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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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, Jamnagar, 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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All rights reserved; no section of this work may be reproduced by any means without the written permission from the author.
A predominant characteristic of urbanization in India is the phenomenal growth of urban population. In the span of last fifty years the urban population has multiplied five times to a staggering 110 million, while the total population has only doubled.

More than half of this population is distributed in 142 cities, which includes 9 metropolitan areas and 133 intermediate cities. The intermediate cities have been growing both in number and population size at a much faster rate than the established metropolitan cities in the country. The conditions of urban settlements in such cities have been deteriorating largely due to their unchecked rapid growth during the last two decades and an increasing rate of poverty.

Five cities in the western state of Gujarat; namely Surat, Vadodara, Rajkot, Jamnagar and Porbandar are briefly studied here in order to identify the issues related to their rapid growth. Having originated in the middle ages and fortified during the Mogul rule, these cities have become centers of urban life, mainly due to their location and the post-independence industrialization. Increased commercial activities due to the rich hinterland and growth of population and poverty in the adjoining rural areas have also been responsible for attracting thousands of migrants to such cities. Moreover, the inherent problems faced by the large metropolitan cities in India such as Ahmedabad, Bombay and Calcutta are already becoming acute in these intermediate cities. Growth of squatter settlements, haphazard growth on the periphery and lack of city services demand immediate attention. This study is concerned with the proper development of such cities to facilitate equal distribution of both the economic activities and gains, and to reduce population pressure on the large metropolitan areas.
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, appartments, 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 123 intermediate cities are also deteriorating rapidly. Approximately 15% to 25% of the population in such cities, live in squatter settlements.
INDIA

NATIONAL CONTEXT

India, situated between latitudes 8°N and 37°N, dominates the South Asian subcontinent 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 7,583Km. Its diversified topography has three major regions: 1) sparsely populated Himalayas 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 Plateau. 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 northeast (Assam Hills) to less than 12cm. in the northwest (Rajasthan Desert).

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:

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.

1. PRIMARY INFORMATION

Country: Republic of India
Capital: New Delhi
Population: 529 million (1977)
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. 1,147
Religion: 85% Hindu, 11% Muslim
Government: Democracy

1. 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 Corporation, 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 enhance implementation. The major objectives of the new five year plan (1975-80) are: elimination of unemployment in the next ten years, significant increase in the standard of living of the poor, 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 the 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 and 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 up to 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

Census of India publications, 1971.
India, a reference annual, 1977.
Government of India.
CITIES IN GUJARAT

URBANIZATION TRENDS: GUJARAT

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 113 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 Surat, Vadodara and Rajkot grew 134%, 70% and 54% respectively.

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 Maharashttra 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 intermedicate 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 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 an administrative city until 1946, 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 has 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.

PHOTOGRAPHS:

(top) Raiya Naka Road, Rajkot, 1978; A commercial street leading to the walled city. (bottom left) Jamnagar, 1978; Jilelmal commercial developments. (bottom right) Surat, 1978; Squatters along the railway lines.

PROJECTED CITY POPULATIONS: 1986

CITY POPULATIONS: 1971

KEY POPULATION

1 Million & more

500,000 - 1 Million

100,000 - 500,000

50,000 - 100,000


THE INTERMEDIATE CITIES GUJARAT STATE

URBAN GROWTH PATTERS

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| **2 VADODARA** |
| POPULATION | 1978: 594,800 | 1971: 467,422 |
| POPULATION GROWTH RATE FROM 1961 TO 1971 | 56.64 % |
| ADMINISTRATIVE CITY LIMITS | 1978: 75.08 Km² | 1961: 25.17 Km² |
| LOCATION | 350 Kms. from Bombay, |
| | 100 Kms. from Ahmedabad, |
| | 120 Kms. from Surat and on the bank of river Vishvamitri. |
| EMPLOYMENT STRUCTURE | 40 % Industrial |
| | 16 % Trade and commerce |
| | 9 % Transport and services |
| LOCAL AUTHORITY | Vadodara Municipal Corporation |
| HOUSING | % of TOTAL HOUSING |
| PERCENTAGE POPULATION LIVING IN RENTAL HOUSES | 72 % Rental |
| OCCUPANCY RATE | 41 % |
| SLUM POPULATION IN 1972 | 2.43 persons/room |
| PUBLIC HOUSING BUILT - NUMBER OF TENEMENTS | 49,903 people |
| | 3987 by GHB and 6389 by VMC. |

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| **3 RAJKOT** |
| POPULATION | 1978: 400,000 | 1971: 300,512 |
| POPULATION GROWTH RATE FROM 1961 TO 1971 | 54.60 % |
| ADMINISTRATIVE CITY LIMITS | 1978: 69.23 Km² | 1961: 38.46 Km² |
| LOCATION | 251 Kms. from Ahmedabad, Connected with other cities by highways, railways and by air. On the bank of river Aji. |
| HISTORY | 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. |
| EMPLOYMENT STRUCTURE | 30 % Industrial |
| | 22 % Trade and commerce |
| | 9 % Transport and services |
| LOCAL AUTHORITY | Rajkot Municipal Corporation |
| HOUSING | % of TOTAL HOUSING |
| PERCENTAGE POPULATION LIVING IN RENTAL HOUSES | 70 % Rental |
| OCCUPANCY RATE | 70.2 % |
| SLUM POPULATION IN 1972 | 3.72 persons/room |
| PUBLIC HOUSING BUILT - NUMBER OF TENEMENTS | 26,578 people |
| | 3185 by GHB and 200 by RMC |

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<td>COLLEGES AND SCHOOLS</td>
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<td>RECREATION AND OPEN SPACES</td>
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</tbody>
</table>
4 JAMNAGAR

1978: 300,000
44.61 %
1971: 214,853
42.41 %
1978: 22.90 Km²
1961: 14.42 Km²

28.5 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
42 % other

Jamnagar Municipality

61 % Rental
43.6 %
2.90 persons/room
44,444 people

2678 by GHS
5 %

Limited
Limited
Limited
Limited
Adequate
None
Limited
Limited
Limited
Limited
Limited

5 PORBANDAR

1978: 125,000
42.41 %
1971: 96,000
44.4 %
1978: 9.92 Km²
1961: 9.92 Km²

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


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

Pormbaner Municipality

60 %
40 %
2.85 persons/room
not available

none
not available

Limited
Limited
Limited
Limited
Adequate
Limited
Limited
Limited
Limited
Limited

AHMEDABAD METROPOLITAN AREA

KEY

- ORIGINAL SETTLEMENTS
- FORTIFICATION: 13th-16th century
- TILL INDEPENDENCE: 1947
- POST INDEPENDENCE: 1947-1978

1978: 2,200,000
44.4 %
1978: 93 Km²
1961: 93 Km²

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.


