

URBAN SETTLEMENTS IN INTERMEDIATE CITIES, GUJARAT STATE, INDIA

Includes Case Studies and an Upgrading Project in Rajkot

BY

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ABSTRACT

This study presents a brief comparison of five intermediate cities in the State of Gujarat, India. It focuses on different typical low income housing systems in the city of Rajkot, Gujarat State. It provides data to formulate, evaluate and implement housing policies especially in the physical planning aspects. At the end, a proposed outline for an upgrading project in Rajkot is also presented.

Thesis Supervisor:.....

Horacio Caminos

Title:

Professor of Architecture



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## PREFACE

The pace of urbanization in India compels increased attention and demands a fresh approach. The attention on urbanization is focused primarily on the problems of the major metropolitan cities in the country. However, the larger part of the urban population is distributed in intermediate and small cities. This study is an attempt to identify the critical issues in several intermediate cities in Gujarat State and particularly on the housing situation in the city of Rajkot.

This study is derived from my field research carried out during the summers of 1977 and 1978. The surveys included socio-economic and physical aspects of urban settlements in various intermediate cities in Gujarat State. The information - maps, reports, and charts - has been collected from various authorities: local municipalities, city survey departments, and Town Planning and Valuation Departments in each of the five cities studied. The entire survey has been reconstructed, due to lack of information from any single source; through maps, reports, studies, photographs and field research, and therefore the quality of information in the locality and segment plans is approximate in some cases. However, the basic pattern, land use, density, and availability of services fairly represent the existing situation. The case study analysis is based on the methodology developed in the Urban Settlement Design in Developing Countries Program, under the direction of Professor Horacio Caminos.

I gratefully acknowledge the guidance and advice of Professor Horacio Caminos, whose experience has been invaluable in the preparation of this study. I am also grateful to Reinhard Goethert for his criticism and personal assistance at various stages of this work,

and to members of the classes of 1976-78 and 1978-80 for their company and comments, to Happy for editing the text, to Vijay Yagnik for his help in the preparation of this work, and to Yashvant Desai for his help during the survey. I also wish to thank Mr. U. S. Mehta, Chief Planner of Rajkot Municipal Corporation and many other professionals in State Town Planning and Valuation Departments, Gujarat Housing Board offices and local municipalities in Surat, Vadodara, Rajkot, Jammagar, Porbandar, Nadiad and Ahmedabad, who cooperated in the preliminary surveys. I am thankful to all those who directly or indirectly contributed to this work but are too numerous to mention here. The partial financial support received from the Kasturbhai Lalbhai Trust and the Khadayata Educational Trust is also gratefully acknowledged. Finally my debt to my parents and members of the Gami family for their love, encouragement and support is beyond the means of expression.

*COVER: Bhilvas, Rajkot, 1978: A walkway used by the children and the adults.*

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The study focuses on the housing situation in the rapidly growing city of Rajkot. Rajkot, with a population of 400,000 people serves as a typical example of a rapidly growing multifunctional urban center in India. The housing problems in the city are particularly pronounced and critical for the low income groups, which constitute nearly half of the total urban population. While the private sector does not contribute to the housing for poor, the governmental approach has remained conventional and piecemeal. The physical planning of urban settlements calls for a new approach that should recognise and encourage popular participation, and that would allow the authorities to focus their attention on the provision of access; to land, infrastructure and credit facilities to the urban poor.

Sites and services projects have usually failed in large metropolitan cities due to their poor location away from employment centers in order to make use of cheap land. In intermediate cities like Rajkot, however, the land is fairly inexpensive, densities are fairly low and the distances between the employment sectors and the housing areas are manageable. At the same time, large areas with relatively cheap land in the outskirts of the city can be opened up for sites and services schemes, with the help of proper and subsidized transportation.

Existing housing systems have been studied here to investigate existing socio-economic and physical patterns and their chronological evolution. The cases are analyzed at four scales: the locality, selected segment of the locality, selected block of the segment and a typical dwelling unit. The efficiency of settlements and physical layouts is studied through comparative analysis/evaluation of land utilization patterns, circulation efficiencies, population densities, existing infrastructure services and community facilities. The selected case studies in the city of Rajkot represent a cross-section of housing systems identified in similar intermediate cities in the Gujarat state.

These case studies are:

-Gamtal	private	mod. low/middle income, traditional walled city
-Karan para	private	middle/higher middle income, European influence
-Bhilvas	private	very low/low income, chawls
-Mafatiya para	popular	very low/low income, squatters
-Anand nagar colony	public	low/middle income, apartments, row houses

Evaluation of urban growth patterns in five cities and the housing systems in the city of Rajkot suggest a need for directing the growth of such cities; by proper infrastructure development and by providing an access to land, infrastructure services, community facilities and credit facilities to the urban poor. Bhaktinagar upgrading and expansion project is an attempt to study the diverse problems of unchecked land development and to propose an alternative way to evaluate and upgrade such areas. The economic feasibility and the optimum utilization of available resources are considered to make this proposal a comparative reference for the project, now being prepared by the Town Planning Branch of the Rajkot Municipal Corporation.

The study is intended to serve as a reference and a tentative set of guidelines for those involved in planning of residential developments and formulation of urban development policies. It provides a comparative framework for the analysis and evaluation of existing and proposed low income developments. It also provides a model for identification of urban environment in similar other small and intermediate size cities in India.

*PHOTOGRAPHS: (top) Shankar Bhavan squatters, Ahmedabad, 1978: In 1971, 80,000 families, or 27% of Ahmedabad's population lived in the squatter settlements. Similar situation exists in other 8 metropolitan cities in the country. (bottom) Vadodara, Gujarat State, 1978: Living conditions in 133 intermediate cities are also deteriorating rapidly. Approximately 15% to 25% of the population in such cities, live in squatter settlements.*

# INDIA

## NATIONAL CONTEXT

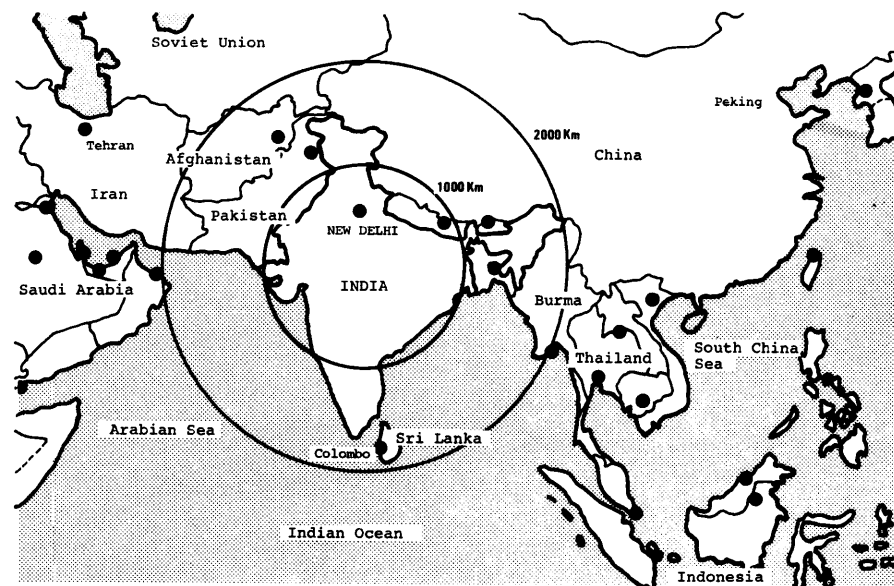
### 2. GEOGRAPHY:

India, situated between 8°4' and 37°6' latitudes, dominates the South Asian sub-continent geographically. It is bounded on the east by Bangla Desh, Burma and the Bay of Bengal; on the west, by Pakistan and the Arabian Sea; and on the north, by the People's Republic of China, Nepal and Bhutan. It measures 3,214Km. north to south and 2,933Km. east to west, has a land frontier of 15,200Km. and a coastline of 6,083Km. Its diversified topography has three major regions: 1) sparsely populated Himalaya Mountains which extend along the whole of the north border; 2) heavily populated, well watered and fertile area in the north, on the Indo-Gangetic Plains; and 3) southern peninsula including the Deccan Platteau. The major river systems are associated with each of the main regions. Chains of low mountains and hills lie roughly west to east across central India and north to south along the peninsular coasts. Deserts and arid regions of west-central India contrast with the heavy forestation in the eastern area.

The climate varies from tropical in the south to temperate in the north. Four seasons are recognized south of the Himalayas: a relatively cool, dry period from December through February; a dry, hot season from March through May, and a rainy season or southwest monsoon period from June through September as well as a northeast or retreating monsoon period of October and November. The temperatures seldom lower below freezing anywhere south of the Himalayas, but often reach as high as 110°F during summer months. Precipitation ranges from over 1,000cm. annually in the northeas (Assam Hills) to less than 12cm. in the northwest (Rajasthan Desert).

### 3. PEOPLE:

Two major ethnic groups predominate in India: Indo-Aryan in the north and Dravidian in the South. The aboriginal tribal people live in the central forests and mountains, and some Mongoloid people live in the far northern regions. 84% of the people are Hindus, 11% Muslims, and the rest are Christians, Sikhs, Jains, Parsis, Buddhists, etc. The caste system, based on employment/occupation related categories ranked on a theoretically defined hierarchy, is gradually breaking down under the impact of urbanization,



LOCATION OF INDIA

industrialization, wider communication and educational opportunities. The 14 principal languages described in the Indian Constitution are collectively spoken by about 87% of the people. The Indo-Aryan languages are spoken by 73% of the population in the northern regions whereas 24.5% speak the Dravidian languages in the south. English is widely used in government, business and education throughout the country.

### 4. HISTORY:

The known history of the Indian people spans some five millennia. Between 3000 and 1500 B. C. a number of settlements developed in the Indus River Valley (now in Pakistan) into complex urban centres based on commerce, trade and agriculture. Aryan tribes originating in Central Asia absorbed parts of this Asian subcontinent. During the next few centuries, India flourished under several successive empires. The Muslim Arabs came to Western India in the seventh and the eighth centuries, A. D. The Mughals reigned from 1526 to 1707, A. D. and were constantly challenged by the Rajputs, the Sikhs and the Marathas. The first British outpost in South Asia was established in 1619. Later in that century, permanent trading stations were opened by the East India Company at Madras, Bombay

and Calcutta; the British gradually expanded their influence from these footholds. Following the first war of independence in 1857, the East India Company was withdrawn and a direct rule of the British Crown was established.

After partition of the Indian subcontinent into India and Pakistan, India became independent on August 15, 1947, with Jawaharlal Nehru as the Prime Minister. India's Constitution was promulgated on January 26, 1950 and the country was declared to be a Democratic Republic. India is a member of the United Nations, the Commonwealth of Nations, the Asian Development Bank, the International Atomic Energy Agency, the International Bank for Reconstruction and Development, the Colombo Plan and the International Monetary Fund.

### 5. GOVERNMENT:

India is a Sovereign Democratic Republic with a parliamentary form of government. The President, elected by an indirect electoral college, is the executive head of the Indian Union. His term of office is five years and is eligible for re-election. He also acts as the Supreme Commander of the armed forces and appoints the Primer Minister, the Attorney General, Governors of the

### 1. PRIMARY INFORMATION

Country:	Republic of India
Capital:	New Delhi
Population:	629 million (1977)
	20% urban, 80% rural
Population growth:	2.01% per year
Area:	3,280,483 sq.km.
Languages:	Hindi, English;
	14 official languages
Currency:	Rupee (8.02 Rupees = US\$ 1.00, 1978)
Per Capita Income:	Rs.
Religion:	85% Hindu, 11% Muslim
Government:	Democracy
Major Cities:	
	Calcuta 7,005,362*
	Bombay 5,968,546
	Delhi 3,629,842
	Madras 2,470,288
	Hyderabad 1,798,910
	Bangalore 1,648,232
	Ahmedabad 1,585,544
	Kanpur 1,273,016

\* Inside municipality boundaries.

States of the Union, the Chief Justice and Other Justices of the Supreme Court as well as the High Courts, and appoints and receives diplomatic representations. The President is aided and advised by a Cabinet of Ministers, headed by the Prime Minister. Members of the Cabinet are chosen from among the two houses of the Parliament and are responsible to it.

The Parliament consists of the President and the two houses - the Rajya Sabha, or the Council of States, and the Lok Sabha, or the House of the People. The Parliament usually holds three sessions a year. One of the principal functions of the Parliament is to make laws on the matters the Constitution specifies to be within its domain. Among its constitutional powers are the fixing or changing of the state boundaries, making amendments to the Constitution, controlling the nation's finances, and removing the Cabinet by a vote of non-confidence. The Rajya Sabha consists of a maximum of 250 representatives, 13 of whom are nominated by the President and the rest are elected indirectly by the members of the state and territorial legislatures. One-third of the members retire every two years, with each member completing a six-year term. Members of the Lok Sabha are elected directly by the people, all for a five-year term. Lok Sabha seats are allocated to states in proportion to their population. In 1978 there were 544 members of the Lok Sabha, including 2 nominated by the President.

By 1978 there were 22 States and 9 Union Territories. The governmental structure at the state level is similar to that of the Central government. The President appoints a Governor for a five-year term, who is aided and advised by a Cabinet of Ministers headed by a Chief Minister. Subject to legislation by the Parliament, the President governs the Union Territories through appointed administrators. The District is the major geographical and administrative subdivision within the state, and usually has 4 to 5 million people, with the District Collector as the chief administrator. The 'Panchayati Raj' system, as a means of decentralizing administration at the very local levels, involves a three-tier structure of self-governing bodies at the village, block and district levels. In large towns and cities, the local self-governing bodies are the Municipality, or the Municipal Cor-

poration, Committee or Board. The Judiciary is a single, integrated hierarchical system, with the Supreme Court at the top, the High Courts at the state level and lower courts at the district and local levels. The Supreme Court is the ultimate interpreter of the Constitution and of the laws of the land. The Chief Justice and a maximum of 13 other Judges of the Supreme Court are appointed by the President.

6. ECONOMY:

India has a mixed economy having a small but important and growing public sector and a large private sector which contributes nearly 75% of the national income. The public sector owns the country's infrastructure, strategic resources, and basic heavy industry. The private sector includes a large small-scale industrial sector and the traditional sector which accounts for 75 to 80% of the population and 50 to 60% of the national product consisting mainly of a subsistence level agriculture and the household and village handicraft production. Surplus labour results in high rates of unemployment and under-employment. Vocational and training programmes are encouraged by the government to produce skilled manpower in order to support the growing industrial sector. Complete information on India's natural resource base is not available. Relatively large quantities of water for irrigation and hydro-electric power generation are potentially available.

7. DEVELOPMENT PLANNING:

India has achieved significant progress since 1950 as a result of the planned development. But it is a disconcerting fact that vast numbers of poor have not received substantial benefits in the process. A concept of rolling plan has been introduced by the Janata Government to strengthen the system of planning and to ensure implementation. The major objectives of the new five year plan (1978-83) are: elimination of unemployment in the next ten years, significant increase in the standard of living of people below poverty line and provision of a large number of public goods and services to masses with a distinctively rural bias. The plan would have a total outlay of Rs. 1,162,400 million (US\$145,300 million) and it envisages a rate of growth of 4.7 percent. Other highlights of the

plan are massive outlay for agriculture, cottage and small industry and a minimum needs program.

8. EDUCATION:

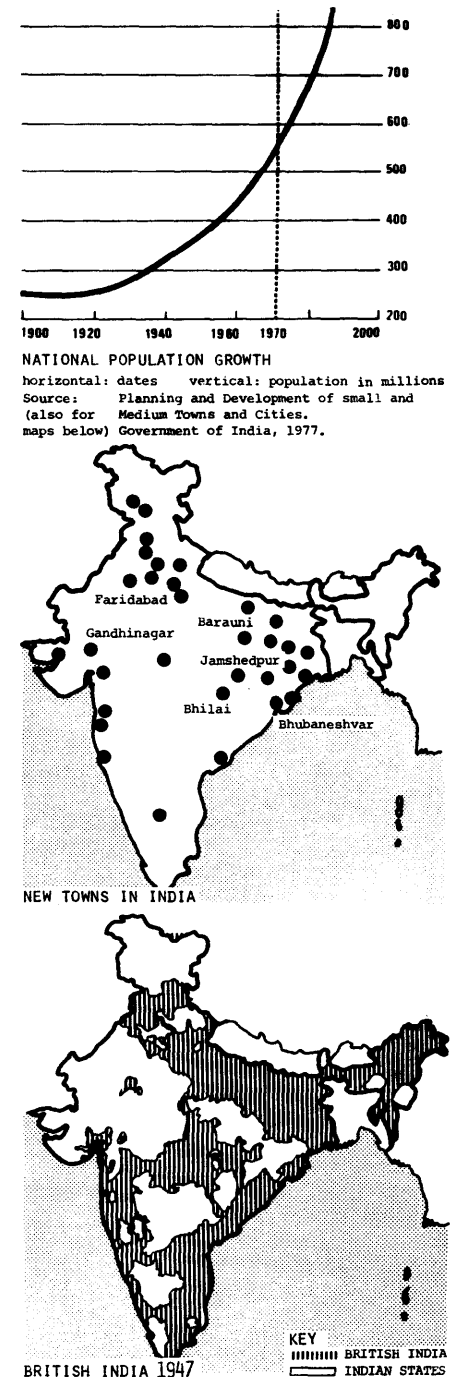
Under the provisions of the Constitution, education is primarily the responsibility of individual states, with some specific powers and responsibilities reserved for the Central government. This accounts for the lack of uniformity in the country's educational system. A uniform pattern of ten years of primary and elementary education followed by two years of secondary - or as it is sometimes called, 'higher secondary' - education, and three years of university education is being adopted in many states. Regional languages are the common media of instruction upto secondary education, whereas English replaces them, for the most part, at the university level. In 1971, 29.45% of the total population, 39.45% of the males, and 18.70% of the females - including the 0 to 4 years age group - were literate.

9. LIVING CONDITIONS:

Consumer goods and preferences vary widely throughout the country. For a larger sector of the population, particularly rural and urban poor, little money is left after expenditures for food, clothing and shelter, which are mostly obtained from what is locally produced and available. However, with increasing communication and extensive transportation networks, wider distribution of consumer goods has been possible. Housing continues to be inadequate in all India. Basic services: water supply, sewage disposal and electricity are inadequate in both rural and urban areas. Poor environmental conditions have created serious health hazards. The main objective of the national health programme is the control and eradication of communicable diseases.

NATIONAL CONTEXT SOURCES

- General Information: A. and V. Chavda, MIT thesis, 1977.
- Census of India publications, 1971.
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- Planning and Development of Small and Medium Towns and Cities, Ministry of Works and Housing, Government of India 1977.





# CITIES IN GUJARAT

## URBANIZATION TRENDS

### URBANIZATION TRENDS: INDIA.

India is no exception to the Third World phenomenon of population explosion coupled with rapid urbanization. During the period from 1921 to 1971, India doubled its population, while the urban population multiplied five times during the same period. Except for the people living in nine metropolitan cities, the major bulk of the population is distributed in 133 intermediate cities, ranging in population between 100,000 and one million each. The towns and cities in India today owe their origin to a number of motivating factors. Most cities have had their origin in the middle ages as centers of administration. They also gained importance as local trading and distribution centers for a variety of agricultural products produced in the region. Locational advantage has been however, an influential factor during the recent years. Cities have sprung up around the important transportation junctions and along the major arteries of the country's transportation network. Growth of such cities has also been witnessed around religious centers, seats of government and campuses of learning. Calcutta, Bombay and Madras -the largest cities- owe their existence to the British rulers, who developed them as port cities. Some of the smaller metropolitan cities of distinctively Indian origin such as Ahmedabad, Bangalore and Hyderabad have gained importance as the seats of various State Governments. New Delhi, developed by British in the early 20th century near the ancient city of Delhi, has experienced rapid growth during post independence era and continues to grow as the capital city of free India. In addition to the growth of metropolitan cities, many of the intermediate cities have also been growing rapidly. During the period between 1961-1971, Calcutta grew 22% to a population of more than 7 million, while some of the smaller cities like Durg, Vadodara and Rajkot grew 134%, 70% and 54% respectively.

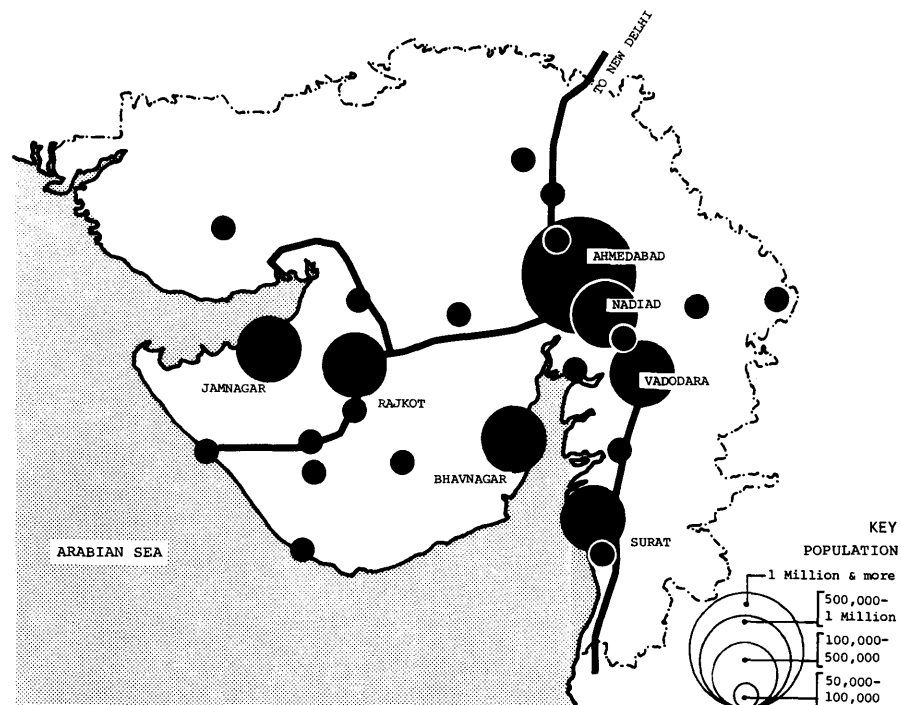
**PHOTOGRAPHS:**  
 (top) Raiya Naka Road, Rajkot, 1978: A commercial street leading to the walled city. (bottom left) Jamnagar, 1978: Illegal commercial developments. (bottom right) Surat, 1978: Squatters along the railway line.

### URBANIZATION TRENDS: GUJARAT STATE

Gujarat, in the western part of India, is the third most urbanized state in India. In 1971, the urban component of Gujarat's total population was 28%, while those of Maharashtra and Tamilnadu States were 31% and 30% respectively.

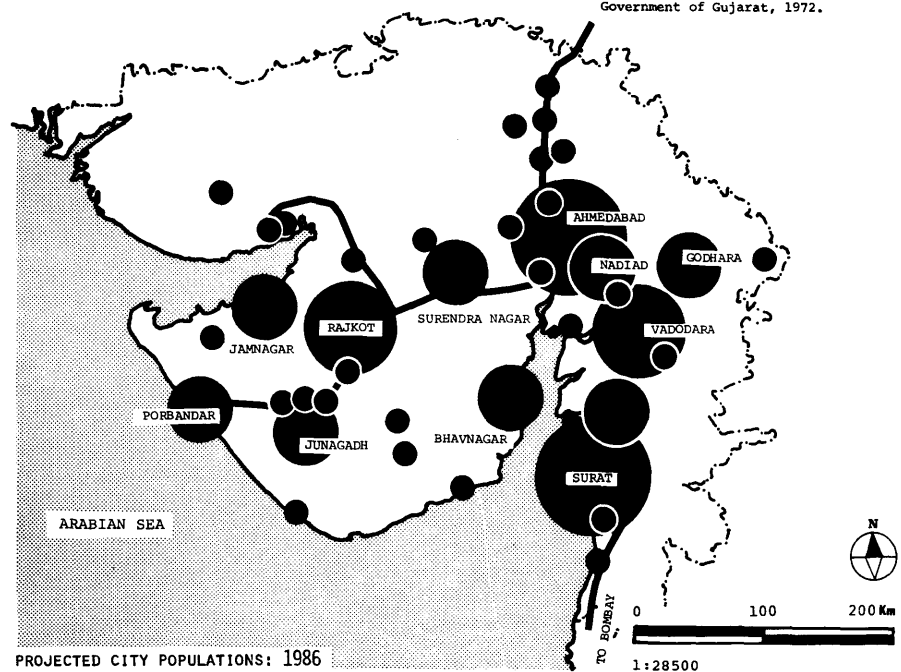
City of Ahmedabad, seventh largest in India and the largest in Gujarat State is one of the centers for industrial and commercial activities in India. In the span of 75 years from 1901 to 1975, the population of Ahmedabad increased 8.5 times to a little over 2 million.

In recent years, Gujarat has witnessed a spectacular growth in industrial development. Five out of the six intermediate cities are rapidly growing industrial centers. Surat with 471,815 people in 1971, is the largest in this category. It has experienced phenomenal development of art silk, textile and diamond industries in the recent years. A rayon factory and an industrial estate within three miles radius of the city have been adding to the city's expansion. Vadodara, at the bifurcation of two major railways linking Bombay with Delhi and Ahmedabad has experienced maximum industrial expansion. Establishment of large industrial complexes as a result of the discovery of oil in the region, along with a large industrial estate have changed this beautiful princely capital into a booming industrial center. Rajkot, in the Saurashtra Peninsula continued its importance as administrative city till 1960, when the capital was shifted to Ahmedabad as a result of the reorganization of states in India. The first city to have an industrial estate in India, Rajkot has developed very rapidly during the past few decades. Both the cities of Jamnagar and Bhavnagar have been experiencing rapid growth in industrial activities Today, seven years after 1971 census, at least four more cities have been added to this category. Porbandar as an all-weather port has been gaining importance as a center for lime and cement products, while Junagadh, the historic princely town, is now the center for agriculture based products and industries. Bharuch, with a new industrial estate and a massive fertilizer complex, is likely to grow at a much faster rate. As the trend suggests, cities between Bombay and Ahmedabad have been growing faster than the other cities.



CITY POPULATIONS: 1971

Source: Perspective Plan of Gujarat 1974-1984. Government of Gujarat, 1972.

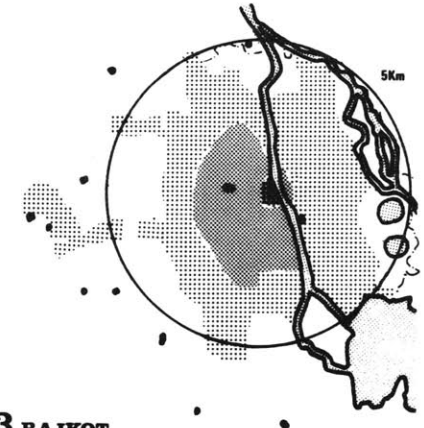
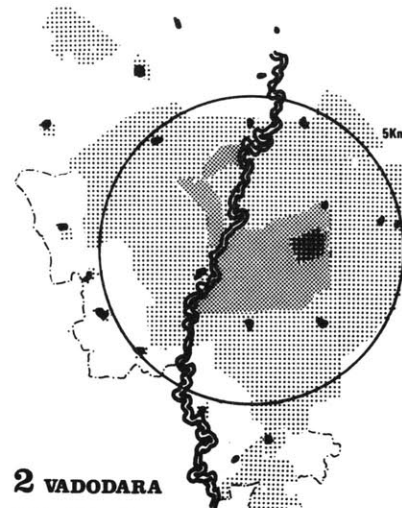
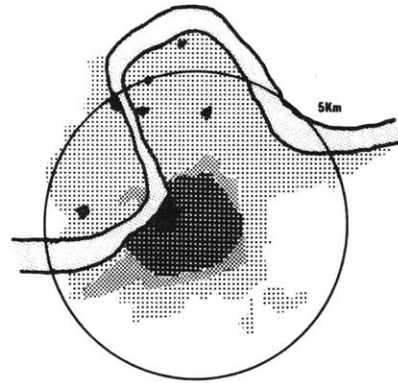
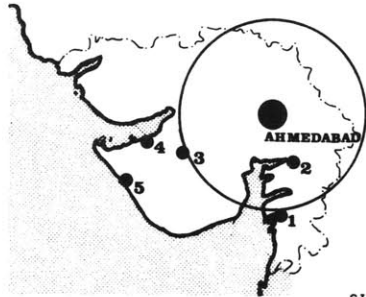


PROJECTED CITY POPULATIONS: 1986

1:28500

**THE INTERMEDIATE CITIES  
GUJARAT STATE**

**URBAN GROWTH PATTERNS**



**CITY DATA**

POPULATION  
POPULATION GROWTH RATE FROM 1961 TO 1971  
ADMINISTRATIVE CITY LIMITS

**1 SURAT**

1978: 550,000      1971: 471,815  
63.81 %  
1978: 65 Km<sup>2</sup> approx. 1961: 08.26 Km<sup>2</sup>

**LOCATION**

230 Kms. from Bombay,  
220 Kms. from Ahmedabad,  
120 Kms. from Vadodara and  
on the bank of river Tapi.

**HISTORY**

Founded in 15th century, sacked by Portuguese  
in 1512. Under Moguls from 1546 to 1725.  
A castle built in 1546. Factories built by  
the British and the Dutch in 16th century.  
Under British Rule from 1759 to 1947.

**EMPLOYMENT STRUCTURE**

20 % Industrial  
35 % Trade and ommerce  
8 % Transport and services  
37 % other

**LOCAL AUTHORITY**

Surat Municipal Corporation

**HOUSING**

PERCENTAGE POPULATION LIVING IN RENTAL HOUSES  
PERCENTAGES OF HOUSEHOLDS IN ONE ROOM HOUSE  
OCCUPANCY RATE  
SLUM POPULATION IN 1972

64 % Rental  
49 %  
2.75 persons/room  
92,587 people

PUBLIC HOUSING BUILT- NUMBER OF TENEMENTS  
- % OF TOTAL HOUSING

2518  
4 %

**INFRASTRUCTURE SERVICES**

WATER  
SEWERAGE  
STORM DRAINAGE  
ELECTRICITY  
GAS  
REFUSE COLLECTION  
PUBLIC TRANSPORTATION  
PAVED ROADS, WALK WAYS  
TELEPHONE  
STREET LIGHTS

Limited  
Limited  
Limited  
Adequate  
None  
Limited  
Limited  
Limited  
Limited  
Adequate

**COMMUNITY FACILITIES**

POLICE  
FIRE PROTECTION  
HEALTH  
COLLEGES AND SCHOOLS  
RECREATION AND OPEN SPACES

Limited  
Limited  
Limited  
Limited  
Limited

**2 VADODARA**

1978: 594,800      1971: 467,422  
56.64 %  
1978: 75.08 Km<sup>2</sup>      1961: 25.17 Km<sup>2</sup>

350 Kms. from Bombay,  
100 Kms. from Ahmedabad,  
120 Kms. from Surat and  
on the bank of river Vishvamitri.

A citadel built in 15th century by Moguls.  
Maratha conquest in 1734. Constant disputes  
among Gaikwads, Peshvas and British. The  
British Rule from 1830 to 1947. The capital  
of Baroda State till independence in 1947.

40 % Industrial  
16 % Trade and commerce  
9 % Transport and services  
35 % other

Vadodara Municipal Corporation

72 % Rental  
41 %  
2.43 persons/room.  
49,903 people.

3987 by GHB and 6389 by VMC.  
10 %

Limited  
Limited  
Limited  
Adequate  
Limited  
Adequate  
Limited  
Limited  
Limited  
Adequate

Limited  
Adequate  
Limited  
Adequate  
Adequate

**3 RAJKOT**

1978: 400,000      1971: 300,512  
54.60 %  
1978: 69.23 Km<sup>2</sup>      1961: 38.46 Km<sup>2</sup>

251 Kms. from Ahmedabad,  
Connected with other cities by highways,  
railways and by air.  
On the bank of river Aji.

Originated in 1259, it was fortified in 1722  
under the Moguls. Under British Rule from  
1822 to 1947. A British civil station was  
established in 18th century. The capital of  
former Saurashtra State till 1960.

30 % Industrial  
22 % Trade and commerce  
9 % Transport and services  
39 % other

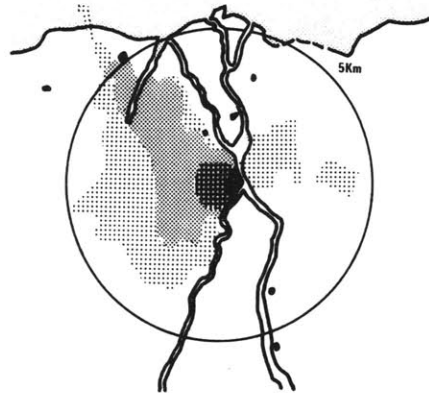
Rajkot Municipal Corporation

70 % Rental  
70.2 %  
3.72 persons/room  
26,578 people

3185 by GHB and 200 by RMC  
6 %

Limited  
Limited  
Adequate  
Adequate  
None  
Limited  
Limited  
Limited  
Limited  
Adequate

Limited  
Adequate  
Limited  
Adequate  
Adequate



**4 JAMNAGAR**

1978: 300,000      1971: 214,853  
 44.61 %      42.41 %  
 1978: 22.90 Km<sup>2</sup>      1961: 14.42 Km<sup>2</sup>

88.5 Kms. from Rajkot. Connected by land, air and sea with other cities. On the confluence of Nagmati and Rangmati rivers.

Founded in 1540 by Jam Raval, it was occupied by Moguls in 1751. Fortified in 1788. Under British Rule from 1812 to 1947. The capital of Navanagar State till independence in 1947.

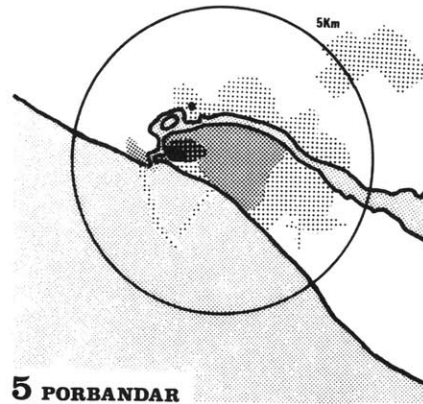
28 % Industrial  
 22 % Trade and commerce  
 8 % Transport and services  
 42 % other  
 Jamnagar Municipality

61 % Rental  
 43.4 %  
 2.90 persons/room  
 44,644 people

2678 by GHB  
 5 %

Limited  
 Limited  
 Limited  
 Adequate  
 None  
 Limited  
 Limited  
 Limited  
 Limited  
 Adequate

Limited  
 Limited  
 Limited  
 Adequate  
 Limited



**5 PORBANDAR**

1978: 125,000      1971: 96,000  
 42.41 %      44.4 %  
 1978: 9.92 Km<sup>2</sup>      1961: 9.92 Km<sup>2</sup>

200 Kms. from Rajkot. All weather port. Connected by land, air and sea with other cities. On Arabian Sea.

A historic city, originated in 100 A.D. An important port. Ruled by Jethvas in 15th century. Fortified in 1686 under Moguls. Under British Rule from 1863 to 1947.

36 % Industrial  
 21 % Trade and commerce  
 23 % Transport and services  
 20 % other  
 Porbandar Municipality

60 %  
 40 %  
 2.85 persons/room  
 not available

none  
 not available

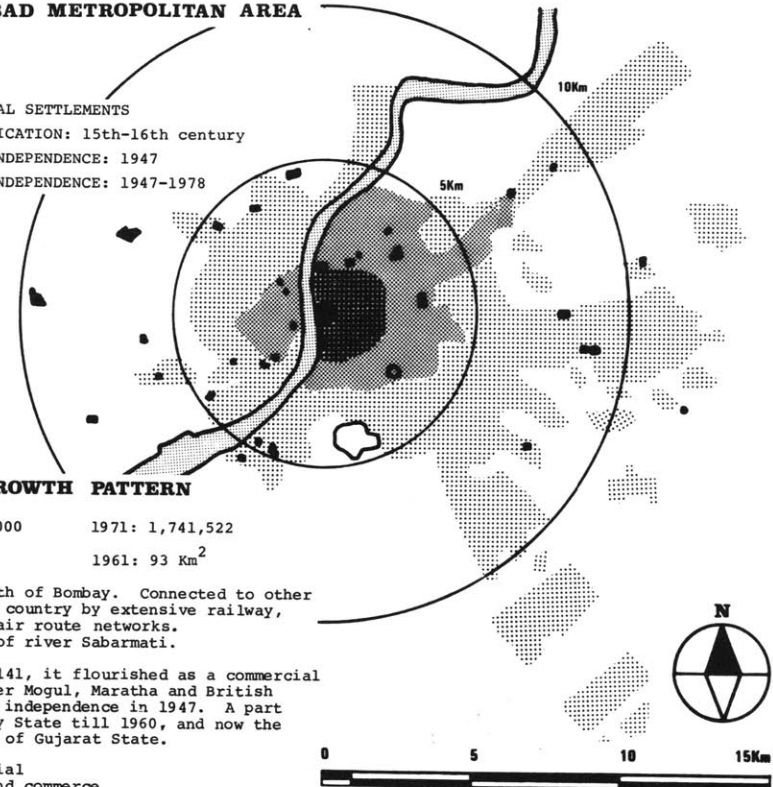
Limited  
 Limited  
 Limited  
 Adequate  
 None  
 Limited  
 Limited  
 Limited  
 Limited  
 Adequate

Limited  
 Limited  
 Limited  
 Limited  
 Limited

**AHMEDABAD METROPOLITAN AREA**

KEY

- ORIGINAL SETTLEMENTS
- ▨ FORTIFICATION: 15th-16th century
- ▩ TILL INDEPENDENCE: 1947
- ▧ POST INDEPENDENCE: 1947-1978



**URBAN GROWTH PATTERN**

1978: 2,200,000      1971: 1,741,522  
 44.4 %      44.4 %  
 1978: 93 Km<sup>2</sup>      1961: 93 Km<sup>2</sup>

560 Kms. north of Bombay. Connected to other parts of the country by extensive railway, highway and air route networks. On the bank of river Sabarmati.

Founded in 1141, it flourished as a commercial center. Under Mogul, Maratha and British Rules before independence in 1947. A part of the Bombay State till 1960, and now the capital city of Gujarat State.

