URBAN LAND UTILIZATION

CASE STUDY: RIYADH, SAUDI ARABIA

by

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Chairman, Department Committee on Graduate Students

John Habraken

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(SEP 5 1975)
ABSTRACT

This is a study of urban dwelling environments with primary emphasis on land utilization: its pattern, intensity, and efficiency. Riyadh, Saudi Arabia, is taken to illustrate the various aspects. The study consists of existing dwelling environments and a model for urban land development. The National Context of Saudi Arabia and the Urban Context of Riyadh are included in brief form as well as a summary of the urban housing policy of Saudi Arabia for reference.

Five distinct urban dwelling environments in Riyadh have been identified, analyzed, and evaluated. These cases were chosen because of the time of their emergence in Riyadh, their location, and layouts, as well as the socio-economic characteristics of their inhabitants. These cases are: Ad-dira (traditional pattern); Manfoha (transitional pattern); Khazzan (contemporary pattern); Malazz (contemporary government development for its employees); Khurais (contemporary government project for low income families). The cases were analyzed on four different levels: the locality with reference to its context, a segment containing the main elements, a typical block, and a typical dwelling. In addition, eight dwelling types, representing the dwelling systems available in Riyadh, have been further identified and evaluated.

The study of the urbanization model consists of the following:
- A review of the proposed master plan of Riyadh;
- The basic studies for a physical development, including site limitations and development plans and process.
- Twelve layouts, three of them adapted from existing models, evaluated with respect to their land utilization.

Objectives:
- To illustrate the correlation between the settlement and its physical, socio-economic, and cultural context.
- To emphasize the relationship between the physical pattern and the development process of a settlement and its land utilization.

Application:
- A guide for preliminary design and evaluation of urban environments in transition.
- A stimulus for future studies.
- A point of reference for policy makers in urban dwelling environments.

Thesis Supervisor: Horacio Caminos
Title: Professor of Architecture
This study is based on field surveys in Riyadh, Saudi Arabia, carried out by the authors during the summer of 1974. The surveys included the physical and socio-economic aspects of selected Riyadh urban dwelling environments. The analysis and evaluations were carried out in the Urban Settlement Design Program, School of Architecture and Planning, M.I.T., during the academic years 1973-74 and 1974-75.

The surveys and evaluations of the urban dwelling environments are based on a procedure developed in the Urban Settlement Design Program. The procedure provides a basis for comparison of urban dwelling environments in different parts of the world.

Mohammed Al-Hussayen and Ali Shuaibi were responsible for all aspects of the thesis. Mohammed Al-Hussayen took particular responsibility in finalizing the case studies of Riyadh. Saleh Al-Hathloul participated fully in the preparation of the urbanization model.

The authors gratefully acknowledge the guidance and kind support of Professor Horacio Caminos during the two years of the study. They are also grateful for: the critique and assistance of Reinhard Goethert during the same period; the classes of 1973-75, 1974-76 for their comments; Dee Clarke for the editing and typing of the text; Fatima Al-Hussayen for her moral support; Riyadh University for financing the research; the Saudi Arabian Educational Mission for their kind cooperation; the Town Planning Authority, the Municipality of Riyadh, the Ministry of Interior for Municipalities, the Housing Authority in the Ministry of Finance, the Aerial Survey Department in the Ministry of Petroleum and Mineral Resources, and the Central Planning Organization for the provision of essential materials. The authors are further indebted to all who directly or indirectly contributed to this work whose names were not mentioned.
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INTRODUCTION

Urban Settlements have witnessed tremendous changes in their structure, functions, and environments during the past few decades. The problems of urban sprawl, social disintegration, and poverty are some of the results of these changes. These problems call for reassessment of the current approaches to the development of urban settlements. The isolation and study of different elements of settlements independently is indispensable to the understanding of its characteristics, but a comprehensive approach in planning and design is essential to a settlement's functioning and livability.

Urban land utilization is influenced by different situations and policy interpretations on different levels; still the study of the relationship between different elements of environments in existing conditions helps the prediction and future planning in a given urban context.

The focus of this study is on urban dwelling environments with primary emphasis on land utilization: its pattern, intensity, and efficiency.

The study attempts to illustrate the correlation between the settlement and its physical, socio-economic, and cultural context, and to emphasise the relationship between the physical pattern and the development process of a settlement and its land utilization.

The study may be applied as a guide for preliminary design and evaluation of urban environments in transition, a stimulus for future studies, and a point of reference for policy makers in urban dwelling environments.

Riyadh, Saudi Arabia, is taken to illustrate the various aspects. The study consists of two basic sections: a survey of existing dwelling environments and a model for urban land development. In addition the National Context of Saudi Arabia and the Urban context of Riyadh are included for reference.

The survey of existing dwelling environments identifies, analyzes, and evaluates five distinct urban areas in Riyadh. These cases were chosen because of the time of their emergence in Riyadh, their locations and layouts, as well as the socio-economic characteristics of their inhabitants. These cases are: Ad-Dira (traditional pattern); Manfoha (transitional pattern); Khazzan (contemporary pattern); Malazz (contemporary, Government development for its employees); Khorais (contemporary, Government project for low income families). Squatter areas are not considered in this study, but if they continue to grow, large-scale distinct dwelling environments may result. The cases were analyzed on four different levels: the locality with reference to its context; a segment showing the main elements: streets, dwellings, lots, open spaces, commercial areas, and community facilities; a typical block; and a typical dwelling. In addition, eight dwelling types, representing the dwelling systems available in Riyadh, have been further identified and evaluated.

The study of the urbanization model consists of the following: a review of the proposed master plan of Riyadh; the basic studies for a physical development, including site limitations and development plans and process; and twelve layouts, three of them adapted from existing models, evaluated with respect to their land utilization.
RIYADH, SAUDI ARABIA

Riyadh is the capital and the largest city in Saudi Arabia. It is located in the Central region of the country at the intersection of major travel routes which link the Arabian Gulf to the Red Sea. The city is situated on a plateau which is 600 meters above sea level at Latitude 24° 38' North, Longitude 46° 43' East. Rain fall is rare; humidity is very low; and temperatures vary from 5°C in winter to 45°C in summer.

Almost 50% of the private households earn less than $1714 per year, and that means that 50% of the private households earn less than 15% of the aggregate personal income. Households earning less than $3428 per year make up 23%, and households who earn more than $3430 per year make up 27% of the total population.

In 1968 the annual per capita income of Riyadh was $461. For the rest of the country it was $350-400.

The municipality of Riyadh is responsible for the current administration of the city's affairs, and jointly with the Ministry of the Interior, for all projects concerning the city, its facilities, and its infrastructure.

A high percentage of urban construction is adobe, concentrated in center of the city. New neighborhoods are of concrete construction.

There is a complete water supply system in the city, but there is a shortage of water in the summer. There is no public sanitary system, so every individual building has a separate cesspool. Sanitary and storm drainage systems are under construction. There is no public gas system, but propane gas in tanks is the main fuel.

The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type. Quality of information: Approximate.

The chart illustrates the approximate availability of utilities, services, and community facilities at three levels: NONE, LIMITED, ADEQUATE. Quality of information: Approximate.
URBAN TOPOGRAPHY AND CIRCULATION

Riyadh was built between the Wadis Hanifah, Aysan and Batha in order to profit from the available water sources. Apart from the Wadis, other natural features of the surrounding area are two rows of hillocks to the east and to the west. The built-up area covers an area of roughly 15km from north to south and approximately 10km from east to west. Of the major entrance points to the city, two are of major importance and these are not connected by the same route inside the city. Use of city streets is required to get from one to the other. The approaches are a) Dammam-Dhahran and b) Hejaz. Three lesser accesses play an important role in the movement of traffic to and from the city.

KEY

A  Airport
1  AD-DIRA
2  MANFAWA
3  KHAIZAN
4  MALAZ
5  KHURAINS

URBAN LAND USE PATTERN

Residential areas exist throughout the city. The old section of the city consists mainly of mud houses. Apartment blocks have developed within the central business district and to the north. New residential areas, which developed after 1945 generally, house mostly middle and high income groups. Although most of the commercial and business activity is concentrated in the central business district, some groups of shops have sprung up in the new residential areas. The industrial area is located to the east of the city along Kharj Road.
The very low income sector is concentrated in the city center and to the south of it. Some small squatter settlements are located in the upper class neighborhood. The middle income group lives in walk-up apartment buildings in the main commercial streets and in neighborhoods distributed around the city center. There is a concentration of the high income sector in neighborhoods towards the west and northwest of the city.

The estimated population of Riyadh in 1968 was 300,000 inhabitants. Since 1960, the average annual rate of increase has been 8.5%. The birth rate contributes only 2% per annum to the increase. The additional 6.5% is attributed to migration. High population density is concentrated in the city center and in the low income neighborhoods. The new residential area in the northern and eastern parts of the city have a low population density.
URBAN CONTEXT: RIYADH CITY

URBAN GROWTH PATTERN

Some records of ancient history, the earliest dating back to 715 B.C., mention the existence of Hajiar in the general area where Riyadh was later founded. Around 1730 Riyadh became the capital of a kingdom under the Iben Saud family, but the capital was subsequently moved to Daraiya, 20km to the north, in the beginning of the 19th century. In 1818, the kingdom was defeated and the capital destroyed. In the beginning of the 20th century King Abdul Aziz Iben Saud liberated and unified many areas of the peninsula from the control of the Ottoman Empire. At the end of World War II Riyadh became the capital of Saudi Arabia.

URBAN LAND VALUE PATTERN

Land prices in the Central Business District are in the range of $500 to $1200 per square meter. They continue to be high along the main commercial streets, and drop gradually towards the west. In the old city outside the Central Business District prices slide from $143 to $28 per square meter. In the new residential areas prices range from $43 to $14 per square meter, and in the industrial area, land costs vary from $20 to $7 per square meter.

DATES

| Year | 1920 | 1950 | 1968 |

PRICES

| Range       | $500-1200/m² | $100-500/m² | $3-100/m² |

1:250000
Riyadh, Saudi Arabia: (top) Batha Street, the main transportation and commercial spine with predominant walk-up apartment buildings.

(bottom) As-Safah, the government palace square, dominated by the increasing number of cars.

URBAN CONTEXT SOURCES


Urban Land Use Pattern: (approximate) IBID.

Urban Income Pattern: (approximate) IBID.

Urban Growth Pattern: (approximate) IBID.

Urban Density Pattern: (approximate) IBID.

Urban Land Value Pattern: (approximate) IBID.

Climate: (accurate) IBID.


General Information: Doxiadis, RYHAD EXISTING CONDITIONS, 1968.
CASE STUDIES

The following section contains case studies depicting selected dwelling environments/situations in the Riyadh urban area at the present time. The 5 cases were selected according to income groups, housing systems, and proportion of the population that each system houses. Each case study is represented at four scales:

LOCALITY: A locality is defined as a relatively self-contained residential area in Riyadh. In general, it is contained within physical boundaries.

LOCALITY SEGMENT: All the localities differ in size and shape. A segment of 400X400 meters has been taken from each locality for purposes of comparison.

LOCALITY BLOCK: Within each locality segment a typical residential block has been selected to allow comparison of land utilization (patterns, percentages, and densities) that are homogeneous. The block is bounded on all sides by circulation so that the ratio of circulation to area served may be compared.

DWELLING UNIT: A typical self-contained unit for an individual, a family, or a group in each locality segment.

CASE STUDIES SURVEYED

1. AD-DIRA : Private, low/middle income, Row-grouped houses/apartments.
2. MANFOHA : Private, low income, row houses.
3. KHAZZAN : Private, middle income, detached houses/ apartments.
4. MALAZZ : Public, middle/high income, detached houses.
5. KHURAIS : Public, moderately middle income, row houses.
1 AD-DIRA
Riyadh

PRIVATE, LOW/MIDDLE INCOME,
ROW GROUPED HOUSES/APARTMENTS

LOCATION: It is located in the old city which includes the central business district and the remaining buildings of the old city.

DEVELOPMENT: Until 1930, Riyadh was a very small town with a radius of about 750m and enclosed within a wall. After it became the capital of Saudi Arabia, the area of the town grew beyond its walls and they were removed. In the Fifties, straight streets cut into the city and the central business district developed along these streets. New buildings were erected with shops occupying the ground floors and business offices in the upper floors. Most of the buildings were originally designed as residential apartments, but business offices are replacing them at an increasing rate. Most of the middle and high income families have moved from the old houses to new neighborhoods on the periphery. Many of the old homes are now used as warehouses.

AD-DI5A, Riyadh: (top) The view shows traditional house facades with their small windows to provide privacy and protection from the weather. A part of a mosque with a simple minaret is seen.
(bottom) This vegetable and fruit market is the main food supply for the city. The umbrellas are for protection from the sun.
LAYOUT: There are two types of street patterns in the locality: 1) traditional, narrow streets within the residential area; 2) wide, commercial streets, open for circulation depending on need. Open spaces are limited for parking and cemeteries.
LAND USE: Commercial activities are concentrated along the main streets. The main food market is located in the south of the locality. The major mosque (Jami) and the government palace (Quaser Alhokrn) occupy the central area around Safat Square. There are three schools, 23 mosques, and a clinic in the locality.

KEY:
- Parking
- Police
- Fire Department
- School
- Mosque
- Recreation
- Library
- University
- Health
- Post Office
- Social Services
- Market
- Cemetery
- Bus
CASE STUDY: AD-DIRA

CIRCULATION: All streets are open to vehicular and pedestrian use. Streets in the old area are narrow and unpaved. The new streets, which are used as the main commercial center for the city, are crowded by vehicles and pedestrians during shopping hours. Parking areas are very limited, and side streets are used.