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

Ahmedabad Municipal Corporation

Limited
Limited
Limited
Limited
Adequate
Limited
Limited
Limited
Limited
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.

<table>
<thead>
<tr>
<th>LOCATIONAL ADVANTAGE:</th>
<th>CENTRAL LOCATION</th>
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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 hot dry 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 Mansukh Khan 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. Reorganisation 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. Shaktinagar 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 24% 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

Income Patterns: (approximate) IBID
Density Patterns: (approximate) IBID
Climatological and Solar Data for India, 1969.
DEMOGRAPHY: The population of Rajkot urban area was 100,612 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, 34.22% between 15-59 years and 4.7% above 60 years. The population consists of 83% Hindus, 8% Muslims and 5% Jains. Gujarati was spoken by 94% of the population.

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, chawk- 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.² to 60 Km.². 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, 6% 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.

CHAWLS: 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 no sanitary facilities; water supply and toilets. Many of the chawls are now governed 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.

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.

**Urban Context: Rajkot**

**Urban Topography and Circulation**

**Urban Land Use Pattern**

**Urban Income Pattern**

**Urban Density Pattern**

**Urban Context:**

**Primary Road**

**Railroad**

**Built-up Area**

**Key Areas**

1. **Gantal**
2. **Karan Para**
3. **Bhivas**
4. **Mankotia Para**
5. **Anand Nagar**

**Areas**

- Residential
- Commercial
- Industrial

**Incomes**

- Low
- Medium
- High
- Very Low

**Densities**

- Low
- Medium
- High

**Densities**

- Low
- Medium
- High

**Recent survey (in 1972) of the squatter co-operative 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. 139.60 lacs (US$1,625,000.00) by 1975. The cooperatives 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 Municipal Corporation 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 installments 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 schemes, 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.
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.

5a ANAND NAGAR
Public, low/middle income, single storey row houses.

5b ANAND NAGAR
Public, low/middle income, Three storied walk-up apartments

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.

PHOTOGRAPH:
1 GAMTAL
PRIVATE, LOW/MIDDLE INCOME, WALLED CITY
Rajkot

LOCATION: Gamtal 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. 64% of the houses were built using stone as primary building material.

LAYOUT: The entire layout is characterized by a geometrically arbitrary pattern of "Pol", 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 Gujarati Bazar Road inside the walled area and Para Bazar, Dhebar Road, Dharmendra Road and Lakshajirao 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, auto-rickshaws, cars, buses and occasionally stray animals.

CASE STUDY SOURCES
- Block Plan: (approximate) 1978.

LOCALITY PLAN 1:10000
CASE STUDY: GAMTAL

KEY

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

AREAS
- RESIDENTIAL
- COMMERCIAL
- INDUSTRIAL
- OPEN SPACES

LOCALITY LAND USE PATTERN

N

LOCALITY CIRCULATION PATTERN

N

KEY

VERICULAR
PEDISTRIAN

0  100  500m
0  100  500m

1:10000
1:10000
INTERMEDIATE CITIES, GUJARAT, INDIA

LOCALITY CONSTRUCTION TYPES

<table>
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<th>Material</th>
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<td>Shack</td>
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<tr>
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<tr>
<td>Masonry Wood</td>
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<tr>
<td>Masonry Concrete</td>
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<td>Concrete</td>
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</tbody>
</table>

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

Quality of information: approximate

LOCALITY UTILITIES AND SERVICES

- 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

1:2500
SUMMARY DIAGRAMS

PATTERN

PERCENTAGES

CIRCULATION EFFICIENCY

LOCALITY BLOCK LAND UTILIZATION DATA

DENSITIES

Total Number | Area Hectares | Density Persons/Ha
LOTS | 127 | 1.09 | 116
DWELLING UNITS | 152 | 1.09 | 139
PEOPLE | 851 | 1.09 | 780

AREAS

PUBLIC (streets, walkways, open spaces) | 0.12 | 11%
SEMIPUBLIC (open spaces, schools, community centers) | 0.44 | 4%
PRIVATE (dwellings, shops, factories, lots) | 0.81 | 74%
SEMIPRIVATE (cluster courts) | 0.12 | 11%
TOTAL | 1.09 | 100%

NETWORK EFFICIENCY

Network length (streets, walkways) = 135 m/Ha
Areas served (total area) | 780

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 caste. Burhanpur 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. Modli'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

| Unit Length | 135 |
| Density | 116 |
| Percentages | 11% |

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.

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.
INTERMEDIATE CITIES, GUJARAT, INDIA

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: -

PHOTOGRAPHS:
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 industrialisation 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
- Block Plan: (accurate) IBaD, Block Land Utilization: (accurate) Field Survey, Bharat Gani, 1978.
- Typical Dwelling: (approximate) IBaD, Physical Data: (approximate) IBaD, Socio-Economic Data: (approximate) IBaD, Bharat Gani, 1978.
- General Information: Field Survey, Bharat Gani, 1978. LOCALITY PLAN
THE CHART SHOWS (1) APPROXIMATE PERCENTAGE OF EACH CONSTRUCTION TYPE WITHIN THE TOTAL NUMBER OF DWELLINGS AND (2) BUILDING GROUP THAT GENERALLY PRODUCES EACH TYPE.

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 APPROPRIATE AVAILABILITY OF UTILITIES, SERVICES, AND COMMUNITY FACILITIES AT THREE LEVELS: NONE, LIMITED, ADEQUATE.

QUALITY OF INFORMATION: APPROXIMATE
CASE STUDY: KARAN PARA

SUMMARY DIAGRAMS

1 Hectare

PATTERN

PERCENTAGES

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

16 Hectares

CIRCULATION EFFICIENCY

Unit length 450 m/Ha.

LOCALITY BLOCK LAND UTILIZATION DATA

DENSITIES

<table>
<thead>
<tr>
<th></th>
<th>Total Number</th>
<th>Area Hectares</th>
<th>Density N/Ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOTS</td>
<td>8</td>
<td>0.15</td>
<td>53</td>
</tr>
<tr>
<td>DWELLING UNITS</td>
<td>13</td>
<td>0.15</td>
<td>800</td>
</tr>
<tr>
<td>PEOPLE</td>
<td>75</td>
<td>0.15</td>
<td>502</td>
</tr>
</tbody>
</table>

AREAS

<table>
<thead>
<tr>
<th></th>
<th>Hectares</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUBLIC (streets, walkways, open spaces)</td>
<td>0.05</td>
<td>33%</td>
</tr>
<tr>
<td>SEMI-PUBLIC (open spaces, schools, community centers)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>PRIVATE (dwellings, shops, factories, lots)</td>
<td>0.10</td>
<td>67%</td>
</tr>
<tr>
<td>SEMI-PRIVATE (cluster courts)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TOTAL</td>
<td>0.15</td>
<td>100%</td>
</tr>
</tbody>
</table>

NETWORK EFFICIENCY

Network length (streets, walkways) = 450 m/Ha.