47 % Industrial  
 20 % Trade and commerce  
 22 % Transport and services  
 11 % other  
 Ahmedabad Municipal Corporation

76 %  
 58 %  
 4 persons/room  
 470,210 people

30,563  
 8 %

Limited  
 Limited  
 Limited  
 Adequate  
 None  
 Limited  
 Adequate  
 Limited  
 Limited  
 Adequate

Limited  
 Limited  
 Limited  
 Adequate  
 Limited



**HOUSING**

PERCENTAGE POPULATION LIVING IN RENTAL HOUSES  
 PERCENTAGES OF HOUSEHOLDS IN ONE ROOM HOUSE  
 OCCUPANCY RATE  
 SLUM POPULATION IN 1972

PUBLIC HOUSING BUILT- NUMBER OF TENEMENTS  
 - % OF TOTAL HOUSING

**INFRASTRUCTURE SERVICES**

WATER  
 SEWERAGE  
 STORM DRAINAGE  
 ELECTRICITY  
 GAS  
 REFUSE COLLECTION  
 PUBLIC TRANSPORTATION  
 PAVED ROADS, WALK WAYS  
 TELEPHONE  
 STREET LIGHTS

**COMMUNITY FACILITIES**

POLICE  
 FIRE PROTECTION  
 HEALTH  
 COLLEGES AND SCHOOLS  
 RECREATION AND OPEN SPACES

**REASONS FOR RAPID URBAN EXPANSION**

*Most Indian cities have traditionally been the centers of administrative and cultural importance. A wide variety of factors have influenced their growth in the recent years, as is shown in the chart below.*

			SURAT	VADODARA	RAJKOT	JAMNAGAR	PORBANDAR
LOCATIONAL ADVANTAGE:	CENTRAL LOCATION	-in the district -in the State -in the geographical area		■	■		
	RICH HINTERLAND			■	■		
	EASY ACCESS TO WATER	-river -lake	■	■	■	■	■
				■	■	■	■
TRANSPORTATION LINK:	RAILWAYS	-junction -on major railway linking Bombay/Delhi	■	■	■		
	ROADS	-on national highway -on state highway	■	■	■		■
	AIR	-international airport -domestic airport	■	■	■	■	■
	WATER	-port facilities -seasonal ports -all weather port				■	■
COMMERCIAL CENTER:		-in the district -in the geographical area	■	■	■	■	
INDUSTRIAL EXPANSION:		-industrial estates -small scale industries -large industries	■	■	■	■	■
EDUCATIONAL FACILITIES:	COLLEGES	-engineering -medicine -general education	■	■		■	
	UNIVERSITIES		■	■	■	■	■
ADMINISTRATIVE CENTER:		-in the district -in the state	■	■	■	■	
INMIGRATION:		-migrants from Pakistan -from rural areas -returning Indians from abroad	■	■	■	■	
HISTORICAL IMPORTANCE:			■	■	■	■	■



# RAJKOT, GUJARAT

## URBAN CONTEXT

**PRIMARY INFORMATION:** Rajkot, one of the 133 intermediate cities in India and an important city in Gujarat State, is situated at about 250 Km south-west of Ahmedabad, in western India. The city is located 138 m above mean sea level on 20 18' north latitude and 70 51' east longitude. It is connected with the other parts of the country by extensive railway, highway and air route networks. The city is characterised by its hotdry climate; summer temperatures go as high as 110 F, with hot winds and occasional sand storms. The four coldest months are mild with temperatures reaching 45 F. The area is characterised by light brown agricultural land and is essentially plain. The annual rainfall is about 600 mm. The Aji river runs north-south through the city but remains dry except during the monsoon months.

**HISTORY:** Originated in 1259 as a relief center during a famine that struck entire India, Rajkot became a flourishing settlement on the western bank of river Aji. The settlement was fortified in 1722 by Masumkhan and a wall was built around it for security. Following constant disputes between the Mogul and the Maratha rulers, supremacy of the British was accepted in 1822. The East India Company established a Civil Station "Sadar" on 638 acres of land near the walled city. As a seat of Governor General and later the Resident and Crown Representatives, Rajkot flourished as an administrative, educational, and commercial center in the region. After independence in 1947, it became the capital of Saurashtra State. Reorganization of states in India in 1960, made it a part of newly formed Gujarat State and Ahmedabad was made the capital city. However, its importance continued. Bhaktinagar Industrial Estate was established in 1950, with the technical assistance from the USA, and Aji Industrial Estate was established in 1960. Post independence industrialization and the establishment of Saurashtra University in 1967 have given a new direction to the growth of the city.

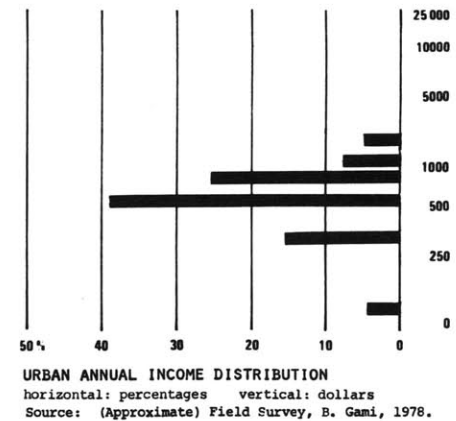
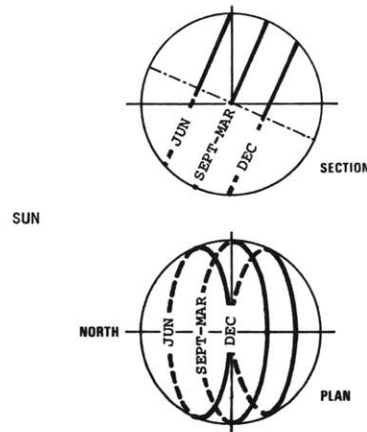
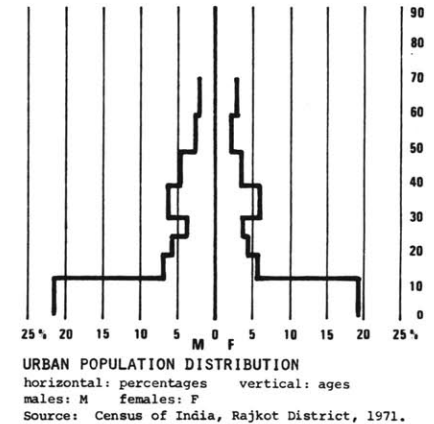
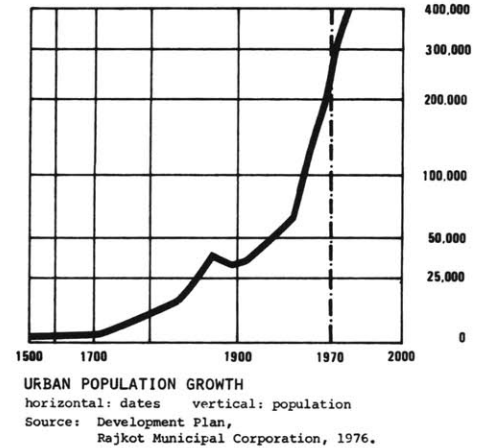
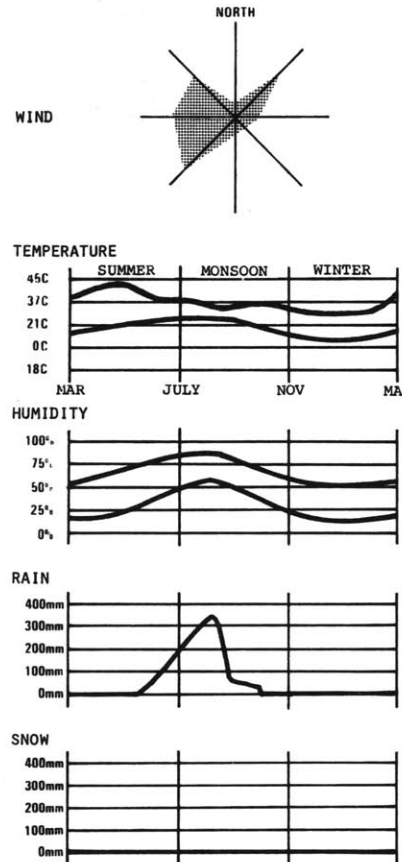
**ECONOMY:** It is a major industrial/commercial city in Saurashtra Peninsula. There are 3000 engineering units mostly manufacturing diesel engine spareparts. The city also has a variety of other industries such as oil mills, solvent extraction plants and machine tools manufacturing units. In 1971, 26% of the city's population was economically active, out of which only 2% was female. 30% of the working population was employed in industries, 22% in trade and commerce, 9% in transportation and communication and 3% in building industry. A part of the non working population is self employed.

**GOVERNMENT:** The Rajkot Municipal Corporation was established in 1973. It is headed by a mayor elected by the members of a council, who are elected representatives from various political wards. ( 18 in 1977 ). The executive power of the municipal corporation vests in a commissioner who is also responsible for prescribing duties of various establishments and supervision of their work. The corporation administers and executes functions relating to taxation and finance, transportation, health and education. An engineering office, a town planning branch and a public works department are responsible for the provision of services authorization of land subdivisions, issuing building licences and building inspection.

### URBAN CONTEXT SOURCES

- Topography /Circulation:* (accurate) Rajkot Municipal Corporation, 1978.
- Land Use Pattern:* (approximate) Field survey, B. Gami, 1977 & 1978.
- Income Pattern:* (approximate) IBID
- Density Pattern:* (approximate) IBID
- Climate:* (accurate) Census of India, Rajkot District Hand-book, 1971. Climatological and Solar Data for India, 1969.
- Photographs:* Bharat Gami, 1977 & 1978.
- General Information:* Development Plan for old limits, 1971, and for extended limits, 1976, Rajkot Municipal Corporation, 1978. Urban Dynamics of Rajkot City, 1971.

RAJKOT 20 18' N





**DEMOGRAPHY:** The population of Rajkot urban area was 300,612 in 1971. It represents an increase of 41.65% in the last decade. Approximately 50% of the population was born outside the city. 47.97% of the population was female. The literacy rate was 55%. The population can be broadly divided into following age groups: 41% below 14 years, 54.22% between 15-59 years and 4.7% above 60 years. The population consists of 83% Hindus, 8% Muslims and 5% Jains.

**SOCIO-CULTURAL:** Like most of the urban centers in India today, Rajkot is populated by people from diversified ethnic origins, religions, socio-cultural backgrounds, occupations and castes. Each group has its own way of life. Expression of their living pattern is frequently found in their environments through uses of areas and spaces of varying character: verandahs, front and back yards, chawl- a centrally located open area where rooms or dwellings lead to, in a house or a cluster.

**SOCIO-ECONOMIC:** More than half of the city's population is classified as poor, who earn less than Rs. 3600 (U.S.\$ 450) per year. Up to 25% of the population belongs to the moderately low and lower middle groups, who earn up to Rs. 10,800 (U.S.\$ 1350) per year. Rest

of the population belongs to middle and high income groups. The low income population has accrued in south-western part of the city.

**URBAN DEVELOPMENT:** In the span of 30 years, from 1947 to 1977, population of the city has increased 4.5 times and the municipal area 1.8 times. One of the earliest comprehensive development plans was prepared in 1929. The city limits were extended in 1962, from 38 Km.<sup>2</sup> to 60 Km.<sup>2</sup>. The development plan for the old city limit was approved in June 1971, while that for the extended city limit was approved in October 1976. However, a lot of land development and subdivision has already taken place in and around the city, without any urban development plans or any regulations. Zoning regulations, municipal building by-laws and other ordinances controlling the urban growth have existed for a long time, but have not been successfully implemented or enforced. At the same time, a need for expansion and/or introduction of infrastructure services and community facilities to accommodate the growing population has been posing great problems to the local authority in the city. The development plan for the extended city limit proposes 30.25% for residential, 14.24% for industrial, 2.46% for commercial



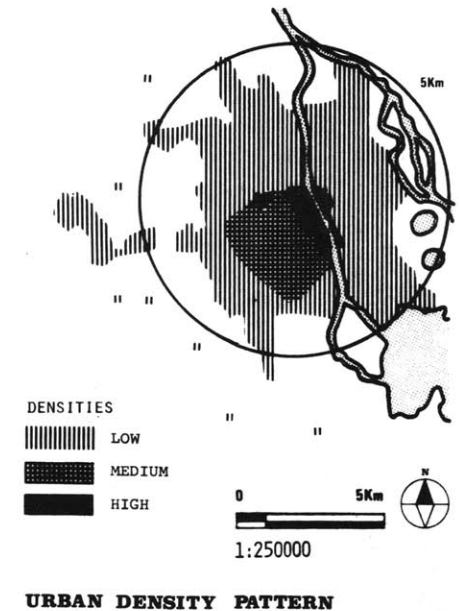
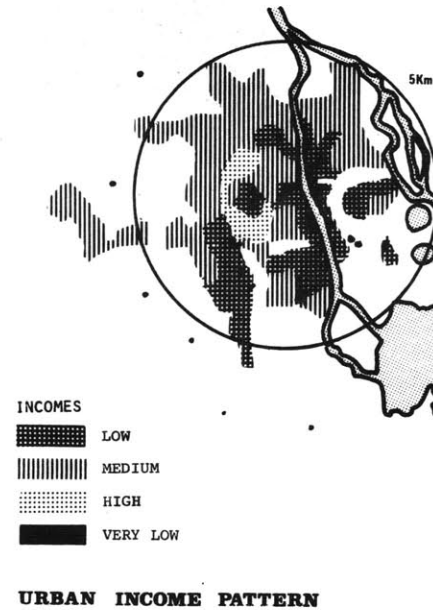
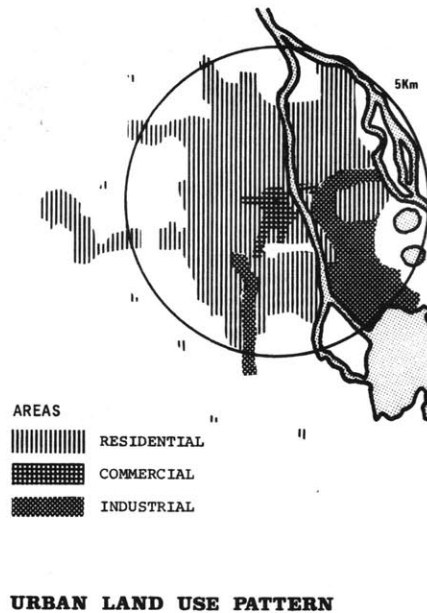
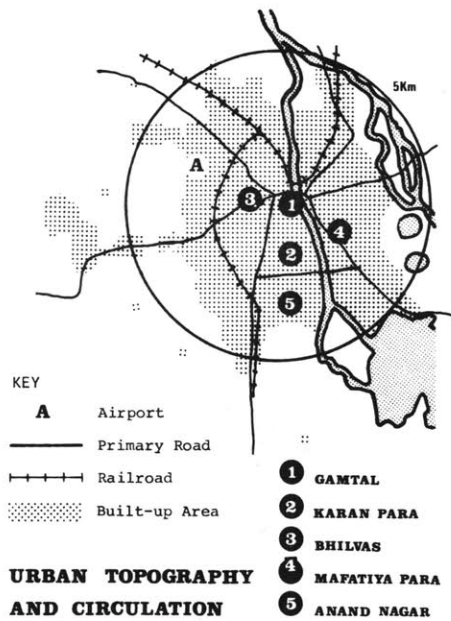
and 24.25% for recreational uses. The range of proposed gross densities is 187 to 493 persons/hectare.

**HOUSING:** A large part of the city's population lives in housing classified by authorities as substandard or unfit for habitation. 70% of the population lives in one room dwellings shared by six persons on an average. Roughly, 70% of the population lives in rental housing. Approximately 15% of the population lives in traditional housing in the walled city, 17% in the squatter settlements, 62% in housing by private sectors and 6% in government housing projects. According to the estimated housing shortages in the city in 1971, about 80% was among the low income groups. The public sector involvement has been marginal. The city lacks realistic urban development and housing policies. The housing development efforts are very small in scale as well as scattered and only in response to immediate needs. The type of housing options and the size of individual units varied according to the needs and the economic constraints of the past years. The following overview of housing systems developed in the past fifty years illustrate the present conditions and future needs.

**PHOTOGRAPHS:**  
(left) Sadar, Rajkot, 1977: A commercial street. (also published in *Urbanization Primer* by H. Caminos and R. Goethert, MIT Press, 1978.) (right) Raiya Naka Road, Rajkot, 1978: A commercial street leading to the walled city.

**CHAWL:** The chawls are generally very high density developments consisting of rows of one room or one room and a fronting verandah. They have limited or inadequate communal facilities; water supply and toilets. Such developments were usually rented to the tenants. High demand and low supply of housing has supported speculation in chawls. Many of the chawls are now governed by the municipal corporation and the rents have been frozen since independence. As a result, the chawls have remained unmaintained and have become an economical burden to the owners. In some instances, the chawls have been sold to the occupants and the physical conditions of the housing have been improved by them.

**SQUATTER SETTLEMENTS:** Recently, with the inability to cope with the high demand for housing by the new migrants, squatting has become prevalent on the open land in the city. These settlements are developed as rural pockets in the urban areas with physical environment resembling the villages.



A recent survey (in 1972) of the squatter settlements in the city, has identified 24 such locations, housing roughly 17% of the city's population. Nearly 75% of the households have a family size of five to seven persons. About 50% of the family heads are illiterate and only 7% of them are educated up to the secondary school level. Nearly 13% are self employed while about 33% work as casual workers. Other sectors of employment include government, private agencies, banks, small manufacturing units, transportation services and so on. These illegal settlements lack basic services. The quality of housing depends on the age of the settlement. The newer settlements have small dwellings made from assorted salvage materials. These temporary dwellings are built around a common semi-private open space. The dwellings in the older settlements are consolidated using mud or brick walls and clay tiles or galvanized iron roofs. Communal water taps and water closets have been provided by the municipal corporation in recent years, but the facilities are highly inadequate.

**CO-OPERATIVE HOUSING SOCIETIES:** In the last 25 years, because of the pressure of increasing land costs, semi-detached houses (locally known as "tenements") and walk-up apartments have become popular among the co-operatives. This is a viable housing option for the higher middle and high income groups. The Gujarat Co-operative Housing Finance Society (GSCFS), a government agency, provides loans with low interest and on long terms for the co-operatives. In 1975, 628 "tenements" were completed and 425 were under construction. The GSCFS had made advances worth Rs. 130.60 lacs (US\$1,625,000.00) by 1975. The co-operatives of 25 to 50 apartments or semi-detached dwellings are continuing to expand very rapidly on the periphery of the city. It is very common to rent one or two rooms which share the services in the same dwelling. However, due to the lack of comprehensive planning, such co-operatives grow haphazardly without any community facilities. Such communities are too small to support any community facilities from their own financial and administrative resources. Such societies are scattered on the periphery.

**PUBLIC HOUSING:** The Housing and Urban Development Corporation (HUDCO) established in 1970, administers and finances through a "revolving fund" a large part of the housing activities at the national level, while the state housing agencies and the local authorities implement the projects. The Town Planning and Evaluation Department of the Gujarat State and the Town Planning Branch of the Municipal Corporation are directly involved in physical planning of the city. The Gujarat Housing Board and the Housing Offices of the Municipal Corporation are responsible for middle and low income housing. The public housing includes a variety of housing types built under various schemes. Integrated subsidized housing schemes are designed for industrial workers in which the government gives 50% as loan and 50% as subsidy. Various low income housing schemes are allotted on hire-purchase basis with an initial deposit of 25% or 50% of the total cost, and remaining amount in monthly instalments spread over 10 to 20 years. However, the housing provided for low income groups remains beyond their financial means. The slum clearance

and environment improvement schemes are partly subsidized by the government and are implemented by the state agency. The aim of these schemes is to rehouse squatters on the same or alternate locations. While the new accommodations, having one room apartments in three storey walk-ups, do not satisfy the socio-cultural needs of the people, the upgrading done in the existing areas are highly inadequate.

Two hundred houses were built in 1977, by the Rajkot Municipal Corporation with the assistance available from the HUDCO. Such attempts by the RMC are to be encouraged for the following reasons. Firstly, as a local authority the RMC is in a position to identify the target population and the housing locations. Secondly, it is possible for the RMC to reserve land for such housing under the various development schemes. (See proposed upgrading project). Since the infrastructure services are provided by the RMC, its own projects would be easily made accessible to such services and would minimize administrative problems.



# CASE STUDIES IN RAJKOT

The selected case studies in the city of Rajkot represent a cross section of housing systems identified in similar intermediate cities in the Gujarat State. These case studies are:

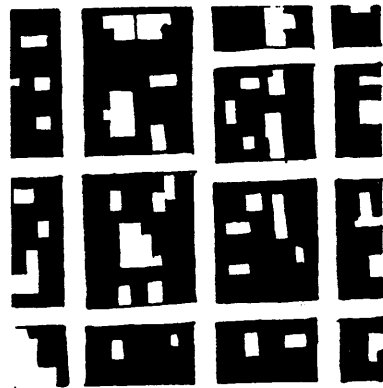
## 1 GAMTAL

Private, low/middle income, Walled city



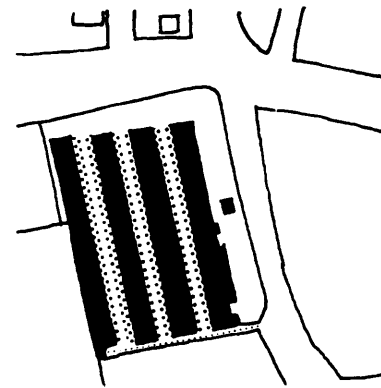
## 2 KARAN PARA

Private, middle/higher middle income. European influence.



## 3 BHILVAS

Private, very low/low income, Chawls.



## 4 MAFATIYA PARA

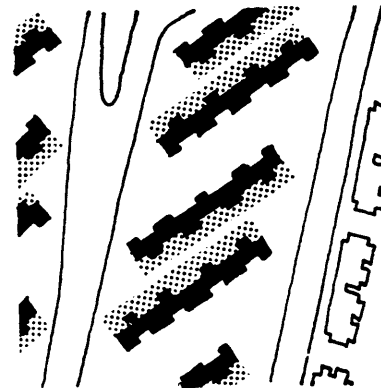
Popular, very low/low income, squatters.



Case studies are the most valuable source of information in formulating urban development policies and housing programs. Existing housing systems have been studied here to investigate their socio-economic and physical patterns and their chronological evolution. The cases are analyzed at four scales: the locality, selected segment of the locality, selected block of the segment and a typical dwelling unit. The efficiency of settlements and physical layouts is studied through comparative analysis/evaluation of land utilization patterns, circulation efficiencies, population densities, existing infrastructure services and community facilities.

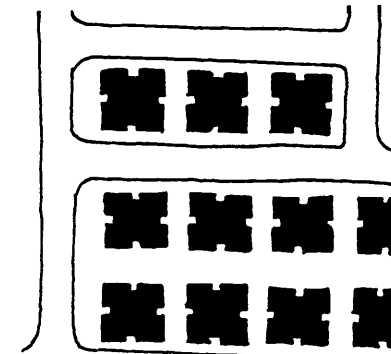
## 5a ANAND NAGAR

Public, low/middle income, single storey row houses.



## 5b ANAND NAGAR

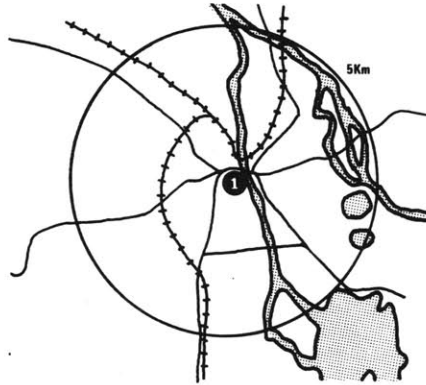
Public, low/middle income, Three storied walk-up apartments



# 1 GANTAL

PRIVATE, LOW/MIDDLE INCOME, WALLED CITY

## Rajkot



**LOCATION:** Gantal is located in the center of the city on the western bank of river Aji. The area, fortified in 1722, covers approximately 35 hectares of land. Major commercial areas in the city are on the western part of the walled city and outside the fortified area. An old fort, known as Darbar Gadh, houses some of the governmental offices today.

**ORIGIN:** Dating back to 1259, the locality was one of the first settlements in the area. Bounded by the river Aji on east and two natural water canals, 'nallahs,' on the north and south respectively, the settlement was fortified in 1722 for security reasons. A moat was dug on the western side, thus protecting the area on all four sides by water. The residential areas which branch off from the main streets were mainly developed by the end of 18th century. A grain market was constructed near Kotharia Naka and Mandvi Chawk on Darbar Gadh, and was developed as a central activity area in the city. Most of the dwellings are two to three stories high with internal chawks. 66% of the houses were built using stone as primary building material.

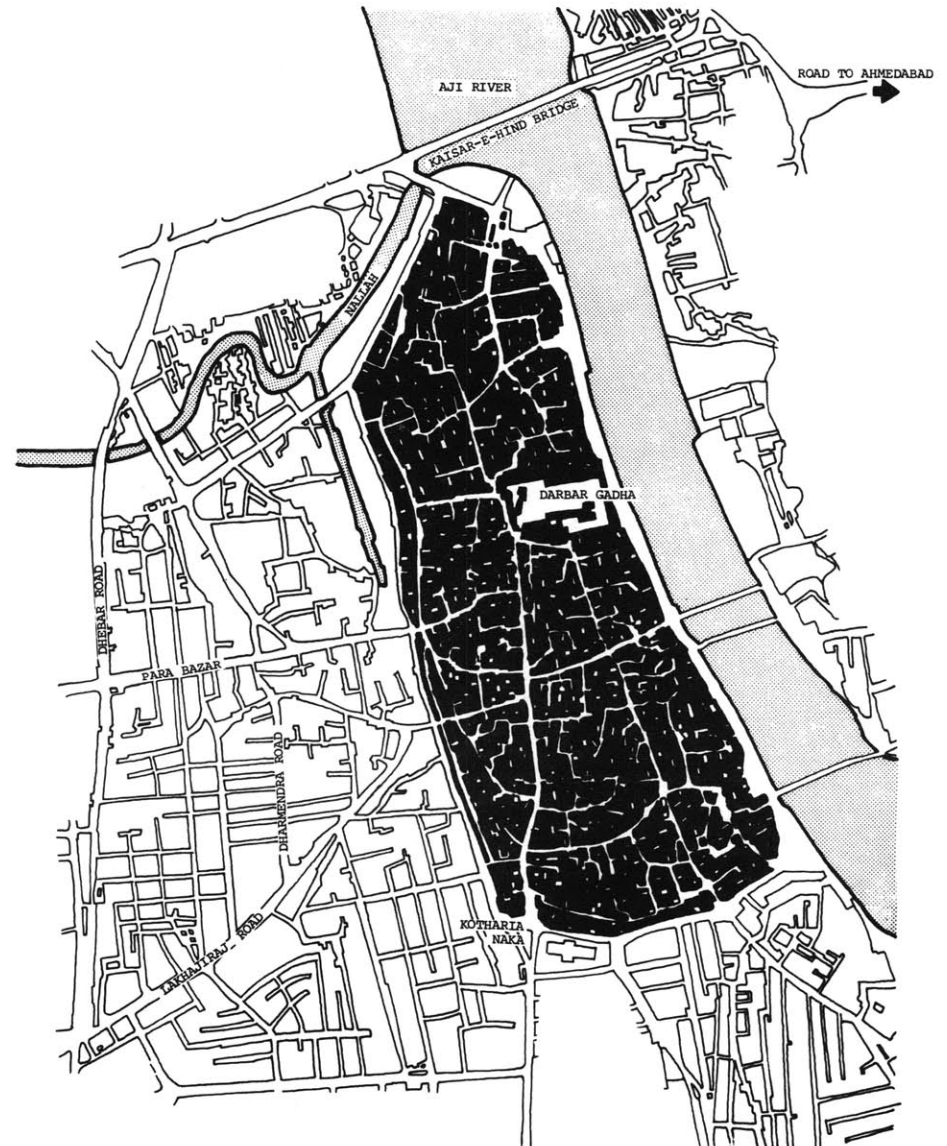
**LAYOUT:** The entire layout is characterized by a geometrically arbitrary pattern of "Pols", which are closed loops or dead end streets terminating to form a "Chawk", an open area providing an access to dwellings around it. The land subdivision within the pol is very irregular and in almost all cases, the entire lot is covered by construction. The lots are narrow and the houses have common walls to avoid heating of walls by direct sun exposure. Two to three stories high houses shade narrow streets as protection against the hot-dry climate. A central open court in many houses is a good source of light and ventilation. A temple or a mosque is shared by 2 to 3 pols.

**LAND USE:** The locality is characterized by mixed land use of residential and commercial areas. The major retail shopping has grown along the important circulation routes. Wholesale and retail markets for food grains, vegetables, fruits, timber, building materials etc. are grouped outside the fortified area. There is a total absence of recreational areas or parks. Municipal buses do not enter the fortified area.

**CIRCULATION:** Darbar Gadh Road and Gujari Bazar Road inside the walled area and Para Bazar, Dhebar Road, Dharmendra Road and Lakhajiraj Road outside the walled area are major circulation routes in the locality. The traffic varies enormously in speed and volume. It includes pedestrians, bicycles, hand pulled carts, scooters, autorickshaws, cars, buses and occasionally stray animals.

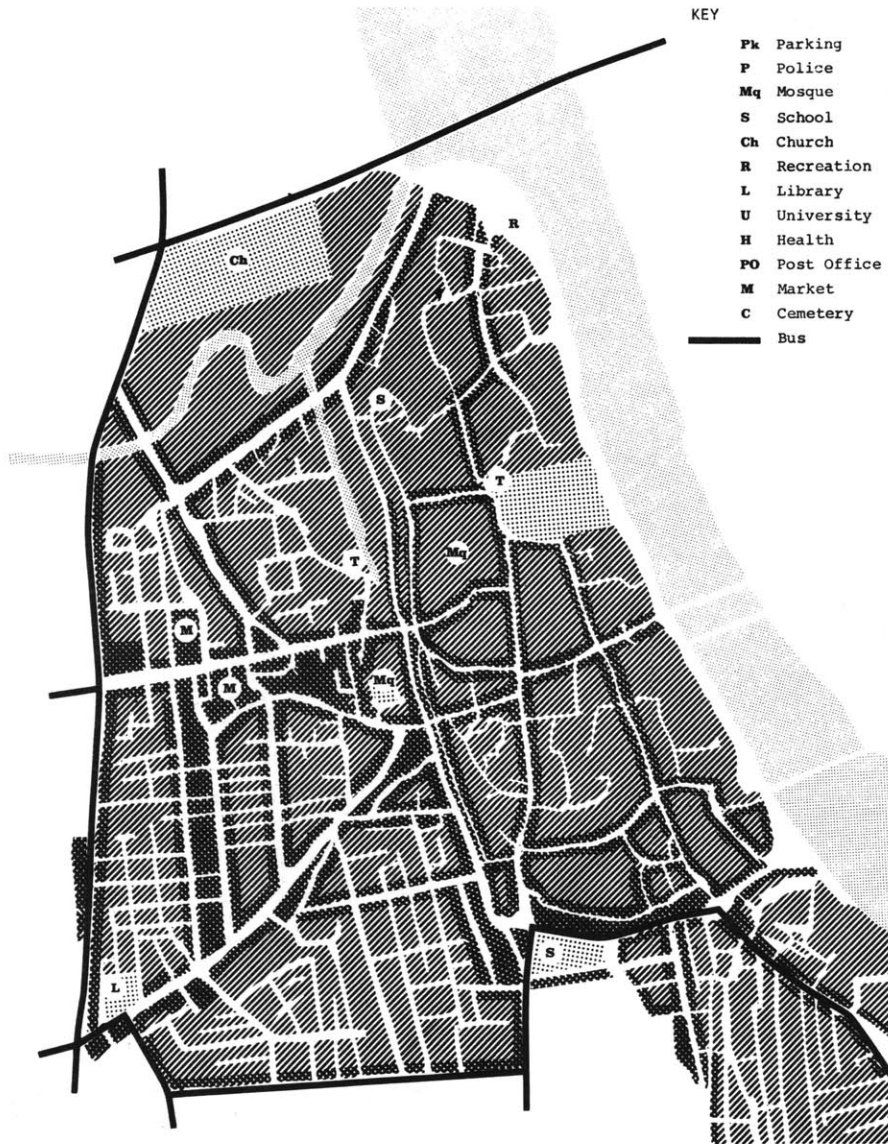
### CASE STUDY SOURCES

plan: (accurate) R.M.C. Office, 1978.  
 Land Use Pattern: (approximate) Field Survey, Bharat Gami, 1978.  
 Circulation Pattern: (approximate) IBID.  
 Segment Plan: (accurate) City Survey Office, 1978.  
 Block Plan: (accurate) IBID.  
 Block Land Utilization: (accurate) Field Survey, Bharat Gami, 1978.  
 Typical Dwelling: (approximate) IBID.  
 Physical Data: (approximate) IBID.  
 Socio-Economic Data: (approximate) IBID.  
 Photographs: Bharat Gami, 1978.  
 General Information: Field Survey, Bharat Gami, 1978.



LOCALITY PLAN

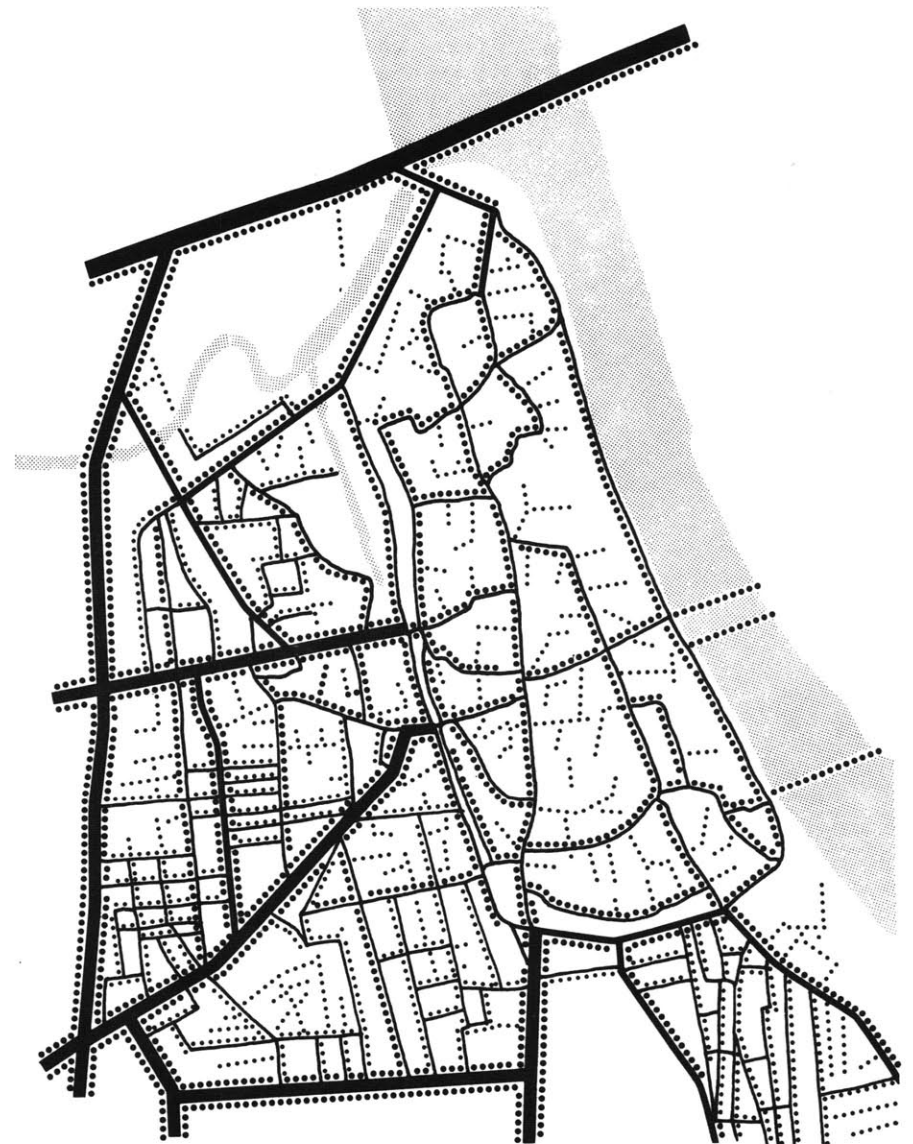
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 1:10000



- KEY
- Fk Parking
  - P Police
  - Mq Mosque
  - S School
  - Ch Church
  - R Recreation
  - L Library
  - U University
  - H Health
  - PO Post Office
  - M Market
  - C Cemetery
  - Bus

- AREAS
- RESIDENTIAL
  - COMMERCIAL
  - INDUSTRIAL
  - OPEN SPACES

LOCALITY LAND USE PATTERN

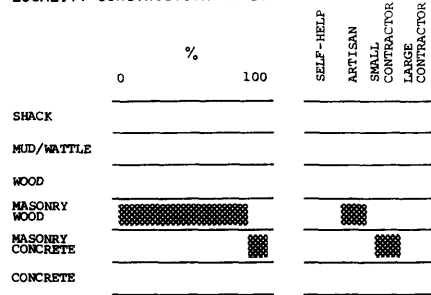


- KEY
- VEHICULAR
  - PEDLSTRIAN

LOCALITY CIRCULATION PATTERN



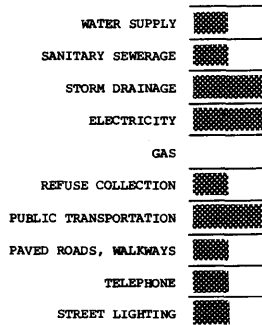
LOCALITY CONSTRUCTION TYPES



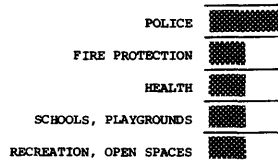
The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type.

Quality of information: approximate

LOCALITY UTILITIES AND SERVICES



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

SELECTED BLOCK



LOCALITY SEGMENT PLAN







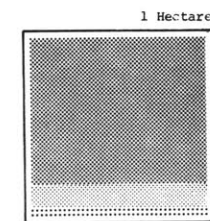
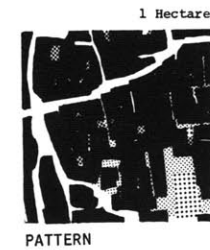
**KEY**

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

**LOCALITY BLOCK LAND UTILIZATION**

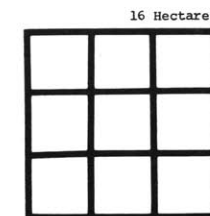


**SUMMARY DIAGRAMS**



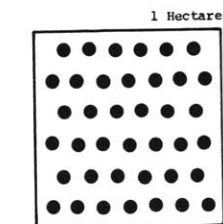
**PERCENTAGES**

Streets/Walkways	11%
Playgrounds	4
Cluster Courts	11
Dwellings/Lots	74



**CIRCULATION EFFICIENCY**

Unit Length	135
m/Ha.	