KEY

VERICULAR

PEDESTRIAN

LOCALITY CIRCULATION PATTERN
**LOCALITY SEGMENT LAND UTILIZATION DATA**

<table>
<thead>
<tr>
<th>Component</th>
<th>Total Number</th>
<th>Area (Hectares)</th>
<th>Density (N/Ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOTS</td>
<td>707</td>
<td>16</td>
<td>44.18</td>
</tr>
<tr>
<td>DWELLING UNITS</td>
<td>700</td>
<td>16</td>
<td>43.75</td>
</tr>
<tr>
<td>PEOPLE</td>
<td>4900</td>
<td>16</td>
<td>306.25</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Areas</th>
<th>Hectares</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUBLIC (streets, walkways, open spaces)</td>
<td>2.9</td>
<td>18</td>
</tr>
<tr>
<td>SEMI-PUBLIC (open spaces, schools, community centers)</td>
<td>0.4</td>
<td>3</td>
</tr>
<tr>
<td>PRIVATE (dwellings, shops, factories, lots)</td>
<td>12.4</td>
<td>77</td>
</tr>
<tr>
<td>SEMI-PRIVATE (cluster courts)</td>
<td>0.3</td>
<td>2</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>16.0</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

**LOCALITY SEGMENT AIR PHOTOGRAPH**

1:2500
CASE STUDY: AD-DIRA

LOCALITY CONSTRUCTION TYPES

<table>
<thead>
<tr>
<th>Construction Type</th>
<th>%</th>
<th>Self-Help</th>
<th>Aparment/ Small</th>
<th>Contractor/ Commission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Others</td>
<td>0</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adobe</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wood</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Masonry Wood</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Masonry Concrete</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concrete</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type.

Quality of information: Approximate

LOCALITY UTILITIES AND SERVICES

<table>
<thead>
<tr>
<th>Utilities and Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Supply</td>
</tr>
<tr>
<td>Cesspool</td>
</tr>
<tr>
<td>Storm Drainage</td>
</tr>
<tr>
<td>Electricity</td>
</tr>
<tr>
<td>Propane Tanks</td>
</tr>
<tr>
<td>Refuse Collection</td>
</tr>
<tr>
<td>Public Transportation</td>
</tr>
<tr>
<td>Paved Roads, Walkways</td>
</tr>
<tr>
<td>Telephone</td>
</tr>
<tr>
<td>Street Lighting</td>
</tr>
</tbody>
</table>

LOCALITY COMMUNITY FACILITIES

<table>
<thead>
<tr>
<th>Community Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Police</td>
</tr>
<tr>
<td>Fire Protection</td>
</tr>
<tr>
<td>Health</td>
</tr>
<tr>
<td>Schools, Playgrounds</td>
</tr>
<tr>
<td>Recreation, Open Spaces</td>
</tr>
</tbody>
</table>

The chart illustrates the approximate availability of utilities, services, and community facilities at three levels: NONE, LIMITED, ADEQUATE.

Quality of information: Approximate

LOCALITY SEGMENT PLAN

SELECTED BLOCK

LOCATIONAL ATTACHMENT

PUBLIC TRANSPORTATION
LOCALITY BLOCK: The traditional pattern appears in this locality. Lot sizes vary since the locality is inhabited by different income groups. Circulation is low and even lower in semi-private areas.

LOCALITY BLOCK LAND UTILIZATION DATA

<table>
<thead>
<tr>
<th>DENSITIES</th>
<th>Total Number</th>
<th>Area (Hectares)</th>
<th>Density (N/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOTS</td>
<td>28</td>
<td>0.80</td>
<td>35</td>
</tr>
<tr>
<td>DWELLING UNITS</td>
<td>28</td>
<td>0.80</td>
<td>35</td>
</tr>
<tr>
<td>PEOPLE</td>
<td>196</td>
<td>0.80</td>
<td>245</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AREAS</th>
<th>Area (Hectares)</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUBLIC (streets, walkways, open spaces)</td>
<td>0.15</td>
<td>19</td>
</tr>
<tr>
<td>SEMI-PUBLIC (open spaces, schools, community centers)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>PRIVATE (dwellings, shops, factories, lots)</td>
<td>0.61</td>
<td>76</td>
</tr>
<tr>
<td>SEMI-PRIVATE (cluster courts)</td>
<td>0.04</td>
<td>5</td>
</tr>
<tr>
<td>TOTAL</td>
<td>0.80</td>
<td>100</td>
</tr>
</tbody>
</table>

NETWORK EFFICIENCY

R-FACTOR

network length (circulation) = 178
area served (circulation, lots) = 0.8

AVERAGE LOT AREA

total area (circulation, lots) = 286
number of lots
CASE STUDY: AD-DIRA

LAND UTILIZATION DIAGRAMS

PATTERN
Public: streets/walkways
Semi-Public: playgrounds
Semi-Private: cluster courts
Private: lots
dwellings

PERCENTAGES
streets/walkways 19%
Playgrounds -
Cluster Courts 5%
Dwellings/Lots 76%

DENSITY
Persons/Hectare 240
20 Persons

LOCALITY BLOCK LAND UTILIZATION

1:1000
TYPICAL DWELLING:

Traditional house characterised by indirect open court to the street. The central court functions as a light source, for air circulation, and as an open private space for family use. The rare court is used as a working area and extension of the kitchen. Reception room is located in the second floor.
CASE STUDY: AD-DIRA

PHYSICAL DATA
(relating to dwelling and land)

<table>
<thead>
<tr>
<th>DWELLING UNIT</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>type</td>
<td>House</td>
<td></td>
</tr>
<tr>
<td>area (sq m)</td>
<td>77</td>
<td></td>
</tr>
<tr>
<td>tenure</td>
<td>Legal ownership</td>
<td></td>
</tr>
<tr>
<td>LAND/LOT utilization</td>
<td>Private</td>
<td></td>
</tr>
<tr>
<td>area (sq m)</td>
<td>71</td>
<td></td>
</tr>
<tr>
<td>tenure</td>
<td>Legal ownership</td>
<td></td>
</tr>
<tr>
<td>DWELLING LOC. location</td>
<td>City center</td>
<td></td>
</tr>
<tr>
<td>type</td>
<td>Row-grouped</td>
<td></td>
</tr>
<tr>
<td>number of floors</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>util.</td>
<td>Single family</td>
<td></td>
</tr>
<tr>
<td>physical state</td>
<td>Fair</td>
<td></td>
</tr>
</tbody>
</table>

DWELLING DEVELOPMENT
mode: Instant
developer: Private
builder: Artisan
construction type: Adobe
year of construction: 1945

MATERIALS
foundation: Rubble
floors: Concrete
walls: Adobe
roof: Wood/Straw/Clay

DWELLING FACILITIES
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>wc</td>
<td>1</td>
</tr>
<tr>
<td>shower</td>
<td>1</td>
</tr>
<tr>
<td>kitchen</td>
<td>1</td>
</tr>
<tr>
<td>rooms</td>
<td>3</td>
</tr>
<tr>
<td>other</td>
<td>Courts</td>
</tr>
</tbody>
</table>

SOCIO-ECONOMIC DATA
(relating to user):

GENERAL: SOCIAL
user's ethnic origin: Saudi from rural Al-Khar
place of birth: Al-Khar
education level: University

NUMBER OF USERS
married: 2
single: 2
children: 4
total: 8

MIGRATION PATTERN
number of moves:
   rural - urban: X
   urban - rural: -
why came to urban area: Employment

GENERAL: ECONOMIC
user's income group: Middle
employment: Government employee
distance to work: 3km
mode of travel: Private car

COSTS
dwelling unit: $7,042
land - market value: $150,000

DWELLING UNIT PAYMENTS
financing: Self-financed
% income for rent/mortgage: Not Available.

LOCALITY SOURCES

Land Use Pattern: (accurate) DOXIADIS, Riyadh Existing Conditions, 1968.
Segment Plan: (accurate) 1968.
Block Plan: (accurate) 1968.
Block Land Utilisation: (accurate) 1968.
Typical Dwellings: (accurate) Fourth-year students field survey, Department of Architecture, Riyadh University, 1972.
Socio-Economic Data: (approximate) Field Surveys, A. Shuaibi & M. Hussen, 1972.
Photographs: A. Shuaibi & M. Hussen
2 MANFOHA
Riyadh
PRIVATE, LOW INCOME, ROW HOUSES

LOCATION: It is located 2km south of the city center in the inner ring.

DEVELOPMENT: It was developed by a land subdivision plan proposed by the Riyadh Municipality for the low income group. Most of the inhabitants are of nomadic origin, now working as taxi drivers. Manfoha took its name from an uninhabited, old village south of the existing locality. People developed their land by introducing new materials into the old patterns: steel in entrance doors, cement on floors and roofs.
CASE STUDY: MANFOHA

LAYOUT: The grid pattern with long blocks is the typical layout for Manfoha. Three main streets connect the locality to the city spine (Batha Street). Locality expansion is limited to the north and east by main street, but open to the south and west.
LAND USE: The main market for the locality and surrounding area is located on the main central street, and most commercial activity is concentrated here also. There are no recreational areas except vacant public spaces around mosques. There are three schools, a women's college in the north-east corner, and 17 mosques.
CASE STUDY: MANFOHA

CIRCULATION: Mixed vehicular and pedestrian circulation exists in this case study. East-west streets connect the locality by the main spine (Batha Street) and include the main circulation routes. Other streets to the north and south contain lot accesses, but with less circulation.
### Locality Segment Land Utilization Data

<table>
<thead>
<tr>
<th>Densities</th>
<th>Total Number</th>
<th>Area Hectares</th>
<th>Density N/Ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lots</td>
<td>750</td>
<td>16</td>
<td>46.88</td>
</tr>
<tr>
<td>Dwelling Units</td>
<td>640</td>
<td>16</td>
<td>40.00</td>
</tr>
<tr>
<td>People</td>
<td>4480</td>
<td>16</td>
<td>280.00</td>
</tr>
</tbody>
</table>

### Areas

<table>
<thead>
<tr>
<th>Areas</th>
<th>Hectares</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public (streets, walkways, open spaces)</td>
<td>8.7</td>
<td>54</td>
</tr>
<tr>
<td>Semi-Public (open spaces, schools, community centers)</td>
<td>0.4</td>
<td>3</td>
</tr>
<tr>
<td>Private (dwellings, shops, factories, lots)</td>
<td>6.9</td>
<td>43</td>
</tr>
<tr>
<td>Semi-Private (cluster courts)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>16.0</td>
<td>100</td>
</tr>
</tbody>
</table>

![Locality Segment Air Photograph](image_url)
CASE STUDY: MANFOHA (23)

LOCALITY SEGMENT PLAN

The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type.

Quality of information: Approximate

LOCALITY UTILITIES AND SERVICES

WATER SUPPLY
CESSPOOL
STORM DRAINAGE
ELECTRICITY
PROPANE TANKS
REFUSE COLLECTION
PUBLIC TRANSPORTATION
PAVED ROADS, WALKWAYS
TELEPHONE
Street LIGHTING

LOCALITY COMMUNITY FACILITIES

POLICE
FIRE PROTECTION
HEALTH
SCHOOLS, PLAYGROUNDS
RECREATION, OPEN SPACES

The chart illustrates the approximate availability of utilities, services, and community facilities at three levels: NONE, LIMITED, ADEQUATE.

Quality of information: Approximate

SELECTED BLOCKS
BLOCK PLAN: Row houses, covering a small area, are approximately 10x10m in size. Most of the lots have one access except those that are located on block corners.

LOCALITY BLOCK LAND UTILIZATION DATA

<table>
<thead>
<tr>
<th>DENSITIES</th>
<th>Total Number</th>
<th>Area Hectares</th>
<th>Density N/Ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOTS</td>
<td>66</td>
<td>1.0</td>
<td>66</td>
</tr>
<tr>
<td>DWELLING UNITS</td>
<td>65</td>
<td>1.0</td>
<td>65</td>
</tr>
<tr>
<td>PEOPLE</td>
<td>455</td>
<td>1.0</td>
<td>455</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AREAS</th>
<th>Hectares</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUBLIC (streets, walkways, open spaces)</td>
<td>0.38</td>
<td>33</td>
</tr>
<tr>
<td>SEMI-PUBLIC (open spaces, schools, community centers)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>PRIVATE (dwellings, shops, factories, lots)</td>
<td>0.62</td>
<td>62</td>
</tr>
<tr>
<td>SEMI-PRIVATE (cluster courts)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1.0</td>
<td>100</td>
</tr>
</tbody>
</table>

NETWORK EFFICIENCY

R-FACTOR

\[
\text{network length (circulation)} = 405 \\
\text{area served (circulation, lots)} = 405n/ha \\
\text{AVERAGE LOT AREA} \\
\text{total area (circulation, lots)} = 151m^2 \\
\text{number of lots} = 405
\]
CASE STUDY: MANFOLIA

PATTERN
Public: streets/walkways
Semi-Public: playgrounds
Semi-Private: cluster courts
Private: lots/dwellings

PERCENTAGES
Streets/Walkways: 38%
Playgrounds: 1%
Cluster Courts: 1%
Lots/Dwellings: 62%

DENSITY
Persons/ha: 460
20 persons/ha

LOCALITY BLOCK LAND UTILIZATION

1:1000 Scale
TYPICAL DWELLING: In spite of its small area, the transitional house retains enough essential elements for the low income family. The service court disappears in these dwellings. In the transitional pattern, new building materials such as concrete floors, cement plaster, and cement blocks, are used. More developed openings are found.
CASE STUDY: MANFOLA

PHYSICAL DATA

(related to dwelling and land)

**DWELLING UNIT**
- type: House
- area (sq m): 121
- tenure: Legal/Ownership

**LAND/LOT**
- utilisation: Private
- area (sq m): 121
- tenure: Legal/Ownership

**DWELLING**
- location: Inner Ring
- type: Row/Grouped
- number of floors: 1
- utilisation: Single family
- physical state: Fair

**DWELLING DEVELOPMENT**
- mode: Instant
- developer: Private
- builder: Artisan
- construction type: Adobe
- year of construction: 1955

**MATERIALS**
- foundation: Rubble
- floors: Concrete
- walls: Adobe
- roof: Wood/Straw/Clay

**DWELLING FACILITIES**
- wc: 2
- shower: 1
- kitchen: 1
- rooms: 4
- other: Court

SOCIO-ECONOMIC DATA

(related to user)

**GENERAL: SOCIAL**
- user’s ethnic origin: Saudi from village
- place of birth: Majmaa
- education level: None

**NUMBER OF USERS**
- married: 2
- single: 2
- children: none
- total: 4

**MIGRATION PATTERN**
- number of moves: 1
- rural - urban: 1
- urban - rural: X
- why came to urban area: Employment

**GENERAL: ECONOMIC**
- user’s income group: Low
- employment: Labor
- distance to work: 10km
- mode of travel: Public transportation

**COSTS**
- dwelling unit: $3000
- land - market value: $4260

**DWELLING UNIT PAYMENTS**
- financing: Self-financed
- rent/mortgage: % income for rent/mortgage: Not Available.

LOCALITY SOURCES

· Land Use Pattern: (approximate) IBID.
· Circulation Pattern: (approximate) IBID.
· Segment Plan: (accurate) IBID.
· Block Plan: (accurate) IBID.
· Block Land Utilisation: (accurate) IBID.
· Typical Dwellings: (approximate) Field Surveys, A. Shuaibi & M. Hussagen
· Physical Data: (approximate) IBID.
· Socio-Economic Data: (approximate) IBID.
· Photographs: A. Shuaibi & M. Hussagen, 1974

3 KHAZZAN
Riyadh

LOCATION: This locality is bordered on the north by Khazzan Street, 700 meters west of a major commercial spine (King Faisal Street) and 800 meters northwest of Al-Janie mosque, the main mosque of Riyadh in the city center.

