014 | 0.1784 |

PERCENT TRACE OF VARIABLES

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| 76.2326 | 78.7162 | 79.4912 | 84.0708 | 69.6026 | 75.7345 | 74.0158 |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 71.7429 | 75.7586 | 61.7084 | 65.8331 | 68.5379 | 79.7021 | 59.6778 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 66.6093 | 83.0424 | 92.9380 | 81.2439 | 85.1153 | 81.0467 | 75.5276 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 75.7545 | 65.4623 | 92.4664 | 66.7546 | 78.1919 | 71.0093 | 79.4562 |
| 29 | 30 | 31 | 32 | 33 | 34 | 35 |
| 87.0801 | 62.4844 | 73.7439 | 86.3902 | 80.5917 | 74.8673 | 89.5173 |
| 36 | 37 | 38 | 39 | 40 | 41 | 42 |
| 85.3620 | 76.0500 | 60.7146 | 58.5043 | 68.9297 | 79.3662 | 89.1031 |
| 43 | 44 | 45 | | | | |
| 73.0559 | 75.9913 | 84.7708 | | | | |

APPENDIX C

VARIMAX ROTATION ANALYSIS

FACTOR SCORES

| E.S.D. NOS. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| 11 | -1.3085 | 3.8247 | -3.0821 | -1.0349 | 0.4747 | -0.3445 | 0.1391 |
| 13 | -0.7806 | 2.8254 | -2.0060 | -0.9743 | 0.2963 | -0.1180 | -0.1956 |
| 15 | 0.0556 | 2.1597 | -0.6833 | -0.1032 | 1.4740 | -3.1488 | -1.0988 |
| 16 | -1.8193 | 0.9385 | -1.1806 | 0.0414 | -0.2330 | -0.3043 | -0.3519 |
| 25 | -0.2853 | -0.1770 | -1.0122 | -0.4317 | 1.2063 | -0.0805 | -0.2418 |
| 33 | -0.1418 | -0.0523 | -0.3092 | -0.1939 | -0.6178 | -1.1907 | -1.8519 |
| 59 | -0.1198 | -0.9023 | -0.9789 | 0.4370 | 0.7667 | -0.3493 | -2.1665 |
| 60 | -0.2489 | -0.1405 | -0.6551 | 1.7522 | -1.5730 | 0.2600 | -0.5691 |
| 61 | 0.0323 | -1.0092 | -0.1491 | 0.2212 | -0.5587 | -1.2739 | -1.8951 |
| 62 | 0.4630 | -0.9423 | -1.0305 | 0.2947 | 0.1467 | -0.5387 | -2.4432 |
| 84 | 0.8031 | -0.6409 | -1.2492 | 0.0714 | 0.1406 | -0.5958 | -1.2519 |
| 85 | -0.0299 | -0.4376 | -1.6219 | 0.0840 | 1.5465 | -0.4721 | -0.1352 |
| 89 | -0.3213 | -1.1512 | -1.2496 | -0.2659 | 3.3596 | -0.8016 | -0.1263 |
| 95 | -1.0377 | -0.8987 | -1.4485 | 0.8553 | 3.0738 | -0.7676 | 0.6526 |
| 96 | -0.2758 | -0.9322 | -1.7701 | 1.2048 | 2.5989 | -0.4550 | 0.6711 |
| 99 | -1.8470 | -0.9784 | -1.2292 | 0.6020 | 0.5206 | 0.5688 | -1.6263 |
| 100 | -0.9297 | -1.0042 | -1.0365 | 0.3958 | 0.3753 | -0.3007 | -1.0066 |
| 102 | -0.8576 | -0.7076 | -1.9616 | 0.4300 | 1.6564 | 0.4256 | -1.0212 |
| 108 | -1.3909 | 0.1892 | -1.0164 | -0.2217 | -0.4794 | 0.4789 | -1.2975 |
| 109 | -1.2845 | -0.0117 | -1.8657 | 0.2825 | 0.8193 | -0.0124 | -1.0618 |
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| 129 | -0.4305 | -1.0214 | -0.2304 | -0.0528 | -0.2658 | 0.0532 | -0.4404 |
| 130 | -1.5735 | -0.0450 | -1.4199 | -0.2255 | -0.5075 | -0.0429 | -1.4370 |
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| 142 | -0.4726 | -0.0396 | -0.4348 | -0.3961 | -0.3570 | -0.7406 | -1.3787 |
| 146 | -0.2095 | -0.6395 | 0.6291 | -0.0994 | -0.1357 | 1.1628 | -1.1535 |
| 159 | -0.7197 | -0.7918 | -1.3795 | -0.3003 | 1.1238 | -0.3751 | 1.1966 |
| 160 | 0.2332 | -0.3028 | -0.7250 | -0.8981 | -0.7051 | -0.4669 | -1.0549 |
| 206 | -0.7608 | 0.1434 | 0.7057 | -0.3184 | -0.3313 | 0.0197 | 0.4387 |
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| 212 | -1.3515 | -0.1031 | 1.7639 | 0.0878 | 0.3504 | -0.3029 | 1.1751 |