**DENSITY**

Persons/Hectare	
● 20 Persons	780

**POPULATION AND INCOME:** In 1971, 15% of the city's population lived in the walled city. In the past upper middle and high income extended families lived in the locality. Many of them moved during the last 100 years to the extensions towards the southwest area of the city. A majority of the new occupants are connected to the surrounding commercial areas. There is a great degree of cohesion and interaction resulting from grouping based on common interests. The annual family income ranges from Rs. 6,000 to Rs. 15,000 (U.S.\$ 750 to \$ 1875), which is two to five times the subsistence level.

**LOCALITY SEGMENT AND BLOCK:** The selected segment shows a section of the walled city along with the adjacent area. A gate known as Raiya Naka marks the beginning of a busy commercial street, "Para Bazar". The typical block is 1.09 hectares and is bounded by three commercial streets which also form the lines of approach for the residential area. The block shows a typical configuration of various communities based upon their common trade, religion or castes. Burhaniah Mosque and the surrounding areas are housed by "Vora Muslims". Shama Sheth's Street as the name suggests is named after Shama Sheth, a prosperous household in the street. Modi's Street houses a number of families belonging to the same caste and a Hindu temple. The dead-end access streets, though very narrow and irregular, form very intimate semi-private areas. The houses are very small and they usually have a small courtyard.

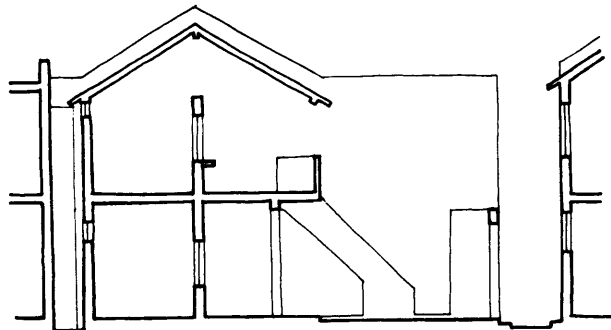
**LOCALITY BLOCK LAND UTILIZATION DATA**

	Total Number	Area Hectares	Density N/Ha
<b>DENSITIES</b>			
LOTS	127	1.09	116
DWELLING UNITS	152	1.09	139
PEOPLE	851	1.09	780

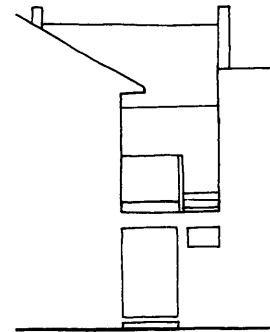
AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	0.12	11%
SEMI-PUBLIC (open spaces, schools, community centers)	0.04	4%
PRIVATE (dwellings, shops, factories, lots)	0.81	74%
SEMI-PRIVATE (cluster courts)	0.12	11%
<b>TOTAL</b>	<b>1.09</b>	<b>100%</b>

**NETWORK EFFICIENCY**

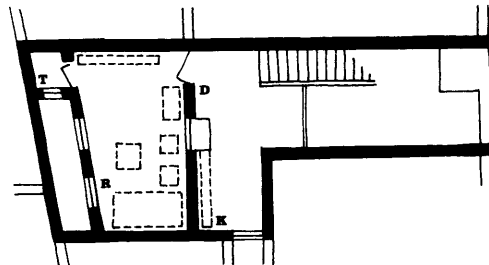
Network length (streets, walkways) = 135 m/Ha  
 Areas served (total area)



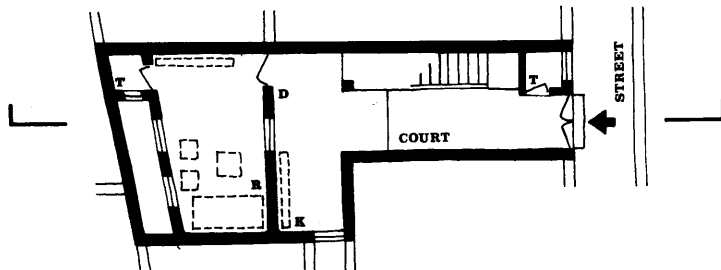
SECTION



ELEVATION



FIRST FLOOR PLAN



GROUND FLOOR PLAN

TYPICAL DWELLING

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)

- DWELLING UNIT
  - type: HOUSE
  - area (sq m): 55.5
  - tenure: LEGAL OWNERSHIP
- LAND/LOT
  - utilization: PRIVATE
  - area (sq m): 46.8
  - tenure: LEGAL OWNERSHIP
- DWELLING
  - location: CITY CENTER
  - type: ROW HOUSES
  - number of floors: 2
  - utilization: EXTENDED FAMILY
  - physical state: FAIR
- DWELLING DEVELOPMENT
  - mode: PROGRESSIVE
  - developer: PRIVATE
  - builder: ARTISAN
  - construction type: MASONARY, WOOD
  - year of construction: 1810
- MATERIALS
  - foundation: STONE
  - floors: STONE
  - walls: MASONARY
  - roof: TILES

DWELLING FACILITIES

- wc: 1
- shower: 2
- kitchen: 2
- rooms: 2
- other: COURT YARD

SOCIO-ECONOMIC DATA  
(related to user)

- GENERAL: SOCIAL
  - user's ethnic origin: HINDU
  - place of birth: RAJKOT
  - education level: UNIVERSITY
- NUMBER OF USERS
  - married: 6
  - single: -
  - children: 2
  - total: 8
- MIGRATION PATTERN
  - number of moves: 1
  - rural - urban: BEFORE 1800 A.D.
  - urban - urban: -
  - urban - rural: -
  - why came to urban area: EMPLOYMENT
- GENERAL: ECONOMIC
  - user's income group: MIDDLE
  - employment: BUSINESS
  - distance to work: 0.2 KM
  - mode of travel: WALKING

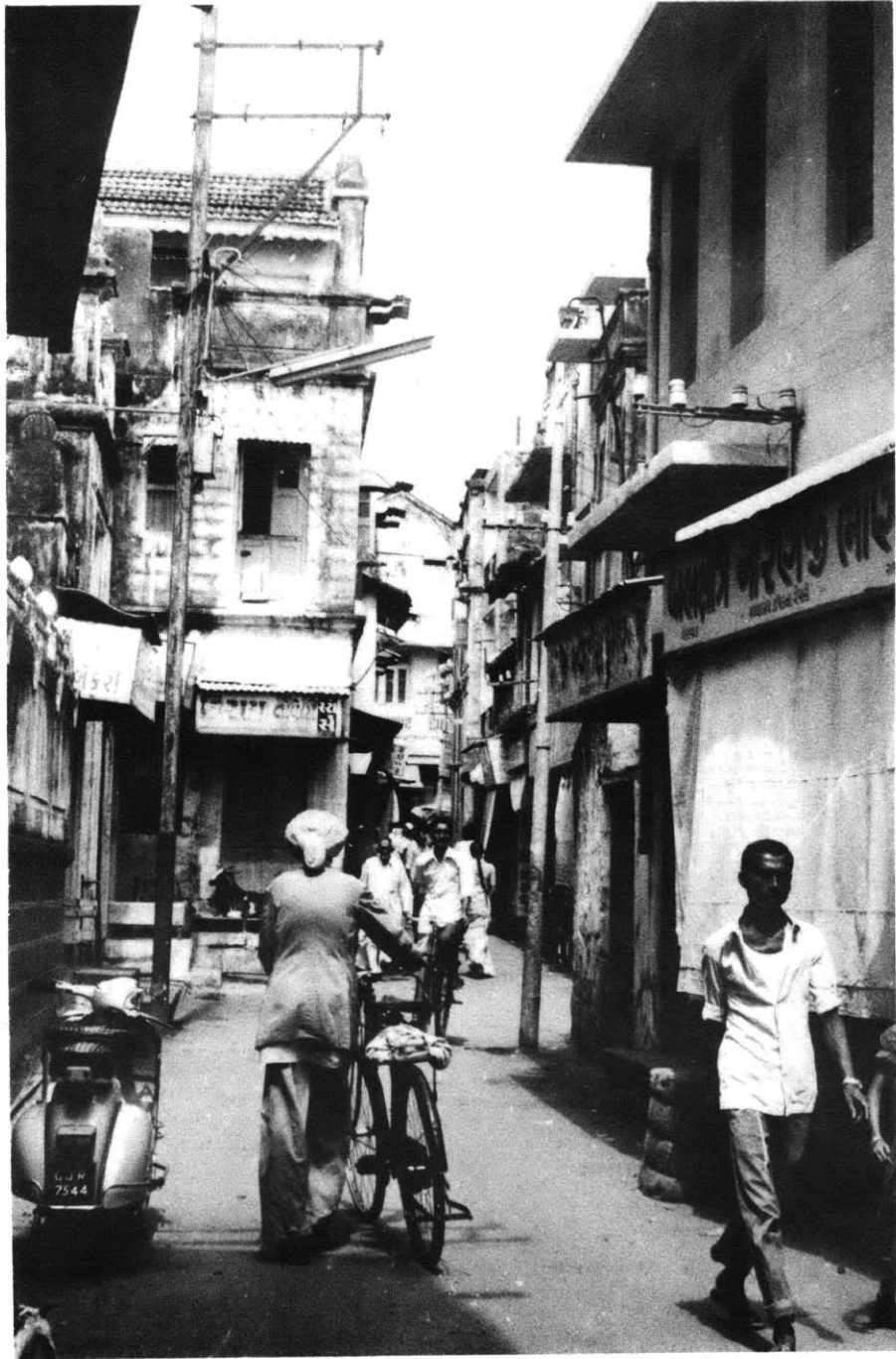
- COSTS
  - dwelling unit: -
  - land - market value: -

- DWELLING UNIT PAYMENTS
  - financing: PRIVATE
  - rent/mortgage: -
  - % income for rent/mortgage: -



1:200

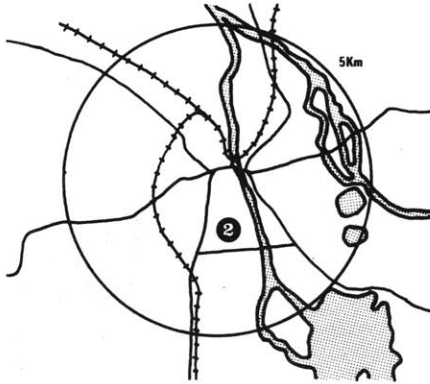
PHOTOGRAPHS:  
(left) Gamtal, Rajkot, 1978: A commercial street in the walled city. (top and bottom right) Gamtal, Rajkot, 1978: Residential streets in the walled city.



## 2 KARAN PARA

PRIVATE, MIDDLE/HIGHER MIDDLE INCOME,  
EUROPEAN INFLUENCE

### Rajkot



**LOCATION:** The Karan Para area is located in the southwest region of the walled city. The area is bounded by Bhupendra Road in the north and Dhebar Road in the west. The new palace occupies the northwest corner of the locality. A road running parallel to the natural water canal divides the locality in two parts. A cotton industry on the Canal Road has led to the development of small informal industrial units along the street.

**ORIGIN:** The area was developed after the establishment of British Civil Station, by Sir Lakhajiraj, ruling chief of the Rajkot town. During his period between 1905 and 1930, Karan Para, Mill Para, Diwan Para and Lohana Para were developed as suburbs of the town. He also established a cotton industry, "Rajkot Weaving and Spinning Mill" in 1920, beginning industrialization in the city. As a democratic ruler, he established People's Assembly in the Rajsthani Court joining the political movement in imperial India. Sir Lakhajiraj had progressive views on administration and is known for legislative reforms.

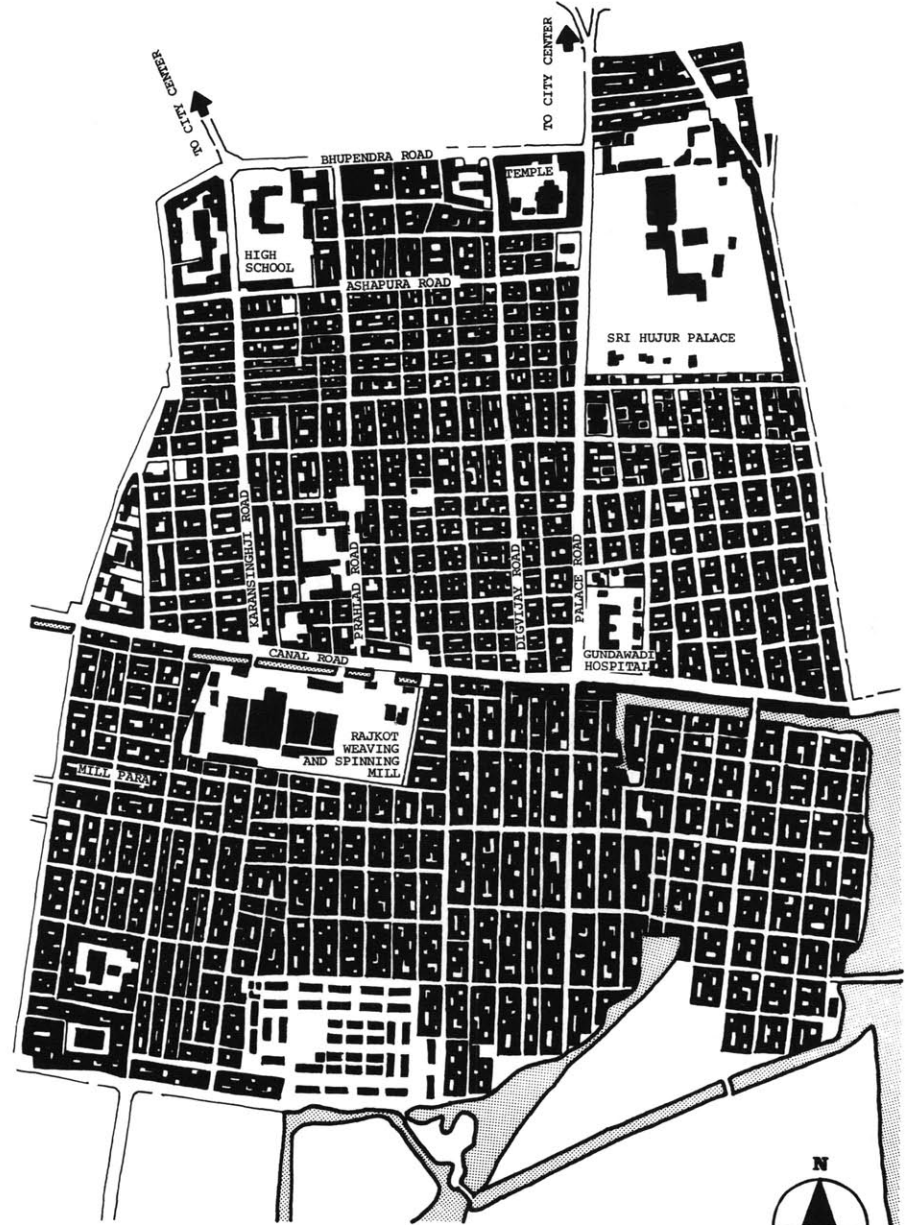
**LAYOUT:** Inspired by his English colleagues and European tours, a gridiron layout was adopted by the enthusiastic ruling chief, as a way to achieve rapid and organized progress. In 1920, building by-laws were formed with the help of Bombay Municipal By-laws and the heights of the buildings were restricted in proportion to their road widths. This layout is in striking contrast to the traditional, intimate and functional layout of the walled city. Avoidance of dead-end streets as community areas and excessive public land make this layout very inefficient. Due to the lack of an underground drainage system, all the houses were designed so that at least one side would face the street, giving an exposure to the toilets for manual handling of solid waste. This also restricted the size of each block.

**LAND USE:** For the first time an attempt was made toward planned development. Though this locality is also characterized by mixed land use, the nature and location of various uses were predetermined. Sri Hujur Palace occupies almost 12 hectares of land. The Rajkot Spinning and Weaving Mill on the Canal Road was the major industry in the city. Major streets have developed as commercial streets. A hospital, two high schools, Diwan's residence, 2 temples and a cinema are located in the locality.

**CIRCULATION:** Bhupendra Road, Karansinghji Road and Canal Road have developed as major circulation routes. The traffic varies enormously in speed and volume. It includes pedestrians, bicycles, hand pulled carts, scooters, autorickshaws, cars, buses and occasionally stray animals. Public buses also run on the major circulation routes.

#### CASE STUDY SOURCES

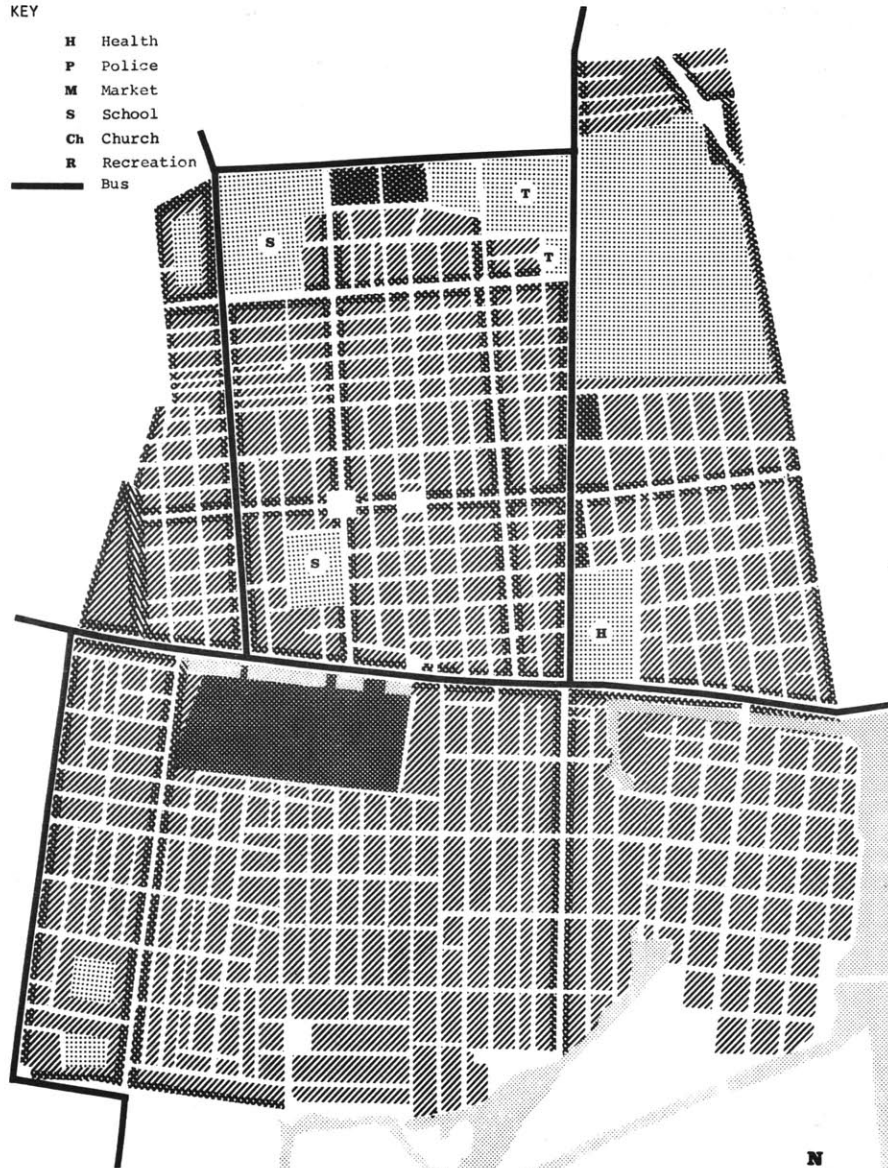
**Plan:** (accurate) R.N.C. Office, 1978.  
**Land Use Pattern:** (approximate) Field Survey, Bharat Gami, 1978.  
**Circulation Pattern:** (approximate) IBID.  
**Segment Plan:** (accurate) City Survey Office, 1978.  
**Block Plan:** (accurate) IBID.  
**Block Land Utilization:** (accurate) Field Survey, Bharat Gami, 1978.  
**Typical Dwelling:** (approximate) IBID.  
**Physical Data:** (approximate) IBID.  
**Socio-Economic Data:** (approximate) IBID.  
**Photographs:** Bharat Gami, 1978.  
**General Information:** Field Survey, Bharat Gami, 1978.



0 100 500m  
1:10000

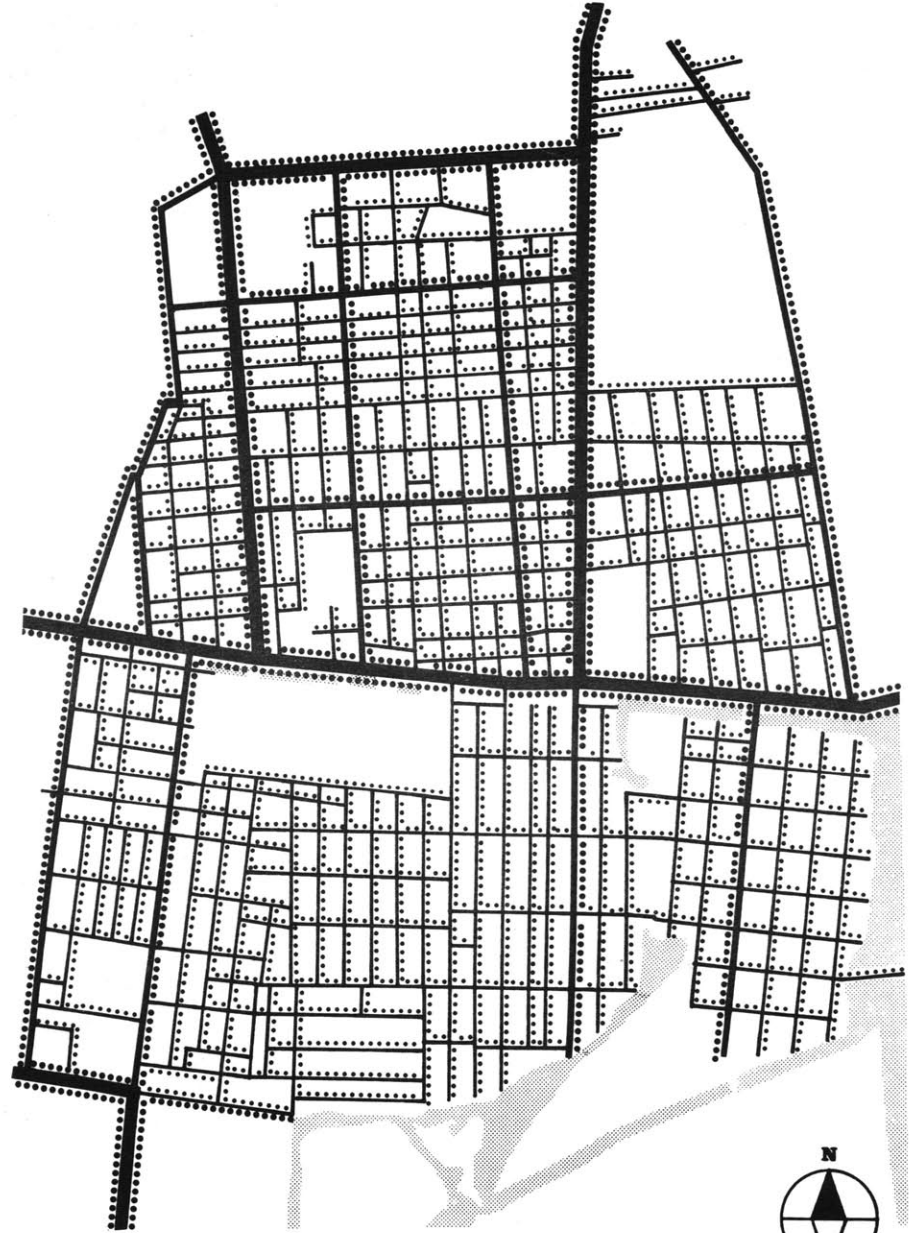
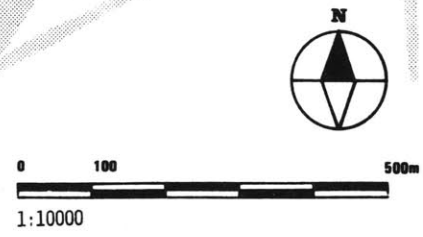
LOCALITY PLAN

- KEY
- H Health
  - P Police
  - M Market
  - S School
  - Ch Church
  - R Recreation
  - Bus



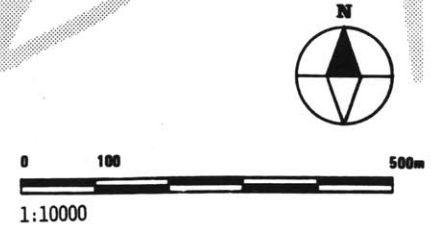
- AREAS
- RESIDENTIAL
  - COMMERCIAL
  - INDUSTRIAL
  - OPEN SPACES

LOCALITY LAND USE PATTERN

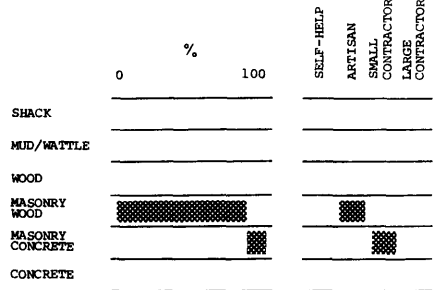


- KEY
- VEHICULAR
  - PEDLSTRIAN

LOCALITY CIRCULATION PATTERN



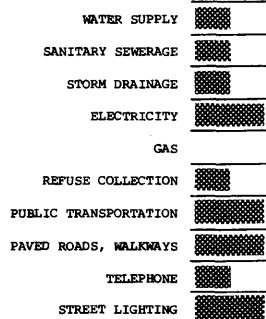
LOCALITY CONSTRUCTION TYPES



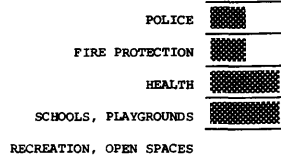
The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type.

Quality of information: approximate

LOCALITY UTILITIES AND SERVICES



LOCALITY COMMUNITY FACILITIES



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

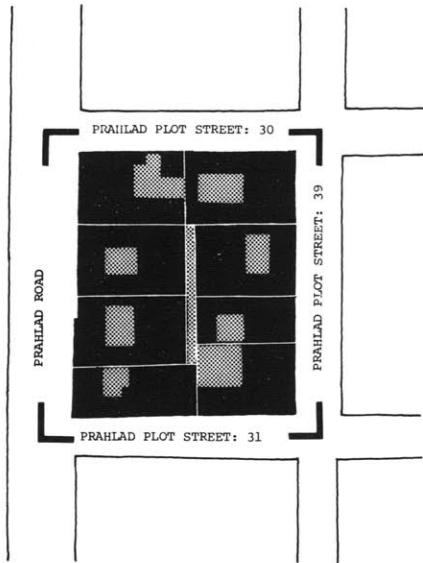
Quality of information: approximate

[Dotted pattern] SELECTED BLOCK



LOCALITY SEGMENT PLAN





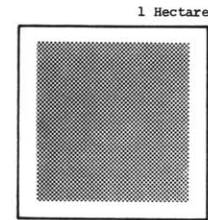
KEY

Public:	streets, walkways	
Semi-Public:	playgrounds	
Semi-Private:	cluster courts	
Private:	lots	
	dwelling	



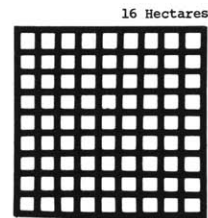
LOCALITY BLOCK LAND UTILIZATION: 1:1000

SUMMARY DIAGRAMS



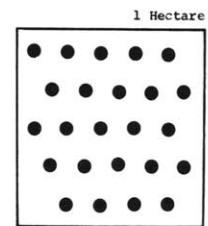
PERCENTAGES

Streets/Walkways	33%
Playgrounds	--
Cluster Courts	--
Dwellings/Lots	67



CIRCULATION EFFICIENCY

Unit Length	450
m/Ha.	



DENSITY

Persons/Hectare	503
● 20 Persons	

POPULATION AND INCOME: Nearly 25% of the city's population lived in this locality in 1971. Most people have migrated in early 20th century due to the increased importance of the city as British Civil Station. Due to congestion, many families also moved out of the walled city to such suburbs. Mill Para was designed and built for workers employed in the cotton mill. As the traditional extended families separated and many families moved to larger cities, houses were subdivided into several one room rental dwellings. High occupancy rates in dwellings centered around a common court and communal toilets have created an adverse social environment. The annual family income ranges from Rs. 6000 to Rs. 20,000 (U.S \$ 750 to 2500), which is 2 to 7 times the subsistence level.

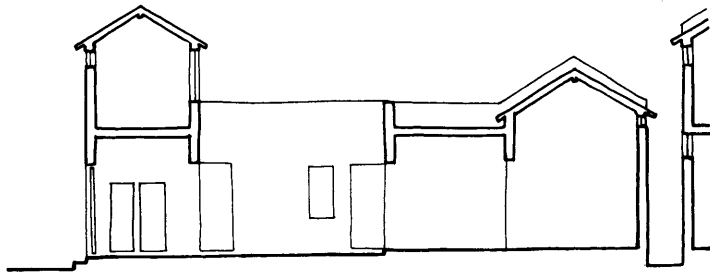
LOCALITY SEGMENT AND BLOCK: The selected segment shows a section of the locality. The Karan Para Chawk, the only open space in the locality, forms a center of the area. Schools for boys and girls are also located near the chawk. A water tank on the Kishoresinghji Road served as a source of communal water in the early part of the 20th century. Karansinghji Road, Prahlad Road, Kishoresinghji Road and Digvijay Road form major commercial streets. The typical block consists of eight individual lots. Most of the houses have shop/office on the street and an interior courtyard. These one to two stories units housed 19 families in 1978. A one meter wide passage between the lots provides light and ventilation to the houses.

LOCALITY BLOCK LAND UTILIZATION DATA

DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	8	0.15	53
DWELLING UNITS	13	0.15	80
PEOPLE	75	0.15	502
<b>AREAS</b>			
		Hectares	Percentages
PUBLIC (streets, walkways, open spaces)		0.05	33%
SEMI-PUBLIC (open spaces, schools, community centers)		-	-
PRIVATE (dwellings, shops, factories, lots)		0.10	67%
SEMI-PRIVATE (cluster courts)		-	-
<b>TOTAL</b>		<b>0.15</b>	<b>100%</b>

NETWORK EFFICIENCY

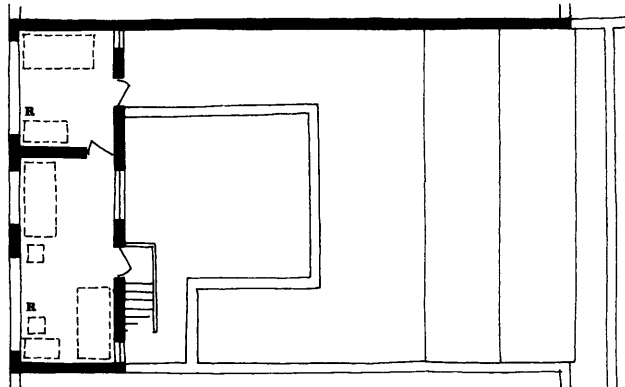
Network length (streets, walkways) = 450 m/Ha.  
 Areas served (total area)



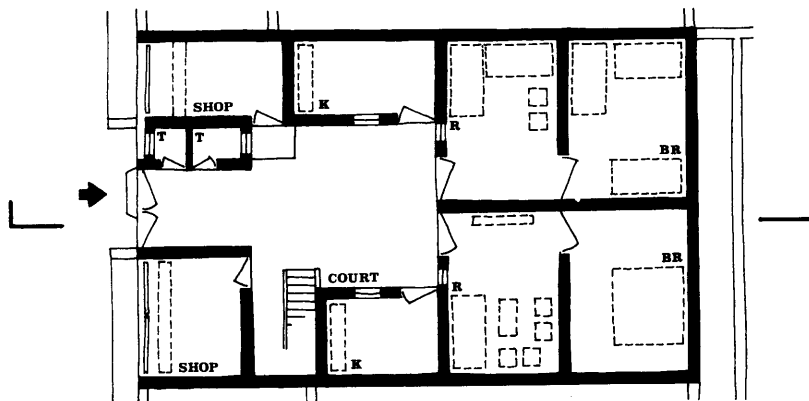
SECTION



ELEVATION



FIRST FLOOR PLAN



GROUND FLOOR PLAN

TYPICAL DWELLING

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

DWELLING UNIT  
 type: HOUSE  
 area (sq m): 136  
 tenure: LEGAL OWNERSHIP

LAND/LOT  
 utilization: PRIVATE  
 area (sq m): 131.4  
 tenure: LEGAL OWNERSHIP

DWELLING  
 location: INNER RING  
 type: ROW HOUSES  
 number of floors: 2  
 utilization: EXTENDED FAMILY  
 physical state: FAIR

DWELLING DEVELOPMENT  
 mode: PROGRESSIVE  
 developer: PRIVATE  
 builder: ARTISAN  
 construction type: MASONARY, WOOD  
 year of construction: 1905 A.D.

MATERIALS  
 foundation: STONE  
 floors: STONE  
 walls: BRICK MASONARY  
 roof: TILES & WOOD

DWELLING FACILITIES  
 wc: 1  
 shower: 1  
 kitchen: 2  
 rooms: 6  
 other: 2 SHOPS, COURT YARD

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

GENERAL: SOCIAL  
 user's ethnic origin: HINDU  
 place of birth: BEDI, RAJKOT DISTRICT  
 education level: UNIVERSITY

NUMBER OF USERS  
 married: 4  
 single: 3  
 children: 4  
 total: 11

MIGRATION PATTERN  
 number of moves: 1  
 rural - urban: BEFORE 1900  
 urban - urban: —  
 urban - rural: —  
 why came to urban area: EMPLOYMENT

GENERAL: ECONOMIC  
 user's income group: HIGHER MIDDLE  
 employment: BUSINESS  
 distance to work: 0.5 KM  
 mode of travel: SCOOTER, BICYCLE

COSTS  
 dwelling unit: —  
 land - market value: —

DWELLING UNIT PAYMENTS  
 financing: PRIVATE  
 rent/mortgage: —  
 % income for rent/mortgage: —



PHOTOGRAPHS:  
 (top) Karan Para, Rajkot, 1978: A view of Canal Road running parallel to a natural water run-off.  
 (bottom) Karan Para, Rajkot, 1978: A residential street in the area.

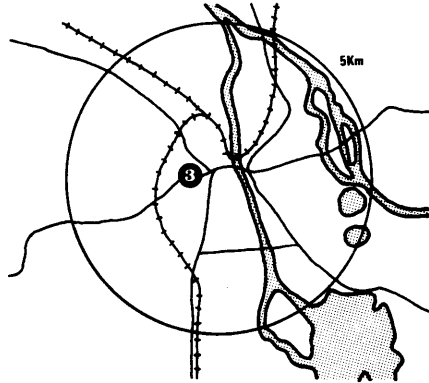




### 3 BHILVAS

PRIVATE, VERY LOW/LOW INCOME, CHAWLS

#### Rajkot



**LOCATION:** Bhilvas chawls are located in the Civil Station "Sadar" area, approximately 2 km away from the city center. In early 20th century this area was situated between the edge of a traditional settlement and a small lake. A natural water canal, which still exists used to pass through the area. Today, a road divides the chawls into two parts and much of the low-lying area around the chawls has been filled.

**ORIGIN:** The establishment of British Civil Station in 1822, by the East India Company increased migration from the nearby areas. Most people who migrated to the city, worked as domestic or office servants (peons) for the British officers residing in the Civil Station area. Though the officers were highly dependent on such peons for their day to day work, no attempt was made to provide them with houses. As a result such people were forced to live in low-lying vacant areas near the lake and the natural water canals. By 1875, many squatter settlements had developed around the lake. As a result of the constant demand for housing, the officers were forced to construct one room row houses known as chawls.

**LAYOUT:** Rows of one room houses with common walls have been grouped together along a central circulation space. Most of the activities are performed outside the habitable room. For 260 existing houses there are only 30 communal water taps. There are no bath rooms, while the government has provided 8 communal water closets for the entire population of roughly 1400 people. Only 10% of the structures have plinth and more than 60% of the structures have been classified by authorities as unfit for habitation.

**LAND USE:** While the majority of the chawl area is residential, housing very low income population, the land use pattern in the entire locality is fairly mixed. There are 3 religious structures in the chawl area. Kotak school for boys and girls, a dispensary, a Jalaram temple, a cemetery, Jumma Masjid and two cinema halls exist in the vicinity of the area. A housing project for the staff of the Life Insurance Company is situated adjacent to the area.

**CIRCULATION:** A major street passes through the chawl area. Majority of the streets are dominated by pedestrians and bicycles. The locality is well connected to the city center by a city bus service, however, the bus takes approximately 15 minutes and is relatively expensive.

#### CASE STUDY SOURCES

- Segment Plan:* (accurate) City Survey Office, 1978.
- Block Plan:* (accurate) IBID.
- Block Land Utilization:* (accurate) Field Survey, Bharat Gami, 1978.
- Typical Dwelling:* (approximate) IBID.
- Physical Data:* (approximate) IBID.
- Socio-Economic Data:* (approximate) IBID.
- Photographs:* Bharat Gami, 1978.
- General Information:* Field Survey, Bharat Gami, 1978. ORG report on Slums in Rajkot, 1972.

**PHOTOGRAPH:**  
Bhilvas, Rajkot, 1978: The photograph shows a semi private street in the chawl area. All private and semi private activities take place in this space. In general such streets vary in widths from 1.5 m (see typical block plan) to 5 m. In the foreground, is a temple, which is also a place that binds the entire community together.