DEVELOPMENT: The lower part in the east was first developed with high income palaces in 1931. Some low income families also settled in the northeast beside the high income section. The remainder of the locality was subdivided and the north part was occupied by high income families in the 1950's with the southern and central parts later gradually developed as middle income areas containing walk up apartment buildings of four floors along the Khazzan Street. Seven story high-rise buildings started to be developed in the 1970's and were mostly occupied by high to middle income foreign employees or small Saudi families. Detached houses built in the 1950's are occupied by large Saudi families. The high income palaces in the north are now used by administrative buildings.

KHAZZAN, Riyadh: (top) Walk-up and high-rise buildings are seen along Khazzan Street. Commercial enterprises occupy the ground floors and the upper floors contain residential apartments.

(bottom) Western style, detached houses (villas) are distributed in the new neighborhoods.
LAYOUT: The area has wide commercial through streets with a predominately grid pattern. The lot sizes are varied. The block layout does not discourage commercial traffic infringement.
LAND USE: There is a huge administrative complex in the north of the locality which forced the commercial activities along Khazan Street to the south and encouraged high densities of population. A private hospital, several mosques, schools, and a public park are found in the locality.
CIRCULATION: The locality is connected with the city center by public transportation, which within walking distance for all residences. The main transportation mod (for detached houses dwellers) is by private cars.
### Locality Segment Land Utilization Data

#### Densities

<table>
<thead>
<tr>
<th>Category</th>
<th>Total Number</th>
<th>Area (Hectares)</th>
<th>Density (N/Ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lots</td>
<td>217</td>
<td>16</td>
<td>13.56</td>
</tr>
<tr>
<td>Dwelling Units</td>
<td>210</td>
<td>16</td>
<td>13.13</td>
</tr>
<tr>
<td>People</td>
<td>1470</td>
<td>16</td>
<td>91.88</td>
</tr>
</tbody>
</table>

#### Areas

<table>
<thead>
<tr>
<th>Area Type</th>
<th>Hectares</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public (streets, walkways, open spaces)</td>
<td>2.92</td>
<td>18</td>
</tr>
<tr>
<td>Semi-public (open spaces, schools, community centers)</td>
<td>0.91</td>
<td>6</td>
</tr>
<tr>
<td>Private (dwellings, shops, factories, lots)</td>
<td>12.17</td>
<td>76</td>
</tr>
<tr>
<td>Semi-private (cluster courts)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>16.00</td>
<td>100</td>
</tr>
</tbody>
</table>

#### Locality Segment Air Photograph

Scale: 1:2500
CASE STUDY: KHASSAN

The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type.

Quality of information: Approximate

LOCALITY UTILITIES AND SERVICES

- WATER SUPPLY
- CESSPOOL
- STORM DRAINAGE
- ELECTRICITY
- PROPANE TANKS
- REFUSE COLLECTION
- PUBLIC TRANSPORTATION
- PAVED ROADS, WALKWAYS
- TELEPHONE
- STREET LIGHTING

LOCALITY COMMUNITY FACILITIES

- POLICE
- FIRE PROTECTION
- HEALTH
- SCHOOLS, PLAYGROUNDS
- RECREATION, OPEN SPACES

The chart illustrates the approximate availability of utilities, services, and community facilities at three levels: NONE, LIMITED, ADEQUATE.

Quality of information: Approximate

SELECTED BLOCK

LOCALITY SEGMENT PLAN

1:2500
LOCALITY BLOCK: There is no definite lot size because, depending on the developer's income, some dwelling units occupy two lots or more. Common dwellings contain a front yard, a back yard, and two narrow strips of land on each side of the built area.

**LOCALITY BLOCK LAND UTILIZATION DATA**

<table>
<thead>
<tr>
<th>DENSITIES</th>
<th>Total Number</th>
<th>Area (Hectares)</th>
<th>Density N/Ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOTS</td>
<td>24</td>
<td>1.38</td>
<td>1.67</td>
</tr>
<tr>
<td>DWELLING UNITS</td>
<td>24</td>
<td>1.38</td>
<td>1.67</td>
</tr>
<tr>
<td>PEOPLE</td>
<td>168</td>
<td>1.38</td>
<td>121.74</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AREAS</th>
<th>Hectares</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUBLIC (streets, walkways, open spaces)</td>
<td>0.4</td>
<td>39.5</td>
</tr>
<tr>
<td>SEMI-PUBLIC (open spaces, schools, community centers)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>PRIVATE (dwellings, shops, factories, lots)</td>
<td>0.98</td>
<td>70.5</td>
</tr>
<tr>
<td>SEMI-PRIVATE (cluster courts)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1.38</td>
<td>100</td>
</tr>
</tbody>
</table>

**NETWORK EFFICIENCY**

<table>
<thead>
<tr>
<th>R-FACTOR</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>network length (circulation)</td>
<td>310</td>
</tr>
<tr>
<td>area served (circulation, lots)</td>
<td>1.38</td>
</tr>
<tr>
<td>AVERAGE LOT AREA</td>
<td></td>
</tr>
<tr>
<td>total area (circulation, lots)</td>
<td>225m²/ha</td>
</tr>
<tr>
<td>number of lots</td>
<td></td>
</tr>
</tbody>
</table>

**LOCALITY BLOCK PLAN**

[Diagram of locality block plan]
CASE STUDY: KHAZZAN

LAND UTILIZATION DIAGRAMS

1 Hectare

PATTERN
Public: streets/walkways
Semi-Public: playgrounds
Semi-Private: cluster courts
Private: lots
dwellings

PERCENTAGES
Streets/Walkways 30%
Playgrounds -
Cluster Courts -
Dwellings/Lots 70%

DENSITY
Persons/Hectare 120

LOCALITY BLOCK LAND UTILIZATION

1:1000
TYPICAL DWELLINGS: Originally the kitchen was located in the house, but the owner shifted the kitchen into the yard for two reasons: the need for more rooms and the desire to separate the service area from the house. Inhabitants use the front yard for greeting visitors and the back yard for private use. There is an underground reservoir, the main water supply, and an upstairs reservoir for daily domestic use.

KEY
LR Living Room
DR Dining/Eating Area
BR Bedroom
K Kitchen/Cooking Area
T Toilet/Bathroom
L Laundry
C Closet
S Storage
R Room (multi-use)
**CASE STUDY: KHAZZAN**

### PHYSICAL DATA
*(related to dwelling and land)*

<table>
<thead>
<tr>
<th>Dwelling Unit</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>House</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Area (sq m)</strong></td>
<td>181</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tenure</strong></td>
<td>Legal ownership</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Land/Lot</strong></td>
<td>Private</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Area (sq m)</strong></td>
<td>351</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tenure</strong></td>
<td>Legal ownership</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Dwelling**
- Location: Inner ring
- Type: Detached
- Number of floors: 1
- Utilization: Single family
- Physical state: Good

**Dwelling Development**
- Mode: Instant
- Developer: Private
- Builder: Small contractor
- Construction type: Concrete
- Year of construction: 1965

**Materials**
- Foundation: Reinforced concrete
- Floors: Mosaic tile
- Walls: Cement brick
- Roof: Reinforced concrete

**Dwelling Facilities**
- WC: 3
- Shower: 3
- Kitchen: 1
- Rooms: 5
- Other: Storage

### SOCIO-ECONOMIC DATA
*(related to user)*

**General:**
- User's ethnic origin: Saudi from urban
- Place of birth: Mecca
- Education level: University

**Number of Users**
- Married: 2
- Single: 2
- Children: 6
- Total: 10

**Migration Pattern**
- Number of moves: 1
- Rural - Urban: X
- Urban - Rural: X
- Why came to urban area: Commerce

**General: Economic**
- User's income group: Middle
- Employment: Trade
- Distance to work: 2km
- Mode of travel: Private car

**Costs**
- Dwelling unit: $28,169
- Land - market value: $11,865

**Dwelling Unit Payments**
- Financing: Self-financed
- % income for rent/mortgage: 20

### Locality Sources
- Land Use Pattern: (approximate) IBID.
- Circulation Pattern: (approximate) IBID.
- Segment Plan: (accurate) IBID.
- Block Plan: (accurate) IBID.
- Block Land Utilization: (accurate) IBID.
- Typical Dwelling: (approximate) IBID.
- Physical Data: (approximate) IBID.
- Social-Economic Data: (approximate) IBID.
- Photographs: A. Shuaibi & M. Hussayen, 1974; Doxiadis
- General Information: Riyadh Existing Conditions, 1968.
4 MALAZZ
Riyadh
PUBLIC, MIDDLE/HIGH INCOME, DETACHED HOUSES

LOCATION: Malaz is located towards the northeast of the city center about 3km from the central business district.

DEVELOPMENT: Originally it was empty land that was intended to be developed as a housing project for middle income government employees when the governmental ministries were transferred from Mecca to Riyadh. The residential area has been developed gradually by individuals since then. The dwelling units are 754 detached houses (villas) and three apartment buildings with a capacity of 180 units for rent. The detached houses are in three sizes: small, medium, and large.
LAYOUT: No definite boundaries define the area except for some public facilities and major traffic roads. The grid pattern predominates, intersecting streets divide the residential area into separate blocks. Most blocks are 100m x 50m, and the lot sizes within vary.

The lots have a depth of 25m and a variety of widths: 25m, 40m, 37m, and 50m.
LAND USE: The administration buildings and some colleges of Riyadh University are south of the locality. There is a private hospital to the north, and a sports center to the south-east of Malaz. In addition, a zoo was founded on the eastern boundary, and there are 8 schools, 5 mosques, and a public clinic.

AREAS
- RESIDENTIAL
- COMMERCIAL
- INDUSTRIAL
- OPEN SPACES

KEY
- Parking
- Police
- Fire Department
- School
- Mosque
- Recreation
- Library
- University
- Health
- Post Office
- Social Services
- Market
- Cemetery
- Bus
- Rapid Transit

LOCALITY LAND USE PATTERN

1:10000
CIRCULATION: Because pedestrian circulation is not separated from vehicular circulation, and there are a large number of intersections without traffic lights or signs, there are many accidents. There are two main streets, University Street and Seventeen Street, with smaller branches which pour into them. Pedestrian movement is very light except in the limited commercial area. Public transportation is provided along the main streets, and the majority of people have private cars.
# Local Land Utilization Data

**Total Densities**

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Area</th>
<th>Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lots</td>
<td>147</td>
<td>16</td>
<td>9.19</td>
</tr>
<tr>
<td>Dwelling Units</td>
<td>138</td>
<td>16</td>
<td>8.63</td>
</tr>
<tr>
<td>People</td>
<td>966</td>
<td>16</td>
<td>60.38</td>
</tr>
</tbody>
</table>

**Areas**

<table>
<thead>
<tr>
<th>Type</th>
<th>Hectares</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public (streets, walkways, open spaces)</td>
<td>7.19</td>
<td>45</td>
</tr>
<tr>
<td>Semi-public (open spaces, schools, community centers)</td>
<td>0.34</td>
<td>2</td>
</tr>
<tr>
<td>Private (dwelling, shops, factories, lots)</td>
<td>8.47</td>
<td>53</td>
</tr>
<tr>
<td>Semi-private (cluster courts)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Total</td>
<td>16.00</td>
<td>100</td>
</tr>
</tbody>
</table>

---

**Local Land Utilization Air Photograph**

1:2500
CASE STUDY: MALAZI

LOCALITY CONSTRUCTION TYPES

- Others
- Adobe
- Wood
- Masonry
- Concrete

The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type.

Quality of information: Accurate

LOCALITY UTILITIES AND SERVICES

- Water Supply
- Cesspool
- Storm Drainage
- Electricity
- Propane Tanks
- Refuse Collection
- Public Transportation
- Paved Roads, Walkways
- Telephone
- Street Lighting

LOCALITY COMMUNITY FACILITIES

- Police
- Fire Protection
- Health
- Schools, Playgrounds
- Recreation, Open Spaces

The chart illustrates the approximate availability of utilities, services, and community facilities at three levels: None, Limited, Adequate.

Quality of information: Approximate
LOCALITY BLOCK: The pattern, Western in origin, was brought to the country to replace the traditional housing pattern. This locality was developed as a housing project with the land divided into three different lot sizes: 25 x 25m, 40 x 25m, and 50 x 50m.

LOCALITY BLOCK LAND UTILIZATION DATA

<table>
<thead>
<tr>
<th>DENSITIES</th>
<th>Total Number</th>
<th>Area Hectares</th>
<th>Density H/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOTS</td>
<td>12</td>
<td>1.19</td>
<td>10.05</td>
</tr>
<tr>
<td>DWELLING UNITS</td>
<td>12</td>
<td>1.19</td>
<td>10.08</td>
</tr>
<tr>
<td>PEOPLE</td>
<td>84</td>
<td>1.19</td>
<td>70.59</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AREAS</th>
<th>Hectares</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUBLIC (streets, walkways, open spaces)</td>
<td>0.58</td>
<td>49</td>
</tr>
<tr>
<td>SEMI-PUBLIC (open spaces, schools, community centers)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>PRIVATE (dwellings, shops, factories, lots)</td>
<td>0.61</td>
<td>51</td>
</tr>
<tr>
<td>SEMI-PRIVATE (cluster courts)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1.19</td>
<td>100</td>
</tr>
</tbody>
</table>

NETWORK EFFICIENCY

R-VECTOR

\[
\text{network length (circulation)} = 318 \\
\text{area served (circulation, lots)} = 1.15 \\
\]

\[
\text{AVERAGE LOT AREA} \\
\text{total area (circulation, lots)} = 992 m^2 \\
\text{number of lots} = 992 m^2 \\
\]
CASE STUDY: MALAAI

LAND UTILIZATION DIAGRAMS

PATTERN
Public: streets/walkways
Semi-Public: playgrounds
Semi-Private: cluster courts
Private: lots/dwellings

PERCENTAGES
- Streets/Walkways: 49%
- Playgrounds: 
- Cluster Courts: 
- Dwellings/Lots: 51%

DENSITY
- Persons/Hectare: 80

LOCALITY BLOCK LAND UTILIZATION

1:1000
TYPICAL DWELLING: The owners increased the originally built area based upon their needs. Two bedrooms in the east and a reception area in the west were added to the original plan. The open space beside the reception area is used as an uncovered garage, and the other open space is used as a private garden. The roof serves as sleeping quarters in the summer.