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.

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 BLOCK LAND UTILIZATION:

1:1000

0 10 50m
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:
Block Plans: (accurate) IBID.
Typical Dwelling: (approximate) IBID.
Socio-Economic Data: (approximate) IBID.

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 1.3 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.
The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type.

Quality of information: approximate

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

Quality of information: approximate
POPULATION AND INCOME: Communities in this chawls are predominantly Bhils and Muslims, who constitute 50% and 33% of the entire population respectively. While 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 uninhabitable. 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.
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 - 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%

PHOTOGRAPH:
Bhilvas, Rajkot, 1978: All elements exist in the "community" except for the infrastructure services.
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 truckes, 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
Block Plan: (approximate) Ibid.
Typical Dwelling: (approximate) Ibid.
Physical Data: (approximate) Ibid.
Socio-Economic Data: (approximate) Ibid.

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 threat of evacuation and demolition by the municipal corporation. This insecurity prevents them from improving the physical conditions and consolidating their dwellings.
**Locality Construction Types**

<table>
<thead>
<tr>
<th>Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shack</td>
<td>0%</td>
</tr>
<tr>
<td>Mud/Wattle</td>
<td>100%</td>
</tr>
<tr>
<td>Wood</td>
<td>0%</td>
</tr>
<tr>
<td>Masonry</td>
<td>0%</td>
</tr>
<tr>
<td>Concrete</td>
<td>0%</td>
</tr>
</tbody>
</table>

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

**Locality Utilities and Services**

<table>
<thead>
<tr>
<th>Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Supply</td>
</tr>
<tr>
<td>Sanitary Sewerage</td>
</tr>
<tr>
<td>Storm Drainage</td>
</tr>
<tr>
<td>Electricity</td>
</tr>
<tr>
<td>Gas</td>
</tr>
<tr>
<td>Refuse Collection</td>
</tr>
<tr>
<td>Public Transportation</td>
</tr>
<tr>
<td>Paved Roads, Walkways</td>
</tr>
<tr>
<td>Telephone</td>
</tr>
<tr>
<td>Street Lighting</td>
</tr>
</tbody>
</table>

**Locality Community Facilities**

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

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

Quality of information: approximate.
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 throughout 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.
INTERMEDIATE CITIES, GUJARAT, INDIA

**PHYSICAL DATA**

**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:** Shack IS
- **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**

**GENERAL:**
- **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:**
- **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) Rafaiya 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.
ANAND NAGAR
PUBLIC, LOW/MIDDLE INCOME, ROW HOUSES
APARTMENTS

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

Segment Plan: (approximate) IBID.  
Block Plan: (accurate) IBID.  
Block Land Utilization: (accurate) IBID.  
Socio-Economic Data: (approximate) IBID.  
Photographs: (approximate) IBID.
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 Subsidised 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 1964-67 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 1973-74 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 sprang 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

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

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

Quality of information: approximate
CASE STUDY: ANAND NAGAR

51

PERCENTAGES

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 m² in area and have 28 m² 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

Percentages

PUBLIC (streets, walkways, open spaces) 69%
SEMI-PUBLIC (open spaces, schools, community centers) 31%
PRIVATE (dwelling, shops, factorias, lots) -
SEMI-PRIVATE (cluster courts) -
TOTAL 1.01 100%

NETWORK EFFICIENCY

Network length (streets, walkways) 582 m/Ha
Areas served (total area)
INTERMEDIATE CITIES, GUJARAT, INDIA

**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
- **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**
- **water:** 1
- **shower:** 1
- **kitchen:** 1
- **rooms:** 2
- **other:** NONE

**SOCIO-ECONOMIC DATA**

(related to user)

**GENERAL:**
- **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:**
- **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 %

**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.
LOCALITY BLOCK LAND UTILIZATION

KEY
- Public: streets/walkways
- Semi-public: playgrounds
- Semi-private: cluster courts
- Private: lots
- Dwellings

CIRCULATION EFFICIENCY

PERCENTAGES

- Streets/walkways: 72%
- Playgrounds: 16%
- Cluster Courts: 8%
- Dwellings/Lots: 28%

LOCALITY BLOCK LAND UTILIZATION DATA

<table>
<thead>
<tr>
<th>AREAS</th>
<th>PUBLIC (streets, walkways, open spaces)</th>
<th>SEMI-PUBLIC (open spaces, schools, community centers)</th>
<th>PRIVATE (dwellings, shops, factories, lots)</th>
<th>SEMI-PRIVATE (cluster courts)</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hectares</td>
<td>0.18</td>
<td>0.07</td>
<td>0.25</td>
<td>1.0</td>
<td>0.25</td>
</tr>
<tr>
<td>Densities</td>
<td>Total</td>
<td>Number</td>
<td>Population</td>
<td>Lots</td>
<td>144</td>
</tr>
<tr>
<td>Hectares</td>
<td>0.25</td>
<td>36</td>
<td>0.25</td>
<td>28</td>
<td>658</td>
</tr>
</tbody>
</table>

DENSITY

- 1 Bedroom
- 2 Bedroom

NETWORK EFFICIENCY

- Total persons: 788
- Average persons per hectare: 31.5

CITY BLOCK, GUJARAT, INDIA

SUMMARY DIAGRAMS

Hectare

PATTERN

LOW INCOME HOUSING SCHEME

Unit Length m/Ha.

1.0

6.0

10

LOCALITY BLOCK LAND UTILIZATION

DENSITY

Persons/Hectare

0

20

788

25%

20

1970-72

1975-76

336

96

25%

20

788

25%

20

788

25%

20

788

Under the "Low Income Housing Scheme", 336 walk-up apartments were built during the 1970-72 period. These apartments were allotted on a hire-purchase basis with an initial deposit of 25% of the total cost and the remaining amount paid in the monthly instalments spread over 10 to 20 years. After the scheme during the 1975-76 period, 96 more units were added under the same scheme. The layout of the scheme was not very efficient and the quality of construction was poor. Despite this, the layout was very compact and the density was high.

LOCALITY BLOCK LAND UTILIZATION

DENSITY

Persons/Hectare

0

20

788

25%

20

1970-72

1975-76

336

96

25%

20

788

25%

20

788

25%

20

788

Under the "Low Income Housing Scheme", 336 walk-up apartments were built during the 1970-72 period. These apartments were allotted on a hire-purchase basis with an initial deposit of 25% of the total cost and the remaining amount paid in the monthly instalments spread over 10 to 20 years. After the scheme during the 1975-76 period, 96 more units were added under the same scheme. The layout of the scheme was not very efficient and the quality of construction was poor. Despite this, the layout was very compact and the density was high.
CASE STUDY: ANAND NAGAR

PHYSICAL DATA
(related to dwelling and land)

DWELLING UNIT
type: APARTMENT
area (sq m): 47

LAND/LOT
utilisation: PUBLIC
area (sq m): --

DWELLING
location: PERIPHERY
type: WALL-UP
number of floors: 3
utilisation: 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

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 - rural: 1970
urban - urban: 1970
why came to urban area: EMPLOYMENT

GENERAL: ECONOMIC
user's income group: MIDDLE
employment: SERVICE/BUISNESS
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 %
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

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

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

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

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.