LOCALITY CONSTRUCTION TYPES

	%		SELF-HELP	ARTISAN	SMALL CONTRACTOR	LARGE CONTRACTOR
	0	100				
SHACK						
MUD/WATTLE						
WOOD						
MASONRY WOOD						
MASONRY CONCRETE						
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: approximate

LOCALITY UTILITIES AND SERVICES

WATER SUPPLY	
SANITARY SEWERAGE	
STORM DRAINAGE	
ELECTRICITY	
GAS	
REFUSE COLLECTION	
PUBLIC TRANSPORTATION	
PAVED ROADS, WALKWAYS	
TELEPHONE	
STREET LIGHTING	

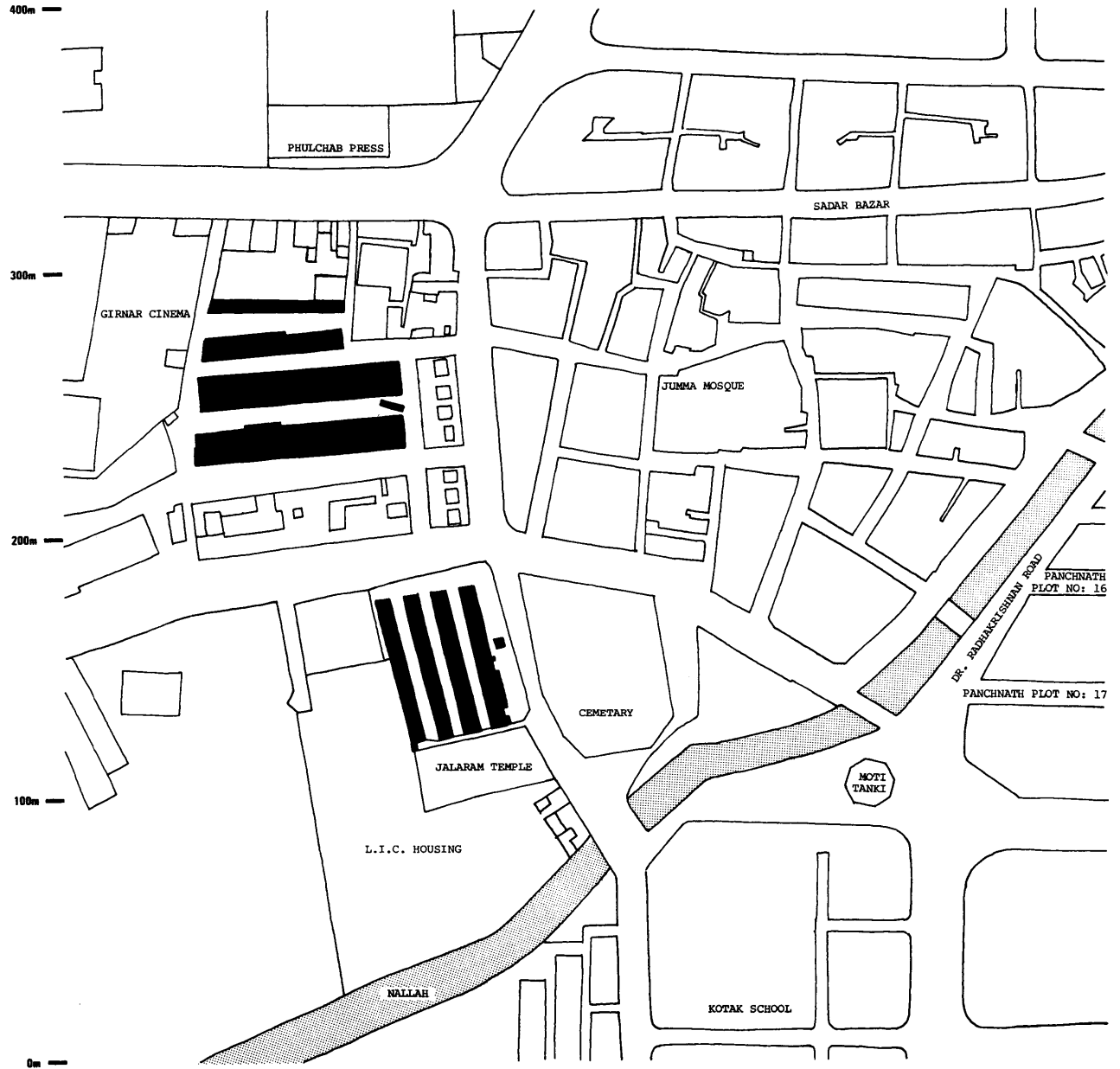
LOCALITY COMMUNITY FACILITIES

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.

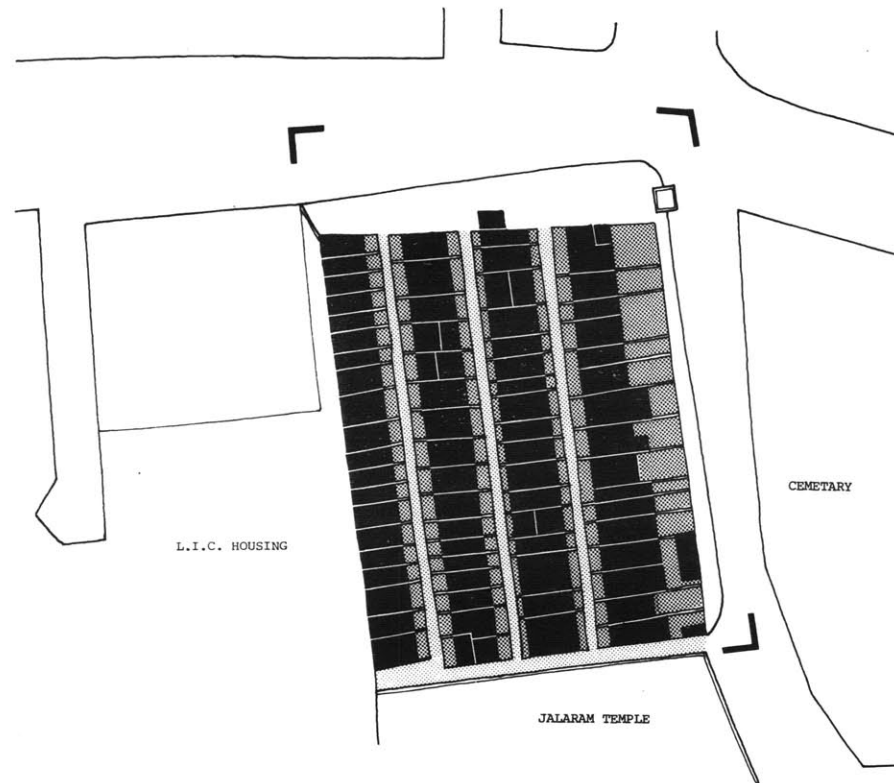
Quality of information: approximate

SELECTED BLOCK



LOCALITY SEGMENT PLAN





**KEY**

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

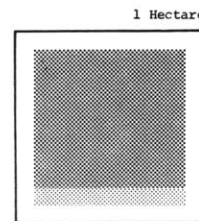
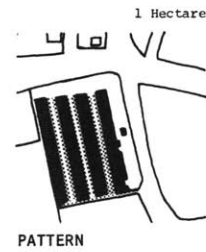
**LOCALITY BLOCK PLAN UTILIZATION**



1:1000

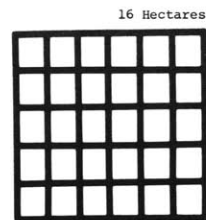


**SUMMARY DIAGRAMS**



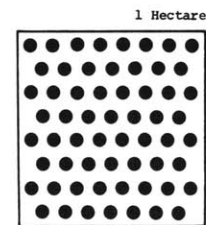
**PERCENTAGES**

Streets/Walkways	32%
Playgrounds	--
Cluster Courts	9
Dwellings/Lots	59



**CIRCULATION EFFICIENCY**

Unit Length	286
m/Ha.	



**DENSITY**

Persons/Hectare	
● 20 Persons	1165

**POPULATION AND INCOME:** Communities in this chawls are predominantly Bhils and Muslims, who constitute 50% and 33% of the entire population respectively. Bhils belong to neighbouring Rajasthan State and were brought to this area to work as domestic and office servants for the English officers. Roughly 60% of the population is Hindu while 35% is Muslim. 38% of the heads of the households are illiterate while only 42% have primary education. Roughly 26% of the household heads are employed with the government while 26% are casual workers and the remaining population is either self employed or unemployed. Up to 10% of the households are engaged in animal husbandry. The annual income ranges from Rs. 1200 to Rs. 2500 (U.S.\$ 150 to \$ 315), which is below the subsistence level.

**LOCALITY BLOCK PLAN;** The typical block has roughly 64 one room dwellings. Most of the houses are deteriorating and are considered un-inhabitable. More than 35 dwellings have ceiling heights of less than five feet. Since only 10 % of the houses have plinth and the entire area is relatively low lying, most of the houses are damaged during the seasonal rains. The houses have been built with bricks and mud mortar walls with tile roofs.

**LOCALITY BLOCK LAND UTILIZATION DATA**

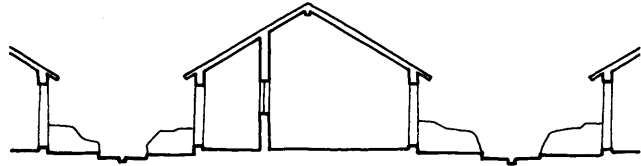
DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	70	0.37	189
DWELLING UNITS	77	0.37	208
PEOPLE	431	0.37	1165

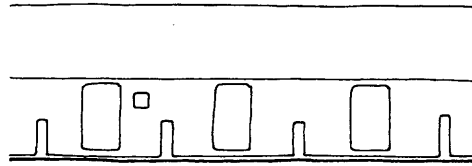
AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	0.12	32%
SEMI-PUBLIC (open spaces, schools, community centers)	-	-
PRIVATE (dwellings, shops, factories, lots)	0.22	59%
SEMI-PRIVATE (cluster courts)	0.03	9%
<b>TOTAL</b>	<b>0.37</b>	<b>100%</b>

**NETWORK EFFICIENCY**

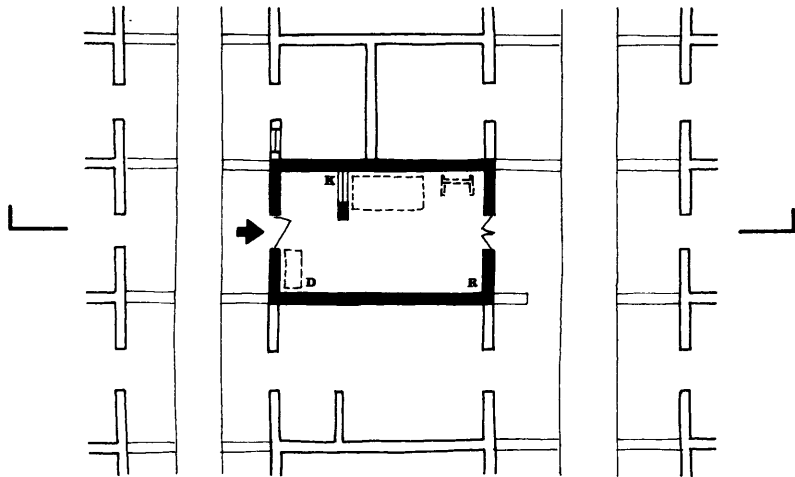
Network length (streets, walkways) = 286 m/Ha.  
 Areas served (total area)



SECTION



ELEVATION



PLAN

## 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)



0 1 5 10m

1:200

## PHYSICAL DATA

(related to dwelling and land)

DWELLING UNIT  
 type: ROOM  
 area (sq m): 20  
 tenure: LEGAL RENTAL

LAND/LOT  
 utilization: SEMI-PRIVATE  
 area (sq m): 30  
 tenure: LEGAL RENTAL

DWELLING  
 location: INNER RING  
 type: ROW HOUSES  
 number of floors: 1  
 utilization: MULTIPLE FAMILY  
 physical state: POOR

DWELLING DEVELOPMENT  
 mode: INSTANT  
 developer: BRITISH AGENT  
 builder: SMALL CONTRACTOR  
 construction type: MASONARY  
 year of construction: 1920

MATERIALS  
 foundation: BRICK  
 floors: CEMENT PLASTER  
 walls: BRICK AND MUD BRICKS  
 roof: TILES

DWELLING FACILITIES  
 wc: 1 FOR 20 FAMILIES  
 shower: NONE  
 kitchen: NONE  
 rooms: 1  
 other: NONE

## SOCIO-ECONOMIC DATA

(related to user)

GENERAL: SOCIAL  
 user's ethnic origin: HINDU, BHILS  
 place of birth: RAJASTHAN  
 education level: HIGH SCHOOL/NONE

NUMBER OF USERS  
 married: 2  
 single: -  
 children: 6  
 total: 8

MIGRATION PATTERN  
 number of moves: 1  
 rural - urban: 1  
 urban - urban: -  
 urban - rural: -  
 why came to urban area: DOMESTIC/OFFICE SERVICE

GENERAL: ECONOMIC  
 user's income group: VERY LOW  
 employment: DOMESTIC/OFFICE SERVICE  
 distance to work: 0.5 KM  
 mode of travel: WALKING

COSTS  
 dwelling unit: -  
 land - market value: -

DWELLING UNIT PAYMENTS  
 financing: -  
 rent/mortgage: U.S.\$ 2-3/MONTH  
 % income for rent/mortgage: 10%

TYPICAL DWELLING

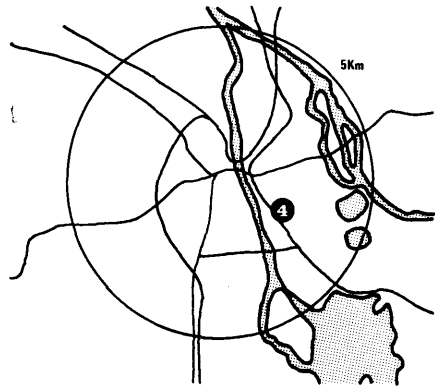
PHOTOGRAPH:  
 Bhilvas, Rajkot, 1978: All elements exist in the  
 "community" except for the infrastructure services.



## 4 MAFATIYA PARA

POPULAR, VERY LOW/LOW INCOME, SQUATTERS

### Rajkot



**LOCATION:** Located half way between the Aji Industrial Estate and the walled city on the eastern bank of river Aji, Mafatiya Para is one of the typical squatter settlements in the city. Approximately 2 km away from the city center, this settlement is located at the intersection of Rajkot-Bhavnagar State Highway and the road to Randarada Lake. The entire settlement is on the low-lying land at the side of a natural water canal and is prone to flooding during rainy season which lasts for 3 to 4 months a year. The settlement is surrounded by an Electrical Power House, a Cement Pipe Factory and various other industries.

**ORIGIN:** The first migrants arrived in the area in 1970 from the draught ridden villages near the coastal town of Dwarka. Industrial expansion in the Aji Industrial Estate area provided these migrants an opportunity to work as industrial workers. Excited with their economic prospects, they invited their neighbours and relatives from the villages to join them. However, the variable demand for labour in the industries and massive migration during the period increased their miseries and kept them away from any permanent employment. In April, 1973, there were 579 people living in this settlement. This number had increased 4 times by the year 1978.

**LAYOUT:** The settlement has grown over the years without any planning. The layout represents an arbitrary pattern, however, the traditional house clusters around common central spaces show the socio-cultural attitudes of the people. Most of the activities take place outside in partly covered and open spaces. The enclosed spaces which are very small serve mainly as storage spaces. The outdoor living spaces have been identified with raised mud platforms. The settlement is primarily a medium density residential area and would, over the years develop as a compact high density traditional settlement of the walled city. The people live under constant threat of evacuation and demolition by the municipal corporation. This insecurity prevents them from improving the physical conditions and consolidating their dwellings.

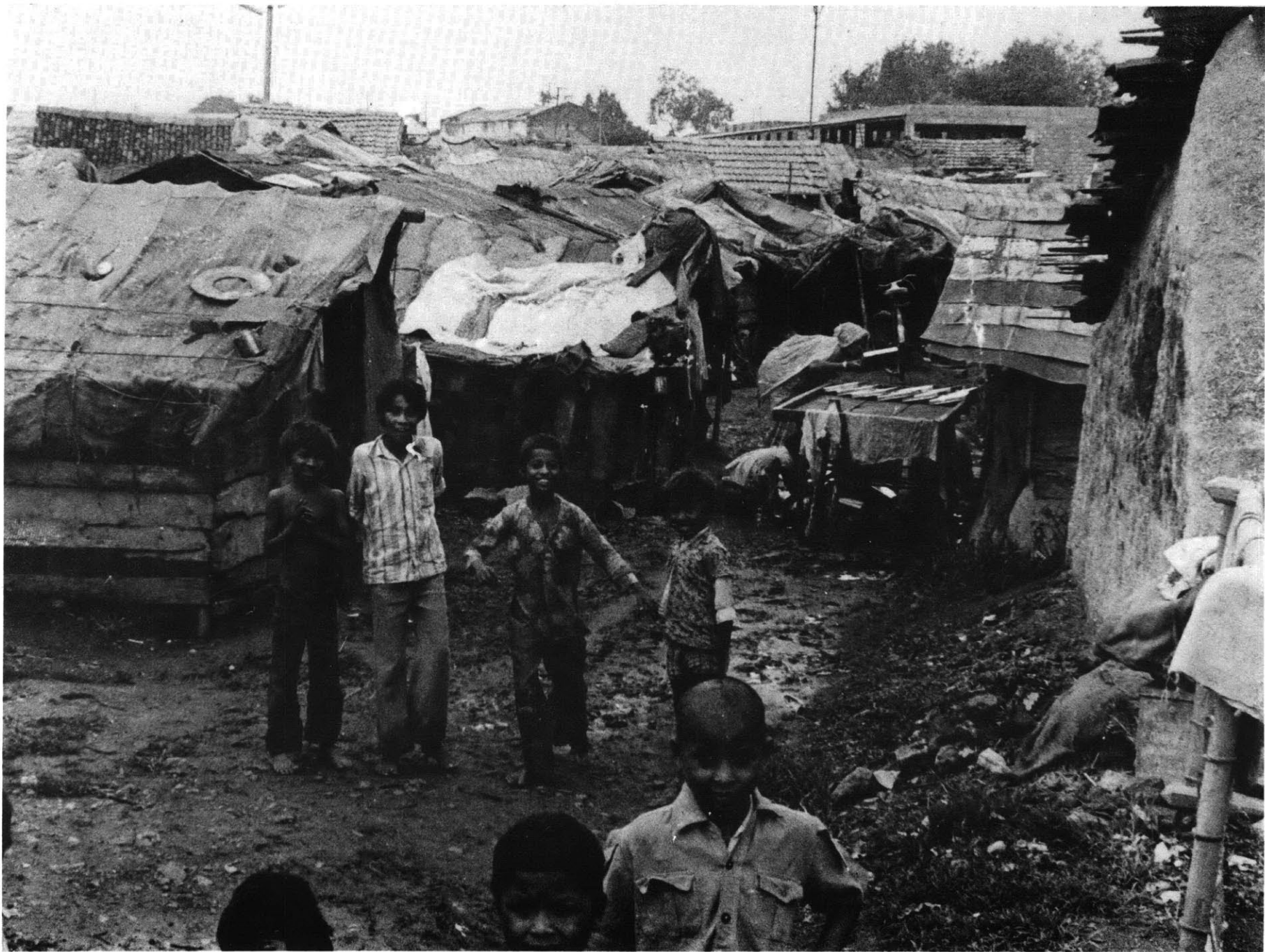
**LAND USE AND CIRCULATION:** The settlement is primarily a medium density residential area. There are a few shop cum dwellings on the major routes. The land use in the locality is divided in two parts by Rajkot-Bhavnagar State Highway. Western part of the highway is primarily for residential use while the eastern part is used for industrial. The highway is also a major route of circulation. The traffic varies enormously and includes trucks, buses, cars, auto-rickshaws, scooters, bicycles, hand pulled carts, pedestrians and occasionally stray animals. During the last two years, the government has identified several circulation paths within the settlement.

#### CASE STUDY SOURCES

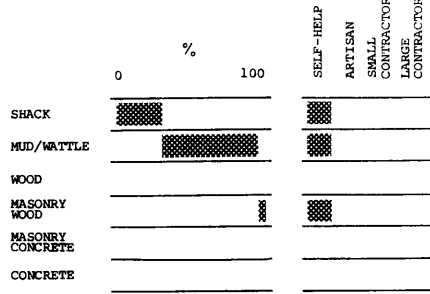
- Segment Plan:* (approximate) Field survey, Bharat Gami, 1978.
- Block Plan:* (approximate) IBID
- Block Land Utilization:* (approximate) Field survey, Bharat Gami, 1978.
- Typical Dwelling:* (approximate) IBID.
- Physical Data:* (approximate) IBID.
- Socio-Economic Data:* (approximate) IBID.
- Photographs:* Bharat Gami, 1978.
- General Information:* Field Survey, Bharat Gami, 1978. ORG report on slums in Rajkot, 1972.

**PHOTOGRAPH:**  
Mafatiya Para, Rajkot, 1978: The photograph shows a view of the squatter settlement, which remains flooded during the rainy season due to its location in the low-lying area. The squatters as illegal occupants of public land, live under constant threats of evacuation and demolition by the Municipality. This insecurity prevents them from improving the physical conditions and consolidating their dwellings.





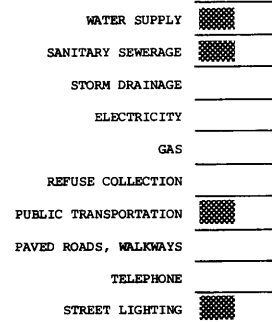
LOCALITY CONSTRUCTION TYPES



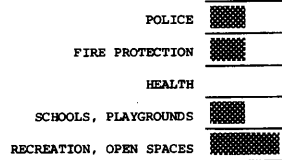
The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type.

Quality of information: approximate

LOCALITY UTILITIES AND SERVICES



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

[Pattern] SELECTED BLOCK



LOCALITY SEGMENT PLAN

0 50 100 150m

1:2500





**KEY**

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



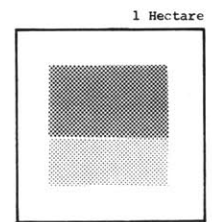
**LOCALITY BLOCK LAND UTILIZATION**

1:1000

**SUMMARY DIAGRAMS**

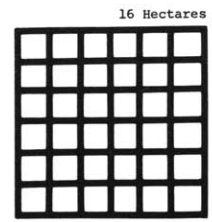


**PATTERN**



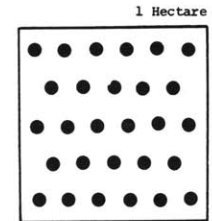
**PERCENTAGES**

Streets/Walkways	59%
Playgrounds	--
Cluster Courts	19
Dwellings/Lots	22



**CIRCULATION EFFICIENCY**

Unit Length	305
m/Ha.	



**DENSITY**

Persons/Hectare	557
●	20 Persons

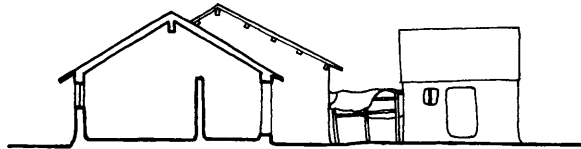
**POPULATION AND INCOME:** Communities in this settlement are predominantly Vagharies and Kories, who constitute 73% and 15% of the population respectively. 89% of the heads of the families work as casual workers while the rest are either self employed or unemployed. Majority of the people speak Gujarati and are Hindus. The family size varies from five to ten persons/family. The annual income ranges from Rs. 600 to Rs. 2500 (U.S. \$ 75 to \$ 315), which is below the subsistence level.

**LOCALITY SEGMENT AND BLOCK:** The segment shows primary routes of circulation and the location of squatter settlement. The selected block shows patterns of land utilization in the settlement. The block consists of several house clusters, in which the houses are grouped around central common spaces. Each enclosed shelter has an extended outdoor space identified mainly by the raised mud platforms. At the time of the field survey in June-July 1978 (rainy season), half of the settlement was under water. Several water pools remain in the area through out the year creating mosquitoes and causing diseases. The physical conditions of structures vary from very poor to fair. Most of the dwellings are made of salvaged materials and sometimes are made with mud walls and clay tiles.

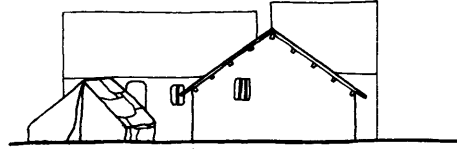
**LOCALITY BLOCK LAND UTILIZATION DATA**

	Total Number	Area Hectares	Density N/Ha
<b>DENSITIES</b>			
LOTS	114	0.92	123
DWELLING UNITS	114	0.92	123
PEOPLE	513	0.92	557
<b>AREAS</b>		<b>Hectares</b>	<b>Percentages</b>
PUBLIC (streets, walkways, open spaces)		0.55	59%
SEMI-PUBLIC (open spaces, schools, community centers)		-	-
PRIVATE (dwellings, shops, factories, lots)		0.20	22%
SEMI-PRIVATE (cluster courts)		0.17	19%
<b>TOTAL</b>		<b>0.92</b>	<b>100%</b>

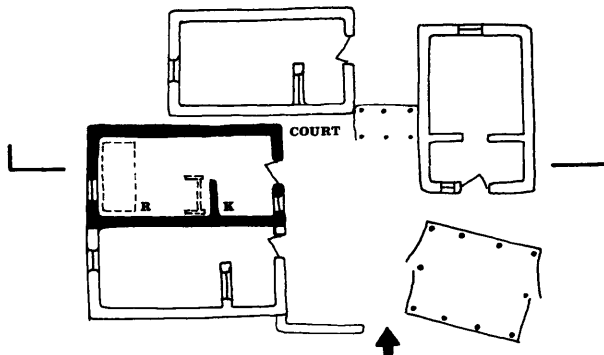
**NETWORK EFFICIENCY**  
 Network length (streets, walkways) = 305 m/Ha  
 Areas served (total area)



SECTION



ELEVATION



PLAN

## 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)

**DWELLING UNIT**  
 type: ROOM  
 area (sq m): 12.5  
 tenure: EXTRALEGAL OWNERSHIP

**LAND/LOT**  
 utilization: SEMI-PRIVATE  
 area (sq m): 17.5  
 tenure: EXTRALEGAL OWNERSHIP

**DWELLING**  
 location: PERIPHERY  
 type: GROUPED  
 number of floors: 1  
 utilization: MULTIPLE FAMILIES  
 physical state: POOR

**DWELLING DEVELOPMENT**  
 mode: PROGRESSIVE  
 developer: POPULAR SECTOR  
 builder: SELF-HELP  
 construction type: SHACKS  
 year of construction: 1971

**MATERIALS**  
 foundation: COMPACTED EARTH  
 floors: EARTH  
 walls: MUD, MUD BRICKS  
 roof: TILES

**DWELLING FACILITIES**  
 wc: 1 PER 35 FAMILIES  
 shower: 1 PER 35 FAMILIES  
 kitchen: NONE  
 rooms: 1  
 other: OPEN PLATFORM

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

**GENERAL: SOCIAL**  
 user's ethnic origin: HINDU/MUSLIM  
 place of birth: NEIGHBOURING VILLAGES  
 education level: PRIMARY SCHOOL/NONE

**NUMBER OF USERS**  
 married: 2  
 single: 1  
 children: 4  
 total: 7

**MIGRATION PATTERN**  
 number of moves: 1  
 rural - urban: 1971  
 urban - urban: -  
 urban - rural: -  
 why came to urban area: DROUGHT IN THE AREA

**GENERAL: ECONOMIC**  
 user's income group: VERY LOW  
 employment: ENTREPRENEURIAL/INDUSTRIAL  
 distance to work: 3 KM  
 mode of travel: BICYCLE/WALKING

**COSTS**  
 dwelling unit: -  
 land - market value: -

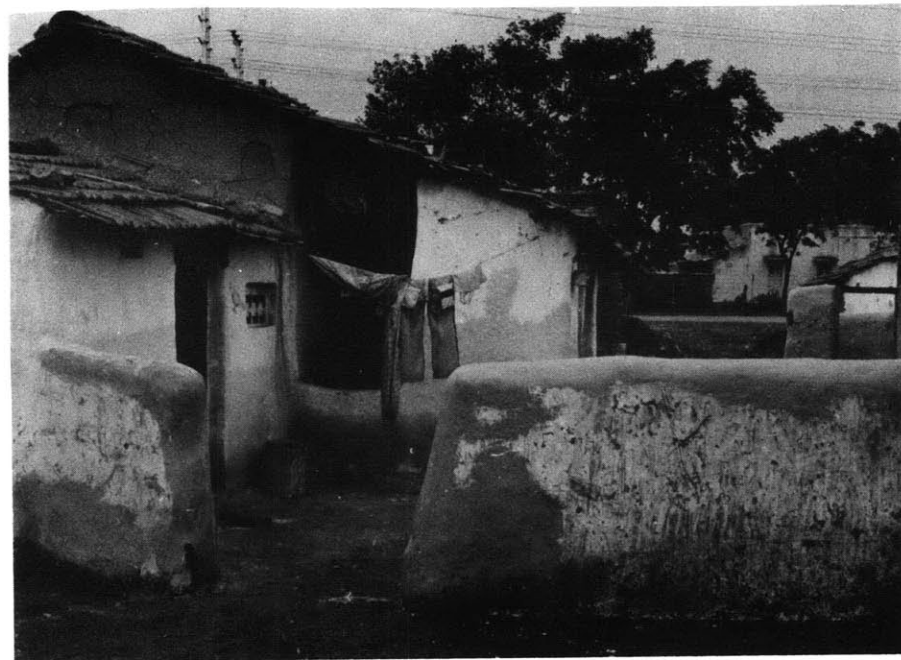
**DWELLING UNIT PAYMENTS**  
 financing: SELF-FINANCED  
 rent/mortgage: -  
 % income for rent/mortgage: -

**PHOTOGRAPHS:**  
 (top) Mafatiya Para, Rajkot, 1978: Brick and stone masonry houses around a cess pool. (bottom left) A house made with mud walls and tiled roof. (bottom right) Cooking ovens under construction with scrap tin buckets and clay. Many families in the settlement are self employed.



1:200

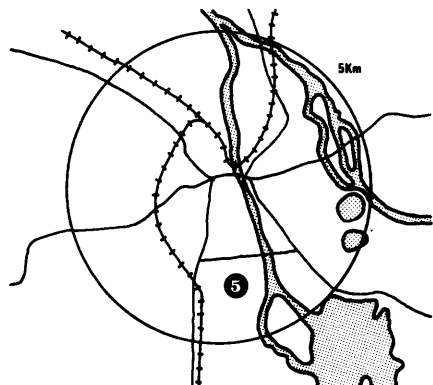
**TYPICAL DWELLING**



# 5 ANAND NAGAR

PUBLIC, LOW/MIDDLE INCOME, ROW HOUSES  
APARTMENTS

## Rajkot



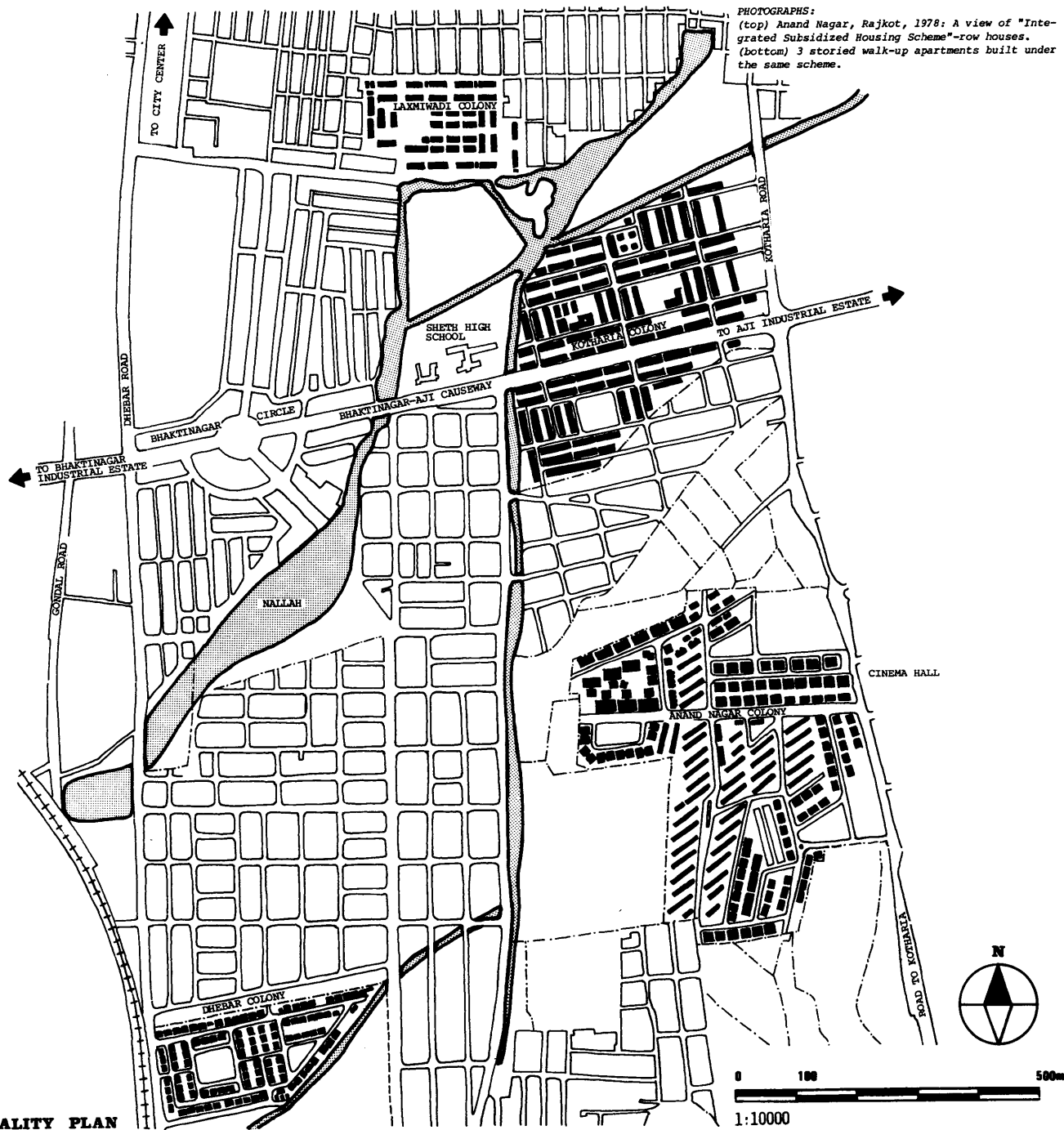
**LOCATION:** Anandnagar Colony is located about 3 km. from the city center in the south-western region of the city. The locality is mainly occupied by the low/middle income population due to its central location between two major industrial areas in the city. The Bhaktinagar-Aji Causeway, Dhebar Road, Gondal Road and Kotharia Road are the primary routes of approach to the locality.

**ORIGINS:** The area began developing as a residential area for middle income groups in the 1950's. The establishment of Aji Industrial Estate in 1960, and the subsequent construction of Bhaktinagar-Aji Causeway gave boost to the development of this area. Many low income families working in the industrial areas started moving into the locality. Parts of this locality are still in the process of development.

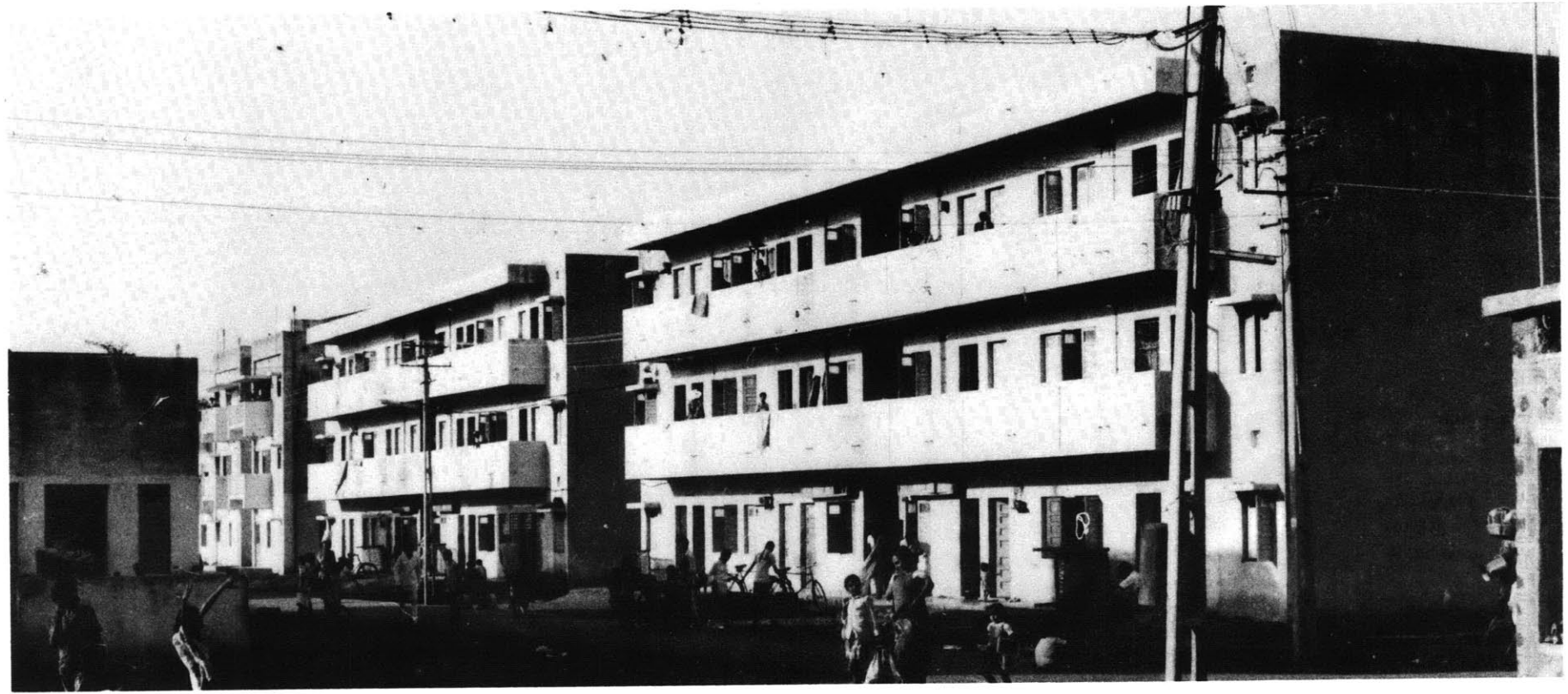
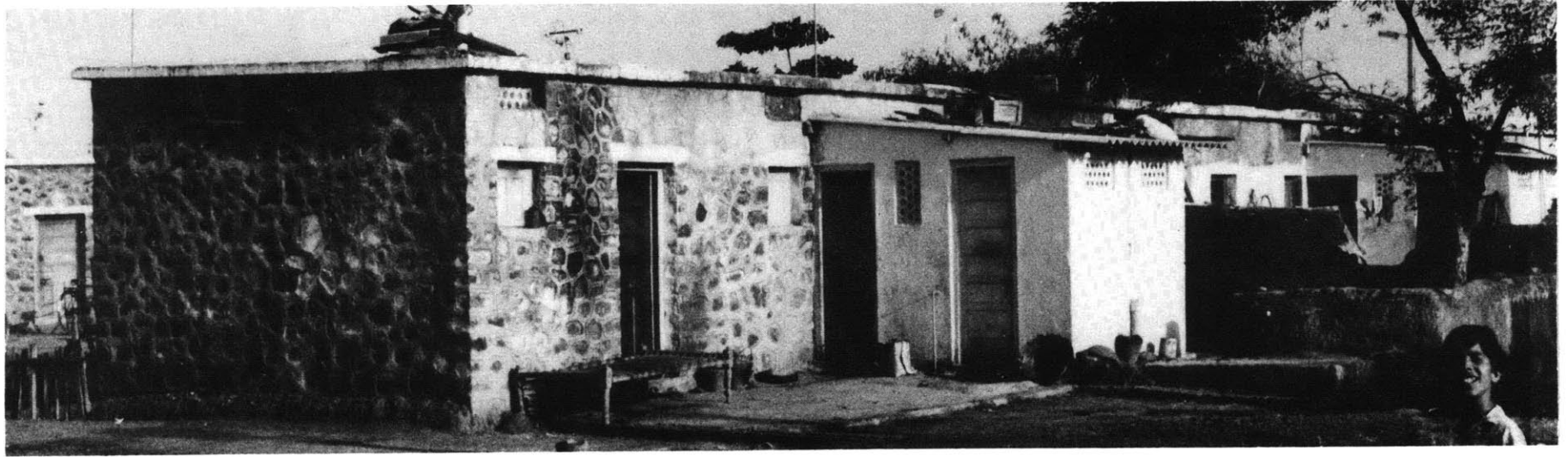
### CASE STUDY SOURCES

- plan: (accurate) R.M.C. Office, 1978.
- Land Use Pattern: (approximate) Field Survey, Bharat Gami, 1978.
- Circulation Pattern: (approximate) IBID.
- Segment Plan: (accurate) Gujarat Housing Board, 1978.
- Block Plan: (accurate) IBID.
- Block Land Utilization: (accurate) Field Survey, Bharat Gami, 1978.
- Typical Dwelling: (approximate) IBID.
- Physical Data: (approximate) IBID.
- Socio-Economic Data: (approximate) IBID.
- Photographs: Bharat Gami, 1978.
- General Information: Field Survey, Bharat Gami, 1978. Gujarat Housing Board office, 1978.

