URBAN EXPANSION AND UPGRAADING, VADODARA, INDIA

by

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Diploma in Architecture, School of Architecture
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Ahmedabad, India
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Submitted in Partial Fulfillment
of the Requirements for the
Degree of
Master of Architecture in Advanced Studies
at the
Massachusetts Institute of Technology
May, 1980

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Thesis Supervisor

Accepted by................. Julian Beinart, Professor of Architecture
Chairman, Departmental Committee for Graduate Students

MAY 30, 1980
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Submitted to the Department of Architecture on May 9, 1980, in partial fulfillment of the requirements for the degree of Master of Architecture in Advanced Studies

ABSTRACT

This study focuses on urban layouts of expanding areas of Vadodara, a rapidly growing medium sized city (population, 0.6 million) in Gujarat State, India. A Reference Model, addressed to planners, residential developers and policy makers is proposed, as guidelines for the design of urban layouts for the expanding sections of the city. The Reference Model has been evolved in the context of an upgrading and expansion project presently under implementation by the local Town Planning Authority in Vadodara. The study incorporates evaluations of dwelling/land systems prevailing in the expanding areas of Vadodara.

Thesis Supervisor: Horacio Caminos
Title: Professor of Architecture
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My acknowledgements are due to Miss Namrata Vyas of Vadodara Municipal Corporation; to professionals in various Central, State, local governmental organizations, and numerous individuals who cooperated in the preliminary surveys. Partial financial support from Kasturbhai Lalbhai Educational Trust is also gratefully acknowledged.

My debt to Anjali and to my parents and family members for their love, encouragement and concern, is inexpressible.

PREFACE

The urgent need to focus attention to the timely development of medium sized cities has to be recognised before they assume chaotic proportions witnessed in the metropolitan centers in the country. The purpose of this study is to provide design references to planners, residential developers and public administrators for the proper channelling of urban growth in the expanding medium cities, in a manner maximizing returns from the limited public resources.

The city of Vadodara, in Gujarat State, has been taken up as representative of a rapidly growing medium city. Within the provisions of the Gujarat Town Planning Act, 1976, a Reference Model is proposed for an Expansion and Upgrading Project, which is presently being implemented in Vadodara, under a Town Planning Scheme declared for an expanding area of the city.

The study is derived from field research conducted during the summers of 1978 and 1979. The surveys included socio-economic and physical aspects of various dwelling environments that exist and are proliferating in the expanding areas of the city. Information, such as maps and reports have been collected from various governmental and semi-voluntary organisations. Due to lack of updated information in certain cases, the surveys have been augmented through photographs and consultations with various individuals and institutions involved in closely related fields.

The methodology employed in the evaluation of case studies was developed in the Urban Settlement Design in Developing Countries Program, under the direction of Professor Horacio Caminos.
INTRODUCTION
INDIA: URBAN GROWTH TRENDS IN MEDIUM CITIES

India reveals diversified variations in its physical, social and economic content. 20% of its 629 million population, living in urban agglomerations, has been rising at a phenomenal rate during the past two decades; rural-urban migration rate being nearly equal to the natural population increase. According to the census report, 1971, 100 million or 1/5th of the country's population reside in about 142 cities with population above 0.1 million. The demographic pattern of the country reveals that the growth in medium sized urban agglomerations (between 0.1 to 0.5 million) has been at a faster rate than the few but large metropolitan centres like Bombay, Calcutta which have already reached a point of saturation, causing deteriorating physical conditions.

Evidently the medium sized cities are becoming the focus of growth due to availability of urbanizable land, lower densities and manageable distances between employment sectors and housing, and at the same time possessing enough infrastructure to attract public and private investments in industry and trade. Yet, urban dispersal in space has been little, having its implications on sharp density differences between the central city and the periphery, land differential values and inadequacies in infrastructure and facilities that have to be provided to the growing population.

The significance of proper development of the medium sized cities cannot be understated in the context of overall development of the country. Immediate action is called for, to arrest in time, the physical decay of congested areas, underutilization of existing infrastructure, proliferation of squatter settlements, haphazard development on the periphery, and establish a proper channelling of growth in a manner requiring minimum initial public outlay.

This study focuses on the issues of urban expansion and upgrading in the city of Vadodara, Gujarat. (See Appendix, Urban Context, page 29). Vadodara has a population of 0.6 million and is expected to reach 1 million by the end of the century. It represents a typical case of a rapidly growing medium city, possessing an historically established infrastructure which has been continually stressed since the advent of large-scale industries on its periphery since 1965. More than 30% of usable land is vacant and/or underdeveloped, in spite of which the municipal limits were extended to accommodate the growing population.

For the purposes of securing planned development, the authorities declare, by notification, the extended urban sectors as "Development Areas". Within the framework of the City Development Plan, the local authorities make and execute "Town Planning Schemes" for such areas. It is observed that due to improper planning, the schemes reflect an imbalance between public expenditure and returns from urbanized land, ultimately catering to higher income groups.

The critical issue to be realized is the physical efficiency of the layout, to minimize public outlay and maximize gains from the private sector, at the same time increasing the accessibility of land and/or residential developments to the lower income groups.

The objective, therefore, of this study is to suggest by way of a Proposed Reference Model, guidelines for the design of such expansion and upgrading schemes. The Model is addressed to those involved in physical planning of residential developments, urban policy makers and public administrators.

The Reference Model consists of: Planning Projections, Design Determinants, Land utilization Plan, Circulation Plan, and a Segment Plan. It incorporates a study and evaluation of prevailing dwelling/land systems, which has been included in the appendix.

The following outlines the Town Planning Legislation in Gujarat State, the provisions of which form the framework of Akota Project, being implemented in Vadodara, and taken up in this study, to propose a Reference Model.

TOWN PLANNING LEGISLATION-GUJARAT STATE

BACKGROUND

Drawing inspiration from the British Town Planning Legislation of 1947, the Bombay Town Planning Act, 1954 was established, which became the model for Gujarat State, amongst others in the country. The concept of Master Plan and detailed development and land use control was enforced in the principal cities in Gujarat till the Act was replaced by the Gujarat Town Planning and Urban Development Act, 1976. The Act combines provisions of Town Planning within Municipal limits with the recent trend towards separate legislation for Urban Development Area which circumscribes non-urban areas surrounding the mother city.

FUNCTIONS

The Development Plan prepared for the city is implemented through "Town Planning Schemes" which are declared from time to time by the local designated authority. The provisions in the Town Planning Scheme outline in detail the
INTRODUCTION

The contents of the Development Plan; they can be summarizes as follows:

1. Laying or relaying of land, either vacant, in the course of development or already built upon. This implies that original plots may be reconstituted by the alterations of its boundaries.
2. Filling up or reclaiming low lying, unhealthy areas.
3. Layout of new streets including construction, diversion, extension, improvement and closing of streets.
5. Allotment, reservation or acquisition of land for roads, open spaces, gardens, recreation areas, schools, markets and transportation facilities and Governmental purposes.
6. Development of infrastructure services such as water supply, drainage, sewage and electricity/street lighting
7. Preservation of monuments.
8. Reservation of land to the extent of 10% of the scheme area for low income housing.

FINANCE

The costs of the Town Planning Scheme include:

1. Cost of engineering works with respect to laying roads and infrastructure networks on public land, filling low lying land, demolition of structures etc.
2. Compensation for land acquired or reserved for roads and community facilities, and for loss incurred to those lots injuriously affected by the scheme.
3. Administration costs.
4. Legal expenses incurred in resolving disputes with private land owners:

RESOURCES

The resources for the execution of the scheme are met from the following funds:

1. Development charges or 'increments' charged on the land owner who benefits from the scheme. The charges are levied in accordance to the use of land, and in proportion to the amount by which the market value of the plot exceeds its original value due to the declaration of the scheme.
2. Funds received by the authority by way of grants, loans and profit-oriented undertakings.

ADMINISTRATION OF SCHEMES

The procedure for execution of the schemes can be summarized as having three steps:

1. Declaration of intention of making a scheme and preparation of a draft scheme.
2. Publication of the draft scheme for public suggestions and meetings with the land owners for tentative proposals resolving litigations and individual grievances.
3. Final approval and sanction of the draft scheme for implementation.
AKOTA: URBAN EXPANSION AND UPGRADED PROJECT, VADODARA

Background

A high rate of growth is presently the key phenomenon of medium-sized cities such as Vadodara, because of the strong potential they present to the public and large private sectors to develop industries and trade. The consequent population increase has lead to uncontrolled spurge of urban expansion in the recent past. Unplanned developments have taken place since on the periphery of the city and within the city limits subsequently extended. These areas are usually deficient in basic services, community facilities and low income housing, as the local authorities are unable to cope with the ever increasing demands for the same. The expanding areas show the following characteristics:

a) Infrastructure services (water supply, sewage, etc) and community facilities (schools, etc) are inadequate.

b) The existing development is haphazard and in conflict with the city building regulations and codes.

c) Land subdivision is irregular and disorganised as property lines were historically established using unscientific methods.

The administrative tool employed by the local authority for directing urban growth and planning basic infrastructure to accommodate and upgrade the growing developments, is the City Development Plan, which is implemented in segments or "Town Planning Schemes". The adjoining page summarizes three representative Schemes in Vadodara, approved for execution. The chart includes preliminary data for the Proposed Reference Model derived for Akota, to provide guidelines for the design of similar schemes. The summary and case studies reveal the following characteristics:

1) The total public area in the declared Schemes is the summation of the initial network (Town Planning roads) and the developed network, the extent and design of which is not predetermined or taken into account by the authority, in the preparation of the Schemes. The public responsibility in the declared Schemes 1, 5 and 18, is thus excessive (35% - 52%) resulting in high infrastructure expenditure and recurring maintenance costs. The Proposed Reference Model advocates an optimum final network, to limit public responsibility.

2) The percentage of private land in the three declared Schemes (41% to 55%) is inadequate in relation to the public land that serves it. This results in financial burdens on private land in terms of taxes and levies. Moreover such a proportion of private land to public land is incompatible with the rising demand in the city for private developed land to accommodate the growing population. These factors add to the problems of accessibility to housing for the urban poor. The Proposed Reference Model recommends a higher percentage of private land incorporating semi-private areas (cluster courts), to permit control of private open areas.