| E.S.D. NOS. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| 214 | 0.2408 | 0.7853 | 0.3956 | -0.6007 | -0.3715 | 0.0801 | -0.0745 |
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| 240 | -0.2237 | 0.8920 | 1.4548 | 0.2414 | 0.0736 | -1.8102 | 0.3475 |
| 244 | -1.3982 | 1.9640 | 1.4902 | 0.3139 | 0.9572 | -1.3590 | 0.4162 |
| 245 | -0.3342 | 0.7367 | 1.3137 | -0.2201 | 0.5492 | 1.6162 | 0.0945 |
| 246 | -1.4644 | 1.4239 | 2.0579 | 0.8671 | 0.4595 | 0.5797 | 1.3235 |
| 247 | 0.2038 | 0.7420 | 0.4596 | -0.2914 | 0.1304 | 2.0754 | -1.2497 |
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| 256 | -0.9970 | -0.2154 | 0.4358 | -0.1768 | 0.3694 | 0.6818 | 1.2345 |
| 259 | -0.3994 | -0.2193 | 1.5036 | 0.9052 | 0.3382 | 1.3542 | 0.3866 |
| 260 | -0.5565 | 0.6444 | 1.3404 | -0.0046 | 1.4496 | 2.8078 | 0.1553 |
| 262 | -1.0752 | 0.1501 | 1.7792 | -0.0830 | 0.9007 | 1.3218 | 0.1716 |
| 263 | -1.2875 | -0.3100 | 0.7436 | -0.3463 | -0.9021 | -0.1403 | -0.0419 |
| 264 | -0.7701 | -0.3071 | 0.1812 | 0.2833 | -0.6340 | -0.2355 | 0.8979 |
| 265 | -0.0393 | -0.6460 | 0.0003 | -0.1801 | -0.2692 | -0.1340 | 0.2845 |
| 266 | -0.1785 | -0.3538 | -1.2688 | -0.7768 | 0.0198 | 0.0526 | -0.1719 |
| 267 | -1.1491 | -0.2911 | -0.2328 | -0.4402 | -0.7432 | 0.0261 | 0.1008 |
| 268 | -0.9631 | -0.5161 | 0.1711 | 0.0565 | 0.1216 | 0.5109 | 0.8102 |
| 269 | -1.0363 | -1.1655 | 0.0903 | -0.2512 | 0.4256 | -0.0453 | 1.9506 |
| 270 | -1.0862 | -0.6105 | 0.5139 | -0.1412 | -0.0165 | 0.3813 | 0.7936 |
| 271 | -1.1584 | -0.5321 | 0.5847 | -0.5376 | -0.3495 | 0.6528 | 1.0531 |
| 272 | -0.7800 | -0.7863 | -0.6699 | 0.1152 | -0.66[illegible] | -0.0446 | -1.2812 |
| 273 | -0.3096 | -0.5825 | -1.6017 | -0.3235 | 0.0236 | 1.2369 | -1.4455 |
| 274 | -0.3552 | -0.6979 | -0.5520 | -0.3610 | -0.5026 | 0.2213 | 0.1837 |
| 275 | -0.7222 | -0.7430 | 0.4062 | -0.5342 | -0.5944 | 0.4699 | 0.0804 |
| 276 | -0.8991 | -0.7499 | -0.1025 | -0.1660 | -0.4255 | 1.3267 | -0.2255 |
| 277 | -0.9137 | -0.9207 | 0.2611 | 0.0928 | 0.4244 | -0.1753 | 1.1870 |
| 278 | -0.0400 | -0.6118 | 0.3051 | -0.3139 | -0.1012 | 0.1601 | 0.9113 |
| 279 | -1.0749 | -0.7439 | 0.0291 | -0.5895 | -0.9314 | 0.1387 | 0.3223 |
| 280 | -0.2812 | -0.5362 | -0.2456 | -0.1689 | 0.2756 | 0.1007 | 0.4721 |
| 281 | -0.1861 | -0.7919 | -1.1584 | -0.4781 | -0.1916 | 0.5480 | 0.5002 |
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| E.S.D. NOS. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| 283 | -0.3457 | -0.8421 | -0.1749 | -0.6694 | -0.3726 | 0.3500 | 1.0041 |
| 284 | -0.6488 | -0.6075 | -0.4324 | -0.3 76 | 0.1012 | -0.2735 | 0.7758 |
| 285 | -0.4996 | -1.1701 | 0.1196 | 1. | 0.2743 | -0.1769 | 0.2021 |
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| 297 | 0.2526 | -1.0173 | 1.0527 | -0.6725 | 0.5543 | 0.2394 | 0.3087 |
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| 308 | 0.6550 | -0.8486 | 0.4109 | -0.0178 | -0.0107 | -1.5974 | 0.7934 |
| 309 | 0.4522 | -0.8672 | -0.3628 | 0.2020 | -0.0698 | -0.2868 | 0.4127 |
| 310 | 0.8603 | -0.3565 | -0.6591 | -0.0799 | -0.6518 | 0.2555 | -0.1416 |
| 311 | 0.4474 | -0.0899 | -0.6380 | -0.6817 | -0.6263 | 0.7902 | 0.2917 |
| 312 | 0.9069 | -0.6062 | -0.4221 | -0.1458 | -0.7391 | 0.3026 | 0.6872 |
| 313 | 0.9175 | -0.1524 | -1.2550 | 0.7190 | 0.1417 | -0.2885 | 0.2719 |
| 314 | 0.7688 | -0.4587 | -0.8748 | 0.2751 | -0.1033 | -0.7189 | -0.0892 |
| 315 | 0.7008 | -0 5424 | -0.3810 | -0.2843 | -0.5893 | -0.1744 | 0.8693 |
| 316 | 0.4775 | -0.6163 | -0.2133 | -0.1494 | -0.5123 | -0.4033 | 0.7370 |
| 317 | 1.0037 | -0.1887 | -0.2345 | -0.0345 | -0.5127 | -0.2792 | 0.8466 |

