

URBAN EXPANSION AND UPGRADING, VADODARA, INDIA

by

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Submitted to the Department of Architecture
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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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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 Camonos.

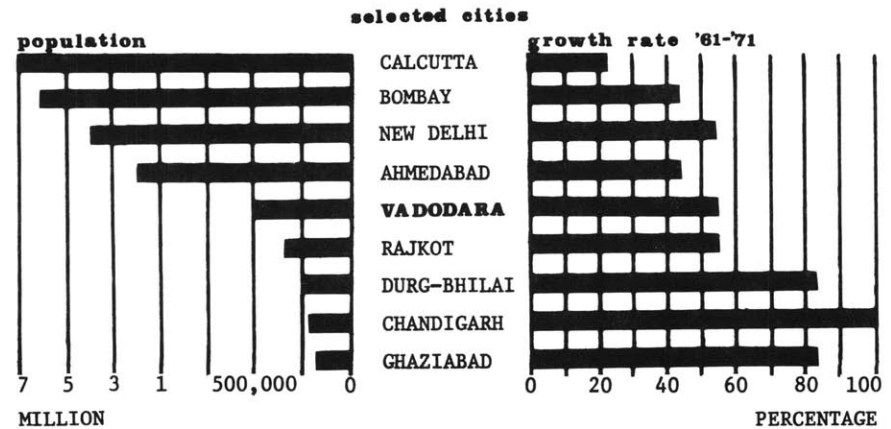
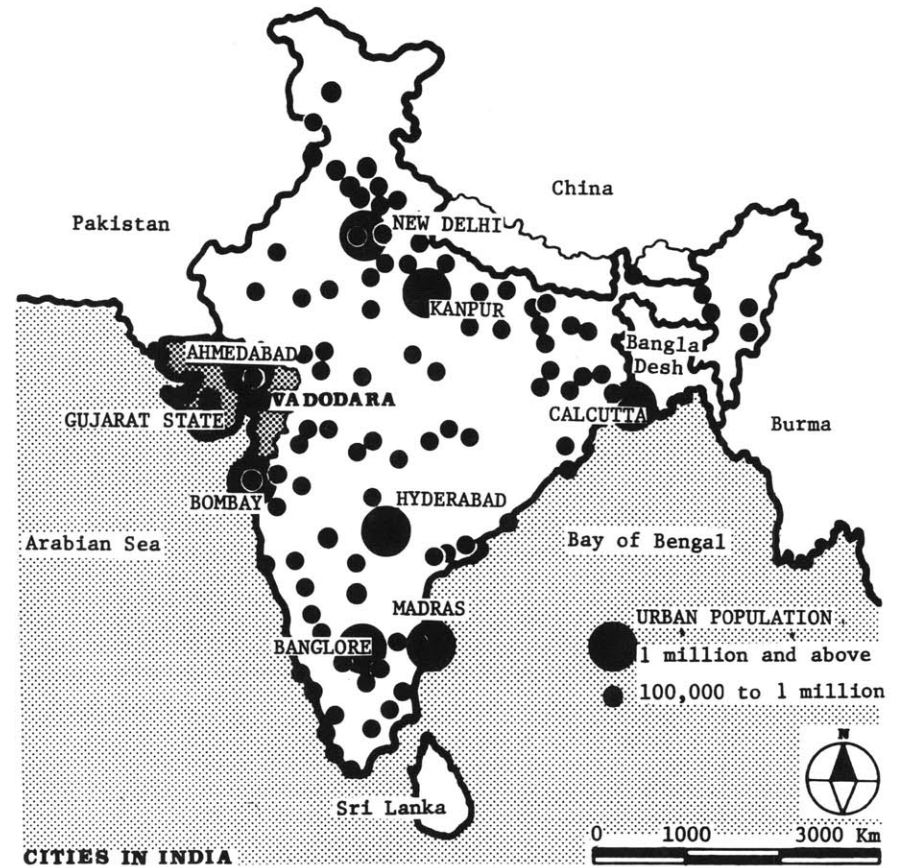
INTRODUCTION

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.



Source: B. Gami, USDP, MIT Thesis, 1978.