Within the constraints of multiple/complex legislations, and marginal resources, the physical efficiency of the layout, in terms of optimum land utilization and circulation, assumes extreme importance; hence the AKOTA EXPANSION AND UPGRADED PROJECT is an attempt to suggest, by way of a Proposed Reference Model, design criteria for laying out an expansion and upgrading schemes for such areas. It provides a reference for subdivision of land within optimum land utilization ranges. The Reference Model incorporates evaluations of prevailing dwelling systems (see Appendix) and follows the provisions in the Gujarat Town Planning and Urban Development Act, 1976. The Proposed Reference Model consists of Planning Projections, Design Determinants, Land Utilization Plan, Circulation Plan and a Segment Plan.
### SUMMARY OF SCHEMES: UPGRADE PROJECT

#### LOCATION OF SELECTED TOWN PLANNING SCHEMES, VADODARA

<table>
<thead>
<tr>
<th>LOCALITY</th>
<th>Scheme 1</th>
<th>Scheme 1 Proposed Reference Model</th>
<th>Scheme 5</th>
<th>Scheme 18</th>
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<td>Semi-Public (Schools, playgrounds)</td>
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<td>Semi-Private (Cluster courts)</td>
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#### PUBLIC (Streets, walkways)

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#### SEMI-PUBLIC (Schools, playgrounds)

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#### PRIVATE (Dwellings, lots)

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<td>109</td>
<td>106 41</td>
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(1) Final network (2) Initial network (3) Developed network.
Akota: Existing situation

Population and Income

Presently only 23% of the total site is developed, housing approximately 12,500 people. The prevalent dwelling types in the area are detached/semi-detached houses mostly in cooperative societies, which cater to the middle and higher income groups. One public housing project and a group of chawls house moderately low to middle income families. Sporadic parcels of land have been occupied by squatters.

Location

Akota is located along the western side of the main railway line that runs north-south. It is about 3 km. from the city centre, and in close proximity to the Race Course area, the Gujarat Electricity Board complex and the railway station.

Boundaries

The triangular shaped site is bounded on the north by the Urmi Society Road. The south-east boundary is formed by the New Padra Road leading to the railway station and city centre. The Old Padra Road, which is a part of the city ring road, forms the north-west boundary.

Approaches and Accesses

The New and Old Padra Roads are the existing approach roads to the site. A third approach road is proposed in the Development Plan, running east-west connecting the Padra Roads to the city centre. The points of intersection of the Padra Roads and the Urmi Society Road are presently the major accesses to the site.

Transportation

The city bus service operates along the two Padra Roads and the Urmi Society Road. Bicycles, scooters and autorickshaws are the popular modes of transportation.

Land tenure

Two parcels of land are owned by the Gujarat Electricity Board and the Police department, the remainder being privately held. Cooperative ownership of land is prevalent.

Zoning Regulations and Byelaws

Except for the southern tip, which is zoned for small scale industries, the area is intended for residential use. The building codes are enforced as per those laid by the Vadodara Municipal Corporation.

Infrastructure Services and Community Facilities

The site is surrounded by an existing network of water supply and sewage lines. Service connections are installed in most of the fully developed cooperative societies. Electricity is available on the entire site. There is no underground drainage in the roads. Storm water drains southwards into the Vishwamitri river. Community facilities are almost nonexistent.

Existing Structures

The northern part of the site is the most developed, with the Gujarat Electricity Board housing, the Police Lines and cooperative societies which have sprung up sporadically on the site. Many such societies are presently under construction. Small parcels of land have been occupied by squatters, close to a group of chawls. A row of small shops have emerged on the west of New Padra Road.

Land Features

The topography is generally flat. Storm water tends to accumulate towards south into the river Vishwamitri. (see also, case study, Akota, page 34).
EXISTING SITUATION: UPGRAADING PROJECT

AKOTA: DECLARED TOWN PLANNING SCHEME 1, 1975

LAND UTILIZATION

<table>
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<tr>
<th>Type</th>
<th>Sectors</th>
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<td>Public (Streets, walkways)</td>
<td>70</td>
<td>35% (1/2)</td>
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<tr>
<td>Semi public (Schools, playgrounds)</td>
<td>19</td>
<td>10%</td>
</tr>
<tr>
<td>Private (Dwellings, lots)</td>
<td>109</td>
<td>55%</td>
</tr>
<tr>
<td>Semi private (Cluster courts)</td>
<td>109</td>
<td>55%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>198</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

(1) Final network (2) Initial network (3) Developed network.

CIRCULATION RATIO

Circulation length (streets) = 350 meters/Hectare
Area served (total area)
PROPOSED REFERENCE MODEL

The Reference Model is proposed within the framework of:

Planning Projections

The following projections have been made for the site on the basis of the prevailing trends of Population/income groups, Land use and Circulation in the city and site.

POPULATION AND INCOME

The gross density predicted for this sector, by the Development Plan is 180 people/hectare. However, the evaluations of prevailing dwelling systems (see page 60) indicate that gross density levels in low/middle income areas range between 300 people/hectare to 980 people/hectare. Taking into account the proposed industrial development in adjacent areas and the continuing trend of middle income housing, the projected gross density would be close to 450 people/hectare. Assuming future expansion by way of 3 or more storey construction and higher occupancy rates, the net density will tend to go as high as 1000 people/hectare. The estimated population at the suggested density level, would approximate 85,000 people at saturation.

LAND USE

Akota will continue to develop rapidly into a primarily residential area. In the private sector, the predominant dwelling system will be cooperative societies comprising of detached/semidetached houses and walkups. There will be a tendency towards eventual subdivision of large plots to form smaller cooperative societies, calling for a layout adaptable to such subdivisions. Private commercial developments shall tend to occur along the two Padra Roads and within the site along primary roads. Following the Development Plan, the southern tip shall develop as an industrial area, while small scale supporting activity will percolate in the adjoining residential area. Privately developed community facilities like primary schools, clinics, religious institutions etc, will find potential throughout the site. Essential facilities like police, fire protection, health centres etc, will have to be introduced by the public sector.

CIRCULATION

The New and Old Padra roads will become important arteries of circulation in relation to the city centre. They shall become the prime generators of growth in the site. The road, proposed by the Development Plan, running east-west towards the city, will form a radial artery and one of the major accesses to the site.

Design Determinants

The following two pages outline the key issues and design guidelines for the Proposed Reference Model, in relation to the policy implications of the Gujarat Town Planning Act.
### Design Determinants

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Gujarati Town Planning and Urban Development Act, 1976</th>
<th>Policy Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>To delegate the appropriate Authority, the powers to prepare and implement the Development Plan for urban expansion and upgrading.</td>
<td>Implementation of the city Development Plan is carried out in segments through Town Planning Schemes declared from time to time. The execution of the Schemes is enforced by the Municipal Corporation.</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Area Selection</th>
<th>May be prepared on any land which is</th>
</tr>
</thead>
<tbody>
<tr>
<td>in the course of development</td>
<td>Segments are selected on the basis of information available as to the growth potential, convenience and economic feasibility.</td>
</tr>
<tr>
<td>likely to be developed or already built upon</td>
<td></td>
</tr>
</tbody>
</table>

| Public Land | The Act provides for allotment/reservation of land for roads and layout of new streets. It sanctions construction, diversion, extension and blocking of new and proposed roads. | Existing streets are consolidated wherever possible. Roads proposed in the Scheme (T.P. roads) are the sole responsibility of the government. The 'internal' streets are built on private land. The cost of construction of these is jointly shared by the corporation and the land owners. (25% to 40% public). These roads eventually become public property. |

| Semi-Public Land | The Act provides for land allotment/reservation for community facilities like schools, community centers, shops/commercial centers etc. | Sporadic parcels of land are acquired for specific functions and eventually developed as and when funds permit. The location is based on availability of acquireable land. |

| Private Land | The Act provides for laying/relaying of private land and imposition of by-laws for future development. Original plots may be reconstituted by alteration of boundaries, transferring of adjoining land/ownership and by relocation. | Private land, in accordance to the original plot areas is constituted into, a) individual plots falling off the T.P. roads and b) cooperative plots, the internal streets within which are eventually handed over to the Municipal Corporation. |

| Low Income Housing | Reservation upto 10% of the total scheme area may be made for housing socially and economically weaker sections of the population. |

<table>
<thead>
<tr>
<th>Costs</th>
<th>Cost ranges in the Vadodara T.P. Schemes were as follows:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. Roads/storm drainage 20% - 40%</td>
</tr>
<tr>
<td></td>
<td>2. Water supply 8% - 23%</td>
</tr>
<tr>
<td></td>
<td>3. Sewage 8% - 11%</td>
</tr>
<tr>
<td></td>
<td>4. Street lighting 7% - 18%</td>
</tr>
<tr>
<td></td>
<td>5. Compensation for land acquisition 10% - 49%</td>
</tr>
<tr>
<td></td>
<td>6. Administrative/legal expenses 3% - 6%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Finance</th>
<th>Major expenses are incurred in roads/storm drainage.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resources</td>
<td>In the Vadodara T.P. Schemes, the income ranges were:</td>
</tr>
<tr>
<td></td>
<td>1. Land owners contribution 47% - 80%</td>
</tr>
<tr>
<td></td>
<td>2. Amount borne by authority 20% - 57%</td>
</tr>
<tr>
<td>PROBLEMS / CONSTRAINTS</td>
<td>PROPOSED POLICIES</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Existing development is haphazard and in conflict with the Development Plan. Lack of coordination between the Town Planning Office and the Municipal Corporation. Limited public participation in the Planning process.</td>
<td>Proper mode of communication to be established between the various Authorities involved. Adequate publicity of the intentions of the Schemes to be enforced to encourage public participation.</td>
</tr>
<tr>
<td>Inadequate and outdated information is available on existing development. Only high/middle income areas benefit from such Schemes Public housing developments become isolated pockets restricting proper planning.</td>
<td>A proper physical data base needs to be formed. Low/middle income sections to be included in Schemes. Public housing to be part of the overall Scheme layout.</td>
</tr>
<tr>
<td>Haphazard layout results in excessive public responsibility. The design of the internal roads is not taken into account in the Schemes, resulting in the eventual increase in public land. Lack of street alignment creates problems of intercommunication and servicing.</td>
<td>The Town Planning roads shall cater to the intercommunication needs and not depend on internal access paths for thoroughfare. Existing internal streets to be blocked for semi private use, to ensure better maintenance/control. The layout, widths and specifications to correspond to circulation modes. Public land for roads may range up to 15% of total.</td>
</tr>
<tr>
<td>Since most community facilities are privately developed, costs of acquisitions and maintenance/control become a financial burden to the Authority. Due to limited resources, land is not developed for a long period, which causes its misuse and proliferation of squatter settlements. Facilities are unevenly distributed and improperly sized. Scattered, small individual plots cause an irregular and redundant layout of T.P. roads and services.</td>
<td>Provisions to be made only for essential facilities like municipal schools, health etc. Commercial areas to be regulated by using street modes and layout as land value generators. Land acquisition provisions in the Act to be enforced to secure viable locations for community facilities and reservations of prime parcels for private developments. Upto 10% of total land may be allotted. Cooperative ownership of land to be encouraged incorporating individual lots. For optimum land utilization private land must range between 60% to 65% of total, while upto 20% of total may comprise of semi-private land-(dead end access paths/ cul-de-sacs)</td>
</tr>
<tr>
<td>A negligible percentage of land is presently reserved for low income housing due to lack of administrative and financial resources.</td>
<td>Provision for land reservation/acquisition for low income groups should be enforced. Consolidated squatter settlements may be considered for upgrading.</td>
</tr>
<tr>
<td>Lengthy court procedures and negotiations regarding the locational/ownership/acquisition aspects related to final plots result in the eventual increase in administrative costs and fluctuating market values.</td>
<td>Roads/drainage costs can be reduced by efficient physical layout and with initial lower specifications. Total cost should match the capacity of people to pay.</td>
</tr>
<tr>
<td>Delays and disputes arise regarding the assessment of the incremental value of land.</td>
<td>Costs of the scheme not to exceed the estimated incremental contribution. The development of the scheme should be phased as per the projected growth trends.</td>
</tr>
</tbody>
</table>
Proposed Reference Model: Land Use Plan

The area will be primarily under residential use, housing a population of approximately 85,000 people at saturation. Industrial development is proposed in the southern segment. Commercial activities are expected to develop along the arterial roads and primary roads within the site. The land use plan takes into consideration the importance of optimizing land utilization, which implies distinct distribution of user responsibility and viable physical controls over land and its regulation/maintenance. The land utilization types are classified as follows:

PUBLIC LAND

Public land is essentially allotted for circulation (roads). The percentage of public land is determined by the density of network, i.e., frequency of network intervals and widths of circulation modes. The evaluations of case studies (see page 60) show a wide fluctuation in public land percentages and reflect the ambiguity in the public and private responsibility in the predominant dwelling system, the cooperative society. (see case study, Majalpur, page 54). For effective control, 13% is proposed for the final network.