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.

3. BHALVAS
- Private, very low/low income, Chawls.
- High percentage of public land, extremely low dwelling area. High density, deteriorating physical environment.

4. MAFATIYA PARA
- Public, low/middle income, single storey row houses.
- Very high percentage land for streets and walkways, undefined physical controls/responsibility, low percentage of private/semi-private areas. Wasteful layout, low density.

5a. ANAND NAGAR
- Public, low/middle income, single storey walk-up apartments.
- High percentage land for streets and walkways, undefined physical controls/responsibility, make it a poor layout.

5b. ANAND NAGAR
- Public, low/middle income, three storey walk-up apartments.
- High percentage land for streets and walkways, undefined physical controls/responsibility, make it a poor layout.
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?

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

### Dwelling system

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Studies</th>
<th>Layout</th>
<th>Origin</th>
<th>Localities</th>
<th>Urban population served</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLUSTERED HOUSES</td>
<td>BOMBAD KATTIES</td>
<td>No lots. On unclaimed public/private land.</td>
<td>One room huts with shared cluster courts.</td>
<td>Center/periphery/on transportation lines.</td>
<td>No specific blocks.</td>
</tr>
<tr>
<td>NOW HOUSES</td>
<td>DELA</td>
<td>Small/medium, narrow.</td>
<td>2-3 Compact houses along the dead and streets, with/without courtyards.</td>
<td>Walled city and adjacent areas.</td>
<td>Organic pattern with closed loops/dead end streets terminating in a chawk.</td>
</tr>
<tr>
<td>NOW HOUSES</td>
<td>GHAZIABAD</td>
<td>Single</td>
<td>Continual</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### User income groups

<table>
<thead>
<tr>
<th>Dwelling utilization</th>
<th>Population density</th>
<th>Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very low</td>
<td>Single</td>
<td>Continuing</td>
</tr>
<tr>
<td>Very low</td>
<td>Single/multiple</td>
<td>Proliferating</td>
</tr>
<tr>
<td>Very low</td>
<td>Single</td>
<td>Continuing</td>
</tr>
<tr>
<td>Very low</td>
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</tr>
<tr>
<td>Very low</td>
<td>Single/multiple</td>
<td>Proliferating</td>
</tr>
</tbody>
</table>

### Cultural acceptance

<table>
<thead>
<tr>
<th>Income group feasibility</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nomadic migrants without capacity to pay for better dwellings.</td>
<td>Juggies will continue to house new/nomadic migrants, however, by providing subsidized land/communal utilities, they can be encouraged to utilize their traditional skills.</td>
</tr>
<tr>
<td>Recent migrants having as main priority accessibility to a job.</td>
<td>Security of tenure and communal utilities/services should be provided to allow consolidation of their dwellings/clusters.</td>
</tr>
<tr>
<td>Low/middle income inhabitants.</td>
<td>Credit facilities may be provided to upgrade dwellings in terms of physical state, sanitary and safety conditions.</td>
</tr>
</tbody>
</table>
EVALUATIONS: TIME PROCESS PERSPECTIVE

ROW HOUSES WITH COURTYARDS


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. Compact one room shelters along public/semi-private lanes with no communal utilities. Center/low-lying areas. Colonial influence, (economic constraints) Bad/acceptable.

Shiv� 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

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

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.

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.
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 transportation 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 Co 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**

<table>
<thead>
<tr>
<th>PRIMARY INFORMATION</th>
<th>TOWN PLANNING SCHEME 1</th>
<th>TOWN PLANNING SCHEME 2</th>
<th>TOWN PLANNING SCHEME 3</th>
<th>TOWN PLANNING SCHEME 4</th>
<th>TOWN PLANNING SCHEME 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>AREA OF THE SCHEME</td>
<td>170.10 Ha</td>
<td>133.65 Ha</td>
<td>149.85 Ha</td>
<td>198.08 Ha</td>
<td>208.42 Ha</td>
</tr>
<tr>
<td>Scheme sanctioned by the State Government</td>
<td>February 25,'77</td>
<td>February 25,'77</td>
<td>July 26, 1978</td>
<td>July 24, 1978</td>
<td>--</td>
</tr>
</tbody>
</table>

**LAND UTILIZATION**

<table>
<thead>
<tr>
<th>PUBLIC (Streets, walkways)</th>
<th>BEFORE THE SCHEME</th>
<th>PROPOSED IN THE SCHEME</th>
<th>BEFORE THE SCHEME</th>
<th>PROPOSED IN THE SCHEME</th>
<th>BEFORE THE SCHEME</th>
<th>PROPOSED IN THE SCHEME</th>
<th>BEFORE THE SCHEME</th>
<th>PROPOSED IN THE SCHEME</th>
<th>BEFORE THE SCHEME</th>
<th>PROPOSED IN THE SCHEME</th>
</tr>
</thead>
<tbody>
<tr>
<td>02.39% 20.20%</td>
<td>03.04% 15.04%</td>
<td>01.03% 11.68%</td>
<td>04.93% 11.84%</td>
<td>05.12% 15.52%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEMI-PUBLIC (Open spaces, schools, community areas)</td>
<td>--</td>
<td>04.85%</td>
<td>--</td>
<td>06.40%</td>
<td>--</td>
<td>04.66%</td>
<td>--</td>
<td>04.57%</td>
<td>--</td>
<td>07.24%</td>
</tr>
<tr>
<td>PRIVATE (Dwellings, shops, factories, lots, etc.)</td>
<td>97.61% 74.52%</td>
<td>96.96% 76.96%</td>
<td>98.97% 82.52%</td>
<td>95.07% 82.04%</td>
<td>94.88% 75.69%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOW INCOME HOUSING (EWS housing)</td>
<td>--</td>
<td>00.43%</td>
<td>--</td>
<td>01.60%</td>
<td>--</td>
<td>01.14%</td>
<td>--</td>
<td>01.55%</td>
<td>--</td>
<td>01.55%</td>
</tr>
<tr>
<td>PROPOSED LAND ACQUISITION</td>
<td>23.09% of total</td>
<td>20.00% of total</td>
<td>16.45% of total</td>
<td>13.03% of total</td>
<td>19.19% of total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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.
EXISTING SITUATION

BASIC SITE DATA

AREA OF THE SITE: 208.42 Ha.

ORIGINAL PLOTS: Total Area: 197.76 Ha.
Includes all areas owned privately and/or owned by the Gujarat Housing Board
Percentage of Total: 10.66 %
Total Numbers: 62
Largest Plot: 17.75 Ha.
Smallest Plot: 0.04 Ha.