| E.S.D. NOS. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| 318 | 0.8214 | -0.1106 | -0.5277 | -0.1156 | -0.0542 | 0.8845 | 0.3022 |
| 319 | 1.6516 | -0.3907 | -0.1359 | 0.1095 | 0.3464 | -0.5480 | 0.5126 |
| 320 | 1.6910 | 0.1637 | -0.8871 | -0.1585 | -0.5773 | 0.0838 | 0.2891 |
| 321 | 1.0915 | -0.3151 | 0.4938 | 0.5557 | 0.1967 | -0.9646 | 1.0115 |
| 322 | 0.8369 | -0.9114 | -0.5312 | -0.1028 | -0.1315 | -0.2041 | 1.3188 |
| 323 | 1.6461 | 0.0346 | -0.4062 | -0.3523 | -1.2043 | -0.7639 | -0.2144 |
| 325 | 1.4471 | 0.1506 | -0.1441 | 0.0977 | -0.6924 | -1.1490 | -0.2327 |
| 326 | 1.3700 | 0.2780 | -0.3095 | -0.3005 | -0.4652 | -0.0721 | 0.2858 |
| 327 | 1.6895 | -0.3416 | 0.4474 | 0.6033 | -0.2700 | 0.1611 | 0.1863 |
| 328 | 1.0010 | -0.8930 | 0.2168 | 0.3312 | 0.0087 | -0.7324 | 0.6860 |
| 329 | 0.6172 | -1.0944 | 0.2019 | 1.0384 | -1.4838 | 0.1834 | 0.4712 |
| 330 | 0.9101 | -0.2690 | 0.3089 | 0.1303 | -0.1666 | -0.2100 | 0.7223 |
| 331 | 0.8427 | 0.0763 | 0.4725 | 0.0265 | 0.3605 | 0.1720 | 0.7322 |
| 332 | 0.7358 | 0.0704 | -0.9301 | -0.4130 | 0.0811 | 1.2359 | 0.0564 |
| 333 | 1.0052 | -0.0894 | 0.5977 | 0.0361 | -1.2259 | -1.6836 | 0.1315 |
| 334 | 1.3549 | -0.0100 | 1.2417 | 2.3974 | -0.4003 | -2.3032 | 0.4217 |
| 335 | 1.3709 | -0.3484 | 0.1969 | 0.3029 | -1.0894 | -0.8071 | 0.1201 |
| 336 | 1.8538 | 1.1154 | 0.3522 | -0.1158 | -0.7824 | -1.2418 | 0.5776 |
| 337 | 1.6783 | 1.2429 | -0.9257 | -0.5482 | -1.6657 | 0.0352 | -0.9938 |
| 339 | 1.6175 | 1.7014 | -0.9172 | -0.6942 | -1.2679 | 0.2133 | 1.1210 |
| 344 | 1.5170 | 2.9031 | -2.1157 | -0.7158 | -0.5739 | 0.9437 | 1.2998 |
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| 346 | 1.0528 | 2.1751 | -0.7136 | -0.6623 | -0.1793 | -0.0403 | 0.5176 |
| 34 | 1.4290 | 2.0008 | -1.3919 | -0.7638 | -0.3138 | 2.1313 | 0.1640 |
| 348 | 0.6427 | 2.4201 | -0.1016 | -0.7921 | -0.1330 | 0.0513 | 0.7067 |
| 449 | 0.2702 | 2.7409 | 0.5334 | -0.5439 | 1.9379 | -0.0533 | 0.0911 |
| 493 | 1.6354 | 0.8200 | 0.8899 | 0.1659 | 0.7081 | -0.5645 | -0.0134 |
| 494 | 1.3093 | -0.5155 | 1.0740 | 0.3396 | -0.0864 | -1.6834 | -0.5952 |
| 495 | 1.6206 | -0.4536 | 1.2272 | 0.6174 | -0.4314 | -1.1554 | -0.4828 |
| 496 | 1.5217 | -0.1389 | 0.8717 | 0.5684 | 0.6136 | 0.2119 | 0.0240 |
| 497 | 1.5340 | -0.0818 | 0.6279 | 0.0225 | 0.0777 | 0.9540 | 0.3885 |
| 498 | 1.2169 | 0.1596 | 1.4424 | 0.4713 | 0.4654 | -0.1347 | 0.7266 |
| 499 | 1.3966 | -0.0173 | 0.7822 | -0.3182 | 0.3031 | 2.4378 | 0.0604 |
| 500 | 1.7115 | 0.1704 | 0.9648 | 0.2590 | 0.8611 | 2.5782 | 0.5411 |

| E.S.D. NOS. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| 501 | 1.9060 | -0.0254 | 1.2076 | 0.3534 | 0.6852 | 1.1907 | 0.3277 |
| 502 | 1.7272 | -0.2292 | 1.1949 | 0.3305 | 0.6278 | 0.5709 | -0.6576 |
| 503 | 1.6895 | -0.6384 | 1.1457 | 0.3230 | -0.3387 | -1.0759 | -1.6774 |
| 504 | 1.2891 | -0.9427 | 0.7701 | 0.8799 | 0.7850 | -0.4868 | -1.5323 |
| 505 | 1.6549 | -0.4309 | 1.0300 | 0.3038 | 0.0842 | 0.0009 | 0.0243 |
| 506 | 0.5357 | 0.1370 | 1.1141 | 1.2128 | 2.6607 | 2.2601 | -1.1246 |
| 507 | 1.0817 | -0.1784 | 1.1809 | 0.4217 | 1.1739 | 1.9147 | -1.5065 |
| 508 | 1.3065 | -0.3876 | 1.0281 | 0.5863 | -0.0264 | -1.0437 | -1.1472 |
| 509 | 1.4606 | 0.2752 | 0.8409 | 0.2905 | 1.9470 | 0.9069 | -2.8611 |
| 510 | 0.9702 | 1.6161 | 0.3158 | 0.1738 | 5.1392 | 0.2177 | -2.9264 |
| 522 | -2.1504 | -0.7900 | 1.5924 | 0.4832 | -2.2142 | -0.2283 | -1.6221 |
| 525 | -0.9233 | 1.8025 | -0.3045 | -0.8794 | 0.2293 | -0.5965 | 0.1925 |
| 567 | -1.2895 | 3.0077 | 0.3961 | -1.3482 | -0.4644 | -0.1112 | 1.4750 |
| 569 | -0.1928 | 0.1711 | 1.3419 | -0.8638 | -0.0229 | /2.1818 | -2.6032 |
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| 571 | -0.3373 | 1.1227 | 0.9214 | -1.0442 | -1.9480 | -0.3725 | -0.5486 |
| 573 | -0.3653 | 0.1777 | 1.4118 | 0.3784 | -1.2844 | -1.4142 | 0.2982 |
| 574 | -1.1150 | -0.5601 | 1.0707 | -0.1410 | -1.3791 | 1.5757 | -0.8393 |
| 576 | -1.1100 | 3.0762 | -2.6847 | 10.3423 | -2.7666 | 1.5692 | 0.6711 |
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| 582 | -0.4302 | 0.8768 | 0.3830 | -1.2287 | -0.6941 | -0.8179 | -0.6769 |
| 583 | -1.1420 | 0.4840 | 0.5823 | -0.8956 | -1.3831 | -0.7890 | 0.0261 |
| 585 | -0.2242 | -0.1010 | 0.8155 | -0.2883 | -1.0306 | -1.3193 | -1.5853 |
| 586 | -1.1559 | 0.7951 | -0.1695 | -0.7397 | -0.4191 | 0.0943 | -0.6800 |
| 588 | -0.9172 | 0.7320 | 0.7816 | -0.6737 | -0.8668 | -1.1840 | 0.1773 |
| 589 | -0.5187 | 0.4435 | 0.4871 | -0.4480 | -1.1641 | -0.1893 | -0.4316 |
| 591 | -1.0395 | 0.9584 | 0.3863 | -0.4492 | -0.9124 | -1.3504 | -0.3593 |

APPENDIX D

Expanded Account of Space Organizing Concepts

The form of the city has had in the past, and will have in the future, certain processes that permeate its growth. It is difficult to derive a single growth theory which can account for all phenomena in the development of a city, but the operation of several ecological processes can be observed, and this has led to the formulation of several theories which account for familiar characteristics and patterns in cities.

The traditional list of ecological processes is outlined by Chapin and consists of concentration, centralization, decentralization, segregation, invasion, and succession. (Chapin, 1964). A further ecological process propounded by Gerald Breese, that will be considered in the discussion is routinization (Breese, 1966, p.110). These ecological processes explain differentiation of land-use in the city in terms of the passage of time and is called, by Alonso, an "historical theory" (Alonso, 1964).