This study focuses on the issues of urban expansion and up-
grading 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 under-
developed, in spite of which the municipal limits were
extended to accomodate 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 frame-
work 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 repla-
ced 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 provi-
sions in the Town Planning Scheme outline in detail the

contents of the Development Plan; they can be summarized 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.
4. Construction, alteration and removal of bridges and other structures.
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.
9. Imposition of building regulations/zoning.

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 UPGRADING 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 led 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 accomodate 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:

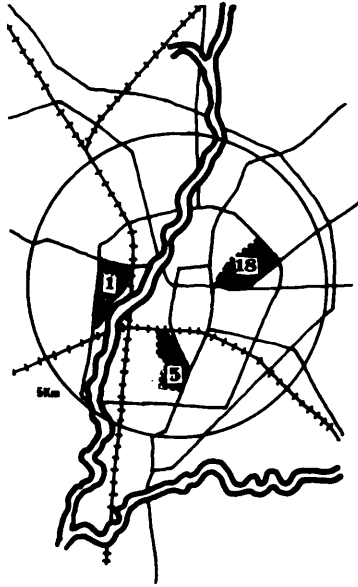
- 1) The total public area in the declared Schemes is the summation of the initial network (Town Planning roads) and the developed network, the extent and design of which is

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 accomodate 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 UPGRADING 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 - TOWN PLANNING
SCHEMES, VADODARA**



LOCATION OF SELECTED
TOWN PLANNING SCHEMES
VADODARA

	SCHEME 1 under execution		SCHEME 1 PROPOSED REFERENCE MODEL		SCHEME 5 under execution		SCHEME 18 under execution	
LOCALITY	AKOTA				BAPOD		MAJALPUR	
DECLARATION DATE	May 1965				Sept 1966		June 1968	
APPROVAL DATE	March 1975				July 1975		Nov 1974	
LAND UTILIZATION	HA	%	HA	%	HA	%	HA	%
PUBLIC (Streets, walkways)	70	(1) 35 (2)(3) (8+27)	25	(1) 13	84	(1) 40 (2)(3) (16+24)	70	(1) 52 (2)(3) (33+19)
SEMI-PUBLIC (Schools, playgrounds)	19	10	19	10	24	12	14	7
PRIVATE (Dwellings, lots) SEMI-PRIVATE (cluster courts)	109	55 [55 0	125	77 [62 15	102	48 [48 0	106	41 [41 0
TOTAL	198	100	198	100	210	100	190	100

(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 auto-rickshaws 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 BYE LAWS