SEMI-PUBLIC LAND

Semi-public land is primarily allotted for community facilities like, schools, playgrounds etc. The percentage for this purpose is based on the population it serves. Specific demands of the area have to be considered with regard to proximity/accessibility of facilities in the adjoining areas. Surveys show that most of the facilities in the city are controlled by the private sector, and it is observed that land reserved by the public sector is subject to squatter settlement proliferation and misuse due to limited public resources for its immediate development. Semi-public land is, therefore, proposed only for essential facilities like municipal schools, fire, health, etc. It is recommended that some parcels be reserved in prime value land, for possible private development of facilities. Location of semi-public areas is determined by the size and accessibility of user groups and rentability of land/development.

PRIVATE LAND

Private land is allotted primarily for residential use including shops and small factories. The proposal incorporates semi-private areas (cul-de-sacs, cluster courts owned in condominium) for reasons of better maintenance/control and social benefits as evident in the traditional dwelling systems in the city. Upto 65% of the total is proposed for private land, while semi-private land is 15% of the total. (see Suggested Segment Plan, page 22).

The location of low income housing is determined by taking into account the proximity to industrial areas and possibility of upgrading existing consolidated squatter settlements. About 11% of the city population lives in slums. Assuming a similar trend in future, low income housing provision is made for at least 11% of the estimated population in the scheme, requiring about 5% of the total area.

<table>
<thead>
<tr>
<th>LAND UTILIZATION</th>
<th>Hectares</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUBLIC (Streets, walkways)</td>
<td>25</td>
<td>13</td>
</tr>
<tr>
<td>SEMI-PUBLIC (Schools, playgrounds)</td>
<td>19</td>
<td>10</td>
</tr>
<tr>
<td>PRIVATE (Dwellings, lots)</td>
<td>125</td>
<td>62/15</td>
</tr>
<tr>
<td>SEMI-PRIVATE (Cluster courts)</td>
<td>29</td>
<td>77</td>
</tr>
<tr>
<td>TOTAL</td>
<td>198</td>
<td>100%</td>
</tr>
</tbody>
</table>
Proposed Reference Model: Circulation Plan

The circulation system assumes extreme importance in the urban layout, as it not only channels the pedestrian and vehicular movements, thereby generating the growth and land value patterns, but also determines the land utilization, subdivision and layout of utilities. The existing pattern of circulation forms a major determinant of the interior circulation network in the site; the exterior circulation, approaches/accesses having been established by the overall City Development Plan. The circulation layout in the proposal is based on the following:

a) Maximizing the use of existing roads in the site.
b) Recognition of predominant pedestrian mode of circulation in the area and the city.
c) Formation of grid blocks, determined by convenient public circulation and not by the dimension of lots. Existing cooperative streets to be blocked for semi private use, to form grid blocks.
d) Optimizing circulation efficiency, i.e. the ratio of circulation length to the area it serves.
e) Minimizing infrastructure investment by the public sector.

The frequency of circulation lines is of significant importance and is a trade-off between the following two conflicting requirements: a) The need for intervals small enough to facilitate pedestrian movement between community elements: dwellings, shops, services, and 2) The need for intervals large enough to minimize public land area percentage and redundancy to minimize public costs of construction, maintenance and operation of utilities.

To maintain an optimum land utilization pattern, the intervals of circulation lines in the proposal range between 100m and 300m.
CIRCULATION PLAN:

REFERENCE MODEL

CIRCULATION MODES

<table>
<thead>
<tr>
<th>MODE</th>
<th>WIDTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode I</td>
<td>VEHICLES (mainly) 30 m</td>
</tr>
<tr>
<td>Mode II</td>
<td>VEHICLES (dominate) PEDESTRIANS 18 m</td>
</tr>
<tr>
<td>Mode III</td>
<td>VEHICLES PEDESTRIANS 12 m</td>
</tr>
<tr>
<td>Mode IV</td>
<td>PEDESTRIANS (dominate) VEHICLES 8 m</td>
</tr>
</tbody>
</table>

AKOTA CIRCULATION PLAN
Proposed Reference Model: Segment Plan

The segment layout is suggested to illustrate land subdivision which allows minimization of public land for circulation, and maximization of private users' responsibility. The principal characteristic of the layout is the formation of grid blocks which are independent of lot dimensions and are determined by convenient public circulation. This significant aspect is ignored in the design of the declared Schemes in Vadodara.

The block comprises a number of lot clusters bounded by public roads. The clusters are formed by lots around a semi-private area owned in condominium, which provides direct access to individual lots and space for extended activities of the occupants. By virtue of its being a dead end/cul-de-sac, with a limited number of users, the semi private space tends to be better controlled/maintained.

Lots in the clusters are rectangular with narrow widths facing the streets or cluster courts, to minimize the unit public circulation length (ratio between circulation length and block area).

The grid layout, incorporating semi-private areas, permits the separation of infrastructure into Basic networks (on public land) and Service connections (on private land), which is essential to allow flexibility/alternatives for progressive development, and to minimize public expenditure on infrastructure that may be underutilized in the initial stages.

The layout is compatible with the prevailing dwelling/land system in the area, namely, the cooperative society, which corresponds to the suggested cluster formations.

<table>
<thead>
<tr>
<th>LAND UTILIZATION</th>
<th>Hectares</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUBLIC (Streets, walkways)</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>SEMI-PUBLIC (Schools, playgrounds)</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>PRIVATE (Dwellings, lots)</td>
<td>13</td>
<td>78</td>
</tr>
<tr>
<td>SEMI-PRIVATE (Cluster courts)</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>21</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

NETWORK EFFICIENCY
Network length (streets, walkways) = 84 meters/hectare
Areas served (total area)
SEGMENT PLAN: REFERENCE MODEL

LOCATION OF SEGMENT

AKOTA SEGMENT PLAN
CONCLUSIONS

The rapid growth trends in the medium sized cities in India, reveal the significance of such urban centers in the context of overall development of the country. The city of Vadodara, Gujarat State, presents a typical case of the disorganized development that is taking place in the expanding areas of the medium city.

The need for proper planning at this stage is imperative in directing development so as to minimize initial outlay and maximize socio-economic returns from public inputs. The planning bodies and local authorities need to recognize the importance of efficient physical layouts as tools, not only to direct urban growth, but also to generate economic solutions to the critical issue of housing accessibility to the low income sections of the population, and provision of basic infrastructure and community facilities.

In the design of efficient urban layouts, two principal components to be considered at the planning stage are Land Utilization and Circulation, the basic properties of which are identified as follows:

LAND UTILIZATION:
Land utilization is essentially the qualification of land in relation to its users, responsibility and physical controls. The utilization types to be considered are:

a) Public Land (streets, walkways, open spaces): user—anyone unlimited; physical controls—minimum; responsibility—public sector.

b) Semi-Public Land (schools, playgrounds, open spaces): user—limited group of people; physical controls—partial or complete; responsibility—public sector and user.

c) Private Land (dwellings, lots): user—owner or tenant; physical controls—complete; responsibility—user.

d) Semi-Private Land (cluster courts, cul-de-sacs): user—group of owners and/or tenants; physical controls—partial or complete; responsibility—user.

The urban layout should reflect, very distinctly, the distribution of users responsibility and controls, legal, physical and socially conducive, of operation, use and maintenance of land and facilities/utilities that serve it. The proportion of land utilization types is a significant aspect of layout design criteria. It is obvious that, to minimize public expenditure on infrastructure and maintenance, and consequently reduce financial burden on the community in terms of taxation and levies, areas of public responsibility have to be minimized, while private/semi-private areas have to be maximized. The extent of semi-public land has to suit projected population densities of the sector. The potential of private sector participation in semi-public development needs to be considered when public resources are marginal.

CIRCULATION:
The circulation system is the major determinant of land utilization, subdivision and layout of utilities, apart from channelling pedestrian and vehicular movement, and generating land values. The following aspects of circulation have to be recognized:

a) Modes of Circulation: The relative dominance of pedestrian or vehicles, according to which, the widths, grades and controls of the streets have to be established.

b) Lines of Circulation: Open-end streets on public land,
for pedestrians/vehicles, that primarily serve the city's population for through movement and not necessarily for direct access to lots.

Lines of Access: Dead-end streets, loops and cluster courts, on private/semi-private land, that serve the abutters by direct access to lots.

The combination of the above two forms the grid block which is determined by convenient public circulation and is independent of lot dimensions.

c) Intervals between Lines of Circulation: They are the spacing between public streets and determine the dimensions of the block. The frequency of circulation lines is a trade-off between 1) Large intervals, needed to minimize public costs, and 2) Small intervals, needed to facilitate intercommunication between community elements such as, dwellings, shops, services.

Unit Circulation Length, that is, the ratio between circulation length and area served, is an indicator of the efficiency in terms of circulation length (meters) serving a unit area (one hectare).

The efficiency of an urban layout depends primarily on establishing optimum land utilization percentages and circulation pattern within the framework of land value compatibility, viable densities, social acceptance and economic/administrative capacity of the public sector/users.
This section contains documentation of socio-economic and physical surveys of dwelling environments in Vadodara city, to elaborate references made in the foregoing study. They form tools for formulating urban development policies.

The section comprises the Urban Context-Vadodara and case studies of dwelling/land systems prevailing in the expanding areas of the city. It includes a summary of land utilization patterns, densities and circulation of the cases in a comparative format.