The ecological processes are all operating in an urban area concurrently, and at different rates of speed under different circumstances with any one being more pronounced in its effect than another, only to be subsequently affected by other ecological processes.

A fundamental background assumption about the workings of the ecological processes is that their operations depend on free competition and mobility. The competition factor is apparent in all of the ecological processes and is in effect the origin of those processes. Competition for space derives from the fact that two objects cannot occupy the same space at the same time. The structure of the urban area is, to a large extent, a product of the competitive interaction of different population groups, land uses, functions and institutions for locations in an urban area that will maximize the fulfilment of their requirements.

Mobility implies the movement of people and goods, land uses, and functional areas from one part of a city to another. Ecological processes can only be understood with mobility as a component. Variation in the nature and extent of mobility in urban areas has been closely related to the availability of various types of transportation facilities.

It is quite clear that competition and mobility are circumscribed to a considerable extent in South Africa and thus the operation of the processes are somewhat curtailed, modified and altered.

The "historical theory" formulated by the ecologists, defined the seven ecologist processes as follows:
Concentration is the process that results in the differential distribution of population in an urban area with a concentration of population in parts of the city due to differential access to transportation facilities, specifically the central parts. The process of centralization relates to the focussing of functions around pivotal parts of activity, with dominance of particular areas being the affect and relationship of the process.
Decentralization refers to the tendency of activities and people to move away from the centre of the city. Segregation is the clustering or sorting out of population groups into harmonious types; while specialization refers to the non-population types of segregation of land-uses. The invasion process, which will be returned to, prevades all of the ecological processes and is defined as "the penetration of a segregated area, by an activity or group different from one already there, and results in a sequence of spatial encroachment." (Lowry, 1960). If the invasion process continues, the original population group or use is gradually replaced and the climax of the process is termed succession. Routinization is defined as the daily movement of population between place of residence to place of daily activity, and of goods from point of origin to point of use.

The operation of these ecological processes throws light on the functional relationships among various parts of an urban area and the overall operation of the urban area. It is with these processes in mind that the discussion can proceed to the models of urban growth as they are implicit in and explicit in the operations of the models.

It is, however, useful to briefly discuss Alonso's "structural" theory not as an alternative to the historical theory, but rather in the sense that they are complementary.

The structural theory of urban residential differentiation represents the "working out of tastes, costs and income in the structure of the market". (Alonso, 1964, p.440). The urban land economists have generalized the pattern and processes of locational change and growth in terms of competition among land uses for urban spaces. The price system in urban housing and residential land markets operate to allocate households to locations in urban space and in determining the number of people, the consumption of housing per household and the quality of housing consumed, and the output of housing in different parts of the city (Muth,1969, p.3). Thus each parcel of land is occupied by the activity which can utilize it most "efficiently" paying in rent an amount up to the savings in transportation costs that result from the accessibility of that site in the urban market. (Bourne, 1971, p.17). This produces distinct sub-markets for urban space, depending on the value placed on different locational attributes placed by individual use of space.

The spatial pattern that emerges shows a strong focus on the city centre, which is occupied by those activities most valueing accessibility to the entire urban region and being capable of operating at relatively high densities. As a consequence, housing prices decline with distance from the CBD. The variation of housing prices and land rentals within the city affects the distribution of population through their consumption and production of housing, with the result that higher incomes households tend to locate at further distances from the CBD because of their "superior purchasing power to buy lower density housing at the cost of a longer journey to work". (Hoover & Vernon, 1962,p.161). This process is associated with this income group's demand for newer housing units.

The structural theory approach is at odds with the historical theory when it comes to understanding the process of development or redevelopment of older residential areas. The historical theory permits hypotheses that high income people can be encouraged to locate in inner suburban and central areas in order to revitalize them. The structural theory shows that while inner suburban redeveloped land

can be provided, it cannot afford sufficiently low prices to permit the low densities that encourage the higher income people to locate there. On the other hand the rentals required, prevent the lowest income people from locating there and thus these apartment areas are attractive to, and only suitable for, households in the middle income and above range, and for people with particular housing tastes and preferences. Alonso indicates the importance of the stage in the family life cycle as "the young couple lives in central area apartments, moves to the suburbs as the family grows, and returns to the centre after the children leave home; thus reflecting their changing space preferences with changing family size." (Alonso, 1964, p.440). This tendency is linked to the desire for more open space with movement along the family life cycle. But Muth points out that expenditure on rented accommodation, after being home owners with tenure and security, as well as the moving costs involved, tends to be greater and there would seem to be little reason for an ageing population to return to the central city as some anticipate.

Models of the Internal Structure of Cities.

The ecological processes of urban growth, as well as the structural theory of the land economists have implied that as a city develops typical patterns of differentiation become apparent as different areas become associated with particular types of population. In this way certain systematic relationships between geographical space, and "social space" appear. The concern of this section is with the spatial aspects of residential differentiation through the use of conceptual models in order to identify a conceptual framework for explaining the spatial structure of apartment development.

Among the major theories of urban growth that have been advanced to account for familiar and typical characteristics, are the classic models of urban form: the zonal, the sectoral and the multiple nuclei. Certain implicit aspects of these models have been expanded upon for greater understanding, viz. the "filtering process" of housing, and the

"stage theory" of redevelopment.

A second approach to the spatial social structure of urban areas that has been of great influence in improving u derstanding 'n more detail, have been the constructs of Social Area Analysis and its implicit handling of urban life styles. Currently, there exists the integrated approach of factorial ecology, and it is to this end that the discussion in this section will proceed.

It is important to reiterate that the relationship between mobility and competitive individual behaviour is central to all these models. Also they assume private ownership of property and a rapidly increasing and large population to account for its form. These models further assume untrammeled urban expansion and the absence of city planning as the institution of the planning process and the intervention into the housing market may well disrupt the dynamics of the model. (Timms, 1970, p.211-222).

The zonal hypothesis of urban growth was developed by Burgess, in which he theorized that the modern American city takes the form of five concentric, more or less symmetrical, rings or zones of development, with each zone having a tendency to expand (invade) outwards into the next. In this model of concentric zones, cities are arranged with the predominant land use changing from commercial through industrial and increasing high quantities of residential development, from t e city centre to the periphery. In the centre of the city was zone 1, the CBD, being the area of high intensity and high land values as a result of being the area of most accessibility. Encircling the CBD and forming its outer ring, is a wholesale and warehousing and light industries district. Zone 2, the zone of transition, surrounds the CBD and is assumed to be in the path of change and expansion of Zone 1, with its residential components suffering most. People were seen as moving successively outwards from the inner city, into better residential areas through the remaining 3 zones, as their social mobility increased with improved economic status. This model has been subsequently subjected to criticism, esperially in

regard to the shape of the CBD which is not necessarily circular and the fact that industry was not located just in the transitional area, but near rail and other facilities wherever they were. Furthermore, low-grade housing is found in many parts of the city, especially near industrial locations. (Johnston, 1971, p.69-78).