KEY
LR Living Room
D Dining/Eating Area
BR Bedroom
K Kitchen/Cooking Area
T Toilet/Bathroom
L Laundry
C Closet
S Storage
R Room (multi-use)
## PHYSICAL DATA
(related to dwelling and land)

<table>
<thead>
<tr>
<th>DWELLING UNIT</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>House</td>
<td></td>
</tr>
<tr>
<td>Area (sq m)</td>
<td>220</td>
<td></td>
</tr>
<tr>
<td>Tenure</td>
<td>Legal ownership</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LAND/LOT</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Utilization</td>
<td>Private</td>
<td></td>
</tr>
<tr>
<td>Area (sq m)</td>
<td>625</td>
<td></td>
</tr>
<tr>
<td>Tenure</td>
<td>Legal ownership</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DWELLING</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Inner ring</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Detached</td>
<td></td>
</tr>
<tr>
<td>Number of floors</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Utilization</td>
<td>Single family</td>
<td></td>
</tr>
<tr>
<td>Physical state</td>
<td>Good</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DWELLING DEVELOPMENT</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode</td>
<td>Instant</td>
<td></td>
</tr>
<tr>
<td>Developer</td>
<td>Public</td>
<td></td>
</tr>
<tr>
<td>Builder</td>
<td>Large contractor</td>
<td></td>
</tr>
<tr>
<td>Construction type</td>
<td>Concrete</td>
<td></td>
</tr>
<tr>
<td>Year of construction</td>
<td>1960</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MATERIALS</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation</td>
<td>Poured reinforced concrete</td>
<td></td>
</tr>
<tr>
<td>Floors</td>
<td>Poured reinforced concrete</td>
<td></td>
</tr>
<tr>
<td>Walls</td>
<td>Cement brick</td>
<td></td>
</tr>
<tr>
<td>Roof</td>
<td>Mosaic tiles</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DWELLING FACILITIES</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>WC</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Shower</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Kitchen</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Rooms</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Storage</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## SOCIO-ECONOMIC DATA
(related to user)

<table>
<thead>
<tr>
<th>GENERAL: SOCIAL</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>User's ethnic origin</td>
<td>Saudi from rural</td>
<td></td>
</tr>
<tr>
<td>Place of birth</td>
<td>Rasuun</td>
<td></td>
</tr>
<tr>
<td>Education level</td>
<td>Intermediate</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NUMBER OF USERS</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Married</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Children</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MIGRATION PATTERN</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of moves</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Rural - Urban</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Urban - Rural</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Why came to urban area</td>
<td>Employment</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GENERAL: ECONOMIC</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>User's income group</td>
<td>Government clerk</td>
<td></td>
</tr>
<tr>
<td>Employment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance to work</td>
<td>3.5km</td>
<td></td>
</tr>
<tr>
<td>Mode of travel</td>
<td>Private car</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COSTS</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dwelling unit</td>
<td>$8500</td>
<td></td>
</tr>
<tr>
<td>Land - Market value</td>
<td>$27,000</td>
<td></td>
</tr>
</tbody>
</table>

### DWELLING UNIT PAYMENTS
<table>
<thead>
<tr>
<th>Financing</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rent/Mortgage</td>
<td>Public</td>
<td></td>
</tr>
<tr>
<td>% Income for rent/mortgage</td>
<td>5%</td>
<td></td>
</tr>
</tbody>
</table>

## LOCALITY SOURCES

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Use Pattern</td>
<td>(approximate) IBID.</td>
<td></td>
</tr>
<tr>
<td>Circulation Pattern</td>
<td>(approximate) IBID.</td>
<td></td>
</tr>
<tr>
<td>Segment Plan</td>
<td>(accurate) IBID.</td>
<td></td>
</tr>
<tr>
<td>Block Plan</td>
<td>(accurate) IBID.</td>
<td></td>
</tr>
<tr>
<td>Block Land Utilisation</td>
<td>(accurate) IBID.</td>
<td></td>
</tr>
<tr>
<td>Typical Dwelling</td>
<td>(approximate) Field Surveys, A. Shuaibi &amp; M. Hussayan, 1974.</td>
<td></td>
</tr>
<tr>
<td>Physical Data</td>
<td>(approximate) IBID.</td>
<td></td>
</tr>
<tr>
<td>Socio-Economic Data</td>
<td>(approximate) IBID.</td>
<td></td>
</tr>
<tr>
<td>Photographs</td>
<td>A. Shuaibi &amp; M. Hussayan, 1974; Doxi-media</td>
<td></td>
</tr>
</tbody>
</table>
5 KHURAIS
Riyadh
PUBLIC, MODERATE LOW/MIDDLG INCOME, ROW HOUSES

LOCATION: The project is located about 10km east of the city center on a main route (Khu- rais Road) which connects Riyadh with the eastern province.

DEVELOPMENT: The new housing project, being developed by the government in stages for low and moderately low income employees, will have a capacity, in the first stage, of 1000 dwelling units, all of them single family houses. The developer will mortgage the dwelling costs on a low percentage of the family income without interest. It will be provided with public facilities and utilities.

Model of Khurais Housing Project shows dwelling units (white) and facilities buildings (black).
CASE STUDY: KHURAIS

LOCALITY PLAN

LAYOUT: Hills in the topography forced the design for the residential area and the circulation to take a special layout. The land is bounded by Khurais Road and the stadium to the north.
LAND USE: Commercial facilities are concentrated in a shopping center, and therefore, are separated from the residential area. The clusters are served by corner shops. The project contains 12 schools, 8 mosques, a police station, and a recreational area. The residential area consists of single family dwellings distributed throughout the entire area.
CASE STUDY: KHURAIM

CIRCULATION: The circulation layout is designed to follow land topography. Four major roads connect the project to Khurair Road. Lines of access serve the dwellings and provide grouped parking areas. There are pedestrian foot paths in the clusters between mosques and schools.
### Locality Segment Land Utilization Data

**Densities**

<table>
<thead>
<tr>
<th></th>
<th>Total Number</th>
<th>Area Hectares</th>
<th>Density N/Ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lots</td>
<td>164</td>
<td>16</td>
<td>10.25</td>
</tr>
<tr>
<td>Dwelling Units</td>
<td>164</td>
<td>16</td>
<td>10.25</td>
</tr>
<tr>
<td>People</td>
<td>1148</td>
<td>16</td>
<td>71.75</td>
</tr>
</tbody>
</table>

**Areas**

<table>
<thead>
<tr>
<th></th>
<th>Hectares</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public (streets, walkways, open spaces)</td>
<td>11.6</td>
<td>76</td>
</tr>
<tr>
<td>Semi-Public (open spaces, schools, community centers)</td>
<td>0.7</td>
<td>4</td>
</tr>
<tr>
<td>Private (dwellings, shops, factories, lots)</td>
<td>3.7</td>
<td>23</td>
</tr>
<tr>
<td>Semi-Private (cluster courts)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>16.0</td>
<td>100</td>
</tr>
</tbody>
</table>

**Income:** The suggested household income incomes are as follows: a) 50% of total households have incomes of $1000/year; b) 25% have $2000/year; c) 25% have $3000/year.

---

**Locality Annual Income Distribution**

<table>
<thead>
<tr>
<th>Income Range</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0 - $2500</td>
<td>50%</td>
</tr>
<tr>
<td>$2501 - $5000</td>
<td>40%</td>
</tr>
<tr>
<td>$5001 - $7500</td>
<td>10%</td>
</tr>
</tbody>
</table>

Source: M & R International
CASE STUDY: KHURAIS LOCALITY

CONSTRUCTION TYPES

The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type.

Quality of information: Accurate

LOCALITY UTILITIES AND SERVICES

The chart illustrates the approximate availability of utilities, services, and community facilities at three levels: NONE, LIMITED, ADEQUATE.

Quality of information: Approximate

LOCALITY COMMUNITY FACILITIES

The chart illustrates the approximate availability of utilities, services, and community facilities at three levels: NONE, LIMITED, ADEQUATE.

Quality of information: Approximate

LOCALITY SEGMENT PLAN

1:2500
BLOCK PLAN: A typical block is surrounded by service streets on three sides, and on the fourth, by pedestrian paths. The lots surround a small, semi-private area used as a playground for 19 dwelling units. All lots are 15 x 15m in size.

LOCALITY BLOCK LAND UTILIZATION DATA

<table>
<thead>
<tr>
<th></th>
<th>Total Area</th>
<th>Hectares</th>
<th>Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOTS</td>
<td>19</td>
<td>1.13</td>
<td>16.81</td>
</tr>
<tr>
<td>DWELLING UNITS</td>
<td>19</td>
<td>1.13</td>
<td>16.81</td>
</tr>
<tr>
<td>PEOPLE</td>
<td>133</td>
<td>1.13</td>
<td>117.70</td>
</tr>
</tbody>
</table>

AREAS

<table>
<thead>
<tr>
<th>TYPE</th>
<th>Hectares</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUBLIC (streets, walkways, open spaces)</td>
<td>0.58</td>
<td>51</td>
</tr>
<tr>
<td>SEMI-PUBLIC (open spaces, schools, community centers)</td>
<td>0.12</td>
<td>11</td>
</tr>
<tr>
<td>PRIVATE (dwelling, shops, factories, lots)</td>
<td>.43</td>
<td>38</td>
</tr>
<tr>
<td>SEMI-PRIVATE (cluster courts)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1.13</td>
<td>100</td>
</tr>
</tbody>
</table>

NETWORK EFFICIENCY

R-FACTOR

network length (circulation) = 191m
area served (circulation, lots) = 1.13

AVERAGE LOT AREA

total area (circulation, lots) = 594m²

number of lots
LOCALITY BLOCK LAND UTILIZATION

CASE STUDY: KHURAIS

LAND UTILIZATION DIAGRAMS

- Streets/Walkways
- Playgrounds
- Cluster Courts
- Lots
- Dwellings

PERCENTAGES
- Streets/Walkways 51%
- Playgrounds 11%
- Cluster Courts 11%
- Dwellings/Lots 38%

DENSITY
- Persons/Hectare
- 120 Persons

1:1000 Scale
Typical Dwelling: Two entrances, the main opening on a front yard and the service entrance opening on a back yard, serve the dwelling. There is a possibility for expansion horizontally or vertically. There is enough room in the bathroom for a washing machine.
CASE STUDY: KHURAIS

PHYSICAL DATA (related to dwelling and land)

DWELLING UNIT
- type: House
- area (sq m): 110
- tenure: Legal ownership

LAND/LOT
- utilization: Private
- area (sq m): 225
- tenure: Legal ownership

DWELLING
- location: Periphery
- number of floors: 1
- utilization: Single family
- physical state: Good

DWELLING DEVELOPMENT
- mode: Instant
- developer: Public
- builder: Large contractor
- construction type: Concrete
- year of construction: 1974

MATERIALS
- foundation: Reinforced concrete
- floors: Tiles
- walls: Cement block
- roof: Reinforced concrete slab

DWELLING FACILITIES
- WC: 2
- shower: 1
- kitchen: 1
- rooms: 3
- other: Store, yard

SOCIO-ECONOMIC DATA (related to user)

GENERAL: SOCIAL
- user's ethnic origin: Information are not available.
- place of birth: Information are not available.
- education level: Information are not available.

NUMBER OF USERS
- married: Information are not available.
- single: Information are not available.
- children: Information are not available.
- total: Information are not available.

MIGRATION PATTERN
- number of moves:
  - rural - urban: Information are not available.
  - urban - rural: Information are not available.
  - why came to urban area: Information are not available.

GENERAL: ECONOMIC
- user's income group: Information are not available.
- employment: Information are not available.
- distance to work: Information are not available.
- mode of travel: Information are not available.

COSTS
- dwelling unit:
  - rent/mortgage: Information are not available.

LOCALITY SOURCES

Plan: (accurate) M & R International
Land Use Pattern: (approximate) IBID.
Circulation Pattern: (approximate) IBID.
Segment Plan: (accurate) IBID.
Block Plan: (accurate) IBID.
Block Land Utilization: (accurate) IBID.
Typical Dwelling: (accurate) IBID.
Physical Data: (accurate) IBID.
Socio-Economic Data: Unknown.
The following sections are contained in the evaluations:

**DWELLINGS TIME/PROCESS PERSPECTIVE**, models relating the case studies to their original models.

**PHYSICAL DATA MATRIX**, a comprehensive summary of the data with comments.

**COMMUNITY FACILITIES, UTILITIES, SERVICES MATRIX**, summary of the availability of facilities.

**LAND UTILIZATION: PATTERNS, PERCENTAGES, DENSITIES**, a graphic comparison of land utilization.

**LAND UTILIZATION: OPTIMUM RANGES**, a cross comparison of densities and percentages of land utilization.

**LAYOUT EFFICIENCY**, a comparative graph illustrating the relationship of the circulation net works with the area served.

**DWELLINGS TIME/PROCESS PERSPECTIVE**

The five case studies of Riyadh city are representative of types of existing housing situations which illustrate different cases of land utilization. Case studies do not include all of the dwelling types existing in Riyadh city. Eight dwelling types represent the existing housing models presented in the following pages. The models have been distributed in the chart in an attempt to relate them to their originating models and to see them in a broader time/process perspective.