PHOTOGRAPHS (opposite page) VADODARA CITY
(left) One of the major commercial streets in the central city. Note the predominant mode of transportation; pedestrian, bicycles and auto-rickshaws.
(right) One of the interior residential streets in the central city. The narrow, winding streets provide security and privacy to the residents. Utilities, such as, storm drainage and sewage are inadequate.
VAHDODARA, GUJARAT

URBAN CONTEXT

PRIMARY INFORMATION: Vadodara, one of the important industrial and cultural cities in the country is situated about 100 km. south of Ahmedabad, Western India. Forming an important centre in the Ahmedabad-Bombay corridor, it is well connected to the other parts of the country by extensive railway, highway and air route networks. The city is characterized by its hot dry climate, summer temperatures going as high as 115° F with hot winds. The four coldest months are mild with temperatures reaching 45° F. The topography is essentially plain, having fertile agricultural soil. The annual rainfall is about 600 mm. The river Vishwamitri running north-south through the city remains dry except during the monsoons.

HISTORY: The history of Vadodara can be traced back to some early settlements along the river Vishwamitri. The emergence of an urban conglomeration did not take place till the mid 15th century after a succession of dynasties ranging from the Guptas period to the Mughal rulers who ruled the region. The fortifications were built by the Muslim ruler Khalikhan who was eventually overthrown by the Maratha kings, of which the Gaikwads played an important role in the development of Vadodara. Finally the British consolidated their position around 1830 AD. Bombay and Vadodara were connected by rail in 1870. Till the end of the 19th century Vadodara grew in trade, commerce and cultural activities. From 1800 to 1921, Vadodara faced acute famine due to locust invasions and subsequent deterioration of crops. A decade of development and transition followed, wherein Vadodara assumed the prominence of the state capital till the declaration of the country's independence in 1947. The establishment of a university complex in 1949 rejuvenated its development. Reorganisation of the states in 1960 made it a part of the newly formed Gujarat State.

ECONOMY: Vadodara forms an important industrial/commercial and institutional centre in Gujarat. In addition to the large scale industries namely a fertilizer complex, petrochemical complex, oil refinery and others, Vadodara provides a base to 467 registered industries and a multitude of small scale and cottage industries. 35% of the working force is involved in industries, and 17% in commerce. The self employed/informal sector comprises of a substantial 54%, while 9% in transportation/services and the rest in agriculture.

GOVERNMENT: The Vadodara Municipal Corporation, administers the civic affairs of the city. It is headed by a Mayor elected by the members of a council, who are in turn elected representatives from political wards in the city. The executive power of the municipal corporation rests in the commissioner who is also responsible for prescribing duties of various departments and supervision of their work. The corporation administers and executes functions relating to taxation, finance, transportation, health and education. An Engineering office, Town Planning Branch and a public works department are responsible for the provision of service, authorization of land subdivisions, issuing building licenses and building inspection.

URBAN CONTEXT SOURCES


URBAN POPULATION DISTRIBUTION horizontal: percentages vertical: ages
DEMOGRAPHY: The population of Vadodara urban area was 467,400 in the 1971 census. Presently it is estimated to be about 600,000, reflecting a decadal growth rate of 56.6%. About 59% of the population is male and 41% female. The literacy rate is 61.6%. The population can be broadly divided into the following age groups: 20% below 14 years, 76.5% between 15-19 years and 3.5% above 60 years. About 80% of the people are Hindus, 7% Muslims and 3% other minorities.

SOCIO-CULTURAL: Social diversity is the characteristic feature of people in most cities in India. Vadodara is populated by people from diverse ethnic, socio-religious backgrounds, castes and occupations. The reflections of their backgrounds is often found in their dwelling environments. Elements like the court/backyard, verandah, 'chawk' directly respond to their lifestyles. Due to rapid modernization, caste barriers are breaking down, being replaced by western ideologies.

SOCIO-ECONOMIC: About half the city's population may be classified as poor, earning less than Rs.3600 ($450) annually. Upto 30% of the population belongs to the moderate and middle income groups, who earn upto Rs.10,800 ($1350) per year. The rest of the population belongs to the high income groups. The lower income sections are scattered in small pockets throughout the city, while one large concentration exists in the eastern sector of the city.

URBAN DEVELOPMENT: During the past seven decades, the population of the city has increased 4.5 times. The earliest comprehensive Development Plan was prepared in 1929 but was brought to effect, with significant modifications in March 1971. The municipal limits were extended in 1975 from 73.15 km² to 134.36 km². The development pattern of the city is markedly influenced by three industrial townships located within a radius of 20 km. Two of these, namely, the Fertilizer and Sankarda Complex are located near the northern periphery, while the Padra/Bhayli complex on the southern periphery. Due to this the growth direction has been north-south while the western side is rapidly being developed. Due to administrative and planning inadequacies, haphazard, unplanned developments have taken place in the expanding urban areas. Though the city possesses extendable infrastructure, capable of servicing the majority of the areas, the authorities are finding it difficult to keep pace with the growing demands for the same. At present, 30% of urban land is vacant/under-developed. The Development Plan proposes 46.3% for residential, 2% for commercial, 14% for industrial, 13.7% for recreational, and the remainder 23% for communications/restricted open areas, etc.

HOUSING: According to surveys done in 1972 50,000 people, i.e. 13% of the total population in the city live in 132 squatter settlements. About 4% of the population live in one room units. The occupancy rate is estimated to be 2.4 persons/room. The percentage of people living in rental houses is 73%. The average household size is 4.6. The housing deficit in 1971 was estimated to be 13,500 units, while the projected housing needs in the 1980s is 120,000 units. The rate of increase in the housing stock to meet the shortage is 5.2% per annum. Public housing accounts for about 13% of the total housing stock. The following overview of housing systems developed in the past three decades, illustrate housing options, present conditions and future trends.

Chawls: The chawls are generally high density developments consisting of rows of one room and at times a front verandah. They have limited or inadequate communal utilities; water supply and toilets. Due to high demand and low supply of housing has caused speculation in chawls. Many of the chawls, which may be called 'tenements', are now governed by municipal legislation,
and the rents have been frozen since independence. As a result, the chawls have remained ill maintained and have become a financial burden to the owners. In some instances, the chawls have been sold to the occupants and the physical conditions have been improved by them.

Squatter settlements: With the inability to cope with the increasing demands for housing in the low income strata of new migrants, squatting has become prevalent on the vacant land, particularly in the expanding areas of the city. These settlements developed by the informal sector, resemble the villages in their physical pattern. A survey conducted in 1976, of the squatter settlements in the city, reveals 192 locations of such developments, housing about 11% of the city's population. The average household size is 5.6 persons. About 88% of the family heads are illiterate, with 9% of them educated up to secondary level. 14.5% of squatter population is self employed while about 35% work as casual labour, and 33% as industrial workers. The other sectors of employment include government, private firms, transportation services etc. The quality of shelters depend on the de facto control possessed by the squatters on the appropriated land. The recent settlements have unconsolidated dwellings made from salvaged materials. In some of the more consolidated settlements, the municipal corporation has installed communal toilet and water taps. The utilities being inadequate, they tend to be overused and ill maintained.

Cooperative Housing Societies: In the recent years, because of the increasing land values, cooperative societies have become popular, wherein land and/or development is owned collectively by a group of private entrepreneurs. The societies mainly comprise of semi-detached/detached houses or walkups apartments. The Gujarat Co-operative Housing Finance Society, a government agency, provides loans with low interest.

Public Housing: The Housing and Urban Development Corporation, a central government agency, administers and finances, through a 'revolving fund' a large part of the housing activities in the different states of the country, while public agencies at State and city level, execute the projects. The Gujarat Housing Board and the Housing offices of the municipal corporation are responsible for middle and low income housing. The public housing schemes include a variety of housing types. Integrated subsidized schemes are designed for industrial workers, in which the government gives 50% as loans and 50% as subsidy. Various low income housing schemes are allotted on hire-purchase basis with an initial deposit of 25% to 50% of the total cost, and the remainder in monthly installments spread over 10 to 20 years. However, the housing provided for low income groups is unaffordable, hence being occupied by higher income groups. The Slum Clearance and Environmental Improvement schemes are involved in rehousing the squatters and providing communal utilities in the settlements. While one room apartments in three storey walkups, are not compatible with the socio-cultural requirements of the people, the upgrading in existing areas is grossly inadequate. 6389 dwelling units were constructed by the Vadodara Municipal Corporation, while about 4000 were developed by the Gujarat Housing Board. Public housing accounts for only about 10% of the total housing in the city.
The following section contains case studies describing dwelling/land systems prevailing in the expanding areas of Vadodara city.

The selection of the localities was based on location, population, income groups and the extent of development taken place at the time of the survey. The three localities are physically defined by the limits of the Town Planning Schemes declared and being implemented in the respective areas. The land use proposals made by the Town Planning Department for the localities have been included.

The dwelling types within the localities were selected so as to represent the cross-section of the existing and proliferating housing systems in the expanding areas.

The case studies are arranged as follows:

1. **AKOTA**
   - **KALUMIYA CHAWL**
     - **Private, Low income, Tenements**
     - Akota is a rapidly developing peripheral area covered by the declared Town Planning Scheme No: 1, presently being implemented. The dwelling type selected is the 'chawl', or tenements, which represent the existing housing option for low income groups in the expanding areas of the city.

2a. **BAPOD**
   - **KISHANWADI**
     - **Popular, Low income, Squatter**
     - Bapod area on the northwestern periphery of Vadodara, falls under the declared Town Planning Scheme No: 5, presently being developed. This area contains a concentration of very low and low income groups. Kishanwadi consists of illegal settlements developed by the popular sector. A large concentration of such developments have emerged throughout the area. The physical condition of the settlements is very poor.

2b. **BAPOD**
   - **GHB HOUSING**
     - **Public, Middle income, Walkups**
     - These are three story walkup apartments built by the Gujarat Housing Board. This dwelling type represents the typical case of public housing being developed in many parts of the country. Though intended for low income groups, the walkups are presently occupied by middle income families.

2c. **BAPOD**
   - **PLINTH QUARTERS**
     - **Public, Low income, Row units**
     - Bapod area on the northwestern periphery of Vadodara, falls under the declared Town Planning Scheme No: 5, presently being developed. This area contains a concentration of very low and low income groups. Kishanwadi consists of illegal settlements developed by the popular sector. A large concentration of such developments have emerged throughout the area. The physical condition of the settlements is very poor.

3. **MAJALPUR**
   - **KRISHNAPURI SOCIETY**
     - **Private, High income, Semi-detached houses**
     - Majalpur represents a typical example of an expanding area in Vadodara. Located on the southern periphery, the area comprises the proliferating dwelling/land system, namely, the cooperative housing society. The land is collectively owned by a group. Middle income families reside in such societies.
AKOTA

Kalumiya chawl
PRIVATE, LOW INCOME, TENEMENTS
Vadodara

LOCATION: Akota is located along the western side of the main Railway line that runs north-south. It is about 3 km from the city centre and in close proximity to the Race Course area, the Gujarat Electricity Board complex and the railway station. The area is accessible by two major routes, the old Padra Road which is the new city ring road and the new Padra Road leading to the railway station.