Hoyt formulated the sector theory, and in contrast to what Burgess had suggested, Hoyt observed that growth appeared to take place rapidly along main transport routes and along lines of least resistance. The sector model not only holds that growth proceeds along particular axes of transportation, but also that growth consists of extensions of the predominant types of land use in the particular corridor. Thus Hoyt saw the city as a circle with various areas as sectors radiating out from the centre, of similar types of land use expanding outward toward the periphery. This model in affect, analyzes the distribution of residential neighbourhoods of various qualities. There are two major components to this model, viz. the impact of the rate of the community's growth upon the pattern of neighbourhood change as it affects the speed with which the high grade, motivating group, moves to new locations; as well as the affect by which each component element is increased in the population. The model postulates that as these high-rent neighbourhoods move outwards, the lower and intermediate status groups filter into their houses (this concept will be returned to in greater detail).

The processes of this theory are the ageing structures; sequential occupance by income levels within each sector; and population growth. For the process to work there must be a balance of the rate of population growth; new construction; ageing of buildings; and a structure of demand according to income,age and type of families. (Alonso, 1964, pp.437-439). This model was formulated before the advent of the explosion of the use of the car and hence some of the assumptions require modification, particularly as it affects growth on the periphery. Hoyt, himself, remarks that "in view of the shifting uses in the CBD, the overall decline in the predominance of central retail areas, the

rapic growth of office centres, and the emergence of redeveloped areas, the former description of patterns must be revised to conform to realities". (Hoyt, 1964, p.89). Hoyt indicates that the increased mobility in particular has permitted distortion on the periphery as the various economic groups locate, by and large, as and where they want, with little relationships to their related sections.

Chauncy Harris and Edward Ullman published what became known as the multiple-nuclei theory of urban growth, in which it was held that land-use patterns of urban areas develop around several discrete nuclei, not around a single centre. These might be nuclei that have existed since the origin of the city, or they may have arisen as a result of migration and specialization of different types of land use. The rise of nuclei and the differentiation of districts of land use are accounted for by a combination of factors, i.e. Certain activities require specialized facilities; and that like activities group together for mutual advantages; while unlike activities are mutually detrimental or incompatible with one another; and that some uses have a relatively lower competitive capacity to purchase good locations.

Filtering, Neighbourhood Change, Life Style and Social Area Analysis Filtering

Residential neighbourhoods change over time and respond not only to self-contained forces of change, but to the quality and alterations in the whole environment. The mechanism by which these changes take place is termed the "filtering" process and implies a succession of occupancy in dwellings originally built for higher-income families. The term "filtering" has been variously defined to mean that with age and deterioration a housing unit usually becomes less desirable for the original occupant, and is abandoned in favour of a newer unit. (Smith, 1964, p.12-15). Thus, lower-income households seem usually to inhabit older, less adequate, centrally located dwellings. Filtering is used to describe not one, but several, processes and has been subjected to a variety of interpretations, based on change of occupancy, housing values, housing standards, and various combinations of income and rent ratios, so that the patterns

of occupancy of an area's housing stock "can be studied in terms of household characteristics (especially income) vis-a-vis housing characteristics (such as quality of buildings or location." (Smith, 1964, p.17). Lowry associates filtering with four types of obsolescence-technological, style, site and locational; which act to alter the nature and rate of change, in addition to the effects of depreciation. (Lowry, 1960, pp.339-347).

A basic assumption of filtering processes is the notion that housing space itself is a necessity, but extra housing quality is a luxury, the consumption of which increases with income. The response consists of each secessively higher-income group moving on - a shifting of households, i.e. filtering, and a new aggregate rent offer being less than before, yet households now occupy better quality housing - they have "filtered-up" while housing has "filtered down". Thus less desirable housing is occupied by the lower-income households. In essence, filtering refers explicitly to the sequential occupance of urban housing units by groups of succeeding lower incomes.

If a community is growing in population, the filtering process is assumed to operate sufficiently, so as to make optimum use of a new inadequate housing stock. Whenever a scarcity arises, whether by the intrusion of in-migrants of better households or a poor or middle income households, the tendency is to force out the lowest rent payer.

The filtering process is reflected spatially in the movement of lower income groups into areas abandoned by groups of higher income, usually immediately adjacent to and further from the city centre.

Three apparent principals emerge from the filtering process for neighbourhood change:

1) Neighbourhoods tend to retain certain of their physical characteristics even though composition of housing demand may change significantly,
2) some neighbourhoods must change their characteristics to accommodate a change in the composition of the total communities demand, and
3) Neighbourhoods tend to make gradual transitions, not

abrupt changes in character. (Smith, 1964, p.39-42).

Cycles of Structural Change in Residential Areas

The examination of the processes of change can now be turned away from general descriptions towards an explanation of the development of apartment areas. The shifting patterns of residential areas has already been schematically described, to some extent, in the work of Hoyt and in the filtering process. In this way the nature of cyclical successions has been considered. The concept of cycles of structural change in neighbourhoods indicate the relationships between urban environmental change and population movement characteristics.

Hoover and Vernon modifies this growth concept to take account of two rings of residential growth, one marked by single-family housing and the other by apartments. (Hoover and Vernon, 1962, p.179). Hoover and Vernon carried the analogy further as a refinement of the concentric zone concept and postulated a series of evolutionary stages of neighbourhoods. This interpretation of the process is relavant, because it can refer explicitly to the redevelopment of the inner areas and the replacement of structures. It is possible, therefore to describe a stage theory and quantitively define the stages similar to those of Hoover and Vernon and to show that:

1) the tendency for any given neighbourhood to move from one stage to the next is quite strong, and
2) the location and movement of various social and economic groups and among neighbourhoods in different stages of development can be identified.

Birch follows Hoover and Vernon's lead and defines stages in terms of residential types and population densities. Six stages of residential development are described as follows: (Birch, 1971).

Stage 1. Rural. This stage is characterized by low population densities and a predominance of single family units with a general uniformity of age and condition.

Stage 2. First Wave of Developments. Subdivision begins with high rates of new construction, predominantly single family units.