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

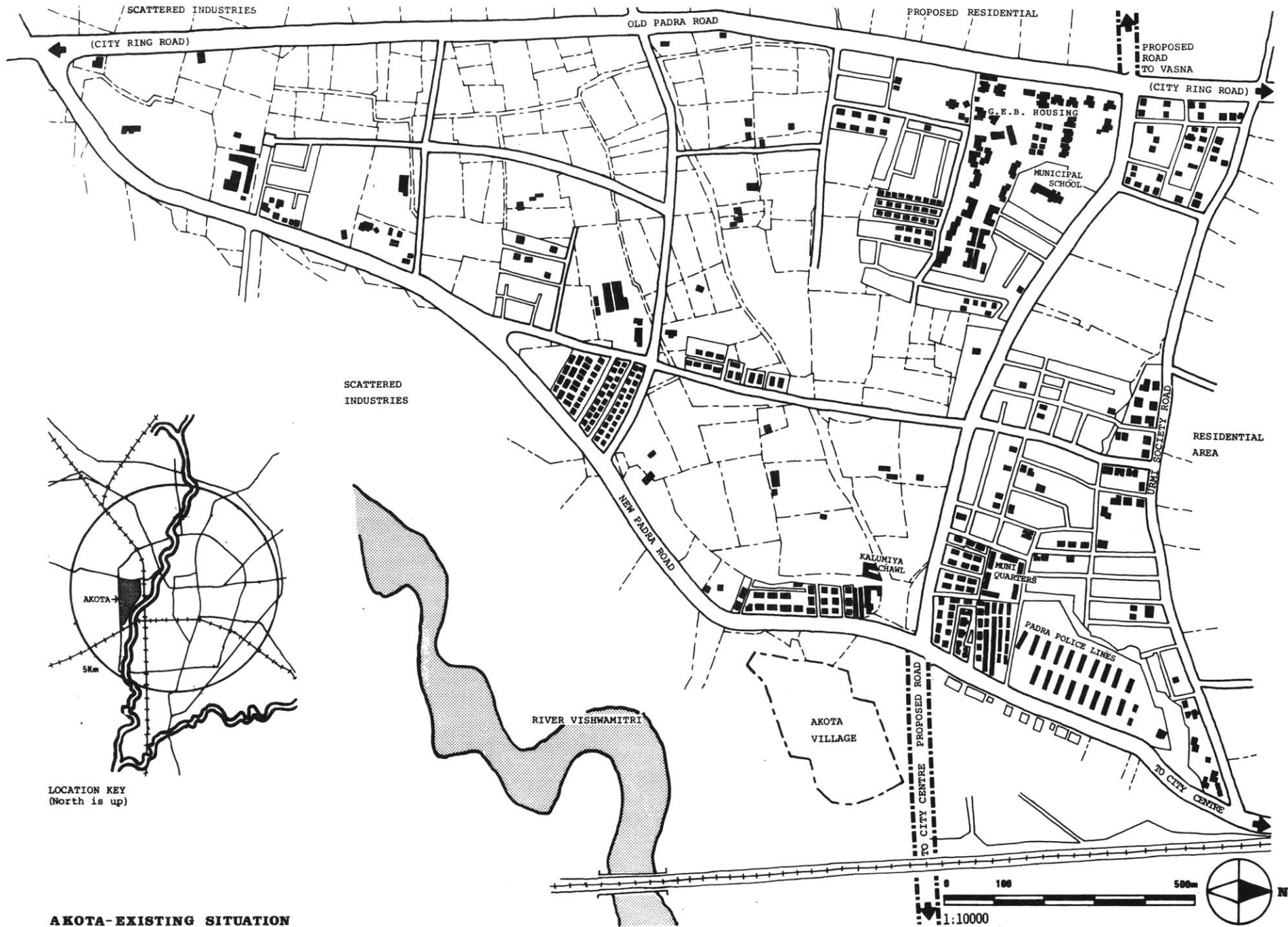
The site is surrounded by an existing network of water supply and sewage lines. Service connections are installed in most of the fully developed cooperative societies. Electricity is available on the entire site. There is no underground drainage in the roads. Storm water drains southwards into the Vishwamitri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