ORIGIN: Adjacent to the village Akota, which was one of the earliest settlements in the region, the locality began developing as a residential area around the 1940s, during which there was a sudden influx of migrants from different parts of the state and country, because of the industrial activity in the region. Following the trends introduced by the British, factory owners started developing housing for their workers in the form of multiple unit 'chawls' or tenements. These became a popular dwelling system for low income groups and also a footfall for the immigrants. With the eventual congestion in the central city, and increasing urban to urban migration, middle and higher income groups started moving out into this sparsely populated area.

LAY OUT: Only about 23% of the area is developed. The existing land subdivision is haphazard and is presently under reconstitution from original agricultural plots to urban plots, under the Town Planning Scheme declared for this area (scheme 1).

The predominant feature, as in all expanding areas in the city, is the sporadic private development of cooperative housing societies. The streets within the societies are often unaligned. This is mainly because they are developed initially on private land with municipal subsidy and eventually handed over to the corporation, which does not have planning control on the layout of societies. Land which has not been reconstituted, are at places occupied by scattered squatter settlements.

LAND USE: The area is primarily a medium density residential area, most of which is being rapidly developed by private developers. Scattered commercial developments have sprung up along the new Padra Road. Sporadic small industries exist in the southern side of the area. Except for a school and the police department, there are no community facilities.

CIRCULATION: The new and old Padra Roads are the existing approach roads to the area. A third approach road is proposed that extends the existing road that links the two Padra Roads, to the city centre. The internal circulation pattern is haphazard and mostly pedestrian dominated. Most of the internal streets are unpaved.

POPULATION AND INCOME: Presently Akota area houses approximately 12,500 people in detached/semidetached houses, mostly in co-operatives which cater to the lower middle to higher income groups. One public housing project (Municipal Quarters) and a group of chawls house moderately low to middle income families. Sporadic parcels of land have been occupied by squatters, who comprise of low/very low income groups.

CASE STUDY SOURCES

Segment plan: (accurate) IBID
Typical Dwelling: (approximate) IBID.
Physical Data: (approximate) IBID.
Socio-Economic Data: (approximate) IBID.
### Locality Construction Types

<table>
<thead>
<tr>
<th>Construction Type</th>
<th>%</th>
<th>Self-Help</th>
<th>Semi-Self-Help</th>
<th>Small Construction</th>
<th>General Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shack</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mud/Wattle</td>
<td></td>
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</tr>
<tr>
<td>Wood</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Masonry Wood</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Masonry Concrete</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Concrete</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

Quality of information: approximate

### Locality Utilities and Services

- **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

---

The chart shows the approximate availability of utilities, services, and community facilities at three levels: **None**, **Limited**, **Adequate**.
LOCALITY SEGMENT PLAN: This segment represents the mixed dwelling systems in the area. While the majority of the new developments are cooperative societies, having low densities, the area is occupied by a group of chawls or tenements with multiple dwelling units. The vacant land in front of the Kalumiya and Ahmed chawls is occupied by a small group of squatters. Community facilities are not accessible in this segment. The city bus service operates along the New Padra Road. This has generated few makeshift shops run by the residents of the chawl and squatters. The diversity in the income groups in the segment is representative of the situations prevailing in the peripheral areas of the city.

LOCALITY BLOCK: The block represents a 'chawl' the dwelling option in the low income groups in the area. It consists of 18 single-room dwelling units around a shared court, housing 108 people. The chawl is accessible only from one side, thereby forming a well-controlled cluster court on which most of the activities of the inhabitants extend. The court also provides space for group social functions. The structure of the dwellings is dilapidating. One w.c. is shared by the 18 families and is in foul condition. Water requirements are taken care of by a bore well within the court.

LOCALITY BLOCK LAND UTILIZATION DATA

<table>
<thead>
<tr>
<th>AREAS</th>
<th>Hectares</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUBLIC (streets, walkways)</td>
<td>0.01</td>
<td>9%</td>
</tr>
<tr>
<td>SEMI-PUBLIC (schools, community centers)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>PRIVATE (dwellings, shops, factories, lots)</td>
<td>0.06</td>
<td>55%</td>
</tr>
<tr>
<td>SEMI-PRIVATE (cluster courts)</td>
<td>0.04</td>
<td>36%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>0.11</td>
<td>100%</td>
</tr>
</tbody>
</table>

DENSITIES

<table>
<thead>
<tr>
<th>Total Number</th>
<th>Area Hectares</th>
<th>Density m/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOTS</td>
<td>18</td>
<td>0.11</td>
</tr>
<tr>
<td>DWELLING UNITS</td>
<td>18</td>
<td>0.11</td>
</tr>
<tr>
<td>PEOPLE</td>
<td>108</td>
<td>0.11</td>
</tr>
</tbody>
</table>

AREA LENGTH

<table>
<thead>
<tr>
<th>Unit Length</th>
<th>m/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>170</td>
<td></td>
</tr>
</tbody>
</table>

NETWORK EFFICIENCY

<table>
<thead>
<tr>
<th>Network length (streets, walkways)</th>
<th>170 m/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Areas served (total area)</td>
<td></td>
</tr>
<tr>
<td>LOTS</td>
<td></td>
</tr>
<tr>
<td>Average area, dimensions = 28.7 m²</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX

PHYSICAL DATA (related to dwelling and land)

DWELLING UNIT
- type: ROOM
- area (sq m): 29
- tenure: LEGAL RENTAL

LAND/LOT
- utilisation: SEMIPRIVATE
- area (sq m): 29
- tenure: LEGAL RENTAL

DWELLING
- location: PERIPHERY
- type: ROW HOUSES
- number of floors: 1
- utilisation: MULTIPLE FAMILY
- physical state: POOR

DWELLING DEVELOPMENT
- mode: INSTANT
- developer: PRIVATE
- builder: SKILL CONTRACTOR
- construction type: MASONARY
- year of construction: 1942

MATERIALS
- foundation: BRICK
- floors: CEMENT
- walls: BRICK
- roof: CORRUGATED SHEETS

DWELLING FACILITIES
- wc: 1 PER 19 FAMILIES
- shower: NONE
- kitchen: NONE
- rooms: 1
- other: VERANDAH

SOCIO-ECONOMIC DATA (related to user)

GENERAL: SOCIAL
- user's ethnic origin: MUSLIM
- place of birth: UTTAR PRADESH
- education level: NONE

NUMBER OF USERS
- married: 4
- single: 1
- children: 4
- total: 9

MIGRATION PATTERN
- number of moves:
  - rural - urban: 1940
  - urban - urban: -
  - urban - rural: -
- why came to urban area: EMPLOYMENT

GENERAL: ECONOMIC
- user's income group: LOW
- employment: INDUSTRIAL WORKER
- distance to work: 1 KM
- mode of travel: WALKING

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

DWELLING UNIT PAYMENTS
- financing: -
  - rent/mortgage: US $ 1.2/MONTH
  - % income for rent/mortgage: 38

PHOTOGRAPHS (opposite page) KICLMU CHAWL, AKOTA
(top left) View of the 'chawl' from the unpaved road. Physical condition is deteriorating. Notice the dilapidated w.c. in extreme left, (top right & bottom) The shared court provides space for extended activities and play area for children.
2 BAPOD
a: Kishanwadi
POPULAR, VERY LOW/LOW INCOME, SQUATTERs
b: GHB Housing
PUBLIC, MIDDLE INCOME, WALKUPS
c: Plinth Quarters
PUBLIC, LOW INCOME, ROW HOUSES

Vadodara

LOCATION: Bapod is located about 2.5 km from the city centre in the north eastern sector, close to the Fatehpura industrial area. It is accessible by the Ajwa road that runs along the southern boundary of the area. Ajwa road forms an important artery linking Vadodara to the neighbouring village and towns.

ORIGIN: Inspite of its close proximity to the central fortified city, the development of Bapod area did not take place till 1950s, because of the urban growth trends towards the western and northern sections of the city. The area provided a vital and convenient location for low income migrants who sought employment in the city. Development of industries in the vicinity accentuated the squatter settlement proliferation forming one of the largest concentrations in the city. In 1966

the Gujarat Housing Board, a state government agency developed 480 dwelling units in walkups for the low income groups. The Vadodara Municipal Corporation executed 240 'Plinth Quarters', under its Environmental Improvement Program, in a combined mode of development. Lower land values have in the recent past attracted moderate income groups to register for cooperative housing.

LAY OUT: About 20% of the total land is presently developed. The boundaries are defined on the southern side by Ajwa road and circumscribed on the other irregular side by the limits of the declared Town Planning Scheme = 5, intended for this area. Re-subdivision of land is in progress under the scheme. The street layout is discontinuous, while a large portion is occupied by squatter settlements.

LAND USE: The area is primarily residential, with more than 3600 shanties occupying about 5 hectares of land. Sporadic groups of small shops have emerged along Ajwa Road. Community facilities are non existent.

CIRCULATION: Ajwa road forms the primary approach from the city. Internal circulation is restricted to the developed parts of the area. Except for the streets within the Gujarat Housing Board development, most of the streets are unpaved.

POPULATION AND INCOME: About 20,036 people reside in this area, with more than 50% belonging to the economically weaker sections living in squatter settlements and 'Plinth Quarters'. The Gujarat Housing Board walkups intended for low income groups have been occupied by middle income families. A small portion of middle income population resides in cooperative societies.

CASE STUDY SOURCES
segment plan: (approximate) IABD.
Block land Utilization: (accurate) Field survey.
Typical Dwelling: (approximate) IABD.
Physical Data: (approximate) IABD.
Socio-economic Data: (approximate) IABD.
General Information: Field survey, Vijay Vaghik.

BAPOD: DECLARED TOWN PLANNING SCHEME 5, 1975

LAND USE PLAN

LAND UTILIZATION

<table>
<thead>
<tr>
<th>Areas</th>
<th>Land Use (%)</th>
<th>hectares (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open Spaces</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>100X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LAND USE (%)</th>
<th>hectares (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUBLIC</td>
<td>10 (13)</td>
</tr>
<tr>
<td>SEMI-PUBLIC</td>
<td>12</td>
</tr>
<tr>
<td>PRIVATE</td>
<td>30</td>
</tr>
</tbody>
</table>

Total: 100X

CIRCULATION RATIO
Circulation length (streets) = 423 m/ha

Area served (total area) = 423 m/ha
CASE STUDY: BAPOD

PROPOSED RESIDENTIAL DEVELOPMENT

LOCALITY PLAN

1:10000
LOCALITY CONSTRUCTION TYPES

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

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

LOCALITY UTILITIES AND SERVICES

- Water Supply
- Sanitary Sewerage
- Storm Drainage
- Electricity
- Gas
- Refuse Collection
- Public Transportation
- Paved Roads, Walkways
- Telephone
- Street Lighting

LOCALITY COMMUNITY FACILITIES

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

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

LOCALITY SEGMENT PLAN

1:2500
CASE STUDY: KISHANWADI, BAPOD

LOCALITY SEGMENT PLAN: The segment is representative of the existing developments in Bapod area. Two public housing projects, squatter settlements and a few cooperative societies occupy the area. The dwelling types include, shanties, row houses, walkups and few semidetached/detached units. The layout is arbitrary while most of the open areas are badly controlled/maintained. The segment is close to Ajwa road which is served by the city bus service. Community facilities are non-existent.