From the eight models described on the following pages, only three are Arabic models (tent, traditional, and transitional houses). One is Western oriental and four are universal. The models permit medium/high densities, with the exception of the detached house which provides low density. Five models are accessible to very low/moderately low income groups and three are accessible to medium/high income group. Five models provide efficient land utilization. Models have to be improved in terms of safety, and it is important to encourage efficiency in administrative procedures.
## Urban Land Utilization

### Dwellings: Time/Process Perspective

#### Original Model

**Tent**
- Physical Characteristics: Separated or grouped movable units, used in the desert by nomads.
- Population Density: Medium/high density.
- Land/Layout: Shepherds looking for pasture lands.
- Users: Arabic temporary structures used by tribal groups.

**Shack**
- Users: Arabic temporary structures used by tribal groups.
- Comments: Not accessible to urban areas. It is suitable for temporary conditions.

**Traditional House**
- Comments: Not accessible to urban areas. It is suitable for temporary conditions.

**Transitional House**
- Comments: Not accessible to urban areas. It is suitable for temporary conditions.

#### Present Model

**Tent**
- Users: Arabian temporary structures used by tribal groups.
- Comments: Not accessible to urban areas. It is suitable for temporary conditions.

**Shack**
- Users: Arabian temporary structures used by tribal groups.
- Comments: Not accessible to urban areas. It is suitable for temporary conditions.

**Traditional House**
- Comments: Not accessible to urban areas. It is suitable for temporary conditions.

**Transitional House**
- Comments: Not accessible to urban areas. It is suitable for temporary conditions.

#### Land Issues

**Permission**
- Arabic Culture: Permits low/medium densities. Accessible to very low income groups. Efficiency of land utilization is limited.
- Universal: Permits medium/high densities. Accessible to very low income groups.
- Arabian Culture: Medium/high density.

**Comments**
- Arabian Culture: Permits medium/high densities. Accessible to very low income groups. Improves land utilization.
- Universal: Provides efficient land utilization.MAXIMIZATION OF PRIVATE RESPONSIBILITY. Provides private courtyard.

**Case Studies**
- Arabian Culture: Provides efficient land utilization. MAXIMIZATION OF PRIVATE RESPONSIBILITY. Provides private courtyard.
- Universal: Improves land utilization.
### Detached House

- **Detached row houses, 1-2 stories.**
- **Low density.**
- Economic use of land is not major constraint.
- European model used originally by middle/high income groups.
- Model was imported to Riyadh in the XX Century. Used on a large scale, replaced the traditional house.
- Middle/high income groups.

### Apartment

- **Groups of several apartments per floor with multiple stories.**
- **Medium/high density.**
- Economic use of land is a major constraint.
- European, XIX Century model, used originally by middle income groups.
- Model was imported to Riyadh in the XX Century. Speculation with rents, high investment in construction and utilities.
- Middle income groups.

### Tenement Room

- **Groups of rooms aligned on a corridor or around interior court, one-story units.**
- **Medium/high densities.**
- Economic use of land is major constraint.
- Universal model used by low income groups.
- As a result of the increase in educational institutes and governmental administration, there is an increased demand for single-family housing.
- Used by single family of low income group.
- Concentrated in the central area, on Batha Street.

### Serviced Room

- **Rooms used by visitors and businessmen like hotel and motel rooms.**
- **High density.**
- Economic use of land is major constraint.
- Universal model used by low income groups.
- Model was known in the Islamic countries from the X Century. The old model was developed and imported to Riyadh in the XX Century.
- Middle/high income groups.
- Concentrated in the city center.

<table>
<thead>
<tr>
<th>ORIGINAL MODEL</th>
<th>Physical Characteristics</th>
<th>Population Density</th>
<th>Land/Layout</th>
<th>Users</th>
<th>Case Studies</th>
<th>LAND ISSUES</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIVERSAL</td>
<td>High population densities. Accessible to middle/high income groups. Very good land utilization.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The physical data of the five case studies existing in Riyadh is summarized in the physical data matrix and in the following comments. The matrix permits:

a) a comprehensive view of the spectrum of dwelling types;
b) a comparison and determination of trends and patterns.
(1) CATEGORY: POPULATION PER CATEGORY: Number of people; (2) PERCENT OF TOTAL POPULATION: (3) NAME OF LOCALITY. The five case studies have been grouped in three categories, identifying different income groups, housing systems and selected physical characteristics. The three categories shown were identified as follows: Category/income Pattern Dwelling

A Low/M.Low/Middle Old Transitional
B Middle New Detached
C M.Low/Middle Public Detached

Category A includes the low, moderately low, and middle income groups, and represents the majority of the population (78%). Category B includes middle income groups and represents 11% of the population. Category C includes the moderately low and middle income groups in public subsidized housing and represents 6% of the population.

(5) USER INCOME GROUP: The income level is the basic indicator in the expected pattern: the higher the income, the higher is the level of the indicator. The process of housing for the low income groups is a matter of survival whereas the higher income groups, it is a service or a commodity. (Note MANFOHA, low income, adobe, 121m², in contrast with MALAZZ, middle income, concrete, 625m².)

(6) DWELLING UNIT TYPE: The percentage of shanty and room is very low. Low income groups live in old, adobe houses in and around the city center. Middle income groups live in apartments along main streets and in new detached houses.

(7) DWELLING UNIT AREA: There is a small percentage of very low income groups living in shacks or tents whose areas in this case are lower than 50m². Low and moderately low income groups live in houses having areas of more than 100m². Middle income groups live in apartments having areas of 50 - 100m² and houses having more than 100m².

(8) DWELLING UNIT TENURE: The low, moderately low, and middle income groups live in legal/ownership of their houses. Some middle income groups live in legal/rented apartments as in Ad-Dira and Khazan.

(9) DWELLING UNIT-PERCENT INCOME FOR RENT AND MORTGAGE: In the cases of public housing projects, Malaz and Khurais, the percent of mortgage is less than 20% of the total household income. In the first three case studies, the mortgage percent is not applicable and rent percentages are not available.

(10) LAND/LOT UTILIZATION: In the five case studies, people have complete control of their land. Squatters, who are a rare phenomenon and were therefore not covered in the typologies section, have public and semi-private land utilization.

(11) LAND/LOT AREA: In the old-pattern quarters like Ad-Dira and Manfoha, the land/lot area ranges from 121m² to 140m². In the new quarters like Khazzan and Malaz, the land/lot area is more than 200m².

(12) LAND/LOT TENURE: Most of the effective tenures are legal rental and legal ownership in Riyadh city. A very low percentage are extralegal.

(13) DWELLING LOCATION: The city center is mostly occupied by low and moderately low income groups (Ad-Dira). Such groups have access to services, jobs, and facilities. The inner ring is occupied by middle income groups (Khazzan, Malaz). Khurais Housing Project is for low middle income groups located on the periphery. High income groups occupy the periphery.

(14) DWELLING TYPES: Ad-Dira has three dwelling types: row/group houses, walk-up apartments, and high-rise units because of its location in the city center. Manfoha, a locality of low income groups, has transitional row houses. Middle and high income groups (Khazzan, Malaz) occupy detached houses built outside the city center.

(15) DWELLING FLOORS: Most dwellings are generally one to two floor units in all income groups. Walk-up apartments are accepted as land values increase. High-rise units are provided on a limited scale for middle income groups.

(16) DWELLING UTILIZATION: Single occupancy in row/group housing (Ad-Dira, Manfoha, Khurais), multiple dwelling occupancy (Khazzan, Malaz), or walk-up apartments are the forms of utilization.

(17) DWELLING PHYSICAL STATE: The pattern of physical state is as follows: Fair states are found in low and moderately low income groups, particularly in Ad-Dira and Manfoha; good physical states are generally typical of middle income groups and of public housing.

(18) DWELLING DEVELOPMENT MODE: Incremental mode is used by low/moderately low income groups, particularly in Manfoha and Ad-Dira. Instant mode is typical of middle/high income groups and public housing projects.

(19) DWELLING DEVELOPER: The private sector deals with land subdivisions and develops their houses individually. The public sector is concerned with housing projects for low and middle income government employees.

(20) DWELLING BUILDER: Artisans are employed in most of the traditional, old-pattern (Ad-Dira, Manfoha) localities. Small contractors are hired by middle/high income groups to build individual houses. The public sector generally employs large contractors for the construction of low/middle income housing projects.

(21) DWELLING CONSTRUCTION TYPES: The most common material is adobe and it counts for approximately 60% of the dwellings in Riyadh. Concrete is typical of the new pattern, and counts for approximately 25% of the dwellings in the city.

(22) DWELLING DEVELOPMENT - YEAR OF CONSTRUCTION: The oldest case study, Ad-Dira located in the city center, was built in 1739. This was followed by Manfoha. As a result of the transferring of the ministries from Jedda to Riyadh, new localities were built after 1950.

(23) DWELLING DEVELOPMENT - DENSITY: There is a clear pattern between density and income group; lower densities characterize middle income groups; higher densities characterize low income groups.
COMMUNITY FACILITIES UTILITIES/SERVICES MATRIX

<table>
<thead>
<tr>
<th>LOCALITIES</th>
<th>COMMUNITY FACILITIES</th>
<th>UTILITIES AND SERVICES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Police</td>
<td>Fire Protection</td>
</tr>
<tr>
<td>A 410,000</td>
<td>78</td>
<td>Good</td>
</tr>
<tr>
<td>B 60,000</td>
<td>11</td>
<td>Adequate</td>
</tr>
<tr>
<td>C 30,000</td>
<td>6</td>
<td>Adequate</td>
</tr>
<tr>
<td>500,000</td>
<td>95</td>
<td>Total</td>
</tr>
<tr>
<td>24,000</td>
<td>5</td>
<td>HIGH INCOME</td>
</tr>
<tr>
<td>524,000</td>
<td>100</td>
<td>TOTAL POPULATION</td>
</tr>
</tbody>
</table>

The Community Facilities, Utilities/Services data of the five case studies existing in Riyadh City is summarized in the Community Facilities, Utilities/Services matrix and in the following comments:

COMMUNITY FACILITIES:
Good, efficient systems of police and fire protection are provided throughout the whole city, so adequate protection exists in the five case studies, except in Khurais which is a housing project under construction. Recreation areas are adequate in housing projects Malazz and Khurais, limited in Khazzan and Ad-Dira, and non is provided in low income locality Manfoha. Health care is adequate in most of the localities except for the low income locality Manfoha and Khurais where none is available. Schools/playgrounds are adequate throughout the city. Different levels of schools exist in every community in Riyadh.

UTILITIES AND SERVICES:
The city has an efficient refuse collection system provided by Riyadh municipality. Water supply and electrical systems are adequate for the entire city.
Every building currently has a separate cesspool, until the sewerage system, now under construction is completed. There is no storm drainage in Riyadh. Propane gas is the main form of fuel, received and used in tanks.
Public transportation is adequate in the main residential parts of the city and the city center. Khurais Housing Project, located on the periphery, is inaccessible by public transportation. Paved roads and walkways are adequate in the city center Ad-Dira, limited in other localities, and proposed for the housing project under construction, Khurais. The telephone system is adequate for the whole city and not available in the housing project.
Street lighting is adequate in the city center and limited in other parts of the city.
**LAND UTILIZATION:**
**PATTERNS, PERCENTAGES, DENSITIES**

1. **AD-DIRA**
   - Houses: private, traditional
   - High percentage of land for lots; low percentage of public and semi-private (cul de sac) streets. There is a medium population density in interior areas and a high population density along the main streets.

2. **MANFOHA**
   - Houses: private, low income
   - Medium percentage of land for streets and walkways and acceptable percentage of land for residential use; high population density.

3. **KHAZZAN**
   - Houses: private, middle income
   - Medium percentage of land for streets and walkways; medium percentage of land for lots; low population density.

4. **MALAZZ**
   - Houses: public, medium-high income
   - High percentage of land for streets and walkways; all public area used for circulation; very low population density.

5. **KHURAIS**
   - Houses: public, low-middle income
   - Public area for cluster's open spaces and circulation; high percentage of land for streets, walkways, and open spaces; low population density.
The three graphs shown are used to evaluate and to compare the 5 case studies in terms of LAND UTILIZATION PERCENTAGES and RESIDENTIAL POPULATION DENSITY.

Land utilization percentages are computed for the following areas:

- **PUBLIC**: streets, walkways, open spaces. Areas within an urban layout used for pedestrian and vehicular circulation. The land has minimum physical controls and maximum public responsibility in initial purchase, development and maintenance. The CURVE shows optimum area percentages for streets, walkways, and open spaces. (20-30 %, based upon case studies in Latin America and in the U.S.A.) The percentage of street and walkway areas varies slightly with density.

- **SEMI-PUBLIC**: open spaces. Areas within an urban layout used for supporting facilities and services. (Open spaces-playgrounds are the only supporting areas considered since the land utilization percentages are only based upon a small sector area). The land has partial or complete physical controls and public/user responsibility in development and maintenance. The CURVE shows optimum area percentages for open spaces. (3-11%, based upon case studies in Latin America and in U.S.A.) The percentage of open spaces varies considerably with density.

- **PRIVATE**: dwellings, lots. Areas within an urban layout used for residential and commercial use. The land has maximum physical controls and owner/tenant/user responsibility in development and maintenance. The CURVE shows optimum area percentages for dwellings and lots. (The range of optimum percentages of land for Public areas is 20-30% with 3-11% for Semi-public areas; therefore, the remaining 77-39% of land is for private use.

Residential population density is the total number of persons per unit hectare. The range of desired/acceptable densities is 300 persons per Ha to 600 persons per Ha, based upon case studies and accepted zoning standards in different urban contexts in developing countries. This range can be achieved assuming that the dwelling development is of 1-3 stories, with an average built-up area of 10-20m^2 per person and 30-35% of land/lot coverage. Land utilization percentages are obtained from locality segments.