### LOCALITY PLAN



**PHOTOGRAPHS:**  
(top) Anand Nagar, Rajkot, 1978: A view of "Integrated Subsidized Housing Scheme"-row houses.  
(bottom) 3 storied walk-up apartments built under the same scheme.



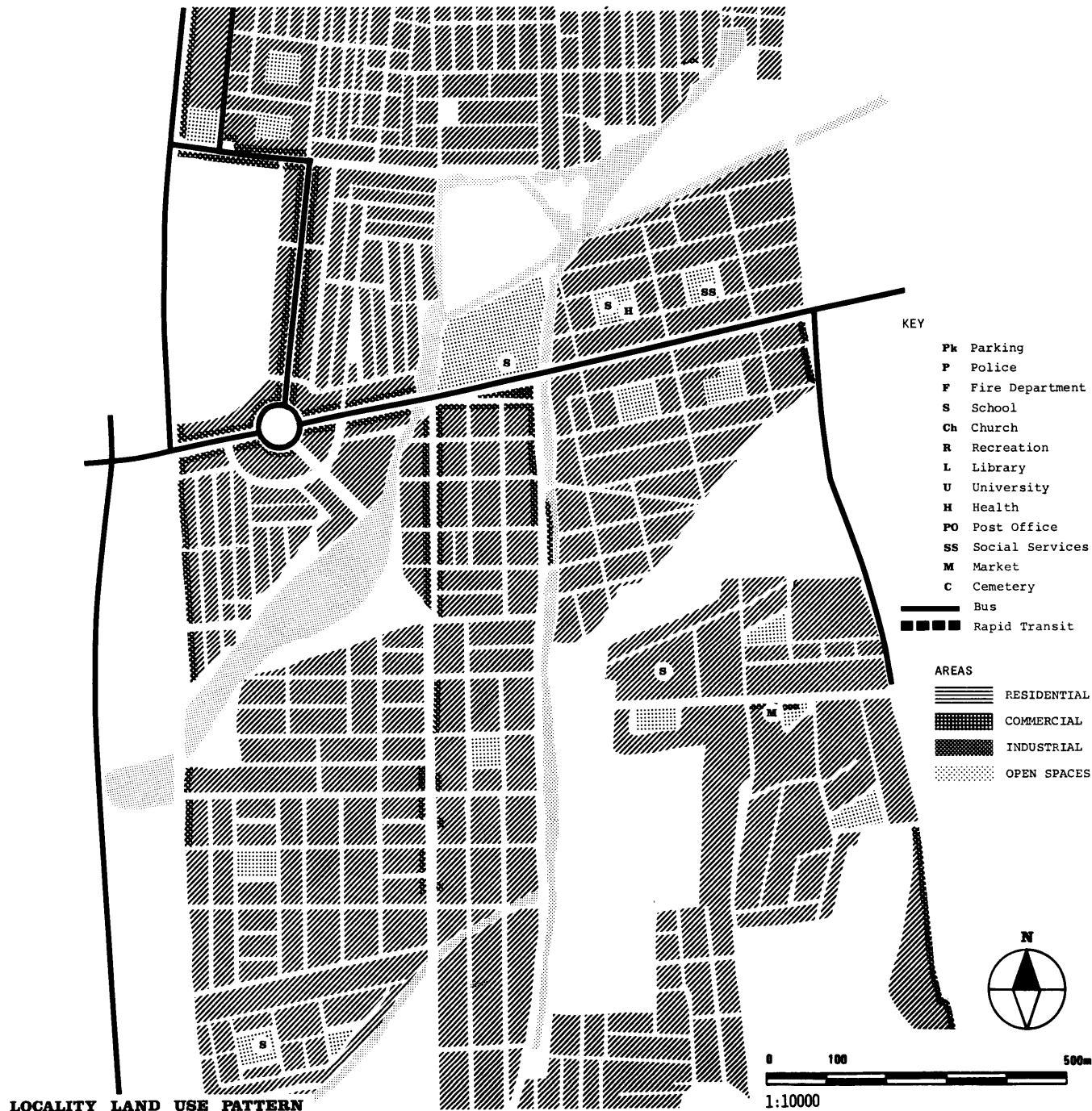
Four out of the eight public housing projects in the city of Rajkot (by GHB) are located in this area. Laxmiwadi Colony, with 344 dwelling units developed during 1955-57 period, was the first public housing project in the city. Two hundred dwelling units were built in the Dhebar Colony during 1957-59 period. Kotharia Colony, developed in 1960-61, has 630 dwelling units developed for the industrial workers in the city. The Gujarat Housing Board (GHB), a state government agency is responsible for the design, development and maintenance of the housing projects.

Anandnagar Colony with 1,759 dwelling units is the largest housing project undertaken by the GHB in the city. The land was acquired incrementally from April 1960, to August 1970 from the original parcel of 2.43 ha. to the final area of 18.3 ha. As a result, the project also has developed incrementally over the span of 15 years. It includes a variety of housing types under various schemes prepared by the state and central government. Under the "Integrated Subsidized Housing Scheme", 300 rowhouses were built during 1963-64 period. These houses were allotted to industrial workers on rental basis. The government has provided 50% as loan and 50% as subsidy for the project. 96 more were added between 1966-67 and 236 dwelling houses units were added during 1972-74 period. Under the "Flood Relief Housing Scheme" (there were no floods in the city), 216 walk-up apartment were built during 1973-75 period. Under the "Low Income Housing Scheme", 336 walk up apartments were built during 1970-72 period. These apartments were allotted on hire-purchase basis with an initial deposit of 25% of the total cost and remaining amount paid in the monthly instalments spread over 10 to 20 years. 96 more units were added under the scheme during 1975-76 period.

Under the "Middle Income Housing Scheme", 72 semi-detached houses were built during 1974-75 period. These houses were also allotted on the hire-purchase basis.

Under the "Economically Weaker Section Housing Scheme", 96 tenements were built during 1973-76 period. These were also allotted on hire-purchase basis to families belonging to the economical weaker sections of the society.

Under the HUDCO financed, "Low Cost Housing Scheme", 307 walk up apartments were built during 1975-76 period.





LAYOUT: The locality has developed without proper planning. With the increasing demand for urban land, the former agricultural land has been subdivided and developed by private developers to form small co-operative housing developments.

The land acquisition for the Anandnagar Colony project area continued for a span of 10 years beginning April, 1960. As a result the project was developed in phases. However, there was no coordination between different stages of the project. The entire layout is arbitrary with an elaborate circulation pattern. Community facilities are proposed on open spaces and are scattered throughout the site. Undefined physical controls/responsibilities make this layout a burden to the agency.

LAND USE: The locality is primarily a medium density residential area. Commercial establishments have sprung along the major routes. Two natural water canals pass through the locality. Parts of the locality are still used for agricultural use. A high school, a bus terminal and several other community facilities are also scattered in the locality.

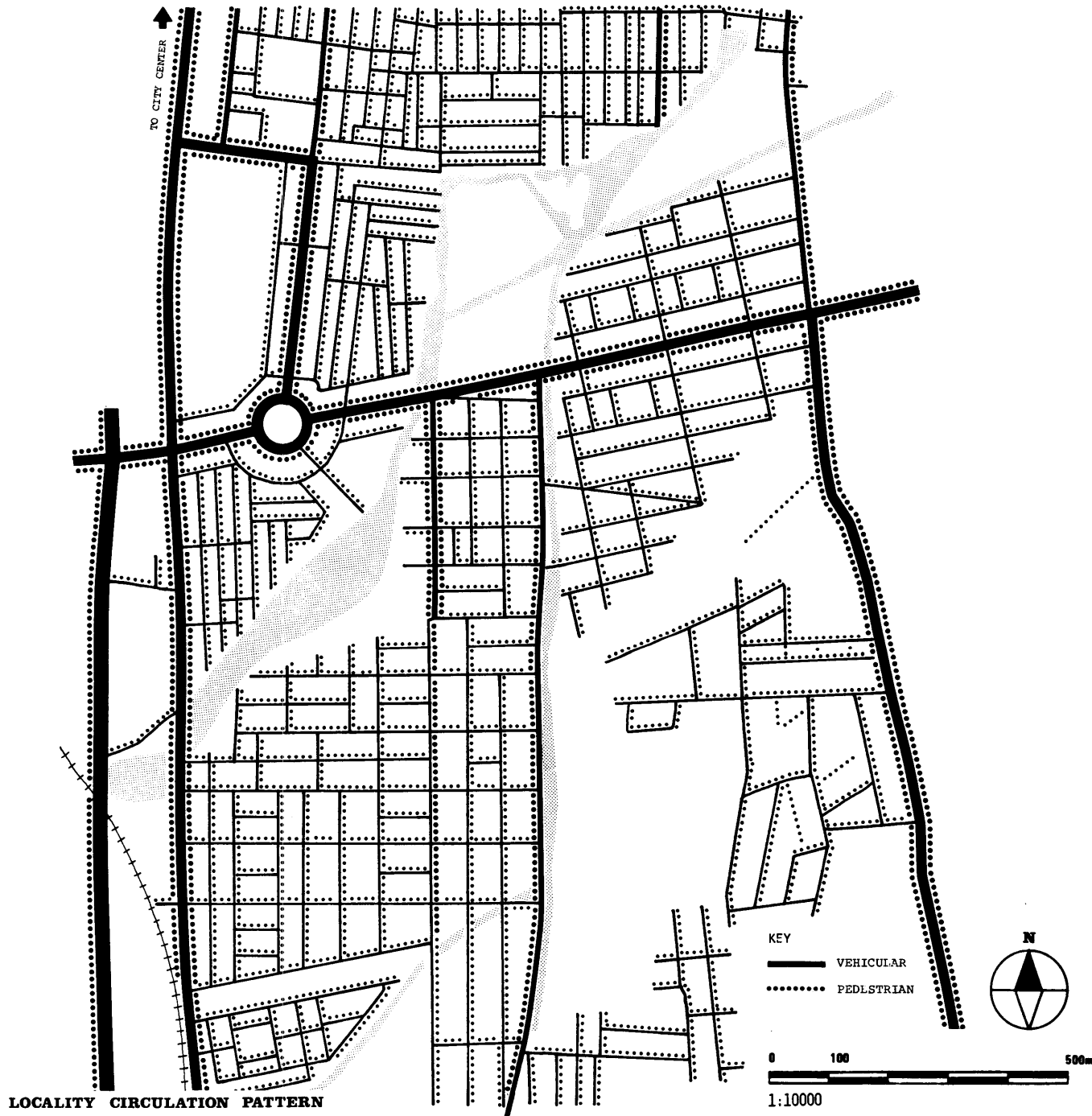
CIRCULATION: Gondal Road, Dhebar Road, Bhaunagar-Aji Causeway and Kotharia Road are the primary routes of circulation. Gondal Road and the causeway carry heavy vehicular traffic, while the rest of the roads are pedestrian dominated. The locality is connected with the city bus service. It takes approximately 25 minutes to go to the city center and the service is relatively expensive.

LOCALITY CONSTRUCTION TYPES

	%		
	0	100	
SHACK	_____	_____	SELF-HELP
MUD/WATTLE	_____	_____	ARTISAN
WOOD	_____	_____	SMALL CONTRACTOR
MASONRY WOOD	_____	_____	LARGE CONTRACTOR
MASONRY CONCRETE	_____	_____	
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: approximate





LOCALITY UTILITIES AND SERVICES

- WATER SUPPLY
- SANITARY SEWERAGE
- STORM DRAINAGE
- ELECTRICITY
- GAS
- REFUSE COLLECTION
- PUBLIC TRANSPORTATION
- PAVED ROADS, WALKWAYS
- TELEPHONE
- STREET LIGHTING

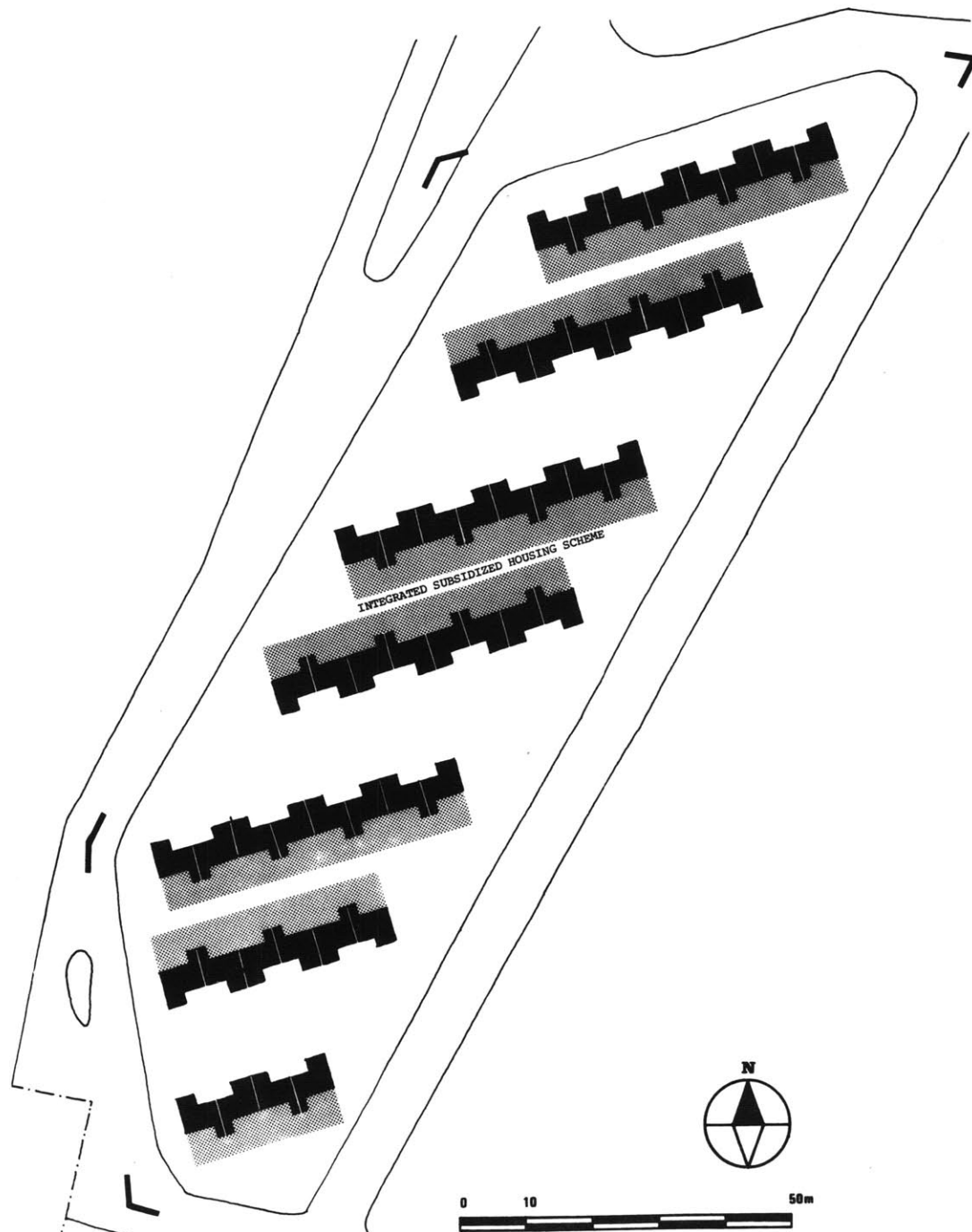
LOCALITY COMMUNITY FACILITIES

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

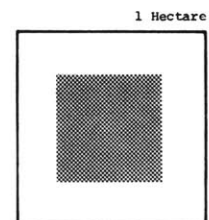
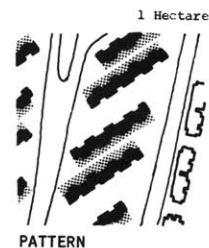
The chart illustrates the approximate availability of utilities, services, and community facilities at three levels: NONE, LIMITED, ADEQUATE.  
 Quality of information: approximate

LOCALITY SEGMENT PLAN

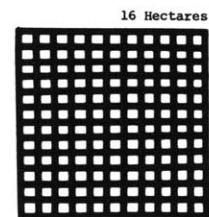




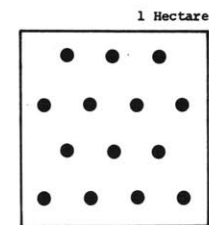
SUMMARY DIAGRAMS



Streets/Walkways	69%
Playgrounds	--
Cluster Courts	--
Dwellings/Lots	31



Unit Length	582
m/Ha.	



Persons/Hectare	287
●	20 Persons

**POPULATION AND INCOME:** The population in the locality belongs to low and middle income strata. Majority of the people are hindus and speak Gujarati. More than half of the population was born outside the Rajkok Urban area. Though many are employed in the adjoining industrial areas, the nature of employment varies enormously. In the Anandnagar Colony, the houses are occupied by families having income levels higher than the target low income groups. Generally, 15 % to 20 % of the monthly income is paid as house rent or loan instalment.

**LOCALITY SEGMENT PLAN:** The selected segment shows a part of the Anandnagar housing colony. The dwelling types vary from rowhouses to three storey walk-up apartments. The city bus service terminates on the Kotharia Road outside the colony. A cinema hall, and various commercial establishments are existing along the road. The layout is completely arbitrary and has no relation to either the orientation or the variety of housing types. Open spaces are badly maintained and used in many cases, as garbage dumps.

**LOCALITY BLOCK A:** One of the typical building types is the rowhouse, built for industrial workers under the "Integrated Subsidized Housing Scheme". The lots are 58 m<sup>2</sup> in area and have 28 m<sup>2</sup> of built up area. Each lot is 6 m. wide and includes an open backyard. In many cases, people have added rooms either in front or at the back of the house. The density is low (287 persons/ha.) due to poor planning and excessive public land.

LOCALITY BLOCK LAND UTILIZATION DATA

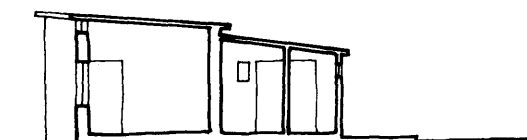
DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	50	1.01	50
DWELLING UNITS	50	1.01	50
PEOPLE	290	1.01	288

AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	0.70	69%
SEMI-PUBLIC (open spaces, schools, community centers)	-	-
PRIVATE (dwellings, shops, factories, lots)	0.31	31%
SEMI-PRIVATE (cluster courts)	-	-
<b>TOTAL</b>	<b>1.01</b>	<b>100%</b>

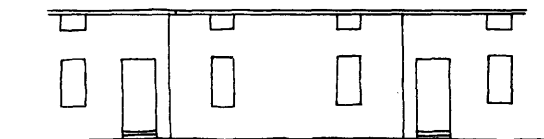
NETWORK EFFICIENCY

Network length (streets, walkways) = 582 m/Ha  
 Areas served (total area)

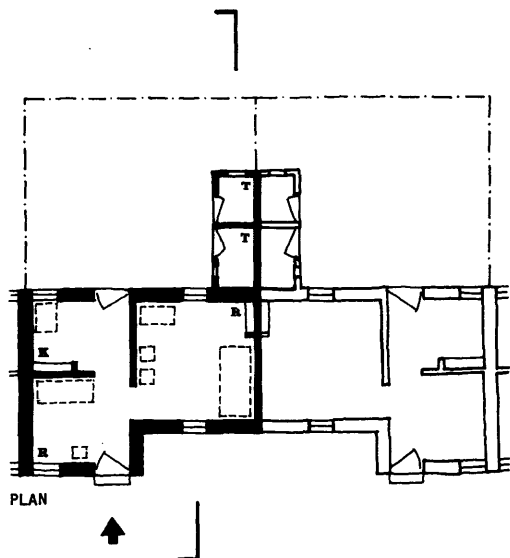
LOCALITY BLOCK LAND UTILIZATION 1:1000



SECTION



ELEVATION



PLAN

## KEY

- L 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)

DWELLING UNIT  
 type: HOUSE  
 area (sq m): 28  
 tenure: LEGAL RENTAL

LAND/LOT  
 utilization: PRIVATE  
 area (sq m): 58  
 tenure: LEGAL RENTAL

DWELLING  
 location: PERIPHERY  
 type: ROW HOUSES  
 number of floors: 1  
 utilization: MULTIPLE FAMILIES  
 physical state: FAIR

DWELLING DEVELOPMENT  
 mode: INSTANT  
 developer: PUBLIC SECTOR  
 builder: LARGE CONTRACTOR  
 construction type: STONE MASONRY  
 year of construction: 1960-61

MATERIALS  
 foundation: STONE  
 floors: CEMENT  
 walls: STONE  
 roof: CORRUGATED SHEETS

DWELLING FACILITIES  
 wc: 1  
 shower: 1  
 kitchen: 1  
 rooms: 2  
 other: NONE

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

GENERAL: SOCIAL  
 user's ethnic origin: HINDU  
 place of birth: RAJKOT DISTRICT  
 education level: PRIMARY SCHOOL

NUMBER OF USERS  
 married: 4  
 single: 2  
 children: 4  
 total: 10

MIGRATION PATTERN  
 number of moves: 2  
 rural - urban: 1950  
 urban - urban: 1960  
 urban - rural: -  
 why came to urban area: EMPLOYMENT

GENERAL: ECONOMIC  
 user's income group: LOW/MIDDLE  
 employment: INDUSTRIAL  
 distance to work: 3 KM  
 mode of travel: BICYCLE

COSTS  
 dwelling unit: U.S.\$ 1125  
 land - market value: -

DWELLING UNIT PAYMENTS  
 financing: SUBSIDIZED RENTAL  
 rent/mortgage: U.S.\$ 5/MONTH  
 % income for rent/mortgage: 6 %

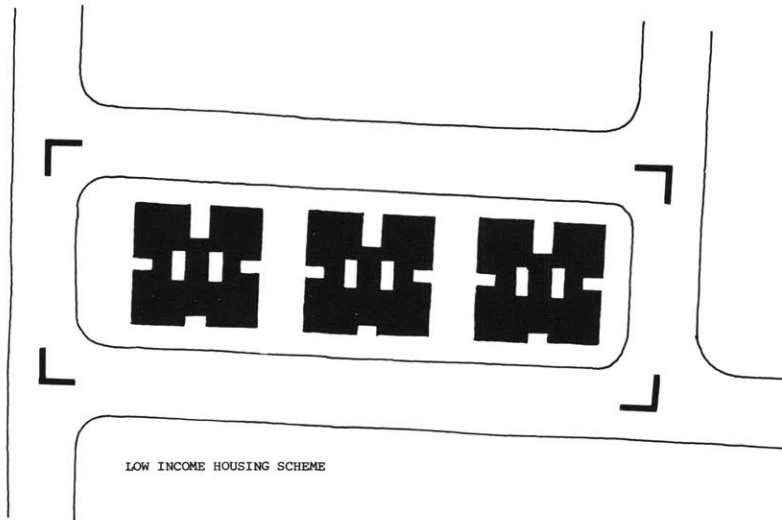


1:200

TYPICAL DWELLING

PHOTOGRAPHS:  
 (top) Anand Nagar, Rajkot, 1978: A view of "integrated Subsidized Housing Scheme"-row houses.  
 (bottom) three storied walk-up apartments built under the same scheme.





**KEY**

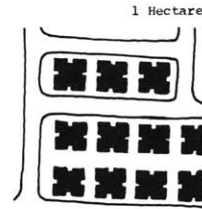
Public:	streets, walkways	
Semi-Public:	playgrounds	
Semi-Private:	cluster courts	
Private:	lots	
	dwellings	



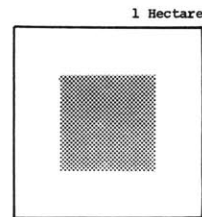
**LOCALITY BLOCK LAND UTILIZATION**

1:1000

**SUMMARY DIAGRAMS**

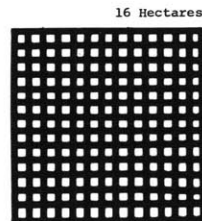


**PATTERN**



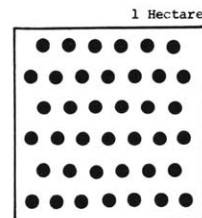
**PERCENTAGES**

Streets/Walkways	72%
Playgrounds	--
Cluster Courts	--
Dwellings/Lots	28



**CIRCULATION EFFICIENCY**

Unit Length	658
m/Ha.	



**DENSITY**

Persons/Hectare	788
● 20 Persons	

**LOCALITY BLOCK B:** Three storey walk-up apartments are very common in the housing projects built by the GHB. Four apartments with a living room, a bedroom, a kitchen, a bath, a w.c. and a verandah are arranged on each floor around a common staircase. Low quality construction, and poorly defined physical controls/responsibilities make this layout very inefficient.

Under the "Low Income Housing Scheme", 336 walk up apartments were built during 1970-72 period. These apartments were allotted on hire-purchase basis with an initial deposit of 25% of the total cost and remaining amount paid in the monthly instalments spread over 10 to 20 years. 96 more units were added under the scheme during 1975-76 period.

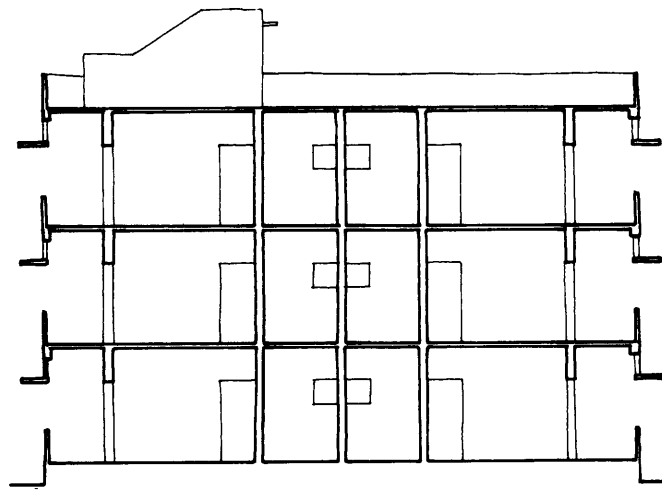
**LOCALITY BLOCK LAND UTILIZATION DATA**

DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	-	0.25	
DWELLING UNITS	36	0.25	144
PEOPLE	197	0.25	788

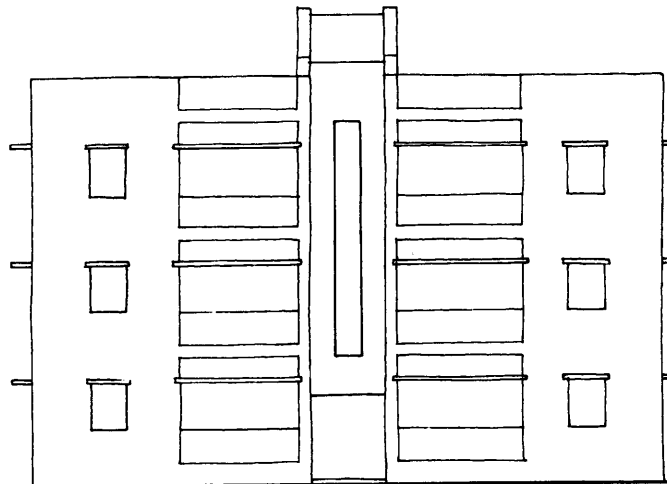
AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	0.18	72%
SEMI-PUBLIC (open spaces, schools, community centers)	-	-
PRIVATE (dwellings, shops, factories, lots)	0.07	28%
SEMI-PRIVATE (cluster courts)	-	-
<b>TOTAL</b>	<b>0.25</b>	<b>100%</b>

**NETWORK EFFICIENCY**

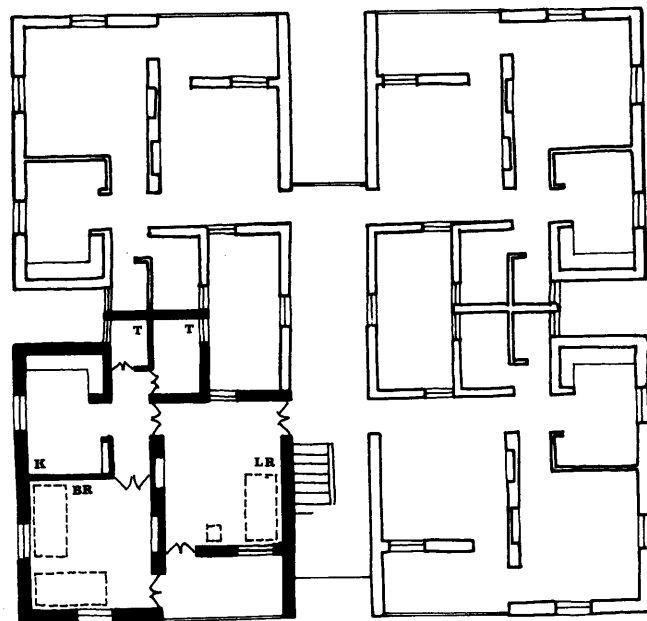
Network length (streets, walkways) = 658 m/Ha  
 Areas served (total area)



SECTION



ELEVATION



PLAN

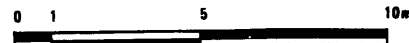
TYPICAL DWELLING

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)

SOCIO-ECONOMIC DATA  
(related to user)

- GENERAL: SOCIAL
- user's ethnic origin: HINDU
- place of birth: SAURASHTRA
- education level: SECONDARY SCHOOL
- NUMBER OF USERS
  - married: 2
  - single: 2
  - children: 3
  - total: 7
- MIGRATION PATTERN
  - number of moves: 2
  - rural - urban: 1960
  - urban - urban: 1970
  - urban - rural:
- why came to urban area: EMPLOYMENT
- GENERAL: ECONOMIC
- user's income group: MIDDLE
- employment: SERVICE/BUSINESS
- distance to work: 4 KM
- mode of travel: BICYCLE/BUS
- COSTS
  - dwelling unit: U.S.\$ 2190
  - land - market value:
- DWELLING UNIT PAYMENTS
  - financing: HIRE-PURCHASE
  - rent/mortgage: U.S.\$ 13/MONTH
  - % income for rent/mortgage: 16 %



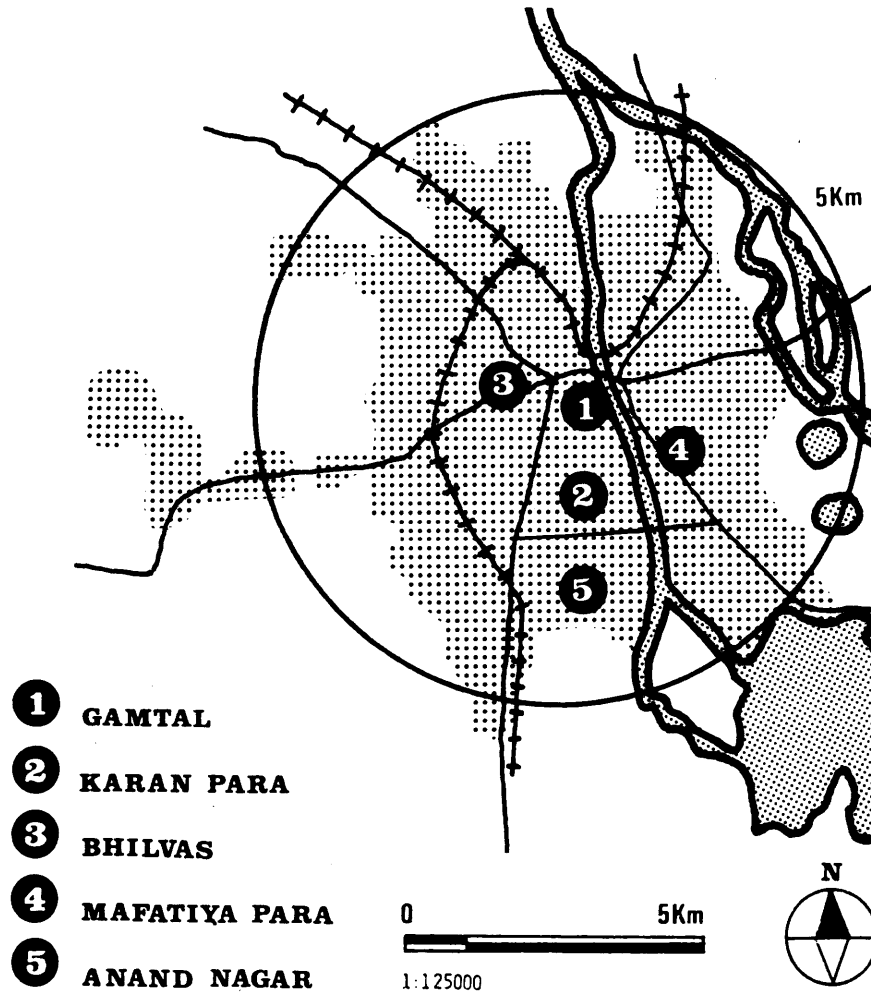
1:200

PHYSICAL DATA  
(related to dwelling and land)

- DWELLING UNIT
  - type: APARTMENT
  - area (sq m): 47
  - tenure: LEGAL OWNERSHIP
- LAND/LOT
  - utilization: PUBLIC
  - area (sq m): --
  - tenure: LEGAL OWNERSHIP
- DWELLING
  - location: PERIPHERY
  - type: WALK-UP
  - number of floors: 3
  - utilization: MULTIPLE FAMILIES
  - physical state: FAIR
- DWELLING DEVELOPMENT
  - mode: INSTANT
  - developer: PUBLIC
  - builder: LARGE CONTRACTOR
  - construction type: MASONRY/CONCRETE
  - year of construction: 1971-72
- MATERIALS
  - foundation: BRICK
  - floors: CEMENT
  - walls: MASONRY
  - roof: REINFORCED CONCRETE
- DWELLING FACILITIES
  - wc: 1
  - shower: 1
  - kitchen: 1
  - rooms: 2
  - other: VERANDAH

## EVALUATIONS

**LAND UTILIZATION:  
PATTERNS, PERCENTAGES, CIRCULATION EFFICIENCIES, DENSITIES**



*The different case studies are represented here in terms of land utilization (Patterns, Percentages, Circulation Efficiencies and Densities) in a format that allows comparison and evaluation of the physical layout of each of the dwelling systems.*

*The cases are arranged in a chronological order of development. The comparison shows a trend towards reduction in private areas and excessive circulation areas. The criteria used in the evaluation of efficiency of physical layouts in the survey are:*

### PATTERNS

1 Hectare

Layout patterns show lot configuration, blocks and circulation, which determine land utilization percentages, circulation lengths and densities in relation to the number of lots, dwellings and people.

### PERCENTAGES

1 Hectare

Proportions of public and private areas: They determine maintenance responsibility, user control and functional efficiency of a layout; e.g. a large percentage of land for circulation results in high costs of installation per person and extensive maintenance for the public sector.

### CIRCULATION EFFICIENCIES

16 Hectares

Circulation lengths: A relation between public circulation length and area served indicates the network efficiency; a high ratio reflects a less efficient network in terms of direct capital investments and maintenance costs.

### DENSITIES

1 Hectare

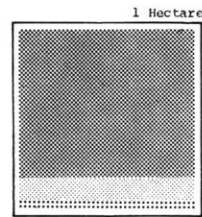
The number of persons per hectare relates to both the number of lots and the types of dwellings per hectare. This determines the intensity of land use; low densities mean higher development costs per person.