PUBLIC LAND: Total Area: 10.66 Ha.
Includes roads, historically established/natural water run-offs.
Percentage of Total: 5.12 %

LOCATION OF TOWN PLANNING SCHEMES IN RAJKOT CITY

BHAKTINAGAR PLAN
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 into 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 substations located at various locations in the city. There are 5924 street lighting points in the city. (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.

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.)

EXISTING STREET LIGHTING

PHOTOGRAPHS:
(Copy) Bhaktinagar Area, Rajkot, 1979: Illegal houses along the road to Kotharia. (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

### Background

**Purpose**
- To ensure implementation of the Development Plan.
- 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).

**Selection of Area**
- The scheme includes allotment or reservation of land for roads and layout of new estates. It also includes the construction, diversion, extension and closing of streets.
- The scheme includes allotment or reservation of land for open spaces, gardens, schools, markets, and other community areas.
- The scheme makes provisions for laying 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 by or transferring ownership.

**Public Land**
- The scheme includes allotment or reservation of land for open spaces, gardens, schools, markets, and other community areas.
- The scheme includes allotment or reservation of land for open spaces, gardens, schools, markets, and other community areas.
- The scheme includes allotment or reservation of land for open spaces, gardens, schools, markets, and other community areas.

### Selection of Area

**Public Land**
- The scheme includes allotment or reservation of land for roads and layout of new estates. It also includes the construction, diversion, extension and closing of streets.

**Public Land Utilization**
- The scheme includes allotment or reservation of land for open spaces, gardens, schools, markets, and other community areas.
- The scheme includes allotment or reservation of land for open spaces, gardens, schools, markets, and other community areas.
- The scheme includes allotment or reservation of land for open spaces, gardens, schools, markets, and other community areas.

### Low Income Housing Areas

**Land Utilization**
- The scheme makes provisions for laying 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 by or transferring ownership.

**Low Income Housing Areas**
- Vested interests and lack of administrative and financial resources restrict the reservation of land for public purpose to bear minimum.

### Costs

**Costs May Include**
- Compensation for land acquired for public purposes,
- Roads,
- Water supply,
- Sewerage,
- Storm water drainage,
- Street lighting,
- Administration and legal expenses.

**Costs May Depending Upon the Level of Existing Services and Development in Each Scheme**
- 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 drainage: 12.11%
  6. Street lighting: 2.65%
  7. Administration and legal expenses: 2.54%
  **Total:** 100.00%

### Financial Aspects

**In Town Planning Scheme:**
- In Town Planning Scheme: 2
  1. Incremental contribution: 85.96%
  2. Amount borne by Incremental contribution: 14.10%

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- In Town Planning Scheme: 2
  1. Incremental contribution: 85.96%
  2. Amount borne by Incremental contribution: 14.10%

**Roads and Storm Water Drainage:**
- Roads and storm water drainage constitute more than half of the total costs. The cost of land acquisition is relatively less.

**Projecnt Development:**
- Difficulty in raising the funds to be borne by the Rajkot Municipal Corporation results in delays.

**Costs of the Scheme should not exceed the estimated increment contribution.**

---

### Design Determinants

**GUJARAT TOWN PLANNING AND URBAN DEVELOPMENT ACT, 1976**

**Purpose**
- To ensure implementation of the Development Plan.

**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).

**Public Land**
- Streets/lanes have been developed without paying/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.

**Low Income Housing Areas**
- Vested interests and lack of administrative and financial resources restrict the reservation of land for public purposes.

**Private Land**
- Land acquired (for public purposes) uniformly from each parcel generates small parcels scattered all over the area.

**Costs**
- Costs may include:
  1. Compensation for land acquired for public purposes,
  2. Roads,
  3. Water supply,
  4. Sewerage,
  5. Storm water drainage,
  6. Street lighting,
  7. Administration and legal expenses.

**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 the original value. The proposed development on the day of the declaration of the scheme.

**In Town Planning Scheme:**
- In Town Planning Scheme: 2
  1. Incremental contribution: 85.96%
  2. Amount borne by Incremental contribution: 14.10%
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.
**Typical Segments**

### Areas

- **Public** (streets, walkways, open spaces): 39.47 hectares, 18.94%
- **Semi-Public** (open spaces, schools, community centers): 9.50 hectares, 4.56%
- **Private** (dwellings, shops, factories, lots): 145.89 hectares, 70.00%
- **Low Income Housing**: 13.56 hectares, 6.50%
- **Total**: 208.42 hectares, 100.00%

### Primary Use

#### Segment A:
- **Residential**: 36.58 hectares
- Potential Density: 187 to 493 P/Ha
- Potential Population: 18,033 People
- Number of Primary Schools: 3

#### Segment B:
- **Residential**: 30.24 hectares
- Potential Density: 187 to 493 P/Ha
- Potential Population: 14,543 People
- Number of Primary Schools: 2 to 3

#### Segment C:
- **Residential**: 31.35 hectares
- Potential Density: 187 to 493 P/Ha
- Potential Population: 15,455 People
- Number of Primary Schools: 2 to 3

#### Segment D:
- **Residential**: 44.85 hectares
- Potential Density: 187 to 493 P/Ha
- Potential Population: 22,111 People
- Number of Primary Schools: 3 to 4

#### Segment E:
- **Residential and Industrial**: 35.20 hectares
- Potential Density: 187 to 493 P/Ha
- Potential Population: 4,329 People
- Number of Primary Schools: 1

#### Segment F:
- **Residential**: 39.00 hectares
- Potential Density: 187 to 493 P/Ha
- Potential Population: 19,227 People
- Number of Primary Schools: 3

---

**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 cannot 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

<table>
<thead>
<tr>
<th>Mode</th>
<th>Type</th>
<th>Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode I</td>
<td>Vehicles</td>
<td>24 m</td>
</tr>
<tr>
<td>Mode II</td>
<td>Vehicles (dominate) AND Pedestrians</td>
<td>18 m</td>
</tr>
<tr>
<td>Mode III</td>
<td>Vehicles AND Pedestrians</td>
<td>12 m</td>
</tr>
<tr>
<td>Mode IV</td>
<td>Pedestrians (dominate) AND Vehicles</td>
<td>7 m</td>
</tr>
<tr>
<td>Mode V</td>
<td>Pedestrians Paths</td>
<td>3-6 m</td>
</tr>
</tbody>
</table>