**Desired/Acceptable Gross Density Range**

<table>
<thead>
<tr>
<th>Desired/Acceptable Gross Density Range</th>
<th>0</th>
<th>100</th>
<th>300</th>
<th>600</th>
<th>1000</th>
<th>2000p/Ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUBLIC Streets, Walkways, Open Spaces</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEMI-PUBLIC Open Spaces</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRIVATE Dwellings, Lots</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**KEY**

VERTICAL SCALE: Land utilization percentages (0 to 100%).
HORIZONTAL SCALE: Residential population density (0 to 2,000 persons per Ha shown on logarithmic scale).
CURVE: Range of optimum land utilization percentages (optimum values vary for different densities based upon case studies and accepted zoning standards in different contexts).
SHADED AREA: Desired/optimum efficiency of land utilization (the intersection of desired/accepted residential population densities and desired/accepted land utilization percentages).
NUMBERED DOTS: The Riyadh case studies.
Evaluations: Layout Efficiency

The comments below relate to the land utilization percentages of the Riyadh case studies. It may be observed from the graphs that only one case study is within reasonable density ranges. Only one case study satisfies all three optimum land utilization requirements (public, semi-public, private).

Public: Cases above curve (2,4,5) have a high percentage of land devoted to streets and walkways; therefore, these cases constitute a great burden to the municipal government in terms of land, construction, maintenance, and operation. The case below the curve (1) has a smaller percentage of land devoted to streets and walkways. This case study is located in the city center and is a burden to the municipal government. There is only one case study (3) that has a reasonable percentage of land devoted to streets and walkways.

Semi-Public: There is no case above curve which has a higher percentage of land devoted to open areas and public facilities. Cases below the curve (1,2) have a smaller percentage of open areas and public facilities. Cases near the curve (3,4,5) have a reasonable percentage of land for open spaces and public facilities.

Private: The case above the curve (1) has a high percentage of private land and therefore is a burden to the municipal government in the provision, maintenance, and operation of utilities and services. Cases below the curve (2,4,5) have low percentages of private land. Case (3) has a reasonable percentage of private land. All of the private land is within the lot area of the dwellings.

Layout Efficiency

For Urban Settlement Design Program Format.

The urban layout is the physical configuration determined by the combination of networks of circulation and areas served. Networks of circulation (highways, streets, walkways) define the lines of distribution/collection of the utilities and services, and are publicly owned land. Areas served (lots, blocks) are usually privately owned land. The urban layout is a major economic determinant in the provision of utilities and services and their maintenance and operation.

The efficiency/effectiveness of a network is the ratio of the length of the network to the area(s) served:

\[
\text{Efficiency of network} = \frac{\text{Network length}}{\text{Area(s) served}}
\]

The R-Value varies inversely to the network efficiency; a smaller R indicates a higher efficiency and vice versa. The layouts of the case studies have been evaluated in terms of network efficiency and are shown in the graph below. For further information on the R-Value see: "A Method for the Evaluation of Urban Layouts", Industrial Forum, Volume 3, Number 2, Montreal, December, 1971.

R-Value Summary

<table>
<thead>
<tr>
<th>Cases</th>
<th>Degree of Efficiency</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Efficient</td>
<td>medium lots, high population density, efficient lot proportion</td>
</tr>
<tr>
<td>2</td>
<td>Efficient</td>
<td>small lots, high population density, efficient lot proportion</td>
</tr>
<tr>
<td>3</td>
<td>Inefficient</td>
<td>medium lots, low population density, inefficient lot proportion</td>
</tr>
<tr>
<td>4</td>
<td>Very Inefficient</td>
<td>large lots, very low population density, inefficient lot proportion</td>
</tr>
<tr>
<td>5</td>
<td>Efficient</td>
<td>medium lots, low population density, efficient lot proportion</td>
</tr>
</tbody>
</table>

Key

Vertical scale: R-Value (efficiency values on logarithmic scale). Horizontal scale: Lot areas (m²). Curve: optimum R-Value (the optimum values are derived from lots of different areas having a width to depth ratio of 1:4, a public street serving only the short dimension of the lot, and transverse streets at intervals of 150 meters). Number dots: The R-Values of the Riyadh case studies.
Since Riyadh was chosen as the capital of Saudi Arabia, it has been growing at a very high rate. In 1930 the city population was about 20000, while in 1968 it was more than 300000. With an average rate of 7 to 10% this population growth caused tremendous problems. Housing shortage, lack of facilities, utilities and services, traffic congestion and uncontrolled development are some of these problems.

By realizing this situation the Ministry of Interior for Municipalities granted the studies of existing conditions and the master plan of the city to C. A. Doxiadis Association. The study of existing conditions was prepared in 1968, then revised in 1971. During this period the study of the master plan was carried out and it has been approved in 1974. The implementation of the plan has been assigned to the Supreme Committee for Planning of Riyadh, the Town Planning Authority and Riyadh City Council.

An abstract of the basic plans proposed by Doxiadis Association is included in the following two pages under the title Master Plan Context. The rest of the study is an attempt by the authors to provide arguments and suggestions to stimulate further studies for the development of the sub-areas (localities) of residential primary use, with an approximate dimensions of 2km x 2km in the proposed plan.

The ultimate objective of this study is to assure continuous balance and harmony between the people and their environments. Such objective can only be achieved by the creation of a dynamic design and planning practice, based on the understanding of process of urbanization and population characteristics.

Stereo type models for the development of new urban areas have been avoided because of the following reasons:
- Every site is unique in its physical characteristics and its relation to the urban context;
- Population characteristics and expectations are in constant change; and that
- Standards, codes and regulations reflect practical trade off between objectives and resources, so, they will not be followed unless the society can afford them.

In response to the previous argument the authors suggest the emphasis on the study of the following:
- Intensity of land utilization as a tool for the qualification of magnitude of different land uses, for the prediction of future changes and for the evaluation of different alternatives.
- Requirements and standards for community facilities, utilities and services; to decide on reservation of some land for future development and for scheduling the provision of facilities and services.
- Development plans; to ensure the consideration of important factors within one integrated framework of development.
- Development process; to ensure the continuous balance in the environment during different periods of development.
- Efficiency of land utilization; to evaluate different alternatives with regard to their efficiency of land utilization.

The scope of consideration and depth of the study has been affected by the limitations of time and distance from the case study.
MASTER PLAN CONTEXT

LAND USE: The physical plan for the development of Riyadh is composed of:
1) a major commercial and civic spine which extends to the northwest and the southeast of the existing business district;
2) an administrative area which is situated perpendicular to the civic and commercial spine;
3) residential districts which extend from both sides of the spine.

A strip of industrial and special-use areas runs parallel to the spine forming a man-made boundary on the northeast. On the other side, the southwest, steep cliff formations of Wadi Hanifah form a natural boundary for the city. These boundaries direct the development of the residential areas parallel to the city spine.

CIRCULATION: The plan of Riyadh shows that the vehicle will continue to be the main mode of transportation. The circulation pattern is planned to have the following hierarchy:
1) FREEWAYS: four majorfreeways connect the city with the country freeway system.
2) EXPRESSWAYS: the grid of expressways runs parallel and perpendicular to the city spine. This grid serves as boundaries for the residential areas (localities);
3) MAJOR ROADS: the grid of major roads runs through the center of residential localities. It connects these localities to each other as well as to the city spine. This grid is expected to be constructed in the first stage of residential development.

CITY STRUCTURE: The master plan devises the city into six large divisions. Each division will be composed of 8-12 localities with an average dimension of 2km x 2km. Each locality is divided into four urban units with a common center.

FORCAST OF RIYADH GROWTH

<table>
<thead>
<tr>
<th>YEAR</th>
<th>ESTIMATED BUILT-UP AREA (Ha)</th>
<th>ESTIMATED POPULATION (Persons)</th>
<th>ESTIMATED RESIDENTIAL DENSITY (person/Ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>9,277</td>
<td>525,000</td>
<td>200</td>
</tr>
<tr>
<td>1980</td>
<td>13,484</td>
<td>685,000</td>
<td>--</td>
</tr>
<tr>
<td>2000</td>
<td>30,436</td>
<td>1,400,000</td>
<td>--</td>
</tr>
</tbody>
</table>

LOCALITY CONTEXT

LOCALITY: is each site on the proposed master plan of division no. VI, which has approximate dimensions of 2km x 2km.

LOCALITY BOUNDARIES: are the grid of limited access expressways proposed in the master plan, which separate localities from each other.

LOCALITY ACCESS: is each point on the borders of the locality which permits the movement to extend beyond its limits. Each locality has four points of accesses. The access leading to city spine is the most important one.

LOCALITY SPINE: is the area along the major road leading to city spine. Most of side streets in the locality lead to locality spine.

STRUCTURE OF COMMUNITIES

KEY
- MAJOR ROAD
- EXPRESSWAY
- FREEWAY
- RAIL ROAD

CIRCULATION PATTERN

STAGES OF DEVELOPMENT

1:250000

1:500000
Community facilities represent an important part of the land utilization pattern of any community. Usually they are considered semi-public areas, such as schools; in some cases, they might be public areas, such as parks.

The size of community facilities is determined by the number of people; the greater the number of people the larger the area required for public facilities.

The type of facilities depends on the age group of the population and their social and cultural background. In Riyadh, those under the age of fourteen represent nearly 46% of the total population, and it is likely that this trend will continue with little decline in the next two decades. This means that more area than currently provided in Riyadh will need to be devoted to schools, playgrounds, and other related activities.

The community facilities' plans indicate the relationship between population and the size of facilities needed. The elements which have been taken into consideration as necessary for a locality are: schools, kindergartens, elementary, intermediate, and secondary; recreation: playgrounds and parks; and other community facilities: health clinics and centers, mosques, libraries, clubs, police stations, fire stations, and municipal buildings.

The plans however indicate the need for:
- A careful prediction of ultimate population density (in any given context).
- Reserving land for future needed facilities.
- Measures to control population growth in planned residential areas.

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The plans however indicate the need for:
- A careful prediction of ultimate population density (in any given context).
- Reserving land for future needed facilities.
- Measures to control population growth in planned residential areas.
LAND UTILIZATION INTENSITY

Land utilization intensity is the magnitude or degree of use of unit land by a certain activity at a certain time. The intensity is the result of a set of determinants: these are:

1) Generators: the sources of attraction which either stimulate the use of a certain type of activity or create the need for it, i.e. employment creates the need for housing;
2) Transmitters: paths and modes which provide an easy access to the source of attraction, i.e. subway lines, main roads;
3) Receivers: areas which receive the effect of generated needs, i.e. a residential area around a source of employment.

For a specific site the intensity is the result of external as well as internal effects. External effects depend upon the proximity of the site to the main determinants of the intensity such as the generators and the transmitters. Internal effects are the local conditions existing inside the site (the receiver) such as availability of utilities, topography, soil conditions, pollution, view, regulation on use, etc. Values given to any factor vary according to local conditions of different societies and different environments.

RESIDENTIAL INTENSITY: CASE OF RIYADH

1) GENERATORS: The main generator for residential intensity in Riyadh is employment opportunities. Such opportunities are mainly created by:
   - Commercial and business activities located along the city spine;
   - Central government agencies located along the administrative zone;
   - Growing industries located nearby;

2) TRANSMITTERS: The main modes of transportation which effect the residential intensity in Riyadh are:
   - Walking;
   - Public transportation (buses and taxis);
   - Private passenger cars.

The residential land utilization intensity charts for the city of Riyadh help to find the relative intensity value of any given site within the city. These charts are based on the preceding analysis of intensity determinants.

The relative intensities given are only hypothetical ones in order to proceed with the study. If the concept is to be applied in-depth research is necessary to determine these values in relation to their generators. The values are subject to change with time.

For a given locality in the city (say locality A), the intensity value will be determined by the total value of all determinants:

a) Effect of commercial and civic spine, cross section (8) on which the locality is situated;
b) Effect of administrative zone (see effect of administrative area);
c) Effect of industrial zone (see effect of industrial area).
3) RECEIVERS: The area available for housing; the characteristics of each area will influence the ultimate pattern of intensities.

According to the preceding analysis of intensity indicators in Riyadh, the closer the site to city spine, administrative zone, and industrial zone, the higher its intensity and vice versa.

Relative intensity value of a given site within a locality depends on the value of generators and length, comfort, and reliability of available transmitters of generated activities. These transmitters are: pedestrian paths, vehicular roads, and public transportation lines.
The process of urbanization implies that following the provision of essential facilities and utilities, the land value will rise. Population and building densities will increase. Commercial growth will naturally follow certain patterns if not restricted and as development matures, growth and change will go hand in hand. This will require land to be structured under flexible tenure patterns.

**CIRCULATION**

In a given locality, the circulation pattern will be as follows:
1) Major roads where public transportation routes and commercial activities are located. These roads will connect the locality with the city spine and the neighboring localities;
2) Side roads: perpendicular to the major roads. These streets will work for transferring traffic from the access ways to major roads;
3) Access ways to private properties.

**LAND UTILIZATION PATTERN**

With the preceding circulation pattern, the intensity value is higher near the major roads in the locality. The value decreases towards the periphery. In the locality, one might expect nearly three zones, each has a range of different land values and intensity of use:
- Zone I: The commercial area with intensive development along major streets. This area commands the highest land values and the highest density.
- Zone II: The residential area which follows the above zone and has less density.
- Zone III: The periphery adjacent to the expressways where open buffer space is provided and low residential density is expected.

**LAND TENURE**

In most of the cases in Riyadh, the land is privately owned. Since the city is responsible for the provision of facilities, utilities, and services, it should acquire land for these facilities before the development takes place.

The land tenure scheme proposes, in the case of new development, the acquisition by eminent domain of land needed for community facilities. It also proposes that the city acquire land located within the locality spine. This makes it cheaper and easier for the city to provide facilities for the inhabitants of the locality. In addition, it gives the city enough control over the development of the locality spine, and enough revenue to run the facilities, utilities and services.
DEVELOPMENT PROCESS

PROGRESSIVE DEVELOPMENT

FIRST STAGE

SECOND STAGE

THIRD STAGE

FINAL STAGE

COMPREHENSIVE DEVELOPMENT

FIRST STAGE

SECOND STAGE

THIRD STAGE

FINAL STAGE

The term development is related to the provision of utilities, facilities and services for a growing settlement.

Two alternative approaches are illustrated here:

1) PROGRESSIVE DEVELOPMENT: The provision of utilities according to a pre-determined set of priorities and needs following the construction of dwellings and growth in the number of inhabitants.

Advantages:
- Equitable provision of essential facilities for a majority of the population when the provision of all facilities is impossible; this is important for a developing country;
- Economic use of most facilities and;
- Secure investment since no risk is involved.

Disadvantages:
- Inconveniences where some services are lacking;
- Difficulty in determining priorities and timing for provision of facilities and;
- Possibilities of higher ultimate costs.