LOCALITY BLOCK A: This block consists of 140 squatter units grouped together in a random pattern forming a series of open spaces which are put to semi-private use. The activities of the inhabitants extend onto the open. The extent of control exercised by each dwelling unit is identified by platforms, mostly made of mud, which also serve to prevent storm water from getting into the shelter. During the monsoons the area is water-logged creating unhygienic conditions which are worsened by the lack of sanitary facilities. The dwellings are mainly single room units made of salvaged material, mud and raw timber.

LOCALITY BLOCK LAND UTILIZATION DATA

<table>
<thead>
<tr>
<th></th>
<th>Total Number</th>
<th>Area Hectare</th>
<th>Density N/Ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOTS</td>
<td>140</td>
<td>0.64</td>
<td>219</td>
</tr>
<tr>
<td>DWELLING UNITS</td>
<td>140</td>
<td>0.64</td>
<td>219</td>
</tr>
<tr>
<td>PEOPLE</td>
<td>700</td>
<td>0.64</td>
<td>1094</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AREAS</th>
<th>Hectare</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUBLIC (streets, walkways, open spaces)</td>
<td>0.30</td>
<td>59%</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>0.21</td>
<td>33%</td>
</tr>
<tr>
<td>SEMI-PRIVATE (cluster courts)</td>
<td>0.05</td>
<td>8%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>0.64</td>
<td>100%</td>
</tr>
</tbody>
</table>

NETWORK EFFICIENCY

Network length (streets, walkways) = 600m/ ha
Areas served (total area)

<table>
<thead>
<tr>
<th>LOTS</th>
<th>Average area, dimensions = 27 m²</th>
</tr>
</thead>
</table>

LOCALITY BLOCK LAND UTILIZATION - A
APPENDIX

PHYSICAL DATA

(DWELLING UNIT)
- type: SHANTY
- area (sq m): 27
- tenure: EXTRALEGAL OWNERSHIP

LAND/LOT
- utilization: SEMIPRIVATE
- area (sq m): 32
- tenure: EXTRALEGAL OWNERSHIP

DWELLING
- location: PERIPHERY
- type: GROUPED
- number of floors: 1
- utilization: MULTIPLE FAMILY
- physical state: POOR

DWELLING DEVELOPMENT
- mode: PROGRESSIVE
- developer: POPULAR SECTOR
- builder: SELF-HELP
- construction type: SHANTY
- year of construction: 1972

MATERIALS
- foundation: COMPACTED EARTH
- walls: EARTH
- roof: CORRUGATED SHEETS

DWELLING FACILITIES
- wc: NONE
- shower: NONE
- kitchen: NONE
- rooms: 1
- other: PLATFORM

SOCIO-ECONOMIC DATA

(GENERAL: SOCIAL)
- user's ethnic origin: HINDU
- place of birth: SAVAD, GUJARAT
- education level: NONE

NUMBER OF USERS
- married: 2
- single: 0
- children: 3
- total: 5

MIGRATION PATTERN
- number of moves: 1
- rural - urban: 1970
- urban - urban: -
- urban - rural: -
- why came to urban area: EMPLOYMENT

GENERAL: ECONOMIC
- user's income group: VERY LOW
- employment: CASUAL LABOUR
- distance to work: 2 KM
- mode of travel: WALKING/BUS

COSTS
- rent/mortgage: -
- income for rent/mortgage: -

Dwelling unit: -
- land - market value: -

DWELLING UNIT PAYMENTS
- financing: SELF FINANCED

PHOTOGRAPHS (opposite page) KISHANWADI, BAPOD
- (top) The view shows the expanse of squatter developments, with utilities/facilities. (bottom left & right) Unpaved walkways are defined by shacks built out of salvaged materials. The physical conditions are worsened during monsoons due to flooding.
CASE STUDY: KISHANWADI, MAPOO
The picture shows a view of the walkups instantly built. The poor condition of land around the walkups reflect the inefficiency of the layout, caused due to excessive public areas, the limits of which are not distinctly defined. Social incompatibility of walkups for low income groups is apparent.

Three storey walk up apartments are a common dwelling type built by the Gujarat Housing Board. Four apartments, each having a multipurpose room, a kitchen, a bath and a verandah, are arranged on each floor around a common staircase. Undefined physical control/responsibility of open areas make this layout very inefficient. Under the "Low Income Housing Scheme" of the Housing Board, 40 such three storey walkups were built between 1966 and 1967.

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>72</td>
<td>0.39</td>
<td>180</td>
</tr>
<tr>
<td>DWELLING UNITS</td>
<td>340</td>
<td>0.39</td>
<td>850</td>
</tr>
</tbody>
</table>

AREAS

PUBLIC (streets, walkways, open spaces) 0.29 75%
SEMI-PUBLIC (open spaces, schools, community centers) - -
PRIVATE (dwellings, shops, factories, lots) 0.10 25%
SEMI-PRIVATE (cluster courts) - -
TOTAL 0.39 100%

NETWORK EFFICIENCY

Network length (streets, walkways) 763 m/Ha
Areas served (total area) - -
PHYSICAL DATA
(relate to dwelling and land)

DWELLING UNIT
- type: APARTMENT
- area (sq m): 43
- tenure: LEGAL OWNERSHIP

LAND/Lot
- utilisation: PUBLIC
- area (sq m): -
- tenure: LEGAL OWNERSHIP

DWELLING
- location: PERIPHERY
- type: WALKUP
- number of floors: 3
- utilisation: SINGLE FAMILY
- physical state: FAIR

DWELLING DEVELOPMENT
- mode: DISTANT
- developer: PUBLIC
- builder: LARGE CONTRACTOR
- construction type: MASONRY/CONCRETE
- year of construction: 1967

MATERIALS
- foundation: BRICK
- floors: CEMENT
- walls: BRICK
- roof: CONCRETE

DWELLING FACILITIES
- wc: 1
- shower: 1
- kitchen: 1
- rooms: 1
- other: BALCONY

SOCI-ECONOMIC DATA
(relate to user)

GENERAL: SOCIAL
- user's ethnic origin: JAIN
- place of birth: BULLEAR, GUJARAT
- education level: GRADUATE

NUMBER OF USERS
- married: 2
- single: 1
- children: 2
- total: 5

MIGRATION PATTERN
- number of moves: 2
- rural - urban: -
- urban - urban: 1960, 1966
- urban - rural: -
- why came to urban area: EMPLOYMENT

GENERAL: ECONOMIC
- user's income group: MIDDLE
- employment: GOVERNMENT SERVICE
- distance to work: 4 KM
- mode of travel: BICYCLE/Bus

COSTS
- dwelling unit: US $1850
- land - market value: -

DWELLING UNIT PAYMENTS
- financing: HIRE-PURCHASE
- rent/mortgage: US $ 13/MONTH
- 1/4 income for rent/mortgage: 12%

PHOTOGRAPHS (opposite page) GHB HOUSING, BAPPO
(top & bottom left) Poor quality and design of utilities has caused deterioration of public areas.
(bottom right) In spite of individual service connections, water supply is inadequate. The picture shows a communal tap which also caters to squatters.
CASE STUDY: GHB HOUSING, BAPOD
A view of the development. The structure on the extreme left is the communal toilet. A small temple, such as this, serves the socio-cultural needs of the people and reflect the spontaneous nature of such functions. The picture shows personalization of dwelling units, as they are built mainly by self-help, only the roof being provided by the public sector. Make-shift shops, one of which is seen, have sporadically developed throughout the site.

LOCALITY BLOCK C: The block describes the land utilization pattern of row houses developed by the Vadodara Municipal Corporation, under the Environmental Improvement Program; they have been called 'Plinth Quarters', as the combined mode of development in this project included construction of plinths and corrugated sheet roofs on wooden posts by the corporation while the rest of the dwelling unit was built by the inhabitants. The roads perpendicular to the rows, were paved and street lighting installed by the Corporation. The rows consist of single dwelling units facing back to front. Most of the dwellings have a multiple purpose room and a cooking/eating area segregated by a low wall. The common sanitary facilities provided are grossly inadequate. The ratio of w.c.'s to the number of families served is 1:50. While the combined mode of development shows positive results as far as the dwelling requirements of each individual family is concerned, the lack of adequate control/responsibility caused by excessive public land makes the layout very inefficient.

LOCALITY BLOCK LAND UTILIZATION DATA

<table>
<thead>
<tr>
<th>AREAS</th>
<th>Hectares</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUBLIC (streets, walkways)</td>
<td>0.19</td>
<td>54%</td>
</tr>
<tr>
<td>SEMI-PUBLIC (open spaces, schools, community centers)</td>
<td>0.14</td>
<td>40%</td>
</tr>
<tr>
<td>PRIVATE (dwellings, shops, factories, lots)</td>
<td>0.14</td>
<td>40%</td>
</tr>
<tr>
<td>SEMI-PRIVATE (cluster courts)</td>
<td>0.02</td>
<td>6%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>0.35</td>
<td>100%</td>
</tr>
</tbody>
</table>

NETWORK EFFICIENCY
Network length (streets, walkways) = 1021 m/Ha
Areas served (total area) =

LOTS
Average area, dimensions = 19 m²
PHYSICAL DATA

(DWELLING and land)

**DWELLING UNIT**
- **type**: ROOM
- **area (sq m)**: 19
- **tenure**: LEGAL OWNERSHIP

**LAND/LOT**
- **utilization**: PRIVATE
- **area (sq m)**: 19
- **tenure**: LEGAL OWNERSHIP

**DWELLING**
- **location**: PERIPHERY
- **type**: ROW HOUSES
- **number of floors**: 1
- **utilization**: SINGLE FAMILY
- **physical state**: FAIR

**DWELLING DEVELOPMENT**
- **mode**: COMBINED
- **developer**: PUBLIC SECTOR
- **builder**: LARGE CONTRACTOR
- **construction type**: WOOD, MASONRY
- **year of construction**: 1973

**MATERIALS**
- **foundation**: BRICK
- **floors**: COMPACTED EARTH
- **walls**: BRICK
- **roof**: ASBESTOS SHEETS

**DWELLING FACILITIES**
- **WC**: 1 PER 50 FAMILIES
- **shower**: NONE
- **kitchen**: NONE
- **rooms**: 1
- **other**: OPEN PLATFORM