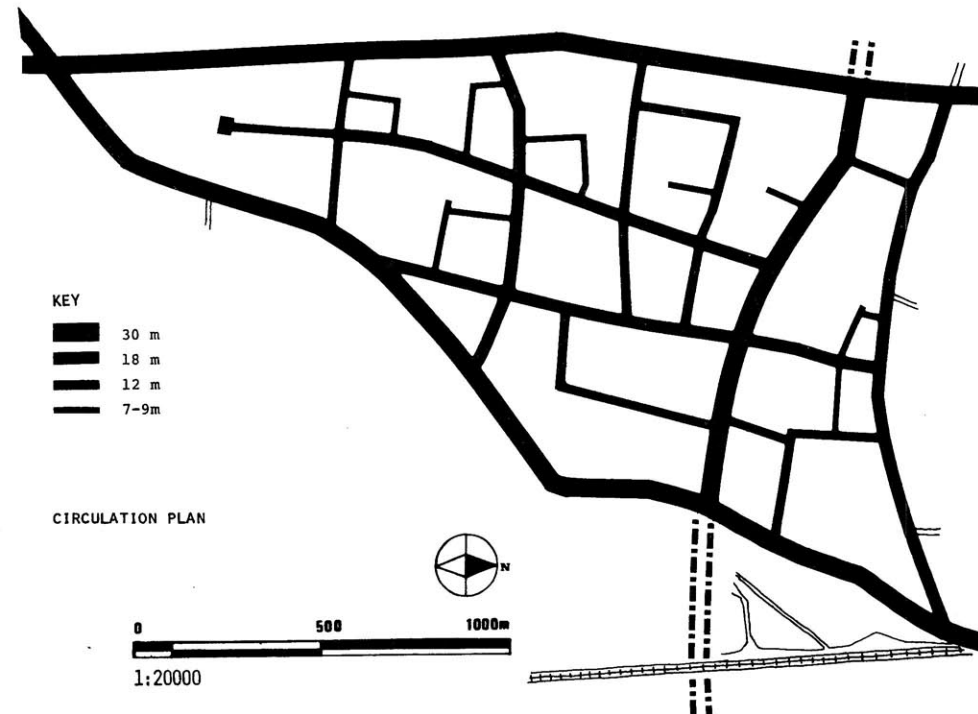
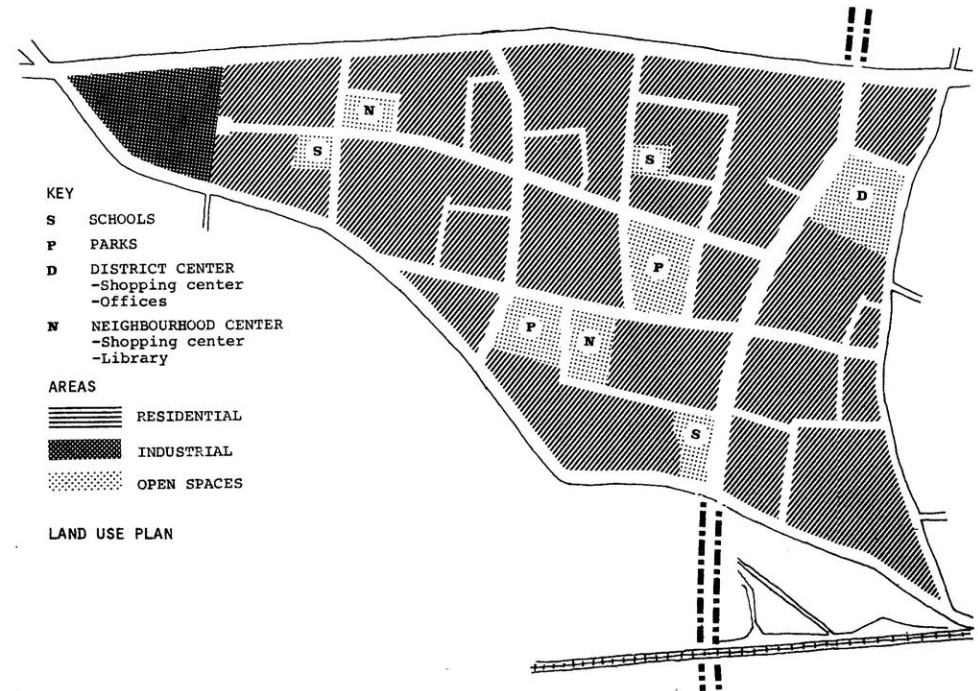
LAND FEATURES

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



AKOTA-EXISTING SITUATION

AKOTA: DECLARED TOWN PLANNING SCHEME 1, 1975



LAND UTILIZATION	Hectares	percentages		
		(1)	(2)	(3)
PUBLIC (Streets, walkways)	70	35	(8+27)	
SEMI PUBLIC (Schools, playgrounds)	19	10		
PRIVATE (Dwellings, lots)	109	55		55 0
SEMI PRIVATE (Cluster courts)				
TOTAL	198	100%		

(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;
1) The existing situation of the site, Akota, 2) The City Development Plan for Vadodara, and 3) The provisions laid in the Gujarat Town Planning and Urban Development Act, 1976.