2) STAGED COMPREHENSIVE DEVELOPMENT: The provision of utilities and facilities instantly preceding or simultaneous with the construction of dwellings and growth in the number of inhabitants.

Advantages:
- Convenience of use and;
- Relative ease of implementation.

Disadvantages:
- Investment risks;
- Under use during period of population growth;
- Inequitable provision of facilities when capacity of construction and provision of these facilities is below the rate of growth.

The advantages and disadvantages could be optimized through detailed studies of designs and through the cooperation of all responsible agencies during construction.
Main elements of the circulation network are the hierarchy of streets and the basic grid.

**Hierarchy of Streets**
Requirements for each transportation mode vary greatly according to the functions of the mode. This makes it essential to determine the functions of circulation paths in each context. Hierarchy of streets in each locality is the following:
1. major roads, connecting localities to other areas;
2. side streets, connect different areas to major roads; and
3. access ways, connect properties to side streets.

**Basic Grid**
The block is the cell of the layout. Dimensions of the block are limited by site conditions, convenience of use, and cost of network. In this study a range of four to ten minutes of walking around the block is considered as the limit to its dimensions in urban areas. This means a range between 80m x 80m to 200m x 200m.

The circulation scheme shows the development of circulation concept:
1. the hierarchy of streets;
2. the basic grid;
3. the modified grid; and
4. the segregated, pedestrian/vehicular, grid.

The following layout alternatives comprise three existing patterns in Riyadh and nine other patterns of set forth limits of block dimensions between 80m x 80m and 200m x 200m.
BASIC GRID ALTERNATIVES

MANFOUTA

MALAZZ

KHURAIS

EXISTING

ALTERNATIVE
**URBAN LAND UTILIZATION**

### MANFOHA

**AREAS**

<table>
<thead>
<tr>
<th>Areas</th>
<th>Hectares</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUBLIC (streets, open spaces)</td>
<td>11.57</td>
<td>35</td>
</tr>
<tr>
<td>SEMI-PUBLIC (open spaces, schools)</td>
<td>4.95</td>
<td>15</td>
</tr>
<tr>
<td>PRIVATE (dwellings, shops, lots)</td>
<td>16.48</td>
<td>50</td>
</tr>
<tr>
<td>SEMI-PRIVATE (cluster courts)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**NETWORK EFFICIENCY**

\[ R = \text{network length (circulation)} \]
\[ S = \text{areas served (circulation, lots)} = 283m/Ha \]

**RESIDENTIAL INTENSITY**

EFFECT OF LOCALITY SPINE (A-A)

---

### MALAZZ

**AREAS**

<table>
<thead>
<tr>
<th>Areas</th>
<th>Hectares</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUBLIC</td>
<td>9.54</td>
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<tr>
<td>SEMI-PUBLIC</td>
<td>5.40</td>
<td>15</td>
</tr>
<tr>
<td>PRIVATE</td>
<td>21.06</td>
<td>58</td>
</tr>
<tr>
<td>SEMI-PRIVATE</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**NETWORK EFFICIENCY**

\[ R = 212m/Ha \]

**RESIDENTIAL INTENSITY**

EFFECT OF LOCALITY SPINE (A-A)
**Urbanization Model**

- **Public**
  - Total: 21.94 hectares, 55%
- **Semi-Public**
  - Total: 8.66 hectares, 22%
- **Private**
  - Total: 9.40 hectares, 23%
- **Semi-Private**
  - Total: 17.3 hectares, 45%

**Network Efficiency**

- Total: 31.60 hectares, 100%

**Residential Intensity**

- **Assumed**: 265m/Ha
- **Existing**: 224m/Ha

**Effect of Locality Spine (A-A)**

- **Residential Intensity**
  - Scale: 1:10000
URBAN LAND UTILIZATION

A-2

<table>
<thead>
<tr>
<th>AREAS</th>
<th>Hectares</th>
<th>Percentages</th>
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<tbody>
<tr>
<td>PUBLIC</td>
<td>10.21</td>
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<tr>
<td>SEMI-PUBLIC</td>
<td>6.12</td>
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<tr>
<td>PRIVATE AND SEMI-PRIVATE</td>
<td>24.47</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>40.8</strong></td>
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NETWORK EFFICIENCY

R = 175m/Ha

PROPOSED

RESIDENTIAL INTENSITY

EFFECT OF LOCALITY SPINE (A-A)

A-3

<table>
<thead>
<tr>
<th>AREAS</th>
<th>Hectares</th>
<th>Percentages</th>
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<tr>
<td>PUBLIC</td>
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NETWORK EFFICIENCY

R = 165m/Ha

PROPOSED

RESIDENTIAL INTENSITY

EFFECT OF LOCALITY SPINE (A-A)

1:10000
URBANIZATION MODEL

B-1

AREAS

<table>
<thead>
<tr>
<th>Type</th>
<th>Hectares</th>
<th>Percentages</th>
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<tbody>
<tr>
<td>PUBLIC</td>
<td>8.58</td>
<td>27</td>
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<tr>
<td>SEMI-PUBLIC</td>
<td>4.74</td>
<td>15</td>
</tr>
<tr>
<td>PRIVATE AND SEMI-PRIVATE</td>
<td>18.28</td>
<td>58</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>31.60</strong></td>
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NETWORK EFFICIENCY

R = 184m/Ha

PROPOSED

RESIDENTIAL INTENSITY

EFFECT OF LOCALITY SPINE (A-A)

B-2

AREAS

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NETWORK EFFICIENCY

R = 178m/Ha

PROPOSED

RESIDENTIAL INTENSITY

EFFECT OF LOCALITY SPINE (A-A)
### URBAN LAND UTILIZATION

#### B-3 AREAS

<table>
<thead>
<tr>
<th>Areas</th>
<th>Hectares</th>
<th>Percentages</th>
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</thead>
<tbody>
<tr>
<td>Public</td>
<td>8.58</td>
<td>27</td>
</tr>
<tr>
<td>Semi-Public</td>
<td>4.74</td>
<td>15</td>
</tr>
<tr>
<td>Private and Semi-Private</td>
<td>18.28</td>
<td>58</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>31.60</td>
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**NETWORK EFFICIENCY**

\[ R = 120 \text{m/Ha} \]

#### C-1 AREAS

<table>
<thead>
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<th>Areas</th>
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<tr>
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<td>Semi-Public</td>
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<td>Private and Semi-Private</td>
<td>18.79</td>
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<td><strong>Total</strong></td>
<td>31.60</td>
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**NETWORK EFFICIENCY**

\[ R = 137 \text{m/Ha} \]

#### RESIDENTIAL INTENSITY

**EFFECT OF LOCALITY SPINE (A-A)**
### URBAN LAND UTILIZATION

#### AREAS

<table>
<thead>
<tr>
<th>PUBLIC (Streets, Open Spaces)</th>
<th>Hectares</th>
<th>Percentages</th>
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<tbody>
<tr>
<td>SEMI-PUBLIC (Open Spaces, Schools)</td>
<td>0.19</td>
<td>33</td>
</tr>
<tr>
<td>PRIVATE (Dwellings, Shops, Lots)</td>
<td>0.39</td>
<td>67</td>
</tr>
<tr>
<td>SEMI-PRIVATE (Cluster Courts)</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>0.58</td>
<td>100</td>
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**NETWORK EFFICIENCY (R-Value)**

<table>
<thead>
<tr>
<th>MANFONAHA</th>
<th>Hectares</th>
<th>Percentages</th>
</tr>
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<tbody>
<tr>
<td><strong>R = 346m/Ha</strong></td>
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<table>
<thead>
<tr>
<th>PUBLIC (Streets, Open spaces)</th>
<th>Hectares</th>
<th>Percentages</th>
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</thead>
<tbody>
<tr>
<td>SEMI-PUBLIC (Open spaces, schools)</td>
<td>0.25</td>
<td>32</td>
</tr>
<tr>
<td>PRIVATE (Dwellings, shops, lots)</td>
<td>0.53</td>
<td>68</td>
</tr>
<tr>
<td>SEMI-PRIVATE (Cluster courts)</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>0.78</td>
<td>100</td>
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**NETWORK EFFICIENCY (R-Value)**

<table>
<thead>
<tr>
<th>MALAZZ</th>
<th>Hectares</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>R = 237m/Ha</strong></td>
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<table>
<thead>
<tr>
<th>PUBLIC (Streets, open spaces)</th>
<th>Hectares</th>
<th>Percentages</th>
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</thead>
<tbody>
<tr>
<td>SEMI-PUBLIC (Open spaces, schools)</td>
<td>0.35</td>
<td>91</td>
</tr>
<tr>
<td>PRIVATE (Dwellings, shops, lots)</td>
<td>0.50</td>
<td>60</td>
</tr>
<tr>
<td>SEMI-PRIVATE (Cluster courts)</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1.25</td>
<td>100</td>
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**NETWORK EFFICIENCY (R-Value)**

<table>
<thead>
<tr>
<th>KHURAI</th>
<th>Hectares</th>
<th>Percentages</th>
</tr>
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<tr>
<td><strong>R = 149m/Ha</strong></td>
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<table>
<thead>
<tr>
<th>PUBLIC (Streets, open spaces)</th>
<th>Hectares</th>
<th>Percentages</th>
</tr>
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<tbody>
<tr>
<td>SEMI-PUBLIC (Open spaces, schools)</td>
<td>0.35</td>
<td>91</td>
</tr>
<tr>
<td>PRIVATE (Dwellings, shops, lots)</td>
<td>0.50</td>
<td>60</td>
</tr>
<tr>
<td>SEMI-PRIVATE (Cluster courts)</td>
<td>--</td>
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</tr>
<tr>
<td><strong>Total</strong></td>
<td>1.25</td>
<td>100</td>
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**NETWORK EFFICIENCY (R-Value)**

<table>
<thead>
<tr>
<th>BLOCK LAND SUBDIVISION</th>
<th>Hectares</th>
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<tr>
<td>1</td>
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</tr>
<tr>
<td>2</td>
<td>0.23</td>
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<td>3</td>
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<td><strong>Total</strong></td>
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**R = 199m/Ha**

<table>
<thead>
<tr>
<th>Hectares</th>
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<tbody>
<tr>
<td>0.23</td>
<td>70</td>
</tr>
<tr>
<td>0.10</td>
<td>9</td>
</tr>
<tr>
<td><strong>1.09</strong></td>
<td><strong>100</strong></td>
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</tbody>
</table>

**R = 178m/Ha**

| 0.27 | 18 |
| 0.14 | 9 |
| **1.52** | **100** |

---

**R = 177m/Ha**

**R = 124m/Ha**

**R = 109m/Ha**

---

**R = 350m/Ha**

**R = 237m/Ha**

**R = 202m/Ha**

**R = 149m/Ha**

**R = 128m/Ha**

---

**R = 124m/Ha**

**R = 252m/Ha**

**R = 199m/Ha**

**R = 178m/Ha**

---

**R = 177m/Ha**

**R = 124m/Ha**

**R = 109m/Ha**
NATIONAL CONTEXT

Kingdom of Saudi Arabia
Population: 6,200,000 estimated for 1975
Area: 2,127,000 square Kilometers Approx.
Language: Arabic and English spoken widely
Currency: SR, Saudi Rial = 100 Halala = US $ 0.28 in 1974
Religion: Islam
Government: Islamic Constitution in a modern government

Major Cities
- Mecca, spiritual capital
  Pop. Estimates: 300,000 (1975)
- Riyadh, administrative cap.
  570,000
- Jeddah, main port
  460,000
- Medina, spiritual city
  136,000
- Taif, summer capital
  150,000
- Dammam, eastern port
  80,000
- Hofuf-Mubarraz
  147,000
- Buraidah
  83,000

LOCATION: Saudi Arabia is located in southwestern Asia, occupying four fifths of the Arabian Peninsula between 34°56' East and 15°29' North of the equator.

HISTORY: Saudi Arabia was named as a unified kingdom after the Al-Saud family in 1932. The name also means prosperity and happiness.

The Arabian Peninsula has been inhabited by Semitic-speaking people for more than 3000 years. The earliest known, large-scale political units were the South Arabian kingdom of the Minaeans (about 1200 B.C.) and the Sabean (before 700 B.C.). They were followed by the Himyarites (about 200 B.C.), who were preceded also by the Nabataeans in the north (about 350 B.C.).

In the early 7th Century A.D., Mecca became the religious center of Islam, which comprised in the 8th Century the area from Spain in Europe to East China in Central Asia. After the Mohammedan era the capital moved to the north. It is only in the middle of the 10th century AD when the Meccan Sherifate was established.

The Ottoman Turks were recognized as rulers of Hejaz after conquering Egypt in 1517.

Their power also included Al-Hass in 1550, but the control was nominal.

The Saudi Dynasty started as a religious revival movement by Emir Mohammed Ibn Saud in support of Sheik Mohammed Ibn Abd Al-Wahab (1703-1792). By 1806, Saudi forces had captured from Dariya in Najd most of the Arabian Peninsula, including Hejaz and Yemen, then parts of Iraq and Syria. Hejaz was captured in 1812 by the Ottoman-Egyptian army, and the capital Dariya in Najd was destroyed in 1818. The Arabian Peninsula entered a period of bloodshed and intrigue after that.

Though in exile in Kuwait, Abd al-Aziz Ibn Saud (Ibn Saud) started the creation of modern Saudi Arabia by capturing Riyadh in 1902, Najed and Al-Hass in 1913, and Medina and Jedda in 1925. In September 1932, the Kingdom of Saudi Arabia was created. In March 1945, Saudi Arabia accepted the principles of the United Nations and, also in that year, the Arab League.
PHYSICAL FEATURES: The dominant feature of Saudi Arabia is the great plateau which slopes slightly to the east. It starts from the Sarawat Mountain Ranges in the west and is interrupted by the Tuwaiq low mountains which form a crescent shape facing northwest. Most of the topography is covered with free sand forming the great deserts.

GEOGRAPHIC REGIONS: The country is divided into five administrative regions supported by geographic and population concentrations. These regions have no defined boundaries. They also do not include the vast desert areas. The regions are: the Eastern, Central, Western, Northern, and Southern.