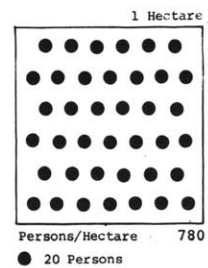
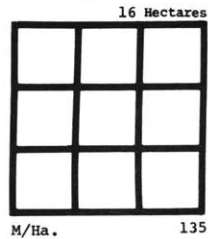
### 1 GAMTAL

Private, low/middle income, Walled city

Low percentage of land for streets & walkways; Adequate land for lots. High density. Deteriorating standards of services due to layout pattern.



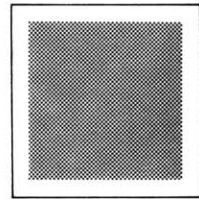
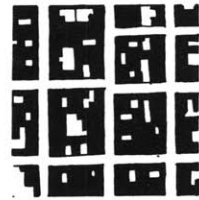
Streets/Walkways	11%
Playgrounds	4
Cluster Courts	11
Dwellings/Lots	74



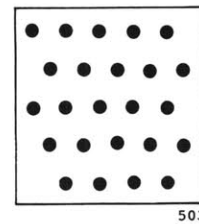
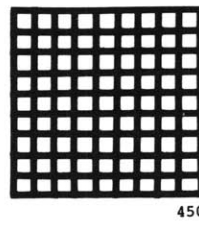
### 2 KARAN PARA

Private, middle/higher middle income. European influence.

High percentage of land for streets and walkways. No semi-public/semi-private areas. Does not suit the living conditions.



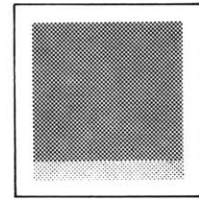
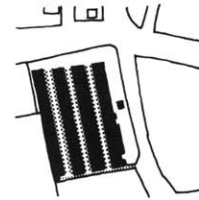
Streets/Walkways	33%
Playgrounds	--
Cluster Courts	--
Dwellings/Lots	67



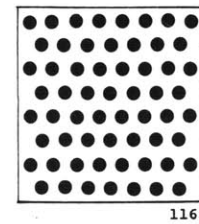
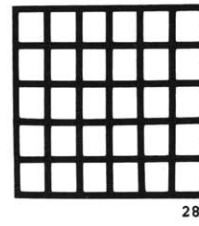
### 3 BHILVAS

Private, very low/low income, Chawls.

High percentage of public land, extremely low dwelling area. High density, deteriorating physical environment.



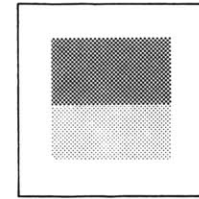
Streets/Walkways	32%
Playgrounds	--
Cluster Courts	9
Dwellings/Lots	59



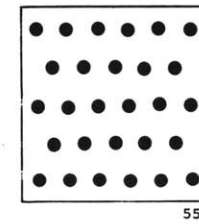
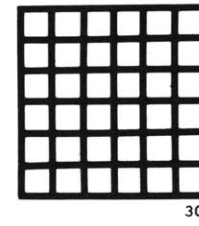
### 4 MAFATIYA PARA

Popular, very low/low income, squatters.

Percentage of land for streets and walkways, not a true representation of utilization due to undefined lot lines/responsibility. Low percentage of private/semi private areas.



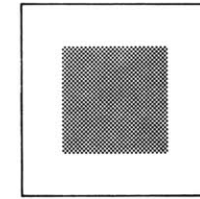
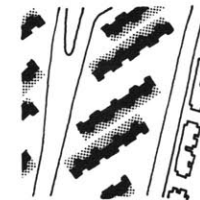
Streets/Walkways	59%
Playgrounds	--
Cluster Courts	19
Dwellings/Lots	22



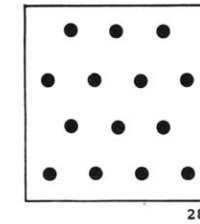
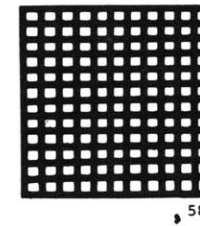
### 5a ANAND NAGAR

Public, low/middle income, single storey row houses.

High percentage of public land, low percentage of private areas. Wasteful layout, low density.



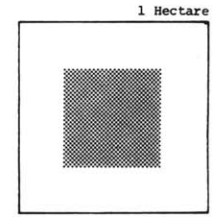
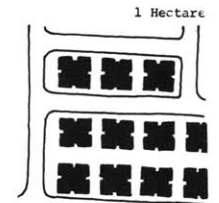
Streets/Walkways	69%
Playgrounds	--
Cluster Courts	--
Dwellings/Lots	31



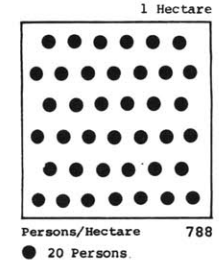
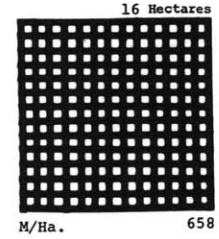
### 5b ANAND NAGAR

Public, low/middle income, Three storied walk-up apartments.

Very high percentage land for streets and walkways, undefined physical controls/responsibilities make it a poor layout.



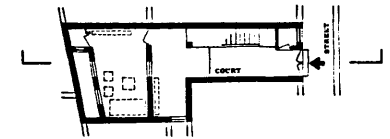
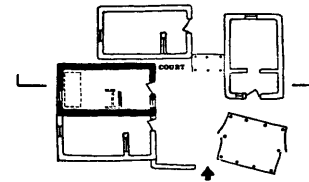
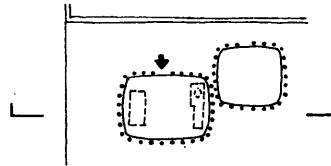
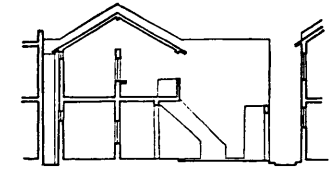
Streets/Walkways	72%
Playgrounds	--
Cluster Courts	--
Dwellings/Lots	28



**TIME/PROCESS PERSPECTIVE**

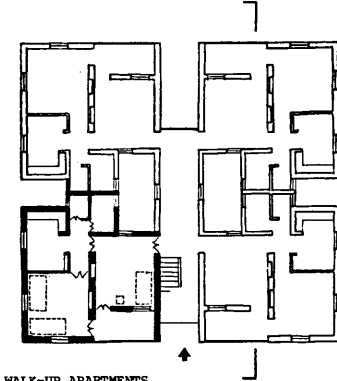
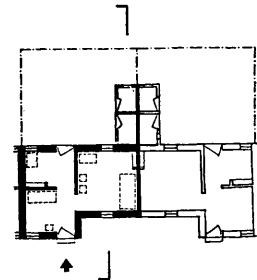
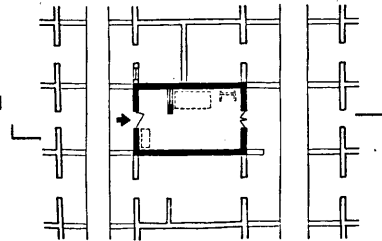
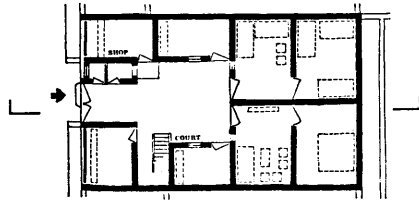
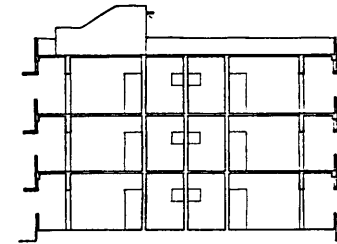
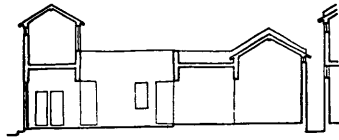
EXISTING HOUSING MODELS ARE THE MOST VALUABLE SOURCES OF INFORMATION IN FORMULATING URBAN LAND POLICIES AND HOUSING PROGRAMS. THE MODELS PROVIDE A GUIDE TO GENERAL YET BASIC QUESTIONS OF LAND USE (FOR WHAT), LAND DISTRIBUTION (TO WHOM) AND LAND SUB-DIVISION (HOW TO).

THE MODELS ALSO PROVIDE A GUIDE TO MORE SPECIFIC QUESTIONS: HOW DO THEY RELATE TO DIFFERENT CULTURES AND VALUES? WHAT RANGES OF POPULATION DO THEY PERMIT? TO WHAT INCOME GROUPS ARE THEY ACCESSIBLE? HOW EFFICIENT IS THE LAND UTILIZATION WHICH THEY PROVIDE?



IDENTIFICATION	Dwelling system	DETACHED SHANTIES VANZARA JUGGIS	CLUSTERED HOUSES ZONPAD PATTIS	ROW HOUSES DELA
	<i>Dwelling Configuration</i>	<i>Lot Stories Layout</i>	No lots. On public/private land. 1 One room shelter with extended open spaces.	No lots. On unclaimed public/private land. 1 One room huts with shared cluster courts.
<i>Location Block layout</i>	<i>Location Block layout</i>	Along railway lines/river banks/periphery. No specific blocks.	Center/periphery/on transportation lines. No specific blocks.	Walled city and adjacent areas. Organic pattern with closed loops/dead end streets terminating in a chawk. Acceptable.
<i>Land utilization</i>	<i>Land utilization</i>	Bad.	Bad.	
<i>Origin Localities Urban population served</i>	<i>Origin Localities Urban population served</i>	Traditional nomadic huts/recent squatters. Scattered through out the city. 2%	Traditional rural huts/recent squatters. Mafatiya Para. Scattered through out city. 10%	Middle ages. Gam Tal 15%
PAST	<i>User income groups Dwelling utilization Population density Trend</i>	Very low Single -- Continuing g	Very low Single Low Continuing	Low/moderately low Extended Medium Continuing
	<i>User income groups Dwelling utilization Population density Trend</i>	Very low Single Medium/high Proliferating	Very low Single/multiple Low/medium Proliferating	Moderately low/middle Extended High Continuing
	<i>User income groups Dwelling utilization Population density Trend</i>	Very low Single/multiple Medium/high Proliferating	Very low/low Single/multiple Medium/high Proliferating	Moderately low/middle Extended High Continuing
FUTURE	<i>Cultural acceptance</i>	Yes	Yes.	Yes.
	<i>Income group feasibility</i>	Nomadic migrants without capacity to pay for better dwellings.	Recent migrants having as main priority accessibility to a job.	Low/middle income inhabitants.
COMMENTS	<i>Model</i>	Juggis will continue to house new/nomadic migrants, however, by providing subsidized land/communal utilities, they can be encouraged to utilize their traditional skills.	Security of tenure and communal utilities/services should be provided to allow consolidation of their dwellings/clusters.	Credit facilities may be provided to upgrade dwellings in terms of physical state, sanitary and safety conditions.

The chart illustrates different dwelling systems existing in the city in an attempt to relate them to their originating models, and to see them in a broader time/process perspective. The dwelling systems illustrate different options available in terms of types, layout characteristics, location in the city, origin and the population served. After identification of the originating models and the recent trends, certain conclusions have been drawn from this study about their cultural acceptance and feasibility for future



**ROW HOUSES WITH COURTYARDS  
FALJA**

Medium/large, narrow.  
1-2  
Houses around semi-private/private courtyards with common individual facilities.

Most areas developed during British Rule. Very small blocks. Colonial influence.

Bad.

Traditional courtyard houses  
Karan Para and adjoining areas.  
35%

Very low	Single	Medium	Continuing
----------	--------	--------	------------

Very low/low	Multiple	High	Continuing
--------------	----------	------	------------

Very low	Multiple	High	Stationary
----------	----------	------	------------

Yes.

Businessmen, public/private office staff.

Credit facilities for expansion may be provided to increase the housing stock. Communal ownership/control/responsibility of certain streets may be considered for semi private use.

**ROW HOUSES  
CHAWLS**

Small, narrow.  
1  
Compact one room shelters along public/semi-private lanes with no/communal utilities.

Center/low-lying areas. Colonial influence. (economic constraints)

Bad/acceptable.

-  
Bhilvas  
5%

Low/moderately low	Extended	Medium	Continuing
--------------------	----------	--------	------------

Middle/higher middle	Extended	Medium	Continuing
----------------------	----------	--------	------------

Middle/high	Multiple	High/medium	Continuing
-------------	----------	-------------	------------

No.

Domestic/office servants.

Chawls should be upgraded and a revised layout should respond to user needs, possibility of expansion and flexibility of spaces.

**ROW HOUSES WITH FRONT/BACK OPEN SPACES  
VASAHAT**

Small/medium, narrow.  
1  
Houses with independent facilities and with extended open spaces.

periphery, public housing projects. Imported.

Bad.

Universal. Post-independence public housing. Anand Nagar Colony.  
7%

Low/middle	Single	Low	Continuing
------------	--------	-----	------------

Low/middle	Multiple	Low	Continuing
------------	----------	-----	------------

Moderately low/middle	Multiple	Low	Continuing
-----------------------	----------	-----	------------

No.

Industrial workers.

A revised model should minimize public land and maximize semi-private spaces with shared cluster courts.

**WALK-UP APARTMENTS**

No lots.  
2-3  
Houses with independent facilities.

Periphery/center. Imported.

Bad.

Universal. Post independence public housing. Anand Nagar Colony.  
5%

Low/middle	Single	Low	Continuing
------------	--------	-----	------------

Low/middle	Multiple	Medium	Proliferating
------------	----------	--------	---------------

Middle/high	Multiple	Medium	Proliferating
-------------	----------	--------	---------------

No.

Low/middle income groups.

A revised model should identify public/private responsibilities for better maintenance, utilization of land and should include traditional values in dwelling design.

**Dwelling system**

Lot Dwelling  
Stories Configuration  
Layout

Location  
Block layout

Land utilization

Origin  
Localities  
Urban population served

User income groups  
Dwelling utilization  
Population density  
Trend

User income groups  
Dwelling utilization  
Population density  
Trend

User income groups  
Dwelling utilization  
Population density  
Trend

Cultural acceptance

Income group feasibility

Model

IDENTIFICATION

PAST

PRESENT

FUTURE

COMMENTS

## CONCLUSIONS

India, which accounts for 1/7th of the world population, is expected to cross the 945 million population mark by the turn of the century. The urban population would reach a staggering 278 million, with 9 intermediate cities reaching the one million mark and the other 30 reaching half a million population.

While the goals for decentralizing metropolises have remained a myth, the need for developing small and intermediate towns, and cities still remains. The intermediate cities will continue to expand in the foreseeable future. At the same time the backlog and shortages in infrastructure services and housing accommodations will continue to multiply. The inevitable result of this growth is reflected in the continuing deterioration in the environment, congestion, and growth of urban poverty.

Obviously, unless appropriate efforts are made now, India would have to deal with environmental and urban chaos in many emerging metropolises in the country. With proper planning and development, the intermediate cities can certainly become the focus of future growth in the country. The role of such cities, namely, to facilitate decentralization of the economic activities and to reduce population pressure on the decaying metropolises, is very significant to the overall development of the country. A few immediate measures at the city scale are indicated as follows:

### PROPER PLANNING AND DEVELOPMENT:

- Extend/alter the city limits to include all peripheral areas, which have already developed and all areas that are likely to develop in the coming 20 years, to bring them under the jurisdiction of one authority.
- Prepare/update development plans for the entire city/extended urban areas.
- Implementation of the development plan should be

the responsibility of the local municipality/development authority in the city.

- Divide the peripheral areas into segments of 100 to 200 hectares and, depending on the priority, develop them with adequate services/utilities.

### EXPANSION/IMPROVEMENT OF CITY UTILITIES/SERVICES:

- Prepare/update basic structural plans for water/sewerage/electricity/circulation/storm drainage.
- Expand/improve the water supply network. Increase the capacity of city water supply by increasing the capacity of water reservoirs/filtration plants, to serve the growing population.

### UPGRADING SQUATTER SETTLEMENTS:

- Undertake surveys of all the squatter settlements in such cities and upgrade them by providing streets, communal utilities/services; and legalize their ownership, wherever possible/feasible.

### INCREASING HOUSING STOCK:

- Develop sites and services, and core/self help schemes at locations reserved for low income housing in the town planning schemes.
- Channelize State Housing Board activities towards provision of utilities/services and community facilities, instead of completed dwellings.
- Provide credit facilities to middle/higher middle income groups to expand their houses, to 2 to 3 floors, to increase the housing stock.
- Encourage/support cooperative housing developments.

### IMPROVING PUBLIC TRANSPORTATION:

- Expand/introduce public transportations in the peripheral areas, to utilize inexpensive fringe land for development.
- Subsidize public transportation in the low income areas.
- Urban land, employment generation programs, industrial development and various related aspects also need consideration.

# BHAKTINAGAR UPGRADING AND EXPANSION PROJECT, RAJKOT

## INTRODUCTION

Unchecked urban expansion has been the key phenomenon in such cities as Rajkot, as a result of the rapid growth of the city populations in the recent past. Such unplanned developments outside the city limits, and/or within the extended city limits (where the city limits have been extended in the last decade) are usually devoid of basic infrastructure services and community facilities. However, the local authorities have not kept pace with the increasing demands for infrastructure services, community facilities, low income housing, transportation and so on. Though financial constraints have posed many problems, lack of long range planning and improper allocation of valuable resources have been primarily responsible for the existing situation.

With proper development, such cities can certainly become the focus of future growth in the country. In such cities, land is fairly cheap, densities are relatively low and the distances between the employment sectors and housing areas are manageable. At the same time such cities are big enough in most cases to support and administer fairly wide range of economic opportunities. The role of such cities in the overall development of the country, to facilitate decentralization of the economic activities and to reduce population pressure on the decaying metropolitan areas is very important.

A solution to many of the problems lie in the proper development of infrastructure services and so the priority must be given to the expansion and/or introduction of infrastructure services. Since the costs of development are directly proportional to the lengths of service networks, an importance must be given to the design of an efficient physical layout. The percentage of land used for streets and walkways

must be reduced to minimize the costs of purchase of land and to maximize the availability of land for such other purposes as low income housing and community facilities. At the same time provision of access to land, infrastructure and credit facilities to the urban poor needs greater attention than the conventional housing programs.

Bhaktinagar Upgrading and Expansion Project in the city of Rajkot, is an attempt to study the diverse problems of unchecked land development and to propose an alternative way to evaluate and upgrade such areas. The project area encompassing 208 hectares of land, is estimated to house 95,000 people at saturated stage. The development in this area would benefit roughly 20,000 people, already living in this area. The economic feasibility and the optimum utilization of available resources have been considered to make this project a comparative reference for the scheme, now being prepared by the Town Planning Branch of the Rajkot Municipal Corporation.

This project is intended to become an Urban Development Model for Bhaktinagar area following the provisions laid down in the Gujarat Town Planning and Urban Development Act of 1976. Since major planning decisions have to be taken in consultation with the local land owners and the concerned authorities, this proposal is studied to provide a tentative set of guidelines and an alternative process for physical development. It optimizes land utilization and infrastructure networks through an efficient layout design. The proposal focuses on a residential sector and includes a physical plan, a circulation plan and a land use plan.

**BACKGROUND**

The area encompassing approximately 208 hectares of land was developed for the first time for urban use in 1950, with the establishment of the Bhaktinagar Housing Society. Dhebar Colony, a public housing project was soon begun along the railway line housing 200 low income families. With the establishment of the Aji Industrial Estate in 1960, a causeway was constructed linking National Highway 8-B with Bhavnagar State Highway. This causeway also formed a primary link between the Aji and the Bhaktinagar industrial areas. Shifting of the railway line in 1961 and construction of Dhebar Road gave boost to the development of this area. 61% of the present site is within the old Municipal Limit, while 39% of land is within the extended Municipal Limit (The limits were extended in 1962). The Development Plan was approved for the old limits on June 4, 1971, while the Development Plan for area between the old limits and the extended limit was approved on October 18, 1976.

The Town Planning Branch of the Rajkot Municipal Corporation has been preparing "Town Planning Schemes" since August 1975, for the control and development of land following the development plan, under the Bombay Town Planning Act of 1954. Such Town Planning Schemes are prepared to check haphazard growth and to implement the provisions for zoning and development laid down in the Development Plan. Bhaktinagar Project Area is the fifth Town Planning Scheme undertaken by the Rajkot Municipal Corporation, under the new Gujarat Town Planning and Urban Development Act of 1976. The work on this area was begun on April 16, 1977, and preliminary surveys of the existing developments were carried out. During the author's field research in July-August 1978, the survey was nearly complete and work had started on preparation

of a draft Town Planning Scheme. The scheme makes provisions for following:

- laying or relaying of land, either vacant or built.
- filling and reclamation of low lying land.
- layout of new streets, including construction, diversion, extension, alteration, improvement and closing of streets.
- construction, alteration and removal of bridges and other structures.
- allotment or reservation of land for roads, open spaces, gardens, recreation areas, schools, markets and transportation facilities.
- development of infrastructure services such as water supply, drainage, sewage disposal and street lighting.
- preservation of monuments.
- reservation of land for low income housing for economically weaker sections of the society.

**SUMMARY OF TOWN PLANNING SCHEMES:**

The chart on the opposite page summarizes five Town Planning Schemes in the city, now under various stages of development. It focusses on the present policies with specific reference to land utilization, low income housing and land acquisition.

## SUMMARY

## TOWN PLANNING SCHEMES IN RAJKOT

BHAKTINAGAR  
PROJECT AREA

	TOWN PLANNING SCHEME 1	TOWN PLANNING SCHEME 2	TOWN PLANNING SCHEME 3	TOWN PLANNING SCHEME 4	TOWN PLANNING SCHEME 5
<i>PRIMARY INFORMATION</i>					
Declaration to prepare the scheme	August 13, 1975	August 13, 1975	June 17, 1976	June 17, 1976	April 16, 1977
AREA OF THE SCHEME	170.10 Ha	133.65 Ha	149.85 Ha	198.08 Ha	208.42 Ha
Scheme sanctioned by the State Government	February 25, '77	February 25, '77	July 26, 1978	July 24, 1978	--
<i>LAND UTILIZATION</i>	<i>BEFORE THE SCHEME</i> <i>PROPOSED IN THE SCHEME</i>	<i>BEFORE THE SCHEME</i> <i>PROPOSED IN THE SCHEME</i>	<i>BEFORE THE SCHEME</i> <i>PROPOSED IN THE SCHEME</i>	<i>BEFORE THE SCHEME</i> <i>PROPOSED IN THE SCHEME</i>	<i>BEFORE THE SCHEME</i> <i>PROPOSED IN THE SCHEME</i>
PUBLIC (Streets, walkways)	02.39% 20.20%	03.04% 15.04%	01.03% 11.68%	04.93% 11.84%	05.12% 15.52%
SEMI-PUBLIC (Open spaces, schools, community areas)	-- 04.85%	-- 06.40%	-- 04.66%	-- 04.57%	-- 07.24%
PRIVATE (Dwellings, shops, factories, lots, etc.)	97.61% 74.52%	96.96% 76.96%	98.97% 82.52%	95.07% 82.04%	94.88% 75.69%
LOW INCOME HOUSING (EWS housing)	-- 00.43%	-- 01.60%	-- 01.14%	-- 01.55%	-- 01.55%
PROPOSED LAND ACQUISITION	23.09% of total	20.00% of total	16.45% of total	13.03% of total	19.19% of total

## EXISTING SITUATION

### POPULATION AND INCOME:

Approximately 20,000 people live in this area in a variety of housing types, which vary from illegal squatter settlements to 3 storey walk-up apartments. 40% to 50% of the population is employed in industries due to its central location between two major industrial areas in the city. More than 60% of the population belongs to low income groups and many of them are living in rental accommodations created by private developers. Many very low income families live illegally on vacant land/natural water run-offs/stone quarry and areas adjacent to the quarry. Several co-operative housing societies and 3 public housing projects provide accommodations for moderately low to middle income groups.

### SITE DATA:

#### LOCATION:

Bhaktinagar area is situated on the southwest periphery of the city of Rajkot at about 3 kms. from the city center. It is at a distance of 2 kms. from the Bhaktinagar industrial area and at about 3 kms. from the Aji industrial area.

#### APPROACHES AND ACCESSES:

The Bhaktinagar causeway running east-west on the north side of the site is the primary approach from Bhaktinagar as well as Aji industrial areas. Gondal Road (National Highway 8-B), Dhebar Road and Kotharia Road running north-south give access to the city center.

#### BOUNDARIES:

The site is bounded by Gondal Road and a railway line on the west, Kotharia Road on the east and Bhaktinagar causeway on the north. The boundary on the south is undefined.

### TRANSPORTATION:

A city bus service operates on the causeway, Gondal Road and Kotharia Road. Bicycles remain the popular mode of transportation.

### LAND TENURE:

Three parcels of land are owned by the Gujarat Housing Board, while the remainder of the land is privately held. The largest plot is 17.75 hectares, while the smallest plot is 0.036 hectares.

### ZONING REGULATIONS AND BUILDING BY-LAWS:

The major portion of the site is zoned for residential use, except for the south-west sector, which is zoned for general industrial use. The proposed project considers land subdivision and building codes enforced by the Rajkot Municipal Corporation.

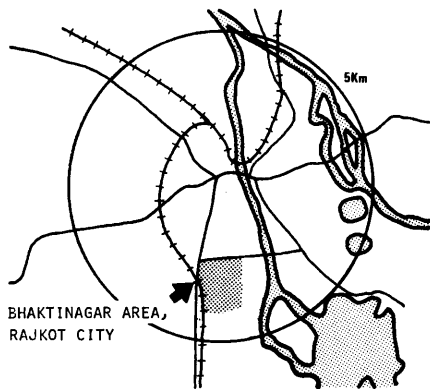
### INFRASTRUCTURE SERVICES AND COMMUNITY FACILITIES:

The city does not have a sewerage system, while the water supply network does not reach the entire site. As a result, individual or co-operative tube wells and septic tanks are commonly used. Electricity, however, is available on the entire site. Plans for expansion of water supply and a city sewerage system are under progress. Community facilities are almost non-existent.

### EXISTING STRUCTURES:

The site has been partially developed. Three Gujarat Housing Board housing projects and co-operative housing societies are scattered in the site. Private speculative development is also wide-spread. A stone quarry on Kotharia Road has attracted many squatters to the nearby land. A small chemical industry along with a few other small industries exist along the railway line on the south-west periphery of the site.

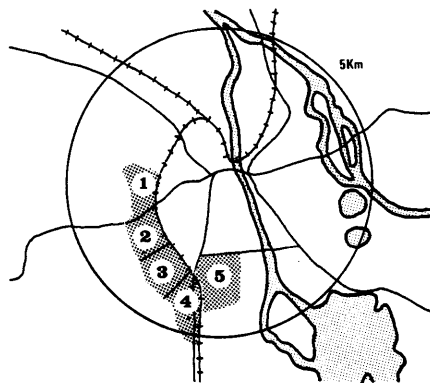




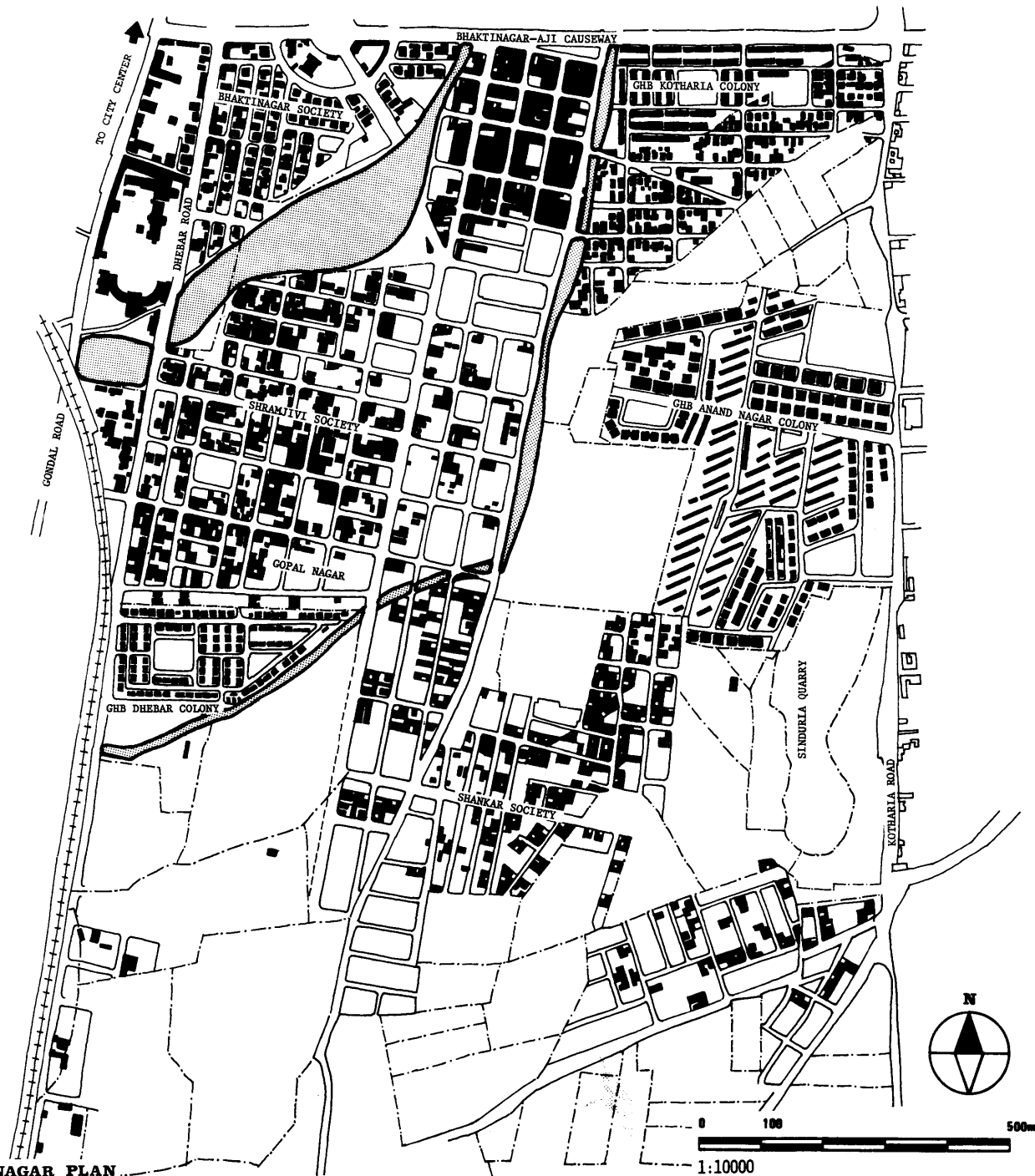
BHAKTINAGAR AREA, RAJKOT CITY

**BASIC SITE DATA**

<b>AREA OF THE SITE:</b>	208.42 Ha.
<b>ORIGINAL PLOTS:</b>	Total Area: 197.76 Ha.
<i>Includes all areas owned privately and/or owned by the Gujarat Housing Board</i>	Percentage of Total: 10.66 %
	Total Numbers: 62
	Largest Plot: 17.75 Ha.
	Smallest Plot: 0.04 Ha.
<b>PUBLIC LAND:</b>	Total Area: 10.66 Ha.
<i>Includes roads historically established/natural water run-offs.</i>	Percentage of Total: 5.12 %



LOCATION OF TOWN PLANNING SCHEMES IN RAJKOT CITY



**BHAKTINAGAR PLAN**

1:10000

**EXISTING INFRASTRUCTURE SERVICES**

**WATER SUPPLY:**

Roughly, 40% to 50% of the houses in this area have piped water supply. At present water is supplied from the Aji Reservoir and the twin lakes of Lalpari and Randerda. A 450 mm diameter supply main, originating from the Aji Reservoir, passes through the site, which distributes water in the site area. However, the distribution network is very badly planned and does not cover the entire site. Bhaktinagar Cooperative Housing Society is linked with the distribution system from the twin lakes. The supply through these sources is limited, therefore the provision is restricted to 1 hour in the morning and 1 hour in the evening. Several community water taps have been provided for low income population along the main distribution lines. (see the photograph on the opposite page.) However, restricted supply and high demand creates many social problems.

**SEWERAGE:**

At present, sullage water from kitchen and wash-rooms is drained away by a network of open gutters running into the drainage canals. (nallahs) and then is discharged in to the river. A separate head carrier was in force to remove human waste until recently when a move was made to abolish it. The human waste is now collected through municipal motorized carriers and is dumped into a pit excavated on a site near Surendranagar Road. The plans for an underground sewerage system have been under preparation for the last 8 to 9 years.





**ELECTRICITY:**

In general, power meets with the present demand in the city. A 66 KW regional electrical grid line passes through the city and power is supplied with the help of 45 sub-stations located at various locations in the city. There are 5924 street lighting points in the city. In the Bhaktinagar area, there is an extensive street lighting network. (see photograph on the opposite page) However, the lamps are often vandalized or are not working.

**TELEPHONE:**

Its supply is so scarce that even high income groups acquire it with difficulty.

**KEY**

-  18" MAIN PIPES
-  10" PIPES
-  8" PIPES
-  4" TO 6" PIPES

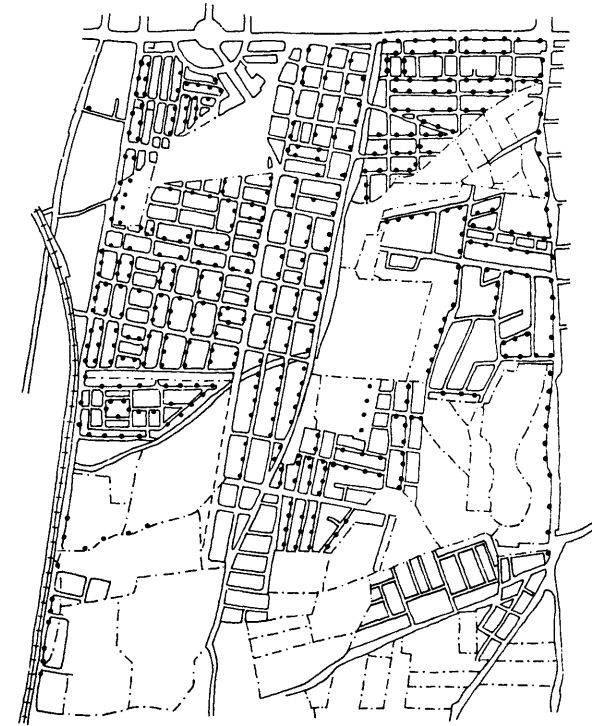
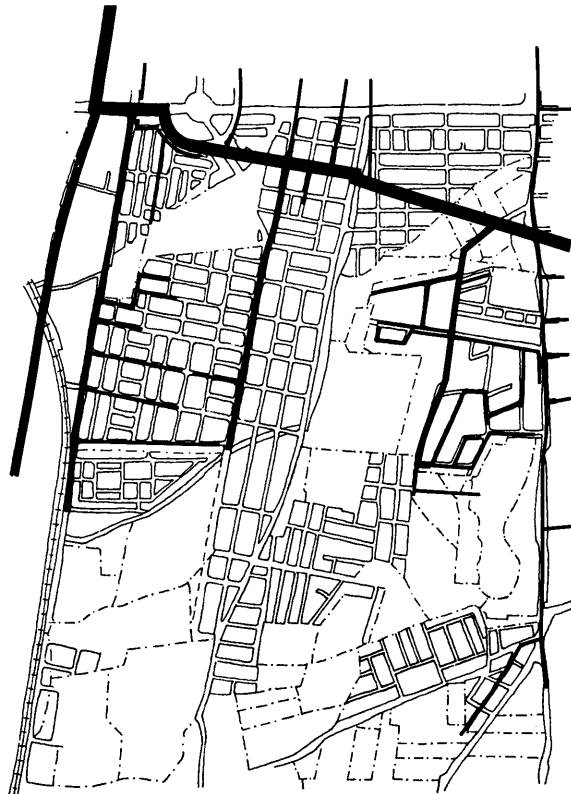
**EXISTING WATER SUPPLY**

**CIRCULATION/STORM WATER DRAINAGE:**

Bhaktinagar-Aji Causeway and Dhebar Road are maintained fairly well. Recently improvements have begun along the Kotharia Road. Other internal roads are on private land and are often unpaved. (see photograph on the opposite page). Open gutters along with the drainage canals (nallahs) serve as storm water drains. Many illegal developments have taken place along such canals.

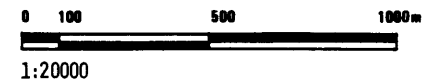
**PUBLIC TRANSPORTATION:**

The bus service is operated by the municipality and it has 24 different routes. Bhaktinagar circle is an important terminus and buses run on Bhaktinagar-Aji Causeway and Gondal Road. There is a terminus near the Housing Board Colony on Kotharia Road. (see page 48 for a public transportation layout in this area.)



**KEY**

-  LAMP POLES



**EXISTING STREET LIGHTING**

**PHOTOGRAPHS:**  
 (top) Bhaktinagar Area, Rajkot, 1978: Illegal houses along the road to Kotharia. Note the extensive street lighting network. (bottom left) Though houses have been built by private developers and co-operative housing societies, roads, storm water drains and sewerage networks have not been developed. (bottom right) At several locations, community water taps and community toilets have been provided, but the facilities are highly inadequate.



## PLANNING PROJECTIONS

### LAND USE:

Bhaktinagar will continue to develop as very low to middle income residential area. Industrial activities will also flourish along the National Highway 8-B and the railway line. In the private sector, co-operative housing societies having detached/semi-detached houses and walk up apartments will be the predominant dwelling system. Recognizing this fact, the overall layout should be flexible enough to allow/encourage similar development of housing systems. Following the Development Plan, the south-west sector of the area is to be developed as an industrial area, while remainder of the site will be residential. The primary use requires supporting land uses, which will include commercial and community facilities, schools, parks, play grounds, health centers and community centers. These facilities should be built incrementally according to the pace of development.

### CIRCULATION:

The causeway will continue to maintain its importance, while Dhebar road and Kotharia Road will become major arteries of circulation for the future growth in this and adjacent area.

### POPULATION:

The development plan predicts the gross density levels ranging from 187-308 persons/hectare to 309-493 persons/hectare. However, depending on the development net densities can be as high as 1100 persons/hectare. The entire area will develop progressively with lower densities initially and medium/high densities at saturation. The estimated population at density levels suggested in the Development Plan would be approximately 95,000 people. The density level assumes predominantly two storied construction, however, the densities may increase

in future as a result of the expansion to 3 or more floors and higher room occupancy due to subletting.