**Mainly arterial streets**

**Primary streets (dominate) and pedestrians**

**Collector streets**

**Residential streets**

**Paths**
**LAND UTILIZATION:**

<table>
<thead>
<tr>
<th>AREAS</th>
<th>Hectares</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUBLIC (streets, walkways, open spaces)</td>
<td>5.98</td>
<td>19.8%</td>
</tr>
<tr>
<td>SEMI-PUBLIC (open spaces, schools, community centers)</td>
<td>1.05</td>
<td>3.5%</td>
</tr>
<tr>
<td>PRIVATE (dwellings, shops, factories, total)</td>
<td>21.22</td>
<td>70.1%</td>
</tr>
<tr>
<td>LOW INCOME HOUSING</td>
<td>1.99</td>
<td>6.6%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>30.24</strong></td>
<td><strong>100.00%</strong></td>
</tr>
</tbody>
</table>

**PERCENTAGES**

<table>
<thead>
<tr>
<th>Areas</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Streets/Walkways</td>
<td>19.8%</td>
</tr>
<tr>
<td>Private</td>
<td>70.1%</td>
</tr>
<tr>
<td>Schools</td>
<td>3.5%</td>
</tr>
<tr>
<td>Low Income Housing</td>
<td>6.6%</td>
</tr>
</tbody>
</table>

**CIRCULATION EFFICIENCY**

- Unit Length: 168 m/ha
- Circulation Efficiency: 168

**DENSITY**

- Persons/Hectare: 714
- 20 Persons
GLOSSARY

The criteria for the preparation of the definitions have been as follows:
- SECOND PREFERENCES: definitions from technical dic-
tionaries or from professional reference manuals.
- THIRD PREFERENCES: definitions from different urban sources or other text sources. They are used when existing sources were not quite appropriate/satisfactory.

Words included for specificity and to focus on a particular level of detail are indicated in parenthesis. Sources of definitions are indicated in parenthesis. (See also: REFERENCES).

ACCESS. The pedestrian/vehicle linkages from/to the site to/from existing or planned approaches (urban streets, limited access highways, public transportation systems, and other systems such as: waterfront, airfields, etc.) (U.S.D.P.)

ACTUAL LAND COST. (The total cost of land) subject to the land transfer tax. The price of land is not a function of any cost conditions; it is set by the market (public demand). (Turner, 1973)

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

AIRPORT DISTURBANCE. The process of destroying the rest, tranquility, or settled state (of a property) due to the presence of aircraft (U.S.D.P.)

AIRPORT BOXING RESTRICTIONS. The regulation of the height or type of structures in the path of moving aircraft (Abras, 1971)

ALTERNATING CURRENT (A.C.). (An electric) current that reverses its direction of flow at regular intervals (A.S.T.M., 1957)

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

APPEARS. Impure (imp) are measures of the rate of flow of electric current. It is somewhat comparable to the discharges of water (quantity/time). A steady current produced by one volt applied across a resistance of one ohm. (A.S.T.M., 1957)

APPRAISAL. An estimate and opinion of value, especially by one fitted to judge (Merriam-Webster, 1974)

APPROACHES. The main routes external to the site (geography) and within 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 (Kaye, 1971)

ASSESSMENT. The evaluation of property for the purpose of levying a tax or the amount of the tax levied. (Kaye, 1971)

BACKFILL. Earth or other material used to replace material not disturbed, such as trees, rocks, and culvert, sewer, and pipeline trenches and behind buried abutments, or other similar conditions. It includes school, health, recreation, police, fire, public transportation, community center, etc. (U.S.D.P.)

BARRIER. (A boundary) as a topographic feature or a physical or psychological quality that tends to separate the individual elements of the development (to face and from the site). (Merriam-Webster, 1971)

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

BINDER COURSE. A transversal 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 bitumen; 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.)

BOUQUET. Something (a line or area) that ties 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 and limb, health, property, and public welfare by regulating and controlling the design, construction, quality of materials, location and maintenance of all buildings and structures within the city, by the city, and certain equipment specifically regulated therein. (ROTC 45-7, 1953)

BUILDING DRAIN. Lowest horizontal piping of the building drainage system receiving discharge from soil, waste, and trap wastes. It is connected to the building sewer. (NOC 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. (NOC 45-7, 1953)

CLARIFIED. A liquid whose colloidal particles have been reduced to the point where it will pass through the most minute filter. (Merriam-Webster, 1971)

CLAY. A soil-like, cohesive, plastic, non-porous, fine-grained substance (inorganic). It is composed of carbonate, silicate, and alumina and other oxides. (Merriam-Webster, 1971)

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

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

COLLECTION SYSTEM. The system of pipes in a sewage network, including primary, collection lines, manholes, etc. (U.S.D.P.)

CONDED. 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.)

CONTRAST ACTIVITY/SERVICES. Facilities/services used by community residents. Facilities include schools, health, recreation, police, fire, public transportation, community center, etc. (U.S.D.P.)

CONTRACTION FACILITIES. Facilities for ar-
crises voluntarily undertaken for pleasure, fun, relaxation, exercise, self-expression, or release from stress or tension. (U.S.D.P.)

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

CONDOMINIUM. A system of direct common ower 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 proportional interest in the common land areas. Two types of condoni-
muns are recognized: (1) the small, detached, row-dwelled types: VERTICAL: walk-up, high-rise dwelling types. (U.S.D.P.)

CONDUIT. Pipes which allow raw materials to flow such as aluminum, copper, iron. (NOC 45-7, 1953)

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

CONSOLIDATION. A process of selecting the means and contriving of a particular process. (Merriam-Webster, 1971)

COST OF URBANIZATION. The collection of the following: CAPITAL: cost of land and infrastructure; OPERATING: cost of administration, maintenance, etc.; DIRECT: includes capital and operating costs; INDIRECT: includes environmen
tal and personal effects. (A.S. Horvitz, A.P. Owies, J. Windsor Lewis, 1975)

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CURRENT. 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 bar-
er built across a water source to control and keep back flowing water. (Merriam-Webster, 1971)

DESCRIPTIIVE ACCELERATION (U.S.D.P.). A tax incentive designed to account for 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 structure, or an object of art. 2) The process of selecting the means and contriving of the elements, steps, and procedures for producing what will adequately satisfy some need. (Merriam-Webster, 1971)

DEVELOPMENT. Gradual advance or growth through pro-
gressive 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 urban area and can use its services and community facilities. (U.S.D.P.)

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

DISTANCE. The degree or amount of separation between two points (the site and another element of the urban context) measured along the shortest path ad-
joining 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 tagged on the trans-
mission lines) and the consumers' service switches. (Merriam-Webster, 1971)

DISTRIBUTED SOIL. Soils that have been disturbed by artificial processes, such as excavation, transporta-
tion, and compaction in fill. (U.S.D.P.)

DRAINAGE. Intersection and removal of ground water from/into surface water, by artificial or natural means (DePina, 1972)

DUST/SILT. Dry, fine, dry, pulverized particles of earth, grit, refuse, waste, litter, etc. (Merriam-Webster, 1971)

DWELLING. The general, global designation of a building/setting in which people live. A dwelling contains one or more living units, a different number of persons may live in a single dwelling. (U.S.D.P.)