CLIMATE: Saudi Arabia has three distinctive climatic regions. One is the desert climate. It is hot and dry in summer, cold and moderately humid in winter. As in Riyadh, summer average maximum temperature is above 40°C and goes up to 45°C. The air cools rapidly at night. Summer relative humidity decreases to 35 percent. In winter, the average minimum temperature is as low as 7°C and can fall below freezing. Winter relative humidity is between 50 and 70 percent. Records show an average rainy days at 20, an average of 25 days of sand storms, and frost is frequent. The second region is the coastal climate, characterized by hot and humid summers and moderate and moderately humid winters. As in Jeddah, average maximum temperature in the summer is about 37°C, but it is coupled with a relative humidity of between 30 and 85 percent; it is 100 percent on occasions. The average minimum winter temperature is about 10°C. Winter relative humidity is between 75 and 35 percent. The average number of rainy days per annum is 8, and the average rainfall is 100mm. The average number of days of sand storms is 12. The average number of foggy days is 9. Third, the mountain climate is characterized by cold to moderate temperatures with moderate humidity in summer, and relatively cold temperatures and moderately humid winters. This climate is common in the mountain settlements on the Sarrawat Mountain Ranges in the west. As in Alkhobar, average maximum summer temperatures is about 25°C. The relative humidity in summer is between 15 and 50 percent.

ECONOMY: The economic activities in the Arabian Peninsula were traditionally based on subsistence arid-zone agriculture, desert pastoralism, fishing, hunting, and limited mining. Pilgrimage to Mecca was of high value to the economy of Hejaz Region. Trade between India and Africa from the south and Byzantine Empire from the north was a fluctuating source of income for Hejaz and Yemen.

The role of oil replaced the traditional economic resources in increasing proportions since its discovery in 1938. It provided approximately 92 percent of the government's revenue in 1971-72.

The government's projects have concentrated on development of necessary infrastructure. Highest priority has been given to the transportation network, health, education, and water resources for agriculture, industry, and domestic uses.
GLOSSARY

COMMUNITY: the people living in a particular place or region and usually linked by common interests; the region itself, any population cluster.

DEVELOPMENT: gradual advance or growth through progressive changes: a developed tract of land.

DWELLING: the general, global designation of a building/shelter in which people live. A dwelling contains one or more ‘dwelling units’.

DWELLING CONSTRUCTION TYPES: Primary dwelling construction types and materials are grouped in the following categories:

- Shack: structure - rods, branches, infill - thatch, mats, flattened tin cans, plastic or canvas sheets, cardboard, scrap wood, and/or mud.
- Walls: structure - rods, branches, poles, infill - thatch, mats, flattened tin cans, plastic or canvas sheets, cardboard, scrap wood, and/or mud.
- Floor: structure/infill - compacted earth.
- Adobe: roof - wood rafters, infill - thatch with mud.
- Walls: structure - Sunday brick mud, infill - mud.
- Masonry/Concrete: roof - wood rafters, infill - corrugated iron or asbestos sheets, or corrugated tin sheets.
- Walls: structure/infill - masonry, stone, brick, block or tile masonry without columns, or with columns for multi-story dwellings.
- Masonry/Concrete: roof - poured reinforced concrete slab on/off grade, wood joists, flooring.
- Wood: roof - wood rafters, infill - thatch, flattened tin cans, plastic or canvas sheets.
- Walls: structure - wood frame, infill - rough hewn wood planks.
- Floor: structure/infill - compacted earth, wood joists, flooring.
- Masonry/Concrete: roof - structure/infill - poured reinforced concrete slab on/off grade, wood and/or brick walls.
- Masonry/Concrete: roof - poured reinforced concrete slab on/off grade.
- Concrete: roof - poured or precast reinforced concrete with tar and gravel, or corrugated tin sheets.
- Walls: structure/infill - masonry, stone, brick, block or tile masonry without columns, or with columns for multi-story dwellings.
- Masonry/Concrete: roof - poured concrete slab on/off grade.
- Wood: roof - wood rafters, infill - thatch, flattened tin cans, plastic or canvas sheets.
- Walls: structure - wooden frame, infill - rough hewn wood planks.
- Floor: structure/infill - poured concrete slab on/off grade.

DWELLING BUILDER: Four groups are considered: Self-help Built: where the dwelling unit is directly built by the user or occupant. Artisan Built: where the dwelling unit is totally or partially built by a skilled craftsman hired by the user or occupant; payments can be monetary or an exchange of services.

Small Contractor Built: where the dwelling unit is totally built by a small organization hired by the user, occupant, or developer; ‘small’ contractor is defined by the scale of operations, financially and materially; the scale being limited to the construction of single dwelling units or single construction projects.

Large Contractor Built: where the dwelling unit is totally built by a large organization hired by a developer; ‘large’ contractor is defined by the scale of operations, financially and materially; the scale requiring more comprehensive and larger scale of operations encompassing the building of large quantities of similar units, or a singularly large complex.

DWELLING DENSITY: The number of dwellings, dwelling units, people or families/unit hectare. Gross density is the density of an overall area (ex. including lots, streets). Net density is the density of selected, discrete portions of an area (ex. including only lots).

DWELLING DEVELOPMENT: Three sectors are considered:

- Popular sector: The marginal sector limited with no or no access to the formal financial, administrative, legal, technical, institutional resources involved in the provision of dwellings. The housing process (presentation, negotiation, construction, operation) is carried out by the Popular sector generally for ‘self use’ and sometimes for profit.
- Public sector: The non-profit organizations involved in the provision of dwellings. The housing process (promotion, financing, construction, operation) is carried out by the Public sector for the profit of society.
- Private sector: The individuals, groups or societies who have access to the formal financial, administrative, legal, technical institutions in the provision of dwellings. The housing process (promotion, financing, construction, operation) is carried out by the Private sector generally for profit.

DWELLING FLOORS: The following number are considered:

- One: single story; generally associated with detached, semi-detached and row/group dwelling types.
- Two: double story; generally associated with detached, semi-detached and row/group dwelling types.
- Three or More: generally associated with walk-up and high-rise dwelling types.

DWELLING GROUP: The context of the dwelling in its immediate surroundings.

DWELLING LOCATION: Three sectors of the urban area considered:

- City center: the area located within a walking distance (2.5 km radius) of the commercial core, relatively high residential densities.
- Inner ring: the area located between the urban periphery and the city center (2.5 to 5 km radius) relatively lower residential densities.
- Periphery: the area located between the rural areas and urban inner ring (5 or more km radius) relatively low residential densities.

DWELLING PHYSICAL STATE: A qualitative evaluation of the physical condition of the dwelling types:
- Room: apartment, house; (the shanty unit is not evaluated).
- Bad: generally poor state of structural stability, weather protection and maintenance.
- Fair: generally acceptable state of structural stability, weather protection and maintenance.
- Good: generally acceptable state of structural stability, weather protection and maintenance without deviation.

DWELLING UNIT: A self-contained unit in a dwelling for an individual, a family, or a group.

DWELLING UNIT AREA: The dwelling unit area (m²) is the built-up, covered area of a dwelling unit.

DWELLING UNIT COST: The initial amount of money paid for the dwelling unit or the present monetary equivalent for replacing the dwelling unit.

DWELLING UNIT TYPE: Four types of dwelling units are considered:

- Room: A SINGLE SPACE usually bounded by partitions and walls, and used for sleeping, eating, cooking, hygiene and storage, such as a bedroom, but not a bath/toilet, kitchen, laundry, etc. (PRIVATE ROOM). SEAVERAL APARTMENT UNITS are contained in a building/shelter and share the use of the parcel of land (on which they are built) as open spaces as sector for profit and/or subsistence (or subsidized housing).
- Apartment: A MULTIPLE SPACE (room/set of rooms with bath, kitchen, etc.). SEVERAL APARTMENT UNITS are contained in a building/shelter and share the use of the parcel of land on which it is built (open spaces) as well as some common facilities (whether or not owner; and between private owners and the public, and includes the assessment of taxes on private land rights and the regulation of land use through government control. There are TWO BASIC FORMS of land tenure.
- Land Tenancy: where the exclusive right of control over land and its usages are achieved over a parcel of land is held in freehold.
- Land Ownership: points the formal holding of mode or holding of land is of another.

DWELLING UTILIZATION: The utilization indicates the type of use with respect to the number of inhabitants/families. Simple - an individual or a family inhabiting a dwelling.

Multiple - a group of individuals or families inhabiting a dwelling.

FINANCING: The process of raising of funds.

Self-Financed: provided by own funds, private or self-financed through the use of loan.

Publicly Subsidized: provided by grant or aid.

DWELLING DEVELOPMENT MODE: The modes are considered:

- Incremental: the construction of the dwelling and the development of the local infrastructure to modern standards by stages, often starting with provision of infrastructure and development of undeveloped land. This essentially traditional procedure is generally practiced by squatters with de facto security of tenure and an adequate building site.

Instant: the formal development procedure in which all structures and services are completed before occupation.

LAND TENURE: the act, right, manner or term of holding land property. Types are categorized by how land is held and for what period of time. Legal definitions are established to determine the utilization of property among various owners, or the relationship between owner and user; and between private owners and the public, and includes the assessment of taxes on private land rights and the regulation of land use through government control. There are TWO BASIC FORMS of land tenure.

Land Ownership: where the exclusive right of control over land and its usages are achieved over a parcel of land is held in freehold.

Land Tenancy: points the formal holding of mode or holding of land is of another.

LAND UTILIZATION: A qualification of the land around a dwelling in relation to user, physical controls, and responsibility.


DWELLING PHYSICAL MEASURES: The physical/financial means or methods of directing, regulating and coordinating the use and maintenance of land by the owners/users.

DWELLING PHYSICAL STATE: A qualitative evaluation of the physical condition of the dwelling types:
- Room: apartment, house; (the shanty unit is not evaluated).
- Bad: generally poor state of structural stability, weather protection and maintenance.
- Fair: generally acceptable state of structural stability, weather protection and maintenance.
- Good: generally acceptable state of structural stability, weather protection and maintenance without deviation.

DWELLING UNIT: A self-contained unit in a dwelling for an individual, a family, or a group.

DWELLING UNIT AREA: The dwelling unit area (m²) is the built-up, covered area of a dwelling unit.

DWELLING UNIT COST: The initial amount of money paid for the dwelling unit or the present monetary equivalent for replacing the dwelling unit.

DWELLING UNIT TYPE: Four types of dwelling units are considered:

- Room: A SINGLE SPACE usually bounded by partitions and walls, and used for sleeping, eating, cooking, hygiene and storage, such as a bedroom, but not a bath/toilet, kitchen, laundry, etc. (PRIVATE ROOM). SEAVERAL APARTMENT UNITS are contained in a building/shelter and share the use of the parcel of land (on which they are built) as open spaces as well as some common facilities (whether or not owner; and between private owners and the public, and includes the assessment of taxes on private land rights and the regulation of land use through government control. There are TWO BASIC FORMS of land tenure.

LAND TENURE: the act, right, manner or term of holding land property. Types are categorized by how land is held and for what period of time. Legal definitions are established to determine the utilization of property among various owners, or the relationship between owner and user; and between private owners and the public, and includes the assessment of taxes on private land rights and the regulation of land use through government control. There are TWO BASIC FORMS of land tenure.

LAND USE: The classification of land around a dwelling in relation to user, physical controls, and responsibility.
LAND UTILIZATION: RESPONSIBILITY: The quality/state of being morally/legally responsible for the use and maintenance of land by the owners/users.

PERCENT RENT/MORTGAGE: The fraction of income allocated for dwelling rental or dwelling mortgage payments expressed as a percentage of total family income.

SUBSISTENCE INCOME: Average amount of money required for the purchase of food and fuel for an average family of 5 people to survive (1974/year in Riyadh, 1973).

TENURE: Two situations of tenure of the dwelling unit/land are considered:
- Legal: having formal status derived from law.
- Extralegal: not regulated or sanctioned by law.

Four types of tenure are considered:
- Rental: where the user pays a fee (daily, weekly, monthly) for the use of the dwelling unit and/or the lot/land.
- Lease: where the user pays a fee for long-term use (generally for a year) for a dwelling unit and/or the lot/land from the owner (an individual, a public agency, or a private organization). No cases of lease are shown in Typology.
- Ownership: where the user holds in freehold the dwelling unit and/or the lot/land which the unit occupies.
- Employer-Owned: where the user is provided a dwelling unit by an employer in exchange for services; i.e., domestic live-in servant. (Only one case is shown in the case studies.)

URBAN AREA: All developed land lying within the urban fringe (politically undefined development lying between the city and the country) including a central city and any of its satellite communities; it is not a political/governmental unit (Bertolmou, 1955).

URBANIZATION: The process of being or becoming urbanized: to cause or take on urban characteristics.

USER INCOME GROUPS: Based upon the subsistence (minimum wage) income per year, five income groups are distinguished: (Minimum income per year in Riyadh is approximately $874).

- Very low (below subsistence level) less than $874/year: The income group with no household income available for housing, services, or transportation.
- Low (1 x subsistence level) 1974/year: The income group that can afford limited subsidized housing.
- Moderate Low (4 x subsistence level) $3,496/year: The income group that has access to public/private commercial housing (rental).
- Middle (15 x subsistence level) $11,110/year: The income group that has access to private commercial housing (ownership).
- High (above 15 x subsistence level) above $33,330/year: The income group that represents the most economically mobile sector of the population.

EQUIVALENTS

METRIC SYSTEM EQUIVALENTS

<table>
<thead>
<tr>
<th>Linear Measures</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 centimeter</td>
<td>0.3937 inches</td>
<td>0.3937 meters</td>
</tr>
<tr>
<td>1 meter</td>
<td>100 centimeters</td>
<td>0.3937 meters</td>
</tr>
<tr>
<td>1 kilometer</td>
<td>1,000 meters</td>
<td>3.2808 feet</td>
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<tr>
<td>1 inch</td>
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<tr>
<td>1 mile</td>
<td>1.6093 kilometers</td>
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</tr>
</tbody>
</table>

Square Measures

| 1 square meter        | 1.550 square inches |
| 10,000 square feet    | 39.282 square meters |
| 1 hectar              | 10.7639 square meters |

DOLLAR EQUIVALENTS

- All income, cost, and rent/mortgage data have been expressed in terms of the U.S. equivalent: $1.00 U.S. dollar = 3.5 Saudi Riyals.

BIBLIOGRAPHY