**SOCIODEMIC DATA**

(related to user)

**GENERAL**: SOCIAL
- **user's ethnic origin**: HINDU
- **place of birth**: SANAND, GUJARAT
- **education level**: PRIMARY SCHOOL

**NUMBER OF USERS**
- **married**: 2
- **single**: -
- **children**: 2
- **total**: 4

**MIGRATION PATTERN**
- **number of moves**: 1
- **rural - urban**: 1969
- **urban - rural**: -
- **why came to urban area**: EMPLOYMENT

**GENERAL**: ECONOMIC
- **user's income group**: LOW
- **employment**: ENTREPRENEURIAL
- **distance to work**: 2 KM
- **mode of travel**: WALKING/BICYCLE

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

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

**PHOTOGRAPH (opposite page)**

The picture shows one of the access lanes between two rows of dwellings. Though the lane is used for spill-over activities, its maintenance is poor since the lane also serves as a thoroughfare.
3 MAJALPUR
Krishnapuri Society
PRIVATE, MIDDLE INCOME, SEMI-DETACHED HOUSES
Vadodara

LOCATION: Majalpur is located on the southern sector of Vadodara close to the L.V. Palace grounds and the narrow gauge railway line to Shahibagh. Situated at a distance of 3 km from the city, the area is accessible by the National Highway No.8 which cuts across the city. Adjacent to the area is the State Reserve Police grounds and the Vadodara Milk Dairy on the eastern side, and the Gujarat Housing Board land on the southern side. The village Majalpur is located on the western boundary.

ORIGIN: Majalpur village was one of the earlier settlements in the region. The development of this area can be traced after the shift of the administrative offices and the Palace to the outskirts of the fortified city at the end of the 1900s. Development in the region was relatively slow in the post-independence period, since most of the industry and commercial activities were concentrated in the western and northern sectors. With the eventual saturation of the central city areas, Majalpur experienced intra-migration of middle income families from the inner city. Land values being relatively low, the area is being gradually subdivided into cooperatives.

LAND USE: The area is primarily residential. Privately developed, a few shops have emerged along the adjoining National Highway No.8. The entire area is devoid of any community facilities. Located in close proximity to Majalpur area is a private secondary school.

CIRCULATION: External circulation comprises of the National Highway No.5 which leads to the city centre. The internal circulation is characterized by streets within cooperative societies. Due to unplanned progressive development, the internal streets are unaligned. The Municipal Corporation subsidizes these internal streets which are built on private land initially and which subsequently become public responsibility.

POPULATION AND INCOME: About 12,000 people reside in this medium density area, most of whom belong to the lower middle/middle income groups living in cooperative societies. About 400 low and very low income people live in scattered squatter settlements and a group of 'Cawals' or tenements.

CASE STUDY SOURCES
Segment Plan: (accurate) IIBR
Typical dwelling: (approximate) IIBR.
Physical Data: (approximate) IIBR.
Socio-Economic Data: (approximate) IIBR.

LAND UTILIZATION

<table>
<thead>
<tr>
<th>Type</th>
<th>Hectares</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUBLIC (Streets, walkways)</td>
<td>70</td>
<td>7%</td>
</tr>
<tr>
<td>SEMI-PUBLIC (Schools, playgrounds)</td>
<td>14</td>
<td>7%</td>
</tr>
<tr>
<td>PRIVATE (Dwellings, lots)</td>
<td>106</td>
<td>41%</td>
</tr>
<tr>
<td>SEMI-PRIVATE (Cluster courts)</td>
<td>41</td>
<td>41%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>190</td>
<td>100%</td>
</tr>
</tbody>
</table>

AREAS

<table>
<thead>
<tr>
<th>Type</th>
<th>Residential</th>
</tr>
</thead>
<tbody>
<tr>
<td>INDUSTRIAL</td>
<td></td>
</tr>
<tr>
<td>OPEN SPACES</td>
<td></td>
</tr>
</tbody>
</table>

Circulation ratio
Circulation length [streets] = 549 m/ha

MAJALPUR: DECLARED TOWN PLANNING SCHEME 18, 1974
LOCALITY CONSTRUCTION TYPES

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

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

LOCALITY UTILITIES AND SERVICES

- Water Supply
- Sanitary Sewerage
- Storm Drainage
- Electricity
- Gas
- Refuse Collection
- Public Transportation
- Paved Roads, Walkways
- Telephone
- Street Lighting

LOCALITY COMMUNITY FACILITIES

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

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

LOCALITY SEGMENT PLAN

1:2500
LOCALITY SEGMENT PLAN: This segment is representative not only of dwelling systems in Majalpur but also of the new developments in the expanding areas of Vadodara. The predominant dwelling system presently is the privately developed cooperative society, wherein land and/or dwellings are owned in condominium. The Gujarat Cooperative Finance Society, a government agency advances loans on low interest to initiate such developments. Since the recent past, practically all the private developers have been availing this facility. The cooperatives comprise mainly of semidetached/detached units or walkups. As an incentive to further promote cooperatives, the Municipal Corporation subsidizes the costs of construction and basic infrastructure on the ‘internal’ streets of the cooperatives. The streets eventually become the property of the Corporation. The regulations require that the internal streets of two adjacent societies be aligned. The streets thus become public by its uncontrolled utilization. The community facilities in this segment are non-existent.

LOCALITY BLOCK: The block represents land utilization in Krishnapuri society. The square lots are arranged in rows facing back to back with single storey semidetached dwellings. Due to factors mentioned in the Segment Plan descriptions, the public areas are excessive causing the residents in this block belong to the lower middle and middle income groups. Some of the dwellings are being extended vertically and sublet as tenements.

LOCALITY BLOCK LAND UTILIZATION DATA

<table>
<thead>
<tr>
<th>AREAS</th>
<th>N / Hectares</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUBLIC (streets, walkways, open spaces)</td>
<td>0.10</td>
<td>42%</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>0.14</td>
<td>58%</td>
</tr>
<tr>
<td>SEMI-PRIVATE (cluster courts)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>TOTAL</td>
<td>0.24</td>
<td>100%</td>
</tr>
</tbody>
</table>

NETWORK EFFICIENCY

Area served (total area) = 506 n / Hectares

LOTS

Average area, dimensions = 87.5 m²
APPENDIX

PHYSICAL DATA

DWELLING UNIT
- type: HOUSE
- area (sq m): 45.5
- tenure: LEGAL OWNERSHIP

LAND/LOT
- utilisation: PRIVATE
- area (sq m): 67.5
- tenure: LEGAL OWNERSHIP

DWELLING
- location: PERIPHERY
- type: SEMIDETACHED
- number of floors: 1
- utilisation: SINGLE FAMILY
- physical state: GOOD

DWELLING DEVELOPMENT
- mode: INSTANT
- developer: PRIVATE
- builder: SMALL CONTRACTOR
- construction type: MASONARY/CONCRETE
- year of construction: 1969

MATERIALS
- foundation: BRICK
- floors: CEMENT
- walls: BRICK
- roof: CONCRETE

DWELLING FACILITIES
- wc: 1
- showers: 1
- kitchens: 1
- rooms: 2
- other: VERANDAH

SOCIO-ECONOMIC DATA

GENERAL:
- user's ethnic origin: HINDU
- place of birth: RAJASTHAN
- education level: GRADUATE

NUMBER OF USERS
- married: 2
- single: 1
- children: 2
- total: 5

MIGRATION PATTERN
- number of moves: 2
- rural - urban: 1940
- urban - urban: 1962
- urban - rural:
- why came to urban area: BUSINESS

GENERAL:
- user's income group: MIDDLE
- employment: SELF EMPLOYED
- distance to work: 3 KM
- mode of travel: BUS/SCOOTER

COSTS
- dwelling unit: US $ 4375
- land - market value: -

PHOTOGRAPHS (opposite page)
- KRISHNAPURI SOCIETY, MAJALPUR
  - (top left) A view of the semi-detached houses.
  - (top right) Undefined/uncontrolled public areas tend to be ill-maintained and are a cause of under-utilisation of urban land.
  - (bottom) The access streets become thoroughfares, and are not conducive to social and physical control. Note grills on verandahs.

TYPICAL DWELLING

SECTION

ELEVATION

PLAN

STREET

VERANDAH

KEY

LR Living Room
BR Bedroom
K Kitchen/Cooking Area
T Toilet/Bathroom

GENERAL:

ECONOMIC

user's income group: MIDDLE
employment: SELF EMPLOYED
distance to work: 3 KM
mode of travel: BUS/SCOOTER

COSTS

dwelling unit: US $ 4375
land - market value: -

PHOTOGRAPHS (opposite page)

KRISHNAPURI SOCIETY, MAJALPUR
- (top left) A view of the semi-detached houses.
- (top right) Undefined/uncontrolled public areas tend to be ill-maintained and are a cause of under-utilisation of urban land.
- (bottom) The access streets become thoroughfares, and are not conducive to social and physical control. Note grills on verandahs.
The first case study, the 'chawl' or tenements, in relation to the other cases, indicate a positive aspect it generates, in terms of the formation of semi-private areas which in effect reduce public responsibility and is also socially conducive. The public circulation length, in relation to the other layouts, is less: implying lower public investment in basic infrastructure/maintenance.

The land utilization in the squatter settlement, case 2a, is not a true representation of actual user responsibility/control as property lines are undefined. This is also illustrative of the significance of secure tenure in housing the urban poor.

The ratio of private land to public land in public housing walkups, case 2b, is extremely low, resulting in excessive waste of land and inadequate control/maintenance of areas around the walkups. This solution is socially incompatible and economically unviable because of which they are accessible to middle and lower income groups mainly.

In relation to the walkups, the extent of private land in Plinth Quarters, case 2c, is more. The back-to-front layout results in excessive circulation lengths, having direct implications on basic infrastructure costs. A reduction in public areas and circulation lengths could have easily been achieved by arranging the lots back-to-back and blocking the access lanes to form semi-private areas.

The cooperative society, case study 3, reveals a low percentage of private areas in relation to the public areas that serve it. The lots being square in shape, the unit circulation length is high. Such a layout proves to be uneconomical, hence inaccessible to lower income groups.

Land utilization diagrams are arranged horizontally according to the chronological order of development. They are related vertically by the layout patterns, land utilization percentages, population densities and circulation efficiencies.

The five dwelling/land systems documented in the foregoing pages have been presented here, in a format that allows a comparative overview of their relative physical efficiency.