Stage 3. Fully developed High Quality Residential. The initial development has run it's full course. In some cases single-family units still prevail, but densities are considerably higher than in stage 2. This represents a transition stage with substantial construction and population growth with new housing occurring as multi-unit apartments replacing older single family units, so that density is increasing. Property values and rents are close to their maximum, relative to other neighbourhoods in the area.

Stage 4. Packing. As the age of structures built during stage 3 increases, filtering operates, as rents fall and lower income groups begin to inhabit the dwellings, at densities higher than the area was designed to hold. In many cities these areas might be called "new slums". In the latter stage of this process increasing densities may be affected by removal of existing structures as well as a widespread conversion of structure taking place.

Stage 5. Thinning. By now the buildings in Stage 4 have deteriorated still further and children of low-income parents who originally moved into them are leaving, probably for a stage 4 or stage 3 area somewhere else in the city. Population declines absolutely, leaving older couples behind. These areas might be called "older slums". Densities decline as dwellings are abandoned or occupied by non-residential users, and as household sizes decline. New construction is limited, and is largely non-residential.

Stage 6. Recapture. At some point the land occupied by an old slum becomes too valuable to justify

its use. Obsolete property is then acquired, levelled or rehabilitated, and put to more effective use, such as private luxury apartments (and subsidized medium and low income public housing) or office buildings. This can be seen as only the last and most recent stage of neighbourhood change and thus the nieghbourhood has reached its second cycle of demolition and replacement. When recapture is completed the area may appear to have many of the properties of a stage 3 area, but with significantly higher densities. Densities increase considerably for individual sites and small areas, but may in fact, continue to decline overall, because of the expansion of non-residential uses. At some point there must be a stage 7, as the recaptured areas themselves begin to decay.

Obviously there is a great over-simplification involved, because of the size of neighbourhoods and the time it takes for a neighbourhood to evolve: This results in a neighbourhood having characteristics of more than one stage; but the characteristics of one stage would dominate. Also, not all residential areas go through the cycle of structural change and its interpretation requires explicit assumptions about long term trends. It must be pointed out, that some areas skip certain of these stages; while in others the cycle is arrested by renewal before the full sequence is completed. Nevertheless, these ideas do suggest a framework for understanding the changes conditioned by time and growth that occur in both structures and areas. Also when neighbourhoods have been through stages, they tend to remain stable for relatively long periods and shift quickly to another stage. Birch conjectures that the shifts from rural to the first wave of development and from thinning to recapture are probably quite abrupt, and that the shifts from stage 2 to higher densities and the subsequent thinning processes are likely to be more gradual. (Birch, 1971, p.82).

The geographical pattern of ageing indicates that the older neighbourhoods are concentrated in the inner city suburbs. Consequently the central area and the inner suburbs have seen most cycles of change.

Hoover and Vernon also suggested that individual family units moved through these stages According to their model, wealthy families have more choices and by and large, they purchase low density living. As one generation of housing becomes rundown or too closely packed, the wealthy will open up new land and build new housing. The lower-income groups have less choices and cannot afford the high cost of new construction. They must, therefore, filter into the abandoned housing of the wealthier. To the extent that they have families, they too push outward for lower density.

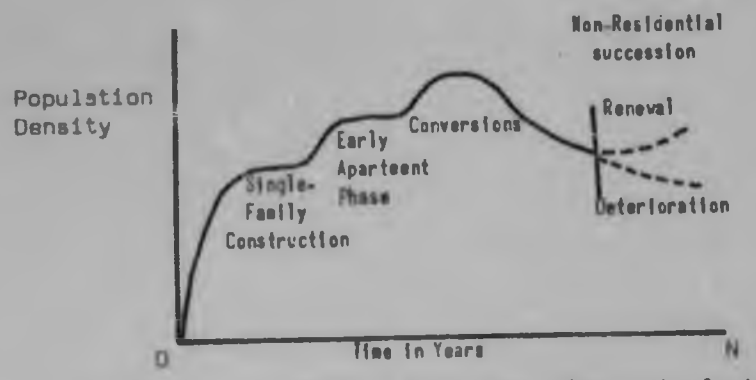
At any point the better established, wealthier live in young neighbourhoods, with poorer, less educated living in older neighbourhoods, and families with more children, regardless of wealth living in younger neighbourhoods. Implicit therefore, is a constant shifting of households from older to younger stages, which may be diagrammed as shown in Fig. D.1.

It is possible to identify specific groups that entered the system and to predict their patterns of location.

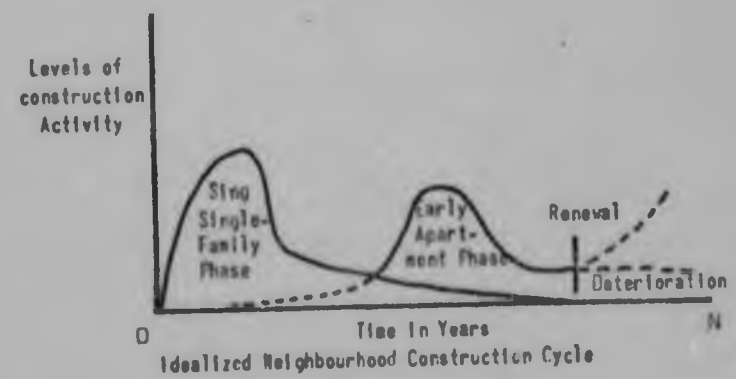
Life Style and the Family life Cycle.

Life style and its concommitant, the family life cycle, are employed as evaluative and classifying concepts, but cannot be definitely identified. These concepts refer to meaningful and distinctive manners or expression of persons, groups, or cultures. The purpose of the construction of life style is to provide a context within which the behaviour of people can be understood in terms of stability, coherence and predictability of activities (Michelson). Differential emphasis on the different choice patterns have been suggested by Bell as offering the degree of three broad life styles for individuals (and married couples). (Johnston, 1971, p.30-32).

1. Familism, in which child rearing is the dominant feature and the whole way of life is centred on the children. This life style is closest to the traditional one. In addition, couples are more able to determine the size of




Idealized Neighbourhood Population Density Cycle Related to New Construction and Structural Change




Idealized Neighbourhood Construction Cycle

FIG.D.1

Idealized Neighbourhood Cycles and Change

(Source: Bourne, L.S., 1967, "Private Redevelopment of the Central City," University of Chicago).

their families, according to the degree to which they want to participate in the other two life styles.