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

	GUJARAT TOWN PLANNING AND URBAN DEVELOPMENT ACT, 1976	POLICY IMPLICATIONS	
BACKGROUND	PURPOSE	To delegate the appropriate Authority, the powers to prepare and implement the Development Plan for urban expansion and upgrading.	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.
	AREA SELECTION	May be prepared on any land which is - in the course of development - likely to be developed or already built upon	Segments are selected on the basis of information available as to the growth potential, convenience and economic feasibility.
LAND UTILIZATION	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 acquirable 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.	
FINANCE	COSTS	Costs may include 1. Roads/storm drainage. 2. Water supply 3. Sewage 4. Street lighting 5. Compensation for land acquisition 6. Administrative/legal expenses.	Cost ranges in the Vadodara T.P. Schemes were as follows: 1. Roads/storm drainage 20% - 40% 2. Water supply 8% - 23% 3. Sewage 8% - 11% 4. Street lighting 7% - 18% 5. Compensation 10% - 49% 6. Administration 3% - 6% Major expenses are incurred in roads/storm drainage
	RESOURCES	The costs of the scheme shall be met wholly or in part by a contribution levied on each plot included in the final scheme, the rest being borne by the authority.	In the Vadodara T.P. Schemes, the income ranges were; 1. Land owners contribution 47% - 80% 2. Amount borne by authority 20% - 57%

PROBLEMS / CONSTRAINTS	PROPOSED POLICIES	PURPOSE	BACKGROUND	
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.	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.	PURPOSE		BACKGROUND
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.	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.	AREA SELECTION	BACKGROUND	
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.	The Town Planning roads shall cater to the inter-communication 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 upto 15% of total.	PUBLIC LAND		LAND UTILIZATION
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.	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.	SEMI-PUBLIC LAND	LAND UTILIZATION	
Scattered, small individual plots cause an irregular and redundant layout of T.P. roads and services.	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)	PRIVATE LAND		
A negligible percentage of land is presently reserved for low income housing due to lack of administrative and financial resources.	Provision for land reservation/acquisition for low income groups should be enforced. Consolidated squatter settlements may be considered for upgrading.	LOW INCOME HOUSING		FINANCE
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.	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.	COSTS	FINANCE	
Delays and disputes arise regarding the assessment of the incremental value of land.	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.	RESOURCES		

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, ie, 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 co-operative 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 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.