DWELLING BUILDING. Four groups are considered: SHELF-HELP BUILD: where the dwelling unit is directly built by the user or occupant; SHELTER BUILD: where the dwelling unit is total built by a skilled craftsman hired by the user or occupant; PAYMENT BUILD: where the dwelling unit is totally or partially built by a skilled craftsman hired by the user or occupant; PAYMENT BUILD: where the dwelling unit is total or partially built by the owner, developer, or contractor. (Merriam-Webster, 1971)

Dwelling. The general global designation of a building/setting in which people live. A dwelling contains one or more living units, a different number of persons may live in a single dwelling unit. (U.S.D.P.)

Dwelling. The general designation of a building/setting in which people live. A dwelling contains one or more living units, a different number of persons may live in a single dwelling. (U.S.D.P.)

Dwelling Unit. Individual dwelling unit, sepa-

GLOSSARY

77

A

FLOOD 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 (U.S.D.P.) or private (PRIVATE SECTOR).

TOR: In three-phase currents flow through each cycle.

a

involved 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.)

DELLING DEVELOPMENT NEK. Two modes are considered: PROFESSIONAL: construction of the dwelling and the development of the local infrastructure to modern standards (cement, construction materials, electricity, water, etc.) resulting in the development of structural and undeveloped land. This essentially translates into the use of larger and more efficient plots, contained in squatters with de facto security of tenure and an administrative permit. INFORMAL: the normal development procedure in which all structures and services are completed before occupation. (U.S.D.P.)

DELLING 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. (U.S.D.P.)

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

DELLING/LAND SYSTEM. A distinct dwelling environment characterized by its use as well as by its physical environment. (U.S.D.P.)

DELLING LOCATION. Three sectors are considered in single or multi-center urban areas. Sectors are identified as well by the density of buildings as follows: CENTER: the area recognized as the highest in terms of开发利用; the most densely built-up sector; NEIGHBOR: the area located between the center and the urban periphery; generally a densely built-up sector; PERIPHERY: the area located between the center and the rural area; generally a sparsely built-up sector. (U.S.D.P.)

DELLING PHYSICAL STATE. A qualitative evaluation of the physical condition of the dwelling unit. Generally: 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.)

DELLING TYPE. The physical arrangement of the dwelling units. Generally: individual dwelling unit with shared common wall (duplex), ROW/HOUSE: dwelling units grouped together linearly or in clusters, NOISE: dwelling units grouped in two to five stories with shared accommodation. The common density is generally between 3-5 dwelling units per 1,000 persons. (U.S.D.P.)

DELLING UNIT. Self-contained unit in a dwelling for an individual, a family, or a group. (U.S.D.P.)

DELLING UNIT AREA. The dwelling unit area (m²) is the built-up covered area of the dwelling unit. (U.S.D.P.)

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

DELLING 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 ROOMS: a building with more than one floor and share the use of the parcel of land on which they are built (open spaces) as well as some common facilities. APARTMENT: a MULTIPLE SPACE (room/set of rooms with bath, kitchen, etc.) generally 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.)

DELLING SYSTEM. May either be a single-phase circuit (for small electrical devices) or a three-phase circuit (for large electrical devices). In single-phase only one current is flowing through the circuit with the voltage dropping to zero twice in one cycle, but the coil cycles through the circuit with the power never dropping to zero. (U.S.D.P.)

DELLING ELECTRICAL SOURCES. The power source is usually derived from central power station; 100-220 voltm, current; 50 cyc or 60 cyc.

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DELLING ELECTRICAL CART. The power source is usually derived from central power station; 100-220 voltm, current; 50 cyc or 60 cyc.

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INDIA (1971)

INTERIOR CIRCULATION SYSTEM (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.)

INTERIAL. A space of time (or distance) between the recurrence of similar conditions or states. (Merriam-Webster, 1971)

KILOMETER (km). (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 1,000 watts of power for a period of 1 hour. (NRTC ST 45-7, 1953)

LANDMARK. A vertical pipe or shaft leading from the surface of the ground to a sewer, for lighting fire 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.; 1953; 1966)

LAND-MARKET VALUE. Refers to: 1) the present money equivalent to replace the land; 2) the present total cost or the present cost 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 streets. (U.S.D.P.)

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

LAND UTILIZATION. A qualification of the land around a dwelling to a building for use: physical controls and responsibility. PUBLIC (streets, walkways, open spaces); user - assigned/limited; public sector. SEMIPUBLIC (open spaces, playgrounds, schools) - user: limited group of people; public controls - partial or complete; responsibility - public sector and user. PRI-VATE (where no ownership exists or is squatter; physical controls - complete; responsibility - user. SEMI-PRI-VATE (cluster courts) - user, group of owners; physical controls - partial or complete; responsibility - user. (U.S.D.P.)

LAND UTILIZATION: PHYSICAL CONTROLS. The physical/locational planning - the way in which something (the site) is built around a locality. (Merriam-Webster, 1971)

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

LEVEL OF SERVICE. Two levels are considered: MINIM-UM, 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 or wastewater to an elevation to avoid deep pipe network(s). (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.)

LOCATIONAL SEGMENT. A 400m x 400m area taken from around 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 community common court (owned in common). (U.S.D.P.)

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

LOT FROMATION. 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, and other accessory equipment such as is integral with the housing. (Defina, 1971)

MANSION. An access hole sized for a man to enter, particularly in sewer and drainage pipe systems, for purposes of inspection or maintenance. (U.S.D.P.; 1953; 1966)

MATRIX (OF BASIC REFERENCE MODELS). A set of models of urban layouts arranged in rows and columns. (Merriam-Webster, 1971)

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, commercial, recreational population distribution and other aspects of growth and development. (Abram, 1972)

MEDI-A RANKER. A double-faced guard rail in the median of or land dividing two adjacent roadways. (Defina, 1971)

MESSING BOUNDARIES. Characterized by continuing, homogeneous, roughly equal, straight, or curved lines. Examples: LINEST, property lines, political or municipal divisions, network areas, similar residential uses, compatible uses (as parts with residential). (U.S.D.P.)

MICROCLIMATE. The local climate of a given site or habitat the result of the climate from a time frame to a large land area, but being usually characterized by differing 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 CURB LAYOUT). A representation of an urban residential area illustrating: land utilization, land subdivision, and utility network of a specific layout of a community. (U.S.D.P.)

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

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

NATURAL UNDISTURBED SOILS. 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 characterized by similar environment. (U.S.D.P.)

NETWORK EFFICIENCY (LAYOUT EFFICIENCY). The ratio of the length of the network to the area(s) contained by the network. (U.S.D.P.)

NEIGHBORING SITE. A site (or property) which the user may deflect or urinate (as into a pit or tub) and ordinarily takes any means of automatic discharge of the matter deposited. (Merriam-Webster, 1971)

NEIGHBORING URBAN. Any sound (affecting the site) that is undesirable. (U.S.D.P.)