The dwelling/land systems proliferating in the expanding areas of the city provide a clue as to the basic issues of land use, land distribution in terms of income groups and land subdivision in terms of how the layouts function. They also raise specific issues concerning population densities and efficiency of land utilization. The case studies provide an understanding of the various housing options accessible to the different income groups and their economic viability. Evaluations of case studies form a vital tool for the formulation of development policies. Some of the inferences that can be drawn are:

The case studies are representative of the existing and proliferating dwelling/land systems in the expanding areas of Vadodara. The criteria used in evaluating the efficiency of physical layouts are:

- **Patterns**
- **Percentages**
- **Densities**
- **Circulation Efficiency**

The case studies are representative of the existing and proliferating dwelling/land systems in the expanding areas of Vadodara. The criteria used in evaluating the efficiency of physical layouts are:

**Patterns**

The layout patterns show lot configuration blocks and circulation, which determine land utilization percentages, circulation lengths and densities.

**Percentages**

The proportion of public and private areas determine the extent of users responsibility and control of land/development. It is indicative of the functional efficiency of the layout; e.g., a high percentage of public land for streets would result in high public investment in infrastructure/maintenance.

**Densities**

The number of people per hectare determines the intensity of use. Low densities result in higher development costs per person. The figures relate to gross densities.

**Circulation Efficiency**

The ratio between public circulation length and the area served indicates the circulation efficiency; higher the ratio, lower the capital investments and maintenance costs.
### Land Utilization Summary

**1 AKOTA KALUMIYA CHAWL**  
Private, Low income, Tenements  

#### Streets/Walkways 94%  
Playgrounds --  
Cluster Courts 36  
Dwellings/Lots 55

**2a BAPOD KISHANWADI**  
Popular, Low income, Squatter  
Percentage of land for streets not actual representation of utilization due to undefined lot lines. Low private areas.

#### Streets/Walkways 94%  
Playgrounds --  
Cluster Courts 6  
Dwellings/Lots 25

**2b BAPOD GHS HOUSING**  
Public, Middle income, Walkups  
Very high percentage of public land, low percentage of private land. Wasteful layout, undefined controls/responsibility.

#### Streets/Walkways 42%  
Playgrounds --  
Cluster Courts 6  
Dwellings/Lots 58

**2c BAPOD FLINTH QUARTERS**  
Public, Low income, Row units  
High percentage of public land and excessive circulation length/Ha. High density

#### Streets/Walkways 75%  
Playgrounds --  
Cluster Courts 40  
Dwellings/Lots 54

**3 MAJALPUR KRISHNAPURI SOC.**  
Private, M. income, semi-detached houses  
High percentage of public areas for circulation. Low percentage of private areas. Low density.

#### Streets/Walkways 42%  
Playgrounds --  
Cluster Courts 56  
Dwellings/Lots --

**Persons/Hectare**  
- 20 Persons 982
- 1094
- 850
- 972
- 333

**Unit Length m/Ha**  
- 170
- 600
- 743
- 1021
- 506

---

**MAJALPUR KRISHNAPURI SOC.**  
Private, M. income, semi-detached houses  
High percentage of public areas for circulation. Low percentage of private areas. Low density.
GLOSSARY

DEWELLING DEVELOPMENT MODE. Two modes are considered:
FRAGMENTATION, the construction of the dwelling and the development of the local infrastructure to modern standards; and NEIGHBOURHOOD DEVELOPMENT MODE, which is essentially the formal development procedure in which all structures and services are completed before occupation.

DEWELLING FLOORS. The following numbers are considered: 0TH, single story; generally associated with detached, semi-detached and row/group dwelling types; TW, double story, generally associated with detached, semi-detached and row/group dwelling types; THREE OR MORE, generally associated with walk-up and high-rise dwelling types.

DEWELLING GROUP. The context of the dwelling in its immediate surroundings.

DEWELLING/LAND/SYSTEM. A distinct dwelling environment characterized by interactions between the user as well as by its physical environment.

DEWELLING LOCATION. Three sectors are considered in single or multi-center urban areas. Sectors are identified as follows: CENTER: The area recognized as the business center of the city, generally the most densely built-up sector; PERIPHERY: the area located outside the urban periphery, generally a densely built-up sector; SUBURBAN: the area designated as the inner ring and the rural areas, generally a scattered built-up sector.

DEWELLING PHYSICAL STATE. A qualitative evaluation of the physical condition of the dwelling unit, separate 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.

DEWELLING TYPE. The physical arrangement of the dwellings in the individual dwelling unit, separated groups sharing a common wall (dual), row/group: dwelling units grouped in two to five stories with stairs for vertical circulation. HIGH-RISE: dwelling units grouped in five or more stories with stairs and lifts for vertical circulation.

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

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

DEWELLING UNIT COST. The initial amount of money paid for the dwelling unit or the present monetary equivalent of the price of the same dwelling unit.

DEWELLING 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 bedroom, a bathroom, but not a bath/toilet, kitchen, laundry, or storage room. SEPARATEユニット A building unit that share and share the use of the parcel of land on which they are built (open spaces) as well as common facilities (circulation, utilities). A MULTIPLE SPACE (room/set of rooms with bath, kitchen, etc.) SEPARATE APARTMENT A building unit that share and share the use of the parcel of land on which they are built (open spaces) as well as common facilities (circulation). HOUSE: A MULTIPLE SPACE (room/set of rooms with bath, kitchen, etc.) that is contained in a building/shelter and has the private use of the parcel of land on which it is built (open spaces).

DEWELLING UNIT UTILIZATION. The utilization indicates the type of use with respect to the number of inhabitants/families. SINGLE: an individual or family inhabiting a dwelling. MULTIPLE: a group of individuals or families inhabiting a dwelling.

DRAIN SYSTEM. A system for the removal of effluent.

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

DRENAJE. Water matter eliminated from the body.

DRENAJE. Waste matter eliminated from the body.

DRENAJE. Waste matter eliminated from the body.

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DRENAJE. Waste matter eliminated from the body.
A representation of an urban layout.

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

Soils that have not been subjected to any kind of land utilization, residential, commercial, industrial, recreational, or any other kind of use. (U.S.D.P.)

The physical environment and the conditions that influence growth and development of a city, town, or other area. (U.S.D.P.)

The costs of making raw land ready for development through the provision of utilities, services, access, etc. (U.S.D.P.)

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

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

65

5. physical magnitude or extent of the site, relative or proportionate dimensions of the site. (Merriam-Webster, 1971)

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

7. smoke. The gaseous products of burning carbonaceous materials, often visible by the presence of carbon particles. (Merriam-Webster, 1971)

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

9. 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., 1971)

10. soil pipe. The pipe in a dwelling which carries the pipe discharge from water closets. (U.S.D.P., 1971)

11. soil survey (initial). An on-site examination of surface soil conditions and reference to a general soil map. It shows the limitations/ restrictions/ hazards for early planning considerations. (U.S.D.P., 1971)

12. stack. The vertical pipe in a dwelling of the soil-waste, or soil-scrubbingadministrations, or soil-air connections. (U.S.D.P., 1971)

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

14. strap pipe. A pipe riser with tap used as a source of water for domestic purposes. (R&D/ Aid, Minimum Standard, 1966)

15. storm drainage. Store: sewer: a sewer (system) designed to carry water wastes except sewage (exclusively storm water, depression runoff, or street wash). (Merriam-Webster, 1971)

16. standard. The vertical pipe in a dwelling of the soil-waste, or soil-scrubbing connections. (U.S.D.P., 1971)

17. stormlighting. Illumination to improve vision at night for security and for the extension of activities. (U.S.D.P., 1971)

18. subdivision regulations. Regulations governing the development of the raw land for residential or other purposes. (Abrams, 1972)

19. subsoil. The layer of natural soil or fill (compact soil) upon which the pavement structure including curbs is constructed. (DePina, 1972)

20. submain or branch sewer. A collector pipe receiving sewage from lateral sewer only. (U.S.D.P., 1971)

21. subsistence income. The minimum amount of money required for the proper marketing of a house, farm, etc. (Merriam-Webster, 1971)

22. tank (also cistern). A fixture for holding a liquid from a pipe, cistern, or vessel. (Merriam-Webster, 1971)

23. tax exemption. A grant by a government of immunity from the payment of taxes; a tax-free status. (Merriam-Webster, 1971)

24. tenant. A person having the legal right to occupy and use property in the absence of the owner for an indefinite period of time. (Merriam-Webster, 1971)

25. telephone. An electrical voice communication network interconnecting all subscribers and transmitting over wires. (U.S.D.P., 1971)

26. telephone system. A method of communicating a message from one place (the site) to another (other parts of the urban context). (Merriam-Webster, 1971)

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

28. toilet. A fixture for defecation and urination, esp. a water closet. (7th Collegiate Webster, 1953)

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

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

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

32. treatment works. Filtration plant, reservoir, and all other construction required for the treatment of a water supply. (NCOT ST 45-7, 1953)

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

34. urban transportation. Means of conveyance of passengers or goods from one place to another along ways, routes, or circulation in a metropolitan context. (U.S.D.P., 1971)

35. urbanization. The quality or state of being or becoming urbanized; to cause to take on urban characteristics. (U.S.D.P., 1971)

36. user tax. The tax on land aimed primarily at enforcing its use or improvement. (U.S.D.P., 1971)

37. user income groups. Based upon the subsistence (minimum wage) income per year, five income groups are designated. (Merriam-Webster, 1971)

38. utility. A right to profit from a parcel of land or control of a parcel of land without becoming the owner or formal lease; legal possession by decree without ownership. (U.S.D.P., 1971)

39. utilities. Includes: water supply, sanitary sewerage, storm drainage, electricity, street lighting, gas, telecommunications. (Merriam-Webster, 1971)

40. valuation. A water supply distribution component which intercuts the supply for maintenance purposes. (U.S.D.P., 1971)

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

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

43. walk-up. Dwelling units grouped in two to five stories with stairs for vertical circulation. (U.S.D.P., 1971)

44. waste pipe. The vertical pipe in a dwelling of the soil-, or sewage connections. (U.S.D.P., 1971)

45. wastewater. The waste of human excretion, domestic, industrial or animal waste. (U.S.D.P., 1971)

46. water distribution. The water system or network which distributes water to various users. (U.S.D.P., 1971)

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

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

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EXPLANATORY NOTES

QUALITY OF INFORMATION

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

Approximate: when deducted from different and/or not completely reliable sources.

Accurate: when taken from reliable or actual sources.

Tentative: when based upon rough estimations of limited sources.

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 or 3.28 feet
1 meter = 100 centimeters=39.37 inches or 3.28 feet
1 kilometer = 1,000 meters = 2,200.03 feet or 0.6137 miles
1 inch = 2.54 centimeters
1 foot = 0.3048 meters
1 mile = 1.60935 kilometers

Square Measures

1 square meter = 1,550 square inches or 10.764 square feet
1 hectare = 10,000 square meters = 2.4711 acres
1 square foot = 0.0929 square meters
1 acre = 0.4047 hectares

DOLLAR EQUIVALENTS

All income, cost and rent/mortgage data have been expressed in terms of U.S. Equivalent: 1 US Dollar = 7.80 Rupees (May 1979)