### THE DESIGN DETERMINANTS:

The chart on the opposite page identifies in an outline form, various critical issues and design criteria. The Gujarat Town Planning Act guidelines have been evaluated with reference to practical constraints affecting the site, present policies and policy implications; dealing specifically with purpose, selection of area, land utilization and financial aspects of such schemes. Suggested policies have been evolved within the framework of the Gujarat Town Planning Act of 1976. The principle objectives are; to direct urban growth according to the Development Plan, to provide infrastructure services/utilities to benefit a large section of the population, to arrive at an optimum level of services /utilities which would facilitate the scheme to be completely self sufficient and reservation of land for low income population in the area. These guidelines have formed a basis for the design of physical layout.

**DESIGN DETERMINANTS**

		GUJARAT TOWN PLANNING AND URBAN DEVELOPMENT ACT, 1976	CITY CONTEXT			PROPOSED POLICIES
			PRACTICAL CONSTRAINTS	PRESENT POLICIES	POLICY IMPLICATIONS	
BACKGROUND	PURPOSE	To ensure implementation of the Development Plan.	Existing development is haphazard and in conflict with the Development Plan.	To ensure implementation of the Development Plan by developing the city in segments of 100 to 200 ha.	Lack of awareness and public participation in the planning process create considerable confusion.	Publicize thoroughly with the help of local media intentions, objectives and benefits of such schemes.
	SELECTION OF AREA	-May be prepared on any land which is; - in the course of development, - likely to be developed or - already built upon.  -No scheme shall be made for areas used for public housing (by GHB).	Lack of accurate information on existing development. No surveys have been made.  Scattered public housing developments on the periphery.	Select segments based upon potential growth, convenience and availability of information; mainly in high/middle income areas.  Omit the areas occupied by public housing projects developed by the Housing Board from such schemes.	Rapid development has occurred in prospective scheme areas since the declaration of the first scheme.  Considerable confusion arises since public housing tenants acquire better facilities without paying extra development charges.	Give priority to low/middle income residential areas in future schemes.  Include public housing projects in future schemes to avoid discrimination and to facilitate efficient physical layout.
	PUBLIC LAND	The scheme includes allotment or reservation of land for roads and layout of new streets. It also includes construction, diversion, extension and closing of streets.	Streets/lanes have been developed/designed in various ways without paving/storm water drainage on private properties. A uniform policy to acquire equal percentage of land from each parcel has to be adopted to avoid delays/disputes.	Consolidate existing streets wherever possible. Streets vary in width from 9 to 24 meters. Up to 15% of land is reserved for roads on an average.	High development costs result due to high specifications and relatively wide streets. 15% of land reserved for roads is inadequate..	Develop roads based upon circulation modes. To achieve cost reductions, develop lower specifications for pedestrian dominated streets and reduce their street widths. Make provisions in the by-laws to allow widening of streets in the future.
	SEMI-PUBLIC LAND	The scheme includes allotment or reservation of land for open spaces, gardens, schools, markets and such other community areas.	Most of the community facilities are privately developed. Costs of acquisition and responsibilities for maintenance/control of community areas become a burden on the authority.	Reserve and allot up to 7% of land for community areas.	Due to limited administrative/financial resources, development of community facilities lag behind the development in the area.	Make provisions for primary schools and essential services (police, fire protection and health centers). Develop commercial/religious and other facilities by enforcing zoning regulations in private areas. Use existing open spaces in public housing projects for such facilities.
LAND UTILIZATION	PRIVATE LAND	The scheme makes provisions for laying out or relaying out of private land and imposition of by-laws for future development. Proposals may be made for reconstitution of an original plot by alteration of boundaries, by transferring adjoining land or by transferring ownership.	Land acquired (for public purpose) uniformly from each parcel generates small parcels scattered all over the area of the site.	Up to 20% of land from each parcel is acquired for public purpose.		Acquire up to 25% of land from each parcel to facilitate optimum land utilization. (See summary of land utilization patterns in the city).
	LOW INCOME HOUSING AREAS	Up to ten percent of total land may be reserved for housing socially and economically backward classes of the population.	Vested interests and lack of administrative and financial resources restrict the reservation of land for such purpose to bear minimum.	1% to 1.5% of land is reserved for housing the economically and socially weaker sections of the society. (EWS Housing)	Such schemes do not benefit the urban poor who constitute 60% of the city population.	Provide housing for at least 17% of the population in such areas. (Studies of housing in the city show that 17% of population lives in squatter settlements.
FINANCIAL ASPECTS	COSTS	Costs may include: 1: Compensation for land acquired for public purpose, 2: Roads 3: Water supply 4: Underground drainage 5: Storm water drainage 6: Street lighting 7: Administration and legal expenses.	Costs may vary depending upon the level of existing services and development in each scheme.	In Town Planning Scheme:2 the costs were as follows 1: Land acquisition 16.59% 2: Roads 33.75% 3: Water supply 20.32% 4: Sewerage 10.79% 5: Storm water drains 13.11% 6: Street lighting 2.85% 7: Administration 2.54% TOTAL: 100.00%	Roads and storm water drainage constitute more than half of the total costs. The cost of land acquisition is relatively less.	Reduce the costs of roads and storm water drainage by efficient physical layout and with initial lower specifications. Increase land acquisition to obtain optimum levels of land utilization. Restrict the total cost to the capacity of people to pay.
	INCOME	The costs of the scheme shall be met wholly or in part by a contribution to be levied on each plot included in the final scheme. Where cost exceeds half the increment the excess shall be borne by the authority.	Delays/disputes arise regarding the value of increment (Increment is an amount by which the market value of each plot would exceed its original value due to proposed development on the day of the declaration of the scheme.)	In Town Planning Scheme:2 the income was derived from 1: Incremental contribution 85.90% 2: Amount borne by the Rajkot Municipal Corporation. 14.10%	Difficulty in raising the funds to be borne by the Rajkot Municipal Corporation causes delays;	Costs of the scheme should not exceed the estimated incremental contribution.

## LAND USE PLAN

Land use plan for the entire scheme is conceived as a whole and is based upon the proposed Development Plan for the city. The site has a population of 95,000 people at the saturation stage. This represents 22% of the present population of Rajkot city. The area will be primarily for residential use. The supporting facilities will include commercial and community facilities: schools, parks, playgrounds, health centers and community centers. Some industrial developments are also proposed along the railway line. Commercial activities will develop as in other parts of the city along the primary and secondary streets, and would be encouraged by making appropriate provisions in the building by-laws.

### PUBLIC LAND:

Public land is primarily allotted for circulation (streets). The percentage of land required for this purpose depends on the density of the network, (intervals of the circulation network) and widths of the circulation modes. Surveys of case studies in the city show percentages vary between 11% and 32% in the older developments. An optimum level of up to 20% of public land is proposed, to keep the acquisition of land to a reasonable limit and to optimize the land utilization pattern.

### SEMI-PUBLIC LAND:

Semi-public land is primarily allocated for public services (schools, playgrounds). The percentage of land required for this purpose depends on the population that it serves in terms of number and density. Surveys of the case studies show that in most cases such services are limited, and are controlled by the private sector. Therefore, the reservation of land would be made only for essential

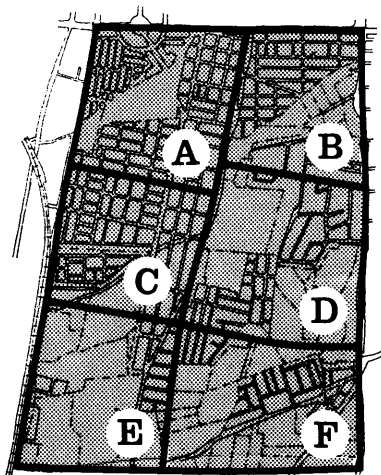
services (schools, police, fire, health, etc.). Certain other services (religious, etc.) could be developed by making provisions in the zoning codes on private land.

### PRIVATE LAND:

Private owners hold 94.88% of the total land now. Equal portions of land need to be acquired from individual plots for public/semi-public uses. Studies of the older developments in the city show percentages vary between 59% to 74%. An optimum level of up to 70% is proposed for private/semi-private ownership. The local authority should create the instruments of control by encouraging cooperative ownership of semi-private areas. Control of open spaces may be assured by encouraging jointly owned land, in condominium, along with individual private lots.

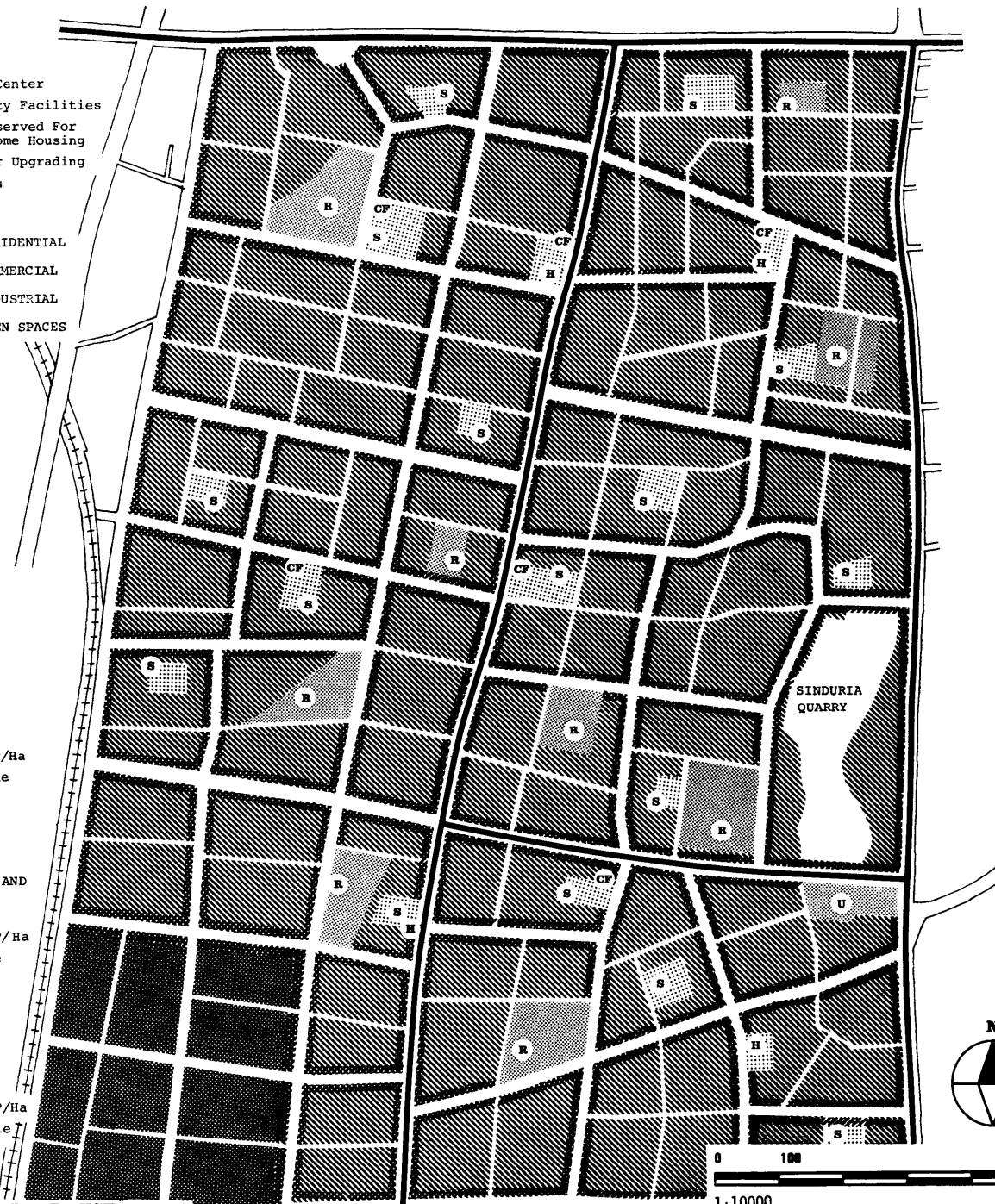
### LOW INCOME HOUSING:

Land for low income housing developments would be reserved at various locations in the area. The percentage has been derived from the studies of low income settlements in the city. Since more than 11% of the city population lives in squatter settlements, and the trend is likely to continue in the foreseeable future, reservation of land for LIG housing would be made for at least 11% of the population in each segment. The percentages of land required varies from 5% to 10% depending on the intensity of the land use.



- KEY**
- S School
  - H Health Center
  - CF Community Facilities
  - R Land Reserved For Low Income Housing
  - U Squatter Upgrading

- AREAS**
- RESIDENTIAL
  - COMMERCIAL
  - INDUSTRIAL
  - OPEN SPACES



**TYPICAL SEGMENTS**

AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	39.47	18.94%
SEMI-PUBLIC (open spaces, schools, community centers)	9.50	4.56%
PRIVATE (dwellings, shops, factories, lots)	145.89	70.00%
LOW INCOME HOUSING	13.56	6.50%
<b>TOTAL</b>	<b>208.42</b>	<b>100.00%</b>

**SEGMENT A:**

PRIMARY USE: RESIDENTIAL  
 AREA OF THE SEGMENT: 36.58 Ha  
 POTENTIAL DENSITY: 187 to 493 P/Ha  
 POTENTIAL POPULATION: 18,033 People  
 NUMBER OF PRIMARY SCHOOLS: 3  
 LOW INCOME HOUSING AREA: 2.5 Ha

**SEGMENT D:**

PRIMARY USE: RESIDENTIAL  
 AREA OF THE SEGMENT: 44.85 Ha  
 POTENTIAL DENSITY: 187 to 493 P/Ha  
 POTENTIAL POPULATION: 22,111 People  
 NUMBER OF PRIMARY SCHOOLS: 3 to 4  
 LOW INCOME HOUSING AREA: 3.04 Ha

**SEGMENT B:**

PRIMARY USE: RESIDENTIAL  
 AREA OF THE SEGMENT: 30.24 Ha  
 POTENTIAL DENSITY: 187 to 493 P/Ha  
 POTENTIAL POPULATION: 14,543 People  
 NUMBER OF PRIMARY SCHOOLS: 2 to 3  
 LOW INCOME HOUSING AREA: 2.00 Ha

**SEGMENT E:**

PRIMARY USE: RESIDENTIAL AND INDUSTRIAL  
 AREA OF THE SEGMENT: 35.20 Ha  
 POTENTIAL DENSITY: 187 to 493 P/Ha  
 POTENTIAL POPULATION: 4,329 People  
 NUMBER OF PRIMARY SCHOOLS: 1  
 LOW INCOME HOUSING AREA: 0.59 Ha

**SEGMENT C:**

PRIMARY USE: RESIDENTIAL  
 AREA OF THE SEGMENT: 31.35 Ha  
 POTENTIAL DENSITY: 187 to 493 P/Ha  
 POTENTIAL POPULATION: 15,455 People  
 NUMBER OF PRIMARY SCHOOLS: 2 to 3  
 LOW INCOME HOUSING AREA: 2.12 Ha.

**SEGMENT F:**

PRIMARY USE: RESIDENTIAL  
 AREA OF THE SEGMENT: 39.00 Ha  
 POTENTIAL DENSITY: 187 to 493 P/Ha  
 POTENTIAL POPULATION: 19,227 People  
 NUMBER OF PRIMARY SCHOOLS: 3  
 LOW INCOME HOUSING AREA: 2.64 Ha



1:10000

**PROPOSED LAND USE PLAN**

## CIRCULATION PLAN

The system of circulation forms one of the most important parts of the urban layout. It not only channels the pedestrian and vehicular movements but, also determines patterns of land utilization, land subdivision and layout of utilities: water supply, sewage disposal, electricity, street lighting and storm drainage.

The existing patterns and modes of circulation in the city and site conditions form a necessary framework for the proposed circulation network and the site development. The circulation layout is based upon:

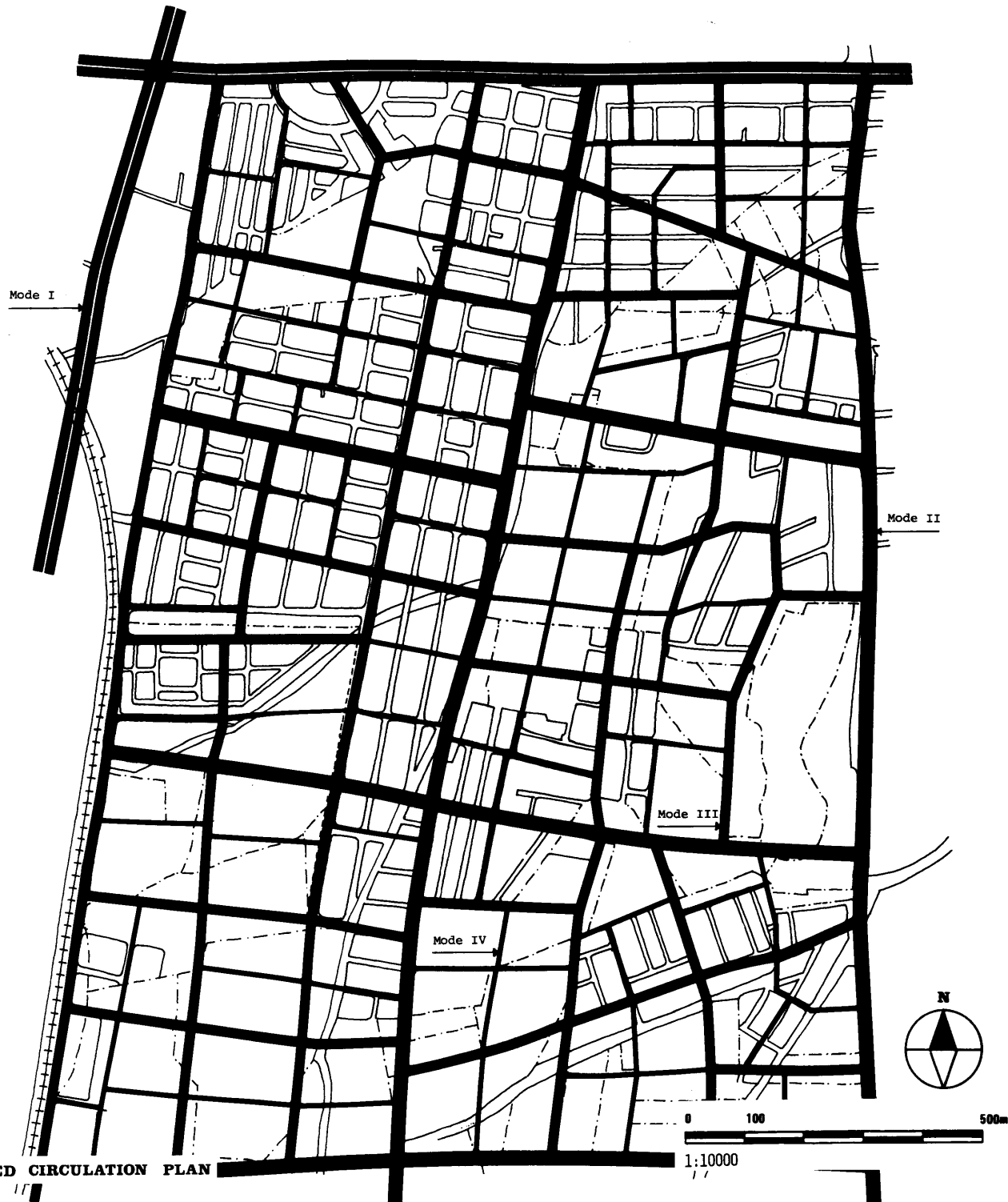
- recognition of predominant pedestrian mode of circulation in the area and in the city.
- maximizing use of existing circulation
- minimizing infrastructure investment for the public sector.
- optimizing costs of land acquisition and development of circulation.

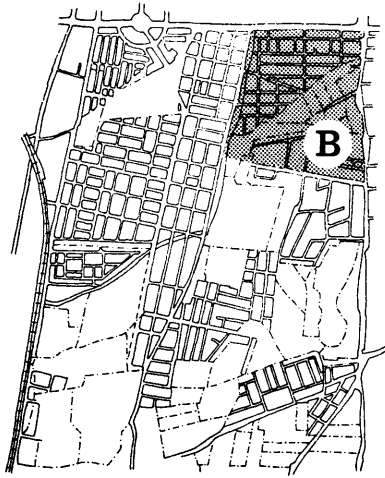
The size of intervals between the lines of circulation is a basic factor in the urban layouts and their determination is a compromise between the following opposing requirements: a) The intervals should be small enough to facilitate pedestrian circulation among the community elements: dwellings, shops, services, etc., b) The intervals should be large enough to minimize public costs in construction, maintenance and operation of utilities and services. The gridiron layouts as in Karan Para (See case study 2) have only lines of circulation and therefore can not be minimized. On the other hand the grid blocks as in Gamtal (See case study 1) combine lines of circulation and lines of access, and therefore allow the minimization of public circulation.



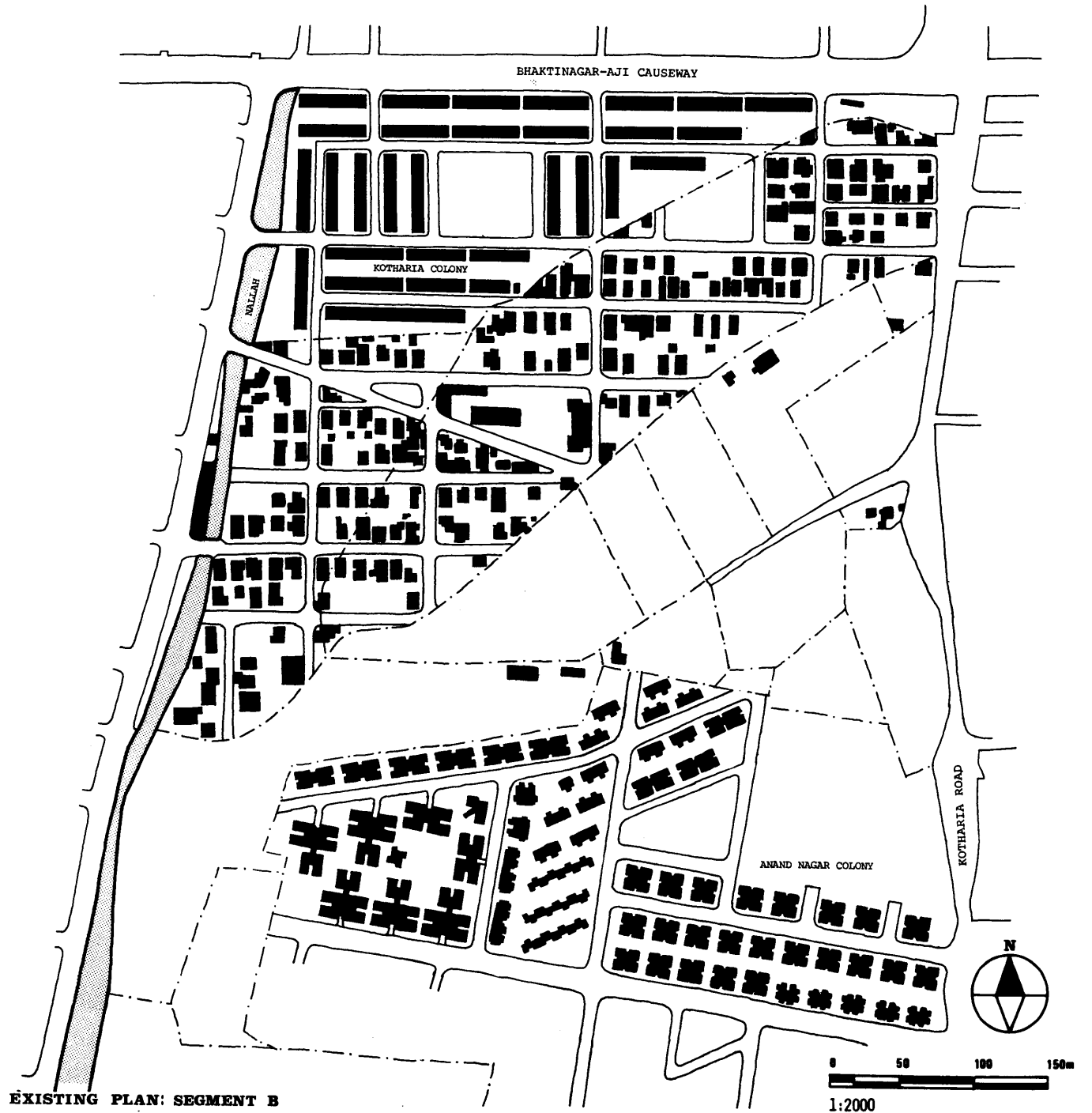
PROPOSED CIRCULATION

MODE	TYPE	WIDTH
Mode I VEHICLES MAINLY	Major arterial	24 m
Mode II VEHICLES (dominate) AND PEDESTRIANS	Primary streets	18 m
Mode III VEHICLES AND PEDESTRIANS	Collector streets	12 m
Mode IV PEDESTRIANS (dominate) AND VEHICLES	Residential streets	7 m
Mode V PEDESTRIANS	Paths	3-6 m





LOCATION OF TYPICAL SEGMENT B

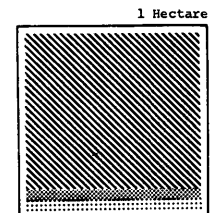


EXISTING PLAN: SEGMENT B



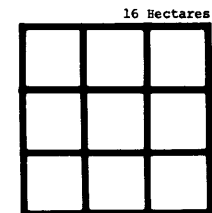
**LAND UTILIZATION:**

AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	5.98	19.8%
SEMI-PUBLIC (open spaces, schools, community centers)	1.05	3.5%
PRIVATE (dwellings, shops, factories, lots)	21.22	70.1%
LOW INCOME HOUSING	1.99	6.6%
<b>TOTAL</b>	<b>30.24</b>	<b>100.00%</b>



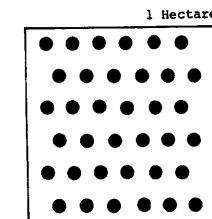
PERCENTAGES

Streets/Walkways	19.8%
Private	70.1
Schools	3.5
Low Income Housing	6.6

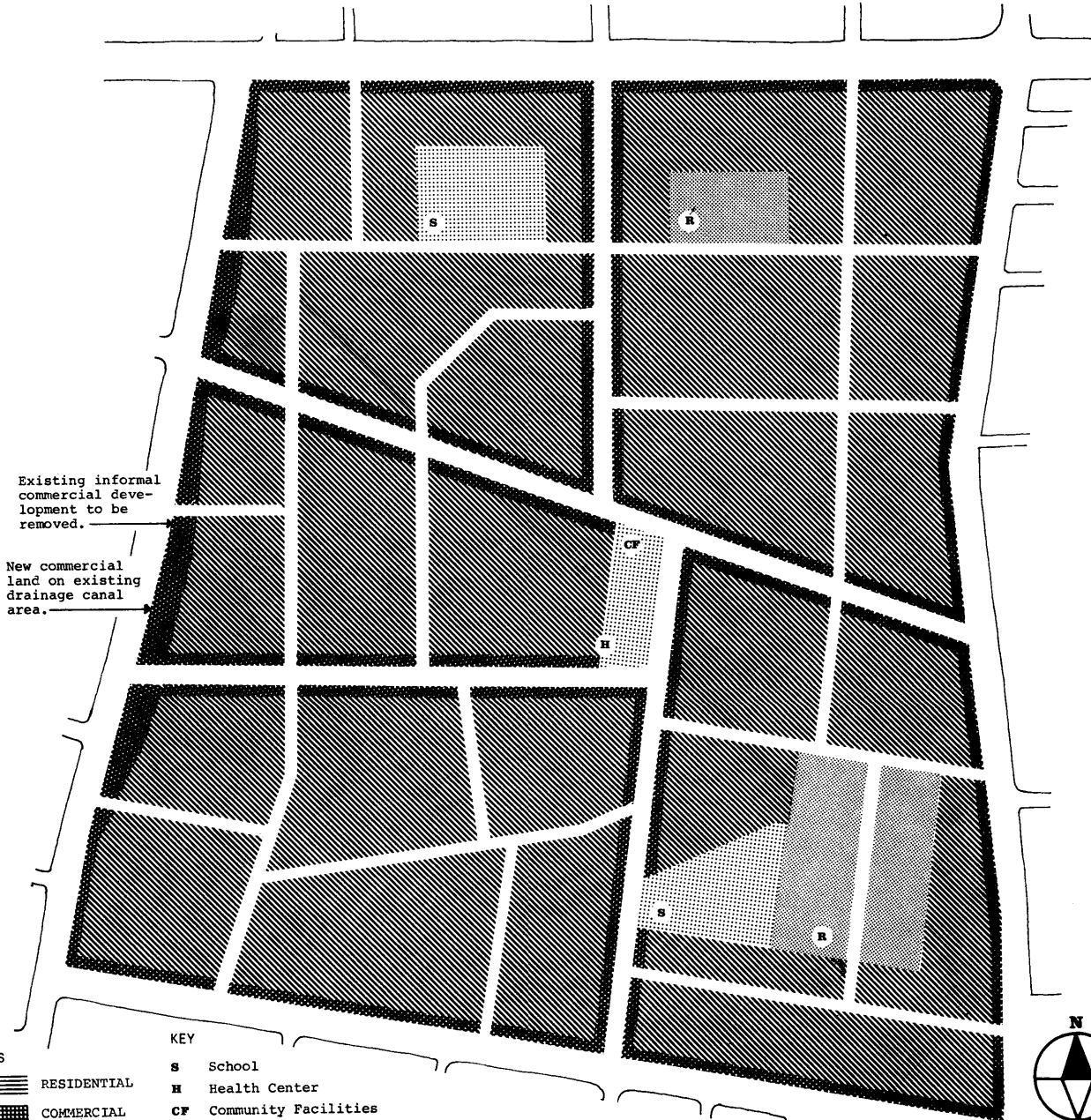


CIRCULATION EFFICIENCY

Unit Length 168  
m/Ha



DENSITY  
Persons/Hectare 714  
● 20 Persons



Existing informal commercial development to be removed.

New commercial land on existing drainage canal area.

**KEY**

AREAS	Symbol	Facility
RESIDENTIAL	Horizontal lines	S School
COMMERCIAL	Vertical lines	H Health Center
INDUSTRIAL	Diagonal hatching	CF Community Facilities
OPEN SPACES	Stippled pattern	R Land Reserved For Low Income Housing
		U Squatter Upgrading



**PROPOSED LAND USE PLAN: SEGMENT B**

1:2000

# GLOSSARY

The criteria for the preparation of the definitions have been as follows:

-FIRST PREFERENCE: definitions from "Webster's Third New International Dictionary", Merriam-Webster, 1971.

-SECOND PREFERENCE: definitions from technical dictionaries, text books, or reference manuals.

-THIRD PREFERENCE: definitions from the Urban Settlement Design Program (U.S.D.P.) Files. They are used when existing sources were not quite appropriate/satisfactory.

Words included for specificity and to focus on a particular context are indicated in parenthesis.

Sources of definitions are indicated in parenthesis. (See also: REFERENCES).

**ACCESSES.** The pedestrian/vehicular linkages from/to the site to/from existing or planned approaches (urban streets, limited access highways, public transportation systems, and other systems such as: waterways, airlines, etc.) (U.S.D.P.)

**ACTUAL LAND COST.** "(The cost of land is)...set solely by the level of demand. The price of land is not a function of any cost conditions; it is set by the users themselves in competition." (Turner, 1971)

**AD VALOREM (TAX).** A tax based on a property's value; the value taxed by local governments is not always or even usually the market value, but only a valuation for tax purposes. (U.S.D.P.)

**AIRPORT DISTURBANCE.** The act or process of destroying the rest, tranquility, or settled state of (the site by the annoyance of airport noise, vibration, hazards, etc.) (Merriam-Webster, 1971)

**AIRPORT ZONING RESTRICTIONS.** The regulation of the height or type of structures in the path of moving aircraft. (Abrams, 1971)

**ALTERNATING CURRENT (A.C.)** (an electric) current that reverses its direction of flow at regular intervals. (ROTC ST 45-7, 1953)

**AMENITY.** Something that conduces to physical or material comfort or convenience, or which contributes satisfaction rather than money income to its owner. (Merriam-Webster, 1971)

**AMPERES.** Amperes (amp) are a measure of the rate of flow of electricity. It is somewhat comparable to the rate of flow of water (quantity/time). A steady current produced by one volt applied across a resistance of one ohm. (ROTC ST 45-7, 1953)

**APPRAISAL.** An estimate and opinion of value, especially by one fitted to judge. (Merriam-Webster, 1971)

**APPROACHES.** The main routes external to the site (pedestrian/vehicular) by which the site can be reached from other parts of the urban context. (U.S.D.P.)

**ASSESSED VALUE.** A valuation placed upon property by a public officer or board as a basis for taxation. (Keyes, 1971)

**ASSESSMENT.** The valuation of property for the purpose of levying a tax or the amount of the tax levied. (Keyes, 1971)

**BACKFILL.** Earth or other material used to replace material removed during construction, such as in culvert, sewer, and pipeline trenches and behind bridge abutments and retaining walls or between an old structure and a new lining. (DePina, 1972)

**BARRIER.** (A boundary) as a topographic feature or a physical or psychological quality that tends to separate or restrict the free movement (to and from the site). (Merriam-Webster, 1971)

**BETTERMENT (TAX).** A tax on the increment in value accruing to an owner because of development and improvement work carried out by local authorities. (U.S.D.P.)

**BINDER COURSE.** A transitional layer of bituminous paving between the crushed stone base and the surface course (to increase bond between base and surface course). (DePina, 1972)

**BITUMINOUS.** A coating of or containing bitumin; as asphalt or tar. (DePina, 1972)

**BLOCK.** A block is a portion of land bounded and served by lines of public streets. (U.S.D.P.)

**BOUNDARY.** Something (a line or area) that fixes or indicates a limit or extent (of the site). (Merriam-Webster, 1971)

**BUILDING CODE.** "A body of legislative regulations or by-laws that provide minimum standards to safeguard life or limb, health, property, and public welfare by regulating and controlling the design, construction, quality of materials, use and occupancy, location and maintenance of all buildings and structures within the city, and certain equipment specifically regulated therein." (BOCA, 1967)

**BUILDING DRAIN.** Lowest horizontal piping of the building drainage system receiving discharge from soil, waste, and other drainage pipes. It is connected to the building sewer. (ROTC ST 45-7, 1953)

**BUILDING MAIN.** Water-supply pipe and fittings from the water main or other source of supply to the first branch of the water-distribution system of a building. (ROTC ST 45-7, 1953)

**CESS POOL.** An underground catch basin that is used where there is no sewer and into which household sewage or other liquid waste is drained to permit leaching of the liquid into the surrounding soil. (Merriam-Webster, 1971)

**CIRCULATION.** System(s) of movement/passage of people, goods from place to place; streets, walkways, parking areas. (U.S.D.P.)

**CLAY.** A lusterless colloidal substance, plastic when moist (crystalline grains less than 0.002mm in diameter). (U.S.D.P.)

**CLEANOUT.** A plug or similar fitting to permit access to traps or sewer lines. Cleanouts are usually used at turns and other points of collection. (ROTC ST 45-7, 1953)

**CLIMATE.** The average condition of the weather at a particular place over a period of years as exhibited by temperature, wind, precipitation, sun energy, humidity, etc. (Merriam-Webster, 1971)

**COLLECTION SYSTEM.** The system of pipes in a sewage network, comprised of house service, collection lines, manholes, laterals, mains. (U.S.D.P.)

**COMBINED SEWER.** A sewer that carries both storm water and sanitary or industrial wastes. (DePina, 1972)

**COMMUNITY.** The people living in a particular place or region and usually linked by common interests: the

region itself; any population cluster. (U.S.D.P.)

**COMMUNITY FACILITIES/SERVICES.** Facilities/services used in common by a number of people. It may include: schools, health, recreation, police, fire, public transportation, community center, etc. (U.S.D.P.)

**COMMUNITY RECREATION FACILITIES.** Facilities for activities voluntarily undertaken for pleasure, fun, relaxation, exercise, self-expression, or release from boredom, worry, or tension. (U.S.D.P.)

**COMPONENT.** A constituent part of the utility network. (U.S.D.P.)

**CONDOMINIUM.** Condominium is a system of direct ownership of a single unit in a multi-unit whole. The individual owns the unit in much the same manner as if it were a single family dwelling; he holds direct legal title to the unit and a proportionate interest in the common land and areas. Two types of condominiums are recognized: *HORIZONTAL*: detached, semi-detached, row/grouped dwelling types; *VERTICAL*: walk-up, high-use dwelling types. (U.S.D.P.)

**CONDUCTORS.** Materials which allow current to flow such as aluminum, copper, iron. (ROTC ST 45-7, 1953)

**CONDUIT.** A pipe or other opening, buried or above ground, for conveying hydraulic traffic, pipelines, cables, or other utilities. (DePina, 1972)

**CONSERVATION EASEMENT.** An easement acquired by the public and designed to open privately owned lands for recreational purposes or to restrict the use of private land in order to preserve open space and protect certain natural resources. (U.S.D.P.)

**CONURBATION.** Area of large urban communities where towns, etc. have spread and became joined beyond their administrative boundaries. (A.S. Hornby, A.P. Cowie, J. Windsor Lewis, 1975)

**CONURBATION.** An aggregation or continuous network of urban communities. (Merriam-Webster, 1963)

**CORPORATION COCK/CORPORATION STOP.** A water or gas cock by means of which utility-company employees connect or disconnect service lines to a consumer. (Merriam-Webster, 1971)

**COSTS OF URBANIZATION.** Include the following: *CAPITAL*: cost of land and infrastructure; *OPERATING*: cost of administration, maintenance, etc.; *DIRECT*: include capital and operating costs; *INDIRECT*: include environmental and personal effects. (U.S.D.P.)

**CURRENT** (See: ALTERNATING CURRENT, DIRECT CURRENT). An electric current is a movement of positive or negative electric particles (as electrons) accompanied by such observable effects as the production of heat, of a magnetic field, or of chemical transformation. (Merriam-Webster, 1971)

**CYCLE.** One complete performance of a vibration, electric oscillation, current alternation, or other periodic process. (Merriam-Webster, 1971)

**DAM.** A barrier preventing the flow of water; a barrier built across a water course to confine and keep back flowing water. (Merriam-Webster, 1971)

**DEPRECIATION ACCELERATION (TAX).** A tax incentive designed to encourage new construction by allowing a faster write-off during the early life of a building. (U.S.D.P.)