NOISE. Any sound (affecting the site) that is undesirable. (U.S.D.P.)

NORMAL. A sound, very faint, without distinction. (Merriam-Webster, 1971)

NORMALIZED DENSITY. Any sound (affecting the site) that is undesirable. (U.S.D.P.)

NORMALIZED WEBSITE. Wire carrying no voltage between itself and a ground. (NRTC ST 45-7, 1953)

NOISE. Any sound (affecting the site) that is undesirable. (U.S.D.P.)

NOW. Any sound (affecting the site) that is undesirable. (U.S.D.P.)

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

OHM (electrical). The unit of resistance to the flow electricity. The higher the number of ohms, the greater the resistance to the flow of electricity. Resistance is constant. (U.S.D.P.)

OPERATION. The establishment of goals, policies, and procedures for the efficient use of public utilities company which is controlled and regulated by a governmental authority. (Merriam-Webster, 1971)

OPERATIONS. The establishment of goals, policies, and procedures for the efficient use of public utilities company which is controlled and regulated by a governmental authority. (Merriam-Webster, 1971)

OXIDATION. The process by which oxygen is used up or consumed. (Merriam-Webster, 1971)

PUBLIC CIRCULATION. Water supply, sanitation, sewage, fire drainage, electricity, street lighting, telephone, circulation networks. (U.S.D.P.)

PUMP. A device or machine that raises, transfers, or may be used for disposal of human excreta. (Merriam-Webster, 1971)

PUMP. A device or machine that raises, transfers, or may be used for disposal of human excreta. (Merriam-Webster, 1971)

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

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

RESIDENTIAL AREA. An area containing the basic land use of homes for the accommodation of human habitation and living. (Merriam-Webster, 1971)

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. (NRTC ST 45-7, 1953)

RIGHT-OF-WAY. A legal right of passage over another property (ground land) or right-of-way exists such as: a path or thorough-fare which one may lawfully walk, 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, streets, sidewalks, and alleys (as streets, sidewalks, and alleys); or by railroads, etc. (Merriam-Webster, 1971).

ROADWAY (HIGHWAY). Portion of the highway included between the outside lines of gutter or side ditches, including all slopes, ditches, culverts, and appurtenances necessary to proper drainage, protection, and use. (DefEx, 1973)

SUBGROUPED HOUSING. Dwelling units grouped together linearly or in clusters. (U.S.D.P.)

SUBPLOT. That part of precipitation carried off from the area upon which it falls. (DefExns, 1972)

SUNOBT. RAINFAFaL RATE. The percentage (ratio) of stormwater on the entire area is not reduced by evaporation, depression storage, surface wetting, and percolation; with increased rainfall, they are also increasing runoff flow. (U.S.D.P.)

SAND. Loose, distinguishable grains of quartz/feldspar, micaceous (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: secreta; waste matter eliminated from the human body; domestic wastes; used water from a house/community containing 0.14 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 and the gaseous products of burning carbonaceous materials are rendered non-hazardous, usually by the presence of carbon particles. (Merriam-Webster, 1971)

SOIL. Soil structure: the arrangement of soil particles in various aggregated differing in shape, size, stability, and cohesion to 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 usually limited to the valuation limitations/assurdiuions for early planning consideration. (U.S.D.P.)

STACK. The vertical pipe in a dwelling of the soil-waste, or soil-waste-vent category over sewers. (U.S.D.P.)

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

STANDEP PIPE. A pipe riser with tap used as a source of water for domestic purposes. (MHD/AID, Minimum Standards, 1966)

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

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

SUBDIVISION REGULATIONS. Regulations governing the development of land for residential or other purposes. (Maspex, 1970)

SUBGRADE. The layer of natural soil or fill (compacted soil) upon which the pavement structure including curbs is constructed. (DefExns, 1971)

SUBWAY or BRANCH SEWER. A collector pipe receiving sewages from local sewers. (U.S.D.P.)

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

SULFATE. 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 taxation; a tax-free grant; especially: a reduction in the tax assessment of property; (New York) an annual tax or a ten-year tax exemption on new buildings. (Abrams, 1966)

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

TAX STRUCTURE - TAXATION. The method by which a nation (state, municipality) implements changes to tax structure on a private sector to the public sector. (U.S.D.P.)

TELEPHONE. An electrical voice communication network interconnecting all subscribbing individuals and communicating over wires. (U.S.D.P.)

TITLE. The instrument (as a deed) that constitutes a legally just cause of exclusive possession (of land, buildings, or both). (U.S.D.P.)

TOILET. A fixture for defecation and urination, esp. a porcelain or BRANCH SEWER. (U.S.D.P.)

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

TREATMENT WORKS. Filtration plant, reservoirs, and other operations required for the treatment of a water supply. (NOTC 45-7, 1953)

TURBIDITY. The quality or state of being turbid; to make turbid; to cause to be turbid; to cause to become turbid. (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.)

USER TAP. The tax on land aimed primarily at enforcing its use or improvement. (U.S.D.P.)

USER INCOME GROUPS. Based upon the subsistence (min. wage) income per year, five income groups are distinguished: VERY LOW (below subsistence level); the income group with no income available for housing, services, or transportation; LOW (1 x subsistence level); the income group that can afford a few goods, services, and transportation (2 x subsistence level); the income group that can afford limited home maintenance and government assistance: HIGH (5 x subsistence level); the income group that can afford continuous home maintenance and government assistance: VERRY HIGH (10 x subsistence level); the income group that represents the most economically mobile sector of the population. (U.S.D.P.)

USEIPUFF. The right to profit from a parcel of land or control of a parcel of land without becoming the owner of such parcel of land by adverse 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, rainfall, etc. in the public interest. (U.S.D.P.)

VALUE. A water supply distribution component which interrelates 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 trash accumulation or back pressure. (NOTC 45-7, 1953)

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

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

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

WASTE PIPE. A pipe in a dwelling which carries water from washbasin, sinks, and similar fixtures. (NOTC 45-7, 45-5, 1953)

WATER GUSVEL. Source, means, or process of supplying water, (as for a community) usually involving reservoirs, pipelines, and often the wastewater 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 stations and users by which a water supply is obtained and distributed to consumers. (U.S.D.P.)

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

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WEIGHTING. The augmentation of a house or lot/land to the and/or collection; otherwise, the erection of an improvement for meeting the public interest. (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 deduced 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
1 mile = 1.60934 kilometers

Square Measures

1 square meter = 10.7639 square feet
1 acre = 0.4047 hectares
1 square foot = 0.0929 square meters

DOLLAR EQUIVALENTS

All income, cost and rent/mortgage data have been expressed in terms of the U.S. equivalent; 1 US Dollar = 8.12 Rupees (1978)