2. Careerism, in which the members are mainly orientated towards the goal of vertical social mobility, and devote the major portion of their time and energy to this end. Many choosing this life style may never marry, but of those who do, most will marry at an older age than is average, and many will have no children. Those who do have children will both have them later in their married life than average, and have fewer than average, so that the children will impede the vertical mobility as little as possible.
3. Consumerism, in which members opt for the good life, preferring to expend their time, money and energy "eating drinking and being merry".

These three are not necessarily exclusive, and most people choose some combination of two or three. In this way residential mobility can be accounted for in terms of duration of residence, distance and distribution of opportunities, economic and tenure status, career pattern and occupations.

As well as the life style choice there are two regular transitions which also affect individual actions. The first of these is age, which is associated with recreation and leisure patterns; but the more important is the family cycle. Broadly speaking, the family-centred households prefer single-family units, partly because of the available space external to the building, while career- and consumer orientated households would be more likely to choose living in rented apartments.

Within the familism choice there are a number of sub-choices which are strongly, though not wholly, correlated with the age of family members and the stage in the family cycle which a household had reached, and in some parts of the family cycle the life style can be similar to that in the other major choices. The various stages of the cycle are outlined, according to Johnston, as:

1. THE PRE-CHILD STAGE. In this, housing demands are broadly comparable to those for households who have chosen one of the other two life styles. Both members of the family are likely to be absent from the dwelling

and at work for much of the day, so demand for space will be low relative to that in later stages in the cycle. Accessibility to the centre is probab'y important. Other aspects of the family's beha iour could be very similar to that of consumer-orientated households, both types spending much of their leisure time away from the home. Finally, at early stages in the male's career his income is likely to be fairly low and thus home purchase is unlikely. Families in this stage should live, therefore, in relatively cheap, central city rental apartments.

2. CHILD-BEARING. Following the normally short pre-child stage, the family should enter its period of most rapid growth and greatest mobility. Space demands increase as the wife now usually remains at home to raise her young children, and the demands continue to expand as the family grows in numbers and the offspring in years. Accessibility to the city centre or some other major nucleus becomes less important to the family while the quality of the local environment becomes more crucial, especially, with regard to the provision of private open space.
3. CHILD-REARING. The family generally stops expanding during this period, but as the children grow and the husband reaches the apex of his career, home ownership, security and stability become important features of family life (many families, for example, will be reluctant to move far during this stage for fear of disrupting their children's education with changes of school). A relatively new suburban home, whose actual location may be determined by such accessibility factors as the quality of neighbourhood schools will be purchased.
4. CHILD-LAUNCHING As children progress through their teens space demands build up again, but the family is usually more able to meet them now than in the second stage. Real income for the head is often at a maximum. Neighbourhood ties are likely to induce the family to stay in the same general area.
5. POST-CHILD. Soon after the move to more spacious quarters, family size declines as children leave home.

Nevertheless, many of the reduced families may not move into smaller accommodation, preferring to enjoy their space and retain it for visits by their children and grandchildren. Smaller homes and gardens might be more desirable for many, but these would probably only be available in:

(1) older stock which would involve filtering down the neighbourhood scale,
(2) new suburbs populated largely by young families, or
(3) central city apartments, built on expensive land and costing as much as suburban homes in many cases. Thus this stage may be marked by residential stability, while others might, if income permit, return to apartment dwelling, perhaps in the suburos. Thus this stage may be marked by residential stability.

6. LATER LIFE. The average family is dissolved by the male's death, but whether husband or wife dies first, a large number of the survivors no longer lead an independent existence, however, much this might be desired." (Johnston, 1971, pp. 104,106).

Johnston points out that this residential location construct is an inductive construct formulated in the United States. Also deviations in the model involve either omission of certain steps or failure to complete the total sequence, e.g. the first two stages could be missed by

1) the higher income families who can afford house purchase immediately after marriage;
2) families with a very short pre-child stage, and
3) families living at a parental home. On the other hand, many families especially in the lower income-groups, will never proceed beyond house rental whatever their stage in the family cycle.

Differences in life style and position in the family cycle acts to produce residential separation of households because of variations in the type of accommodation required.

Age structure, as it relates to households has a significant influence on housing market behaviour, and secondly, rentership rates generally decline as the families life

cycle increases. Also, sizeable changes in the age structure of households are taking place. As the size of households increase rentership declines and the reason seems to lie in the interaction between desires and availability, as families move to adjust to changed needs for space, often tending to accept lower housing quality in order to obtain extra space. Rentership also declines with income increases, as this is the determinant of whether a preference can be satisfied. In most instances purchase of a house requires a large initial cash outlay which is usually obtained from savings. The amount of income therefore affects the possible savings, with the lower income market therefore tending to be in rented apartments.

Rentership continues to decline throughout the age range. Mc Allister points out that an apparent change in attitude towards ownership occurs during the very early life cycle stages. (McAllister, 1967, pp.130-134). Between the ages of twenty and thirty, a substantial shift in the propensity to save takes place. Among the important shifts in reasons for saving between young single and childless couples was the purpose of buying a house. This change in behaviour takes place upon marriage, and this distinguishes the differences in rentership between one and two person household in the twenty to thirty age category. Also, as age increases, more assets accumulate, even with constant incomes. Since ownership is the preferred form of tenure for most households, rentership generally declines with progression along the family life cycle. Note that his agreement supports Muth's contention that even after children have left home, tenure and securit, tend to maintain an older couple in a suburban home. (Muth, 1969). Alonso points out the number of young people in the society (which is proportionately higher now), structure the demand for their particular housing preference (Alonso, 1964, p.441). Thus it is possible to attribute much of the shift from single to multiple dwellings to temporary changes in age composition of the population rather than changes in taste, but this will be short lived as this population reaches into its thirties.

Social Area Analysis.

Another approach to determine linkages between social, structural and locational spaces in the city "Social Area Analysis" was outlined by Shevky and Bell. (Rees, 1970, pp. 314-319).

Social Area Analysis rests upon certain broad conceptual notions or postulates concerning the changing character of industrial society. These postulates illustrate three broad trends of modern society which relate to the way in which urban populations are differentiated. These trends or changes have cross-sectional as well as temporal relevance for any point in time. On the basis of these changes, three factors are chosen which might be used to study a particular social system at one point in time. These constructs are called economic status, family status and ethnic status.

By means of these constructs it is possible to identify social areas in the city; as well as integrate theories of social change, by characterizing each census tract by scores for each of the three indices. Those tracts which exhibit similar scores can be grouped into relatively uniform social areas.

These constructs make it possible to isolate homogeneous communities with respect to the characteristics of their inhabitants; the nature of the housing stock; and by implication with respect to the way people live within the community.