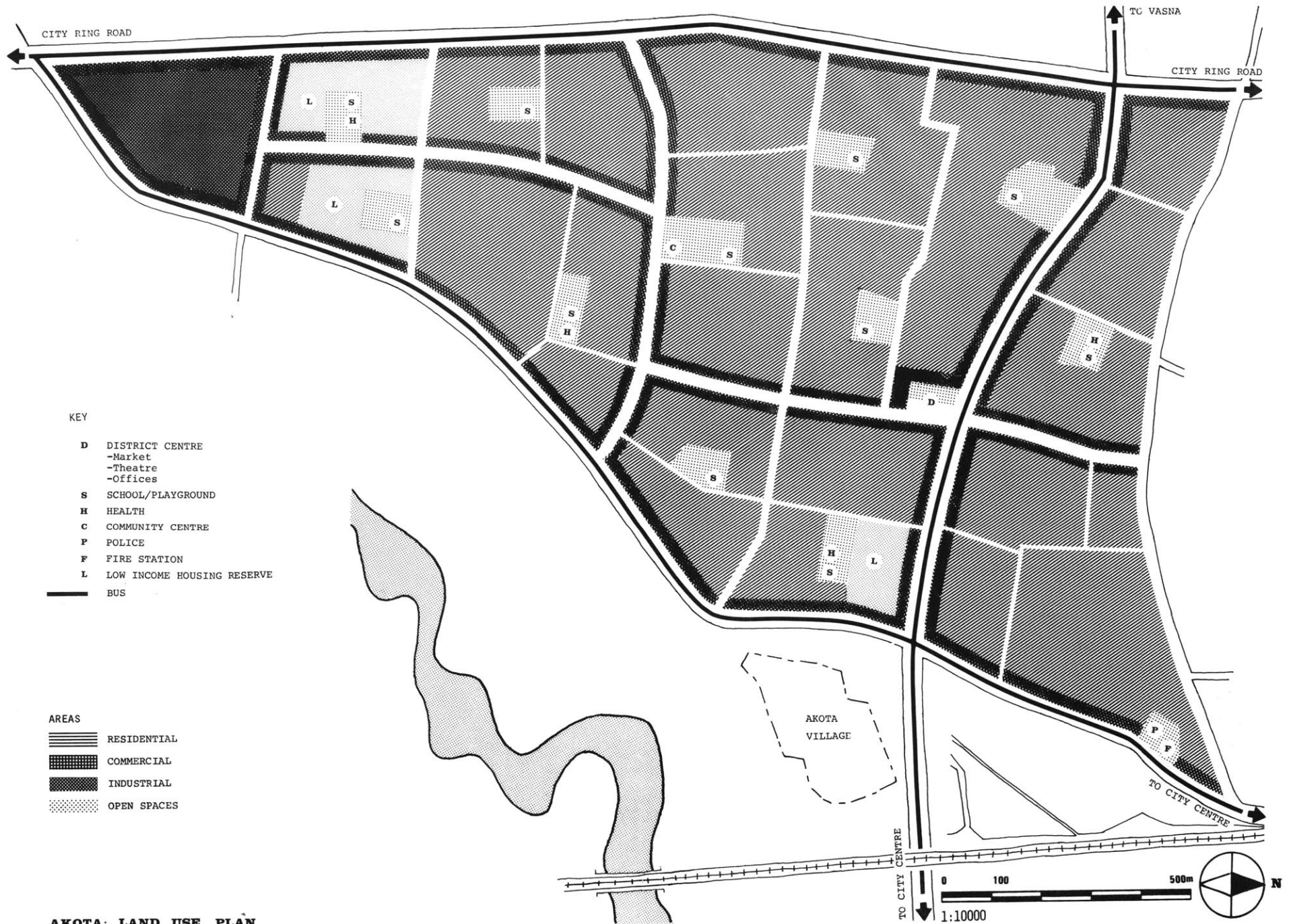
PRIVATE LAND

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.

LAND UTILIZATION	Hectares	Percentages
PUBLIC (<i>Streets, walkways</i>)	25	13
SEMI-PUBLIC (<i>Schools, playgrounds</i>)	19	10
PRIVATE (<i>Dwellings, lots</i>)	125	77 [62 15
SEMI-PRIVATE (<i>Cluster courts</i>)	29	
TOTAL	198	100 %



KEY

- D DISTRICT CENTRE
-Market
-Theatre
-Offices
- S SCHOOL/PLAYGROUND
- H HEALTH
- C COMMUNITY CENTRE
- P POLICE
- F FIRE STATION
- L LOW INCOME HOUSING RESERVE
- BUS

AREAS

- RESIDENTIAL
- COMMERCIAL
- INDUSTRIAL
- OPEN SPACES

AKOTA: LAND USE PLAN

TO CITY CENTRE

0 100 500m

1:10000

N

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, ie. 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 MODES

MODE	WIDTH
Mode I VEHICLES MAINLY	30 m
Mode II VEHICLES (dominate) PEDESTRIANS	18 m
Mode III VEHICLES PEDESTRIANS	12 m
Mode IV PEDESTRIANS (dominate) VEHICLES	8 m

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.

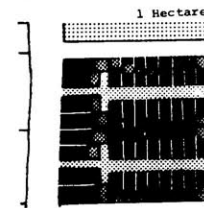
The block comprises a number of lot clusters bounded by public roads. The clusters are formed by lots around a semi-private area owned in condominium, which provides direct access to individual lots and space for extended activities of the occupants. By virtue of its being a dead end/cul-de-sac, with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

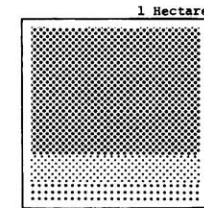
The grid layout, incorporating semi-private areas, permits the separation of infrastructure into Basic networks (on public land) and Service connections (on private land), which is essential to allow flexibility/alternatives for progressive development, and to minimize public expenditure on infrastructure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

UTILIZATION DIAGRAMS

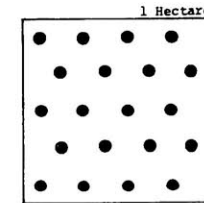


PATTERN



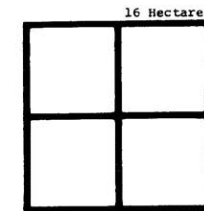
PERCENTAGES

Streets/walkways	13
Playgrounds	9
Cluster courts	15
Dwellings/lots	63



DENSITY