**DESIGN.** 1) The arrangement of elements that make up a work of art, a machine or other man-made object. 2) The process of selecting the means and contriving the elements, steps, and procedures for producing what will adequately satisfy some need. (Merriam-Webster, 1971)

**DETACHED DWELLING.** Individual dwelling unit, separated from others. (U.S.D.P.)

**DEVELOPMENT.** Gradual advance or growth through progressive changes; a developed tract of land (U.S.D.P.)

**DEVELOPMENT SIZE.** There are two general ranges of size: *LARGE*: may be independent communities requiring their own utilities, services, and community facilities; *SMALL*: generally are part of an adjacent urbanization and can use its supporting utilities, services, and community facilities. (U.S.D.P.)

**DIRECT CURRENT (D.C.)** (An electric current that) flows continuously in one direction. (ROTC ST 45-7, 1953)

**DISCHARGE (Q).** Flow from a culvert, sewer, channel, etc. (DePina, 1972)

**DISTANCE.** The degree or amount of separation between two points (the site and each other element of the urban context) measured along the shortest path adjoining them (paths of travel). (Merriam-Webster, 1971)

**DISTRIBUTION (STATION).** The part of an electric supply system between bulk power sources (as generating stations or transformation station tapped from transmission lines) and the consumers' service switches. (Merriam-Webster, 1971)

**DISTURBED SOIL.** Soils that have been disturbed by artificial process, such as excavation, transportation, and compaction in fill. (U.S.D.P.)

**DRAINAGE.** Interception and removal of ground water or surface water, by artificial or natural means. (De Pina, 1972)

**DUST/DIRT.** Fine dry pulverized particles of earth, grit, refuse, waste, litter, etc. (Merriam-Webster, 1971)

**DWELLING.** The general, global designation of a building/shelter in which people live. A dwelling contains one or more dwelling units! (U.S.D.P.)

**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 complexes; *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 reflects a more comprehensive and larger size of operations encompassing the building of large quantities of similar units, or a singularly large complex. (U.S.D.P.)

**DWELLING DENSITY.** The number of dwellings, dwelling units, people or families per 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). (U.S.D.P.)

**DWELLING DEVELOPER.** Three sectors are considered in the supply of dwellings: *POPULAR SECTOR*: the marginal sector with limited or no access to the formal financial, administrative, legal, technical institutions involved in the provision of dwellings. The housing process (promotion, financing, construction, operation) is carried out by the Popular Sector generally for 'self use' and sometimes for profit. *PUBLIC SEC-*

**TOR:** the government or non-profit organizations involved in the provision of dwellings. The housing process (promotion, financing, construction, operation) is carried out by the Public Sector for service (non-profit or subsidized housing). **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 for profit. (U.S.D.P.)

**DWELLING DEVELOPMENT MODE.** Two modes are considered: **PROGRESSIVE:** the construction of the dwelling and the development of the local infrastructure to modern standards by stages, often starting with provisional structures and underdeveloped 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. (U.S.D.P.)

**DWELLING FLOORS.** The following numbers 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. (U.S.D.P.)

**DWELLING GROUP.** The context of the dwelling in its immediate surroundings. (U.S.D.P.)

**DWELLING/LAND SYSTEM.** A distinct dwelling environment/housing situation characterized by its users as well as by its physical environment. (U.S.D.P.)

**DWELLING LOCATION.** Three sectors are considered in single or multi-center urban areas. Sectors are identified by position as well as by the density of buildings as follows: **CENTER:** the area recognized as the business center of the city, generally the most densely built-up sector; **INNER RING:** the area located between the city center and the urban periphery, generally a densely built-up sector; **PERIPHERY:** the area located between the inner ring and the rural areas, generally a scatteredly built-up sector. (U.S.D.P.)

**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 with some deviation. **GOOD:** generally acceptable state of structural stability, weather protection, and maintenance without deviation. (U.S.D.P.)

**DWELLING TYPE.** The physical arrangement of the dwelling unit: **DETACHED:** individual dwelling unit, separated from others. **SEMI-DETACHED:** two dwelling units sharing a common wall (duplex). **ROW/GROUPED:** dwelling units grouped together linearly or in clusters. **WALK-UP:** dwelling units grouped in two to five stories with stairs for vertical circulation. **HIGH-RISE:** dwelling units grouped in five or more stories with stairs and lifts for vertical circulation. (U.S.D.P.)

**DWELLING UNIT.** A self-contained unit in a dwelling for an individual, a family, or a group. (U.S.D.P.)

**DWELLING UNIT AREA.** The dwelling unit area (m<sup>2</sup>) is the built-up, covered area of a dwelling unit. (U.S.D.P.)

**DWELLING UNIT COST.** The initial amount of money paid for the dwelling unit or the present monetary equivalent for replacing the dwelling unit. (U.S.D.P.)

**DWELLING UNIT TYPE.** Four types of dwelling units are considered: **ROOM:** A SINGLE SPACE usually bounded by

partitions and specifically used for living; for example, a living room, a dining room, a bedroom, but not a bath/toilet, kitchen, laundry, or storage room. **SEVERAL ROOM UNITS** are contained in a building/shelter and share the use of the parcel of land on which they are built (open spaces) as well as common facilities (circulation, toilets, kitchens). **APARTMENT:** A MULTIPLE SPACE (room/set of rooms with bath, kitchen, etc.) **SEVERAL APARTMENT UNITS** are contained in a building and share the use of the parcel of land on which they are built (open spaces) as well as some common facilities (circulation). **HOUSE:** A MULTIPLE SPACE (room/set of rooms with or without bath, kitchen, etc.) **ONE HOUSE UNIT** is contained in a building/shelter and has the private use of the parcel of land on which it is built (open spaces) as well as the facilities available. **SHANTY:** A SINGLE OR MULTIPLE SPACE (small, crudely built). **ONE SHANTY UNIT** is contained in a shelter and shares with other shanties the use of the parcel of land on which they are built (open spaces). (U.S.D.P.)

**DWELLING UTILIZATION.** The utilization indicates the type of use with respect to the number of inhabitants/families. **SINGLE:** an individual or family inhabiting a dwelling. **MULTIPLE:** a group of individuals or families inhabiting a dwelling. (U.S.D.P.)

**EASEMENT.** Servitude: a right in respect of an object (as land owned by one person) in virtue of which the object (land) is subject to a specified use or enjoyment by another person or for the benefit of another thing. (Merriam-Webster, 1971)

**EFFICIENCY.** Capacity to produce desired results with a minimum expenditure of energy, time, money or materials. (Merriam-Webster, 1971)

**EFFLUENT.** Outflow or discharge from a sewer or sewage treatment equipment. (DePina, 1972)

**ELECTRIC FEEDER.** That part of the electric distribution system between the transformer and the service drop or drops. (HUD, Mobile Court Guide, 1970)

**ELECTRIC SERVICE DROP.** That part of the electric distribution system from a feeder to the user's service equipment serving one or more lots. (HUD, Mobile Court Guide, 1970)

**ELECTRIC TRANSFORMER.** A device which changes the magnitude of alternating voltages and currents; generally from distribution voltages to user voltages; a distribution component that converts power to usable voltage. (TM 5 765 US Army, 1970; U.S.D.P.)

**ELECTRICAL CIRCUIT.** A closed, complete electrical path with various connected loads. Circuits may either be 'parallel' (voltage constant for all connected loads) or 'series' (voltage divided among connected loads). Parallel circuits are fixtures wired independent of each other, which are used in nearly all building wiring. (U.S.D.P.; ROTC ST 45-7, 1953)

**ELECTRICAL FREQUENCY.** The number of times an alternating electric current changes direction in a given period of time. Measured in cycles per second: hertz. (ROTC ST 45-7, 1953)

**ELECTRIC GROUND.** The electrical connection with the earth or other ground. (Merriam-Webster, 1971)

**ELECTRICAL NETWORK COMPONENTS.** It is composed of the following: **GENERATION:** produces electricity; **TRANSMISSION:** transports energy to user groups; **DISTRIBUTION STATION:** divides power among main user groups; **SUBSTATION:** manipulates power into useful energy levels for consumption; **DISTRIBUTION NETWORKS:** provides electric service to user. (U.S.D.P.)

**ELECTRIC PHASE.** May be either a single-phase circuit (for small electrical devices) or a three-phase circuit (for heavy equipment, large electrical devices). In single-phase only one current is flowing through

the circuit with the voltage dropping to zero twice in each cycle. In three-phase currents flow through the circuit with the power never dropping to zero. (U.S.D.P.)

**ELECTRICAL POWER.** The source or means of supplying energy for use; measured in watts. (U.S.D.P.)

**ELECTRICAL WIRING SYSTEMS.** May either be single-phase or three-phase. **SINGLE-PHASE:** 2 hot wires with 1 neutral wire; **THREE-PHASE:** 3 hot wires with 1 neutral wire. (ROTC ST 45-7, 1953)

**ELECTRICITY.** Electrification: the process (network) for supplying (the site) with electric power. (Merriam-Webster, 1971)

**EMBANKMENT (or FILL).** A bank of earth, rock, or other material constructed above the natural ground surface. (DePina, 1972)

**EROSION.** The general process whereby materials of the earth's crust are worn away and removed by natural agencies including weathering, solution, corrosion, and transportation; (specific) land destruction and simultaneous removal of particles (as of soil) by running water, waves and currents, moving ice, or wind. (Merriam-Webster, 1971)

**EXCRETA.** Waste matter eliminated from the body. (U.S.D.P.)

**EXISTING STRUCTURE.** Something constructed or built (on the site). (U.S.D.P.)

**EXPLORATORY BORING.** Initial subsurface investigations (borings) are done on a grid superimposed on the areas of interest and on areas indicated as limited/restricted/hazard in the initial survey. (U.S.D.P.)

**EXTERIOR CIRCULATION/ACCESSES (SITE PLANNING).** The existing and proposed circulation system/accesses outside but affecting the site. These include limited access highways as well as meshing access to the surrounding area. Exterior circulation/accesses are generally given conditions. (U.S.D.P.)

**FAUCET (also TAP).** A fixture for drawing liquid from a pipe, cask, or other vessel. (Merriam-Webster, 1971)

**FINANCING.** The process of raising or providing funds. **SELF FINANCED:** provided by own funds; **PRIVATE/PUBLIC FINANCED:** provided by loan; **PUBLIC SUBSIDIZED:** provided by grant or aid. (U.S.D.P.)

**FIRE/EXPLOSION HAZARDS.** Danger: the state of being exposed to harm; liable to injury, pain, or loss from fire/explosion (at or near the site). (Merriam-Webster, 1971)

**FIRE FLOW.** The quantity (in time) of water available for fire-protection purposes in excess of that required for other purposes. (Merriam-Webster, 1971)

**FIRE HYDRANT.** A water tap to which fire hoses are connected in order to smother fires. (U.S.D.P.)

**FIRE PROTECTION.** Measures and practices for preventing or reducing injury and loss of life or property by fire. (Merriam-Webster, 1971)

**FLEXIBLE PAVEMENT.** A pavement structure which maintains intimate contact with and distributes loads to the subgrade and depends upon aggregate interlock, particle friction, and cohesion for stability. (DePina, 1972)

**FLOODING.** A rising and overflowing of a body of water that covers land not usually under water. (U.S.D.P.)

**FLOODWAY FRINGE.** The floodplain area landward of the natural floodway which would be inundated by low velocity floodwaters. (U.S.D.P.)

**FLOW METER.** A device to measure flow of water. (U.S.D.P.)

**FLUSH TANK TOILET.** Toilet with storage tank of water used for flushing bowl. (U.S.D.P.)

**FLUSH VALVE TOILET.** Toilet with self-closing valve which supplies water directly from pipe. It requires adequate pressure for proper functioning. (U.S.D.P.)

**FOOT CANDLE.** A unit of illuminance on a surface that is everywhere one foot from a uniform point source of light of one candle and equal to one lumen per square foot. (Merriam-Webster, 1971)

**FUMES.** Gaseous emissions that are usually odorous and sometimes noxious. (Merriam-Webster, 1971)

**GAS.** A system for supplying natural gas, manufactured gas, or liquefied petroleum gas to the site and individual users. (U.S.D.P.)

**GRADE.** Profile of the center of a roadway, or the invert of a culvert or sewer. (DePina, 1972)

**GRID BLOCKS.** The block determined by a convenient public circulation and not by dimensions of lots. In grid blocks some lots have indirect access to public streets. (U.S.D.P.)

**GRIDIRON BLOCKS.** The blocks determined by the dimensions of the lots. In gridiron blocks all the lots have direct access to public streets. (U.S.D.P.)

**GRID LAYOUTS.** The urban layouts with grid blocks. (U.S.D.P.)

**GRIDIRON LAYOUTS.** The urban layouts with gridiron blocks. (U.S.D.P.)

**GOVERNMENT/MUNICIPAL REGULATIONS.** In urban areas, the development of the physical environment is a process usually controlled by a government/municipality through all or some of the following regulations: Master Plan, Zoning Ordinance, Subdivision Regulations, Building Code. (U.S.D.P.)

**HEAD.** (Static). The height of water above any plane or point of reference. Head in feet = (lb/sq. in. x 144)/(Density in lb/cu. ft.) For water at 68°F. (DePina, 1972)

**HIGH-RISE.** Dwelling units grouped in five or more stories with stairs and lifts for vertical circulation. (U.S.D.P.)

**HOT WIRE.** Wire carrying voltage between itself and a ground. (ROTC ST 45-7, 1953)

**HYDRAULICS.** That branch of science or engineering that deals with water or other fluid in motion. (DePina, 1972)

**ILLEGAL.** That which is contrary to or violating a rule or regulation or something having the force of law. (Merriam-Webster, 1971)

**INCOME.** The amount (measured in money) of gains from capital or labor. The amount of such gain received by a family per year may be used as an indicator of income groups. (U.S.D.P.)

**INCOME GROUPS.** A group of people or families within the same range of incomes. (U.S.D.P.)

**INCREMENT (TAX).** A special tax on the increased value of land, which is due to no labor/expenditure by the owner, but rather to natural causes such as the increase of population, general progress of society, etc. (U.S.D.P.)

**INFRASTRUCTURE.** The underlying foundation or basic framework for utilities and services: streets; sewage, water network; storm drainage, electrical network;

gas network; telephone network; public transportation; police and fire protection; refuse collection, health, schools, playgrounds, parks, open spaces. (U.S.D.P.)

**INSULATOR.** A material or body that is a poor conductor of electricity, heat, or sound. (Merriam-Webster, 1971)

**INTERIOR CIRCULATION NETWORK (SITE PLANNING).** The pedestrian/vehicular circulation system inside the site. It should be designed based upon the exterior circulation/accesses and land development requirements. (U.S.D.P.)

**INTERVAL.** A space of time (or distance) between the recurrences of similar conditions or states. (Merriam-Webster, 1971)

**KILOWATT (kw).** (1000 watts) A convenient manner of expressing large wattages. Kilowatt hours (kwh) measure the total quantity of energy consumed in a given time. One kwh represents the use of an average of 1 kilowatt of electrical energy for a period of 1 hour. (ROTC ST 45-7, 1953)

**LAMPHOLE.** A vertical pipe or shaft leading from the surface of the ground to a sewer, for admitting light for purposes of inspection. (U.S.D.P.)

**LAND COST.** Price: the amount of money given or set as the amount to be given as a consideration for the sale of a specific thing (the site). (Merriam-Webster, 1971)

**LAND DEVELOPMENT COSTS.** The costs of making raw land ready for development through the provision of utilities, services, accesses, etc. (U.S.D.P.)

**LAND LEASE.** The renting of land for a term of years for an agreed sum; leases of land may run as long as 99 years. (U.S.D.P.)

**LAND-MARKET VALUE.** Refers to: 1) the present monetary equivalent to replace the land; 2) the present tax based value of the land; or 3) the present commercial market value of the land. (U.S.D.P.)

**LAND OWNERSHIP.** The exclusive right of control and possession of a parcel of land. (U.S.D.P.)

**LAND SUBDIVISION.** The division of the land in blocks, lots and laying out streets. (U.S.D.P.)

**LAND TENANCY.** The temporary holding or mode of holding a parcel of land of another. (U.S.D.P.)

**LAND UTILIZATION.** A qualification of the land around a dwelling in relation to user, physical controls and responsibility. **PUBLIC** (streets, walkways, open spaces): user -anyone/unlimited; physical controls -minimum; responsibility -public sector. **SEMI-PUBLIC** (open spaces, playgrounds, schools): user -limited group of people; physical controls -partial or complete; responsibility -public sector and user. **PRIVATE** (dwellings, lots): user -owner or tenant or squatter; physical controls -complete; responsibility -user. **SEMI-PRIVATE** (cluster courts): user -group of owners and/or tenants; physical controls -partial or complete; responsibility -user. (U.S.D.P.)

**LAND UTILIZATION: PHYSICAL CONTROLS.** The physical/legal means or methods of directing, regulating, and coordinating the use and maintenance of land by the owners/users. (U.S.D.P.)

**LAND UTILIZATION: RESPONSIBILITY.** The quality/state of being morally/legally responsible for the use and maintenance of land by the owners/users. (U.S.D.P.)

**LATERAL SEWER.** A collector pipe receiving sewage from building connection only. (U.S.D.P.)

**LATRINE.** A receptacle (as a pit in the earth or a water closet) for use in defecation and urination, or

a room (as in a barracks or hospital) or enclosure (as in a camp) containing such a receptacle. (Merriam-Webster, 1971)

**LAYOUT.** The plan or design or arrangement of something that is laid out. (Merriam-Webster, 1971)

**LEVELS OF SERVICES.** Two levels are considered: **MINIMUM**, are admissible or possible levels below the standard; **STANDARD**, are levels set up and established by authority, custom of general consent, as a model, example or rule for the measure of quantity, weight extent, value or quality. (U.S.D.P.)

**LIFT PUMP.** A collection system component that forces sewage to a higher elevation to avoid deep pipe networks. (U.S.D.P.)

**LOCALITY.** A relatively self-contained residential area/community/neighborhood/settlement within an urban area which may contain one or more dwelling/land systems. (U.S.D.P.)

**LOCALITY SEGMENT.** A 400m x 400m area taken from and representing the residential character and layout of a locality. (U.S.D.P.)

**LOCATION.** Situation: the way in which something (the site) is placed in relation to its surroundings (the urban context). (Merriam-Webster, 1971)

**LOT.** A measured parcel of land having fixed boundaries and access to public circulation. (U.S.D.P.)

**LOT CLUSTER.** A group of lots (owned individually) around a semipublic common court (owned in condominium). (U.S.D.P.)

**LOT COVERAGE.** The ratio of building area to the total lot area. (U.S.D.P.)

**LOT PROPORTION.** The ratio of lot width to lot depth. (U.S.D.P.)

**LUMINAIRE.** In highway lighting, a complete lighting device consisting of a light source, plus a globe, reflector, refractor, housing and such support as is integral with the housing. (DePina, 1972)

**MANHOLE.** An access hole sized for a man to enter, particularly in sewer and storm drainage pipe systems for cleaning, maintenance and inspection. (U.S.D.P.)

**MATRIX (OF BASIC REFERENCE MODELS).** A set of models of urban layouts arranged in rows and columns. (U.S.D.P.)

**MASTER PLAN.** A comprehensive, long range plan intended to guide the growth and development of a city, town or region, expressing official contemplations on the course its transportation, housing and community facilities should take, and making proposals for industrial settlement, commerce, population distribution and other aspects of growth and development. (Abrams, 1972).

**MEDIAN BARRIER.** A double-faced guard rail in the median or island dividing two adjacent roadways. (DePina, 1972)

**MESHING BOUNDARIES.** Characterized by continuing, homogeneous land uses or topography, expressed as: **LINES:** property lines, political or municipal divisions, main streets, etc.; **AREAS:** similar residential uses, compatible uses (as parks with residential). (U.S.D.P.)

**MICROCLIMATE.** The local climate of a given site or habitat varying in size from a tiny crevice to a large land area, but being usually characterized by considerable uniformity of climate. (Merriam-Webster, 1971)

**MODE OF TRAVEL.** Manner of moving from one place (the

site) to another (other parts of the urban context). (U.S.D.P.)

**MODEL (OF URBAN LAYOUT).** A representation of an urban residential area illustrating circulation, land utilization, land subdivision, and utility network of a specific layout and lot. (U.S.D.P.)

**MUTUAL OWNERSHIP.** Private land ownership shared by two or more persons and their heir under mutual agreement. (U.S.D.P.)

**NATURAL FEATURES.** Prominent objects in or produced by nature. (U.S.D.P.)

**NATURAL UNDISTURBED SOIL.** Soils that have not been disturbed by artificial process. Although natural, they depend greatly on local conditions, environment, and past geological history of the formations. (U.S.D.P.)

**NEIGHBORHOOD.** A section lived in by neighbors and having distinguishing characteristics. (U.S.D.P.)

**NETWORK EFFICIENCY (LAYOUT EFFICIENCY).** The ratio of the length of the network to the area(s) contained within; or tangent to it. (U.S.D.P.)

**NEUTRAL WIRE.** Wire carrying no voltage between itself and a ground. (ROTC ST 45-7, 1953)

**NOISE.** Any sound (affecting the site) that is undesired (such as that produced by: traffic, airports, industry, etc.) (Merriam-Webster, 1971)

**ODOR.** A quality of something that affects the sense of smell. (Merriam-Webster, 1971)

**OHMS (electrical).** The unit of resistance to the flow electricity. The higher the number of ohms, the greater the resistance. When resistance is constant, amperage (and wattage) are in direct proportion to voltage. Resistance varies inversely with the cross-sectional area of the wire. Ohms = volts/amperes.  $R = E/I$ . The practical mks unit of electrical resistance that is equal to the resistance of a circuit in which a potential difference of one volt produces a current of one ampere or to the resistance in which one watt of power is dissipated when one ampere flows through it and that is taken as standard in the U.S. (U.S.D.P.; ROTC ST 45-7, 1953; Merriam-Webster, 1971)

**OPTIMIZE/OPTIMIZE.** To bring to a peak of economic efficiency, specially by the use of precise analytical methods. (Merriam-Webster, 1971)

**ORGANIC SOILS.** Soils composed mostly of plant material. (U.S.D.P.)

**OXIDATION POND (LAGOON).** A method of sewage treatment using action of bacteria and algae to digest/decompose wastes. (U.S.D.P.)

**PERCENT RENT/MORTGAGE.** The fraction of income allocated for dwelling rental or dwelling mortgage payments; expressed as a percentage of total family income. (U.S.D.P.)

**PIT PRIVY/LATRINE.** A simple hole in the ground, usually hand dug, covered with slab and protective superstructure; for disposal of human excreta. (U.S.D.P.)

**PLANNING.** The establishment of goals, policies, and procedures for a social or economic unit, i.e. city. (U.S.D.P.)

**PLOT/LOT.** A measured parcel of land having fixed boundaries and access to public circulation. (U.S.D.P.)

**POLICE PROTECTION.** Police force: a body of trained men and women entrusted by a government with the maintenance of public peace and order, enforcement of laws, prevention and detection of crime. (Merriam-

Webster, 1971)

**POPULATION DENSITY.** It is the ratio between the population of a given area and the area. It is expressed in people per hectare. It can be: **GROSS DENSITY:** includes any kind of land utilization, residential, circulation, public facilities, etc. **NET DENSITY:** includes only the residential land and does not include land for other uses. (U.S.D.P.)

**POSITION.** The point or area in space actually occupied by a physical object (the site). (Merriam-Webster, 1971)

**PRIMER.** A small introductory book on a specific subject. (U.S.D.P.)

**PRIVATE LAND OWNERSHIP.** The absolute tenure of land to a person and his heirs without restriction of time. (U.S.D.P.)

**PRIVY.** A small, often detached building having a bench with one or more round or oval holes through which the user may defecate or urinate (as into a pit or tub) and ordinarily lacking any means of automatic discharge of the matter deposited. (Merriam-Webster, 1971)

**PROJECT.** A plan undertaken; a specific plan or design. (U.S.D.P.)

**PUBLIC CIRCULATION.** The circulation network which is owned, controlled, and maintained by public agencies and is accessible to all members of a community. (U.S.D.P.)

**PUBLIC FACILITIES.** Facilities such as schools, playgrounds, parks, other facilities accessible to all members of a community which are owned, controlled, and maintained by public agencies. (U.S.D.P.)

**PUBLIC SERVICES AND COMMUNITY FACILITIES.** Includes: public transportation, police protection, fire protection, refuse collection, health, schools, and playgrounds, recreation and open spaces, other community facilities, business, commercial, small industries, markets. (U.S.D.P.)

**PUBLIC SYSTEM (general).** A system which is owned and operated by a local governmental authority or by an established public utility company which is controlled and regulated by a governmental authority. (HUD/AID, Minimum Standards, 1966)

**PUBLIC UTILITIES.** Includes: water supply, sanitary sewerage, storm drainage, electricity, street lighting, telephone, circulation networks. (U.S.D.P.)

**PUMP.** A device or machine that raises, transfers, or compresses fluids or that attenuates gases especially by suction or pressure or both. (Merriam-Webster, 1971)

**REFUSE COLLECTION.** The service for collection and disposal of all the solid wastes from a community. (U.S.D.P.)

**RESERVOIR.** Large-scale storage of water; also functions to control fluctuations in supply and pressure. (U.S.D.P.)

**RESIDENTIAL AREA.** An area containing the basic needs/requirements for daily life activities: housing, education, recreation, shopping, work. (U.S.D.P.)

**RESISTANCE.** The opposition to electrical flow. (Resistance increases as the length of wires is increased and decreases as the cross-sectional area of wires is increased). (ROTC ST 45-7, 1953)

**RIGHT-OF-WAY.** A legal right of passage over another person's ground (land), the area or way over which a right-of-way exists such as: a path or thorough-fare which one may lawfully use, the strip of land devoted to or over which is built a public road, the land

occupied by a railroad, the land used by a public utility. Rights-of-way may be shared (as streets; pedestrians and automobiles) or exclusive (as rapid transit routes; subways, railroads, etc.) (Merriam-Webster, 1971; U.S.D.P.)

**ROADWAY (HIGHWAY).** Portion of the highway included between the outside lines of gutter or side ditches, including all slopes, ditches, channels, and appurtenances necessary to proper drainage, protection, and use. (DePina, 1972)

**ROW/GROUPED HOUSING.** Dwelling units grouped together linearly or in clusters. (U.S.D.P.)

**RUNOFF.** That part of precipitation carried off from the area upon which it falls. (DePina, 1972)

**RUNOFF-RAINFALL RATIO.** The percentage (ratio) of stormwater runoff that is not reduced by evaporation, depression storage, surface wetting, and percolation; with increased rainfall duration, runoff-rainfall ratios rise increasing runoff flow. (U.S.D.P.)

**SAND.** Loose, distinguishable grains of quartz/feldspar, mica (ranging from 2mm to 0.02mm in diameter). (U.S.D.P.)

**SANITARY SEWERAGE.** The system of artificial usually subterranean conduits to carry off sewage composed of: *excreta*: waste matter eliminated from the human body; *domestic wastes*: used water from a home/community containing 0.1% total solids; and some *industrial wastes*, but not water from ground, surface, or storm. (U.S.D.P.)

**SEMI-DETACHED DWELLING.** Two dwelling units sharing a common wall (duplex). (U.S.D.P.)

**SEPTIC TANK.** A tank in which the organic solid matter of continuously flowing sewage is deposited and retained until it has been disintegrated by anaerobic bacteria. (Merriam-Webster, 1971)

**SERIES CIRCUIT.** Fixtures connected in a circuit by a single wire. When one fixture is out, the circuit is broken. Fixtures with different amperages cannot be used efficiently in the same circuit. (ROTC ST 45-7, 1953)

**SETTLEMENT.** Occupation by settlers to establish a residence or colony. (U.S.D.P.)

**SEWAGE.** The effluent in a sewer network. (U.S.D.P.)

**SEWER.** The conduit in a subterranean network used to carry off water and waste matter. (U.S.D.P.)

**SEWER BUILDING CONNECTION.** The pipe connecting the dwelling with the sewer network. (U.S.D.P.)

**SEWERAGE.** Sewerage system: the system of sewers in a city, town or locality. (Merriam-Webster, 1971)

**SHAPE.** Form/configuration of the site surface as defined by its perimeter/boundaries. (U.S.D.P.)

**SHOPPING.** (Facilities for) searching for, inspecting, or buying available goods or services. (U.S.D.P.)

**SILT.** Loose, unconsolidated sedimentary rock particles (ranging from 0.02mm to 0.002mm in diameter). (U.S.D.P.)

**SITE.** Land (that could be) made suitable for building purposes by dividing into lots, laying out streets and providing facilities. (Merriam-Webster, 1971)

**SITE AREAS.** Two types are considered: *GROSS AREA*: includes the whole site or the bounded piece of ground. *USABLE AREA*: includes only the portion of the site that can be fully utilized for buildings, streets, playgrounds, recreation facilities, gardens, or other structures. (U.S.D.P.)

**SITE AND SERVICES.** The subdivision of urban land and the provision of services for residential use and complementary commercial use. Site and services projects are aimed to improve the housing conditions for the low income groups of the population by providing: a) *SITE*: the access to a piece of land where people can build their own dwellings; b) *SERVICES*: the opportunity of access to employment, utilities, services and community facilities, financing and communications. (U.S.D.P.)

**SIZE.** Physical magnitude or extent (of the site), relative or proportionate dimensions (of the site). (Merriam-Webster, 1971)

**SLOPE.** Degree or extent of deviation (of the land surface) from the horizontal. (Merriam-Webster, 1971)

**SMOKE.** The gaseous products of burning carbonaceous materials made visible by the presence of carbon particles. (Merriam-Webster, 1971)

**SOIL.** Soil structure: the arrangement of soil particles in various aggregates differing in shape, size, stability, and degree of adhesion to one another. (Merriam-Webster, 1971)

**SOIL INVESTIGATION.** It is the process to find the soil structure and other characteristics. It may include the following stages: initial soil survey, exploratory boring, construction boring. (U.S.D.P.)

**SOIL PIPE.** The pipe in a dwelling which carries the pipe discharge from water closets. (U.S.D.P.)

**SOIL SURVEY (INITIAL).** An on-site examination of surface soil conditions and reference to a *GENERAL SOIL MAP*. It is used to reveal obvious limitations/restrictions/hazards for early planning consideration. (U.S.D.P.)

**STACK.** The vertical pipe in a dwelling of the soil-, waste-, or vent-pipe systems. (ROTC ST 45-7, 1953)

**STANDARD.** 1) Something that is established by authority, custom or general consent as a model or example to be followed. 2) Something that is set up and established by authority as a rule for the measure of quantity, weight, extent, value or quality. (Merriam-Webster, 1971)

**STANDPIPE.** A pipe riser with tap used as a source of water for domestic purposes. (HUD/AID, Minimum Standards, 1966)

**STORM DRAINAGE.** Storm sewer: a sewer (system) designed to carry water wastes except sewage (exclusively storm water, surface runoff, or street wash). (Merriam-Webster, 1971)

**STREET LIGHTING.** Illumination to improve vision at night for security and for the extension of activities. (U.S.D.P.)

**SUBDIVISION REGULATIONS.** Regulations governing the development of raw land for residential or other purposes. (Abrams, 1972)

**SUBGRADE.** The layer of natural soil or fill (compacted soil) upon which the pavement structure including curbs is constructed. (DePina, 1972)

**SUBMAIN or BRANCH SEWER.** A collector pipe receiving sewage from lateral sewer only. (U.S.D.P.)

**SUBSISTENCE INCOME.** The minimum amount of money required for the purchase of food and fuel for an average family to survive. (U.S.D.P.)

**SULLAGE.** Drainage or refuse especially from a house, farmyard, or street. (Merriam-Webster, 1971)

**TAP (also FAUCET).** A fixture for drawing a liquid from a pipe, cask, or other vessel. (Merriam-Webster, 1971)

**TAX EXEMPTION.** A grant by a government of immunity from taxes; (a ten-year tax exemption on new housing in New York stimulated new construction in the 1920's; to ease its housing shortage, Turkey granted a ten-year tax exemption on new buildings). (Abrams, 1966)

**TAX INCENTIVE.** Favorable tax treatment to induce the beneficiary to do as he would not otherwise be likely to do. (U.S.D.P.)

**TAX STRUCTURE - TAXATION.** The method by which a nation (state, municipality) implements decisions to transfer resources from the private sector to the public sector. (U.S.D.P.)

**TELEPHONE.** An electrical voice communication network interconnecting all subscribing individuals and transmitting over wires. (U.S.D.P.)

**TENURE.** Two situations of tenure of the dwelling units and/or the lot/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 users pay a fee (daily, weekly, monthly) for the use of the dwelling unit and/or the lot/land; *LEASE*: where the users pay 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); *OWNERSHIP*: where the users hold in freehold the dwelling unit and/or the lot/land which the unit occupies; *EMPLOYER-PROVIDED*: where the users are provided a dwelling unit by an employer in exchange for services, i.e. domestic live-in servant. (U.S.D.P.)

**TITLE.** The instrument (as a deed) that constitutes a legally just cause of exclusive possession (of land, dwellings, or both). (Merriam-Webster, 1971)

**TOILET.** A fixture for defecation and urination, esp. water closet. (7th Collegiate Webster, 1963)

**TOPOGRAPHY.** The configuration of a (land) surface including its relief and the position of its natural and man-made features. (Merriam-Webster, 1971)

**TRANSPORTATION.** Means of conveyance or travel from one place (the site) to another (other parts of the urban context). (Merriam-Webster, 1971)

**TRAP.** A fitting that provides a water seal to prevent sewer gases and odors being discharged through fixtures. (ROTC ST 45-7, 1953)

**TREATMENT WORKS.** Filtration plant, reservoirs, and all other construction required for the treatment of a water supply. (ROTC ST 45-7, 1953)

**UNIT.** A determinate quantity adopted as a standard of measurement for other quantities of the same kind. (Merriam-Webster, 1971)

**URBAN TRANSPORTATION.** Means of conveyance of passengers or goods from one place to another along ways, routes of circulation in a metropolitan context. (U.S.D.P.)

**URBANIZATION.** The quality or state of being or becoming urbanized; to cause to take on urban characteristics. (U.S.D.P.)

**USE TAX.** The tax on land aimed primarily at enforcing its use or improvement. (U.S.D.P.)

**USER INCOME GROUPS.** Based upon the subsistence (minimum wage) income per year, five income groups are distinguished: *VERY LOW (below subsistence level)*: the income group with no household income available for housing, services, or transportation; *LOW (1 x subsistence level)*: the income group that can afford no or very limited subsidized housing; *MODERATE (3 x subsistence level)*: the income group that can afford limited housing and rent only with government assistance; *HIGH (5 x subsistence level)*: the income

group that can afford housing without subsidy, by cash purchase, through mortgage payments, or by rent; *VERY HIGH (10 x subsistence level)*: the income group that represents the most economically mobile sector of the population. (U.S.D.P.)

**USUFRUCT.** The right to profit from a parcel of land or control of a parcel of land without becoming the owner or formal lessee; legal possession by decree without charge. (U.S.D.P.)

**UTILITIES.** Include: water supply, sanitary sewerage, storm drainage, electricity, street lighting, gas, telephone. (U.S.D.P.)

**UTILITY/SERVICE.** The organization and/or infrastructure for meeting the general need (as for water supply, wastewater removal, electricity, etc.) in the public interest. (U.S.D.P.)

**VALVE.** A water supply distribution component which interrupts the supply for maintenance purposes. (U.S.D.P.)

**VENT.** A pipe opening to the atmosphere, which provides ventilation for a drainage system and prevents trap siphonage or back pressure. (ROTC ST 45-7, 1953)

**VIBRATION.** A quivering or trembling motion (such as that produced by: heavy traffic, industry, aircraft, etc. (Merriam-Webster, 1971)

**VIEWS.** That which is revealed to the vision or can be seen (from the site). (Merriam-Webster, 1971)

**WALK-UP.** Dwelling units grouped in two to five stories with stairs for vertical circulation. (U.S.D.P.)

**WASTE PIPE.** A pipe (in a dwelling) which carries water from wash basins, sinks, and similar fixtures. (ROTC ST 45-7, 1953)

**WATER SUPPLY.** Source, means, or process of supplying water, (as for a community) usually involving reservoirs, pipelines, and often the watershed from which the water is ultimately drawn. (Merriam-Webster, 1971)

**WATERSHED.** The catchment area or drainage basin from which the waters of a stream or stream system are drawn. (Merriam-Webster, 1971)

**WATERWORKS.** The whole system of reservoirs, channels, mains, and pumping and purifying equipment by which a water supply is obtained and distributed to consumers. (Merriam-Webster, 1971)

**WATT.** Watts (w) measure the power of the flow of energy through a circuit. Wattage is the product of volts times amperes. Both watts and horsepower denote the rate of work being done. 746w = 1hp. (ROTC ST 45-7, 1953)

**ZONING ORDINANCE.** The demarcation of a city by ordinance into zones (areas/districts) and the establishment of regulations to govern the use of land and the location, bulk, height, shape, use, population density, and coverage of structures within each zone. (U.S.D.P.)

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## EXPLANATORY NOTES

## QUALITY OF INFORMATION

The quality of information given in drawings, charts and descriptions has been qualified in the following manner:

- Approximate: when deducted from different and/or not completely reliable sources.
- Accurate: when taken from reliable or actual sources.
- Tentative: when based upon rough estimations of limited sources.

## QUALITY OF SERVICES, FACILITIES AND UTILITIES

- None: when the existence of services, facilities and utilities are unavailable to a locality.
- Limited: when the existence of services, facilities and utilities are available to a locality in a limited manner due to proximity.
- Adequate: when the existence of services, facilities and utilities are available to a locality.

## METRIC SYSTEM EQUIVALENTS

Linear Measures

1 centimeter	=	0.3937 inches
1 meter = 100 centimeters	=	39.37 inches or 3.28 feet
1 kilometer = 1,000 meters	=	3,280.83 feet or 0.62137 miles
1 inch	=	2.54 centimeters
1 foot	=	0.3048 meters
1 mile	=	1.60935 kilometers

Square Measures

1 square meter	=	1,550 square inches
	or	10.7639 square feet
1 hectare = 10,000 sq.meters	=	2.4711 acres
1 square foot	=	0.0929 square meters
1 acre	=	0.4087 hectares

## DOLLAR EQUIVALENTS

All income, cost and rent/mortgage data have been expressed in terms of the U.S. equivalent; 1 US Dollar = 8.02 Rupees (1978)