Social Area Analysis has been criticised for not having a carefully formulated theoretical basis for explaining the typology but is an "ex post facto rationalization for their choice of indexes" as well as the methods of procedure adopted for scoring and indexing. (Murdie, 1969, p.287).

Nevertheless, by means of interrelating the concepts of social space and the classic notions of ecological space, it is possible to provide a coherent and logically demonstrable frame of reference to identify the differentiation of the urban structure.

These approaches summarize several essential aspects of the city's residential differentiation and is a useful comparative tool. These constructs are the basis for the

approach undertaken by Factorial Ecology.

Factorial Ecology and an Integrat d Approach.

The analysis and identification of social or ecological areas have derived primarily from the use of concentric and sector models and the social area analyst; but these studies have lacked a comprehensive approach. Building on a review of studies such as these, Berry and Rees, through the use of factorial ecology studies, have presented a useful framework for a comprehensive model. (Berry, 1971, pp. 307-319). Their study assumes that the model is generally valid for most large industrial cities within the developed nations of the world. It is a descriptive model of urban ecological structure, and change which takes into account social area analysis and the three classic models of intra-urban location. Murdie states that the model "is an idealized pattern which, when applied to the real world, describes the structure of some cities better than others" and further that"recognition must be given to the importance of social values and administrative processes in shaping the ecological structure of individual urban areas", so that it becomes necessary to identify them as they affect the patterns of ecological structure. (Murdie, 1969, p.283).

This model shows that the three classic models complement one another, each describing a seperate aspect of social differentiation within the city. It is based on an assumption that a city's social structure contains two major dimensions socio-economic status and stage in the life cycle. Together these independent dimensions produce the urban social space which reflects the price or rent of housing; its size and quality; and the life cycle correlates with housing type. Each individual household unit thus has a social position which is associated with the type of home it occupies; and since people of different types tend to live in similar areas, this produces a community space.

Districts are then recognised by socio-economic, and family characteristics which takes the form of series of zones and sectors. Within each sector, there is a zonal pattern of life cycle position. The patterns that result are, broadly speaking, that Economic Status is primarily

sectorial; Family Status is primarily zonal; Ethnic Status is mainly sectoral, although with "clumping" has aspects of zonality; and that recent growth is mainly zonal. Further, each sector is not homogeneous in its socio-economic characteristics, but is also zonally patterned. Within the highest status sectors, such zoning has emerged; whereas lower status sectors display zonal patterns dominated by the family cycle pattern.

Berry and Rees, further showed two important distorting factors leading to a more complex pattern. The first of these concerns the distribution of ethnic groups, some of them relatively low in socio-economic status and living in highly segregated communities. As socio-economic status groups they generally occupy sectoral settlement patterns. Secondly, complexity is increased by the introduction of secondary workplaces which act as minor nuclei around which communities cluster. The resulting pattern is shown in Fig. D.2.

The interaction of social divisions; along lines of occupation, income, life style, age, ethnicity, religion and birthplace, etc., tends to the development of complex patterns of residential areas and results in homogeneous areas containing similar sorts of people. The character of these "social" (or natural) areas, in turn, influence the housing choice of subsequent occupants, because people seek compatible environments. Also, topographic and man-made systems act as barriers to movements of populations and tend to fix the boundaries of these natural areas. Thus from "the mobile competing stream of the cities population, each natural area of the city tends to collect the particular individual's pre-destined to it". (Timms, 1970, pp5-6).

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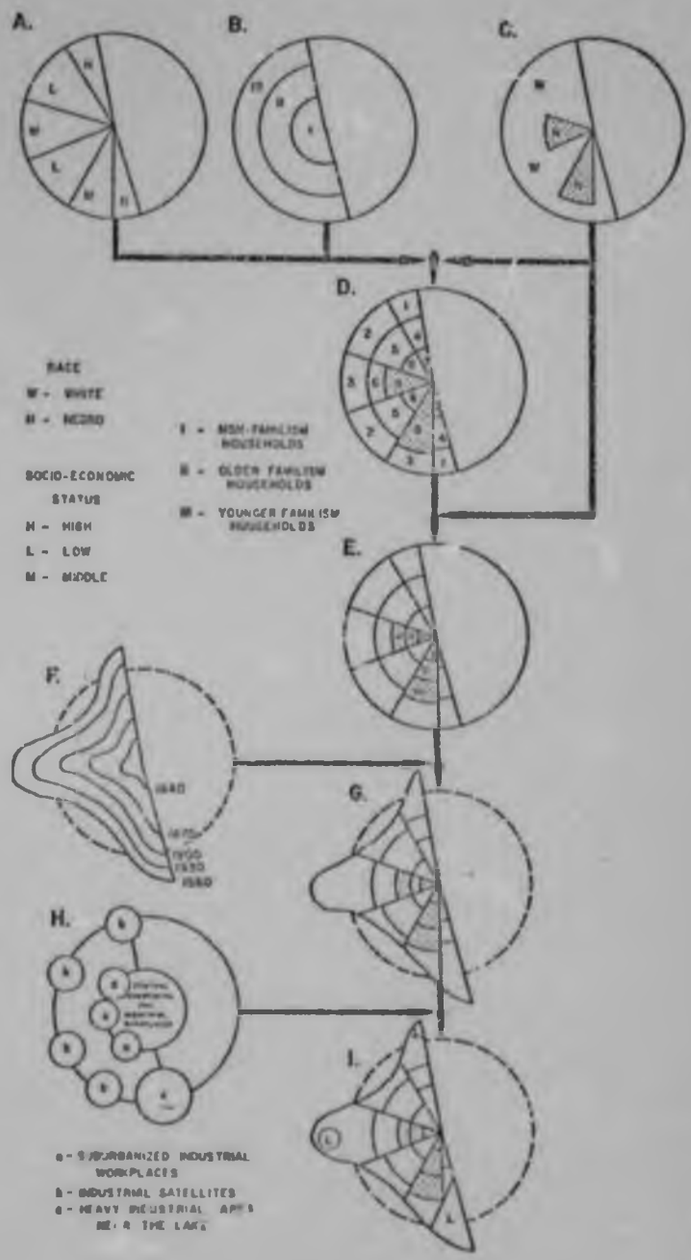



FIG.D.2

An integrated Spatial Model of Urban Residential Areas, based on Chicago.

A, B, and C show the socio-economic status, family status and racial patterns respectively; D amalgamates the three types; E indicates differences in zonal patterns between White and Negro areas; F and G show how these are distorted by processes of urban growth; H and I introduce further distortions based on the location of workplaces.

(Source; Johnston, after Berry and Rees, 1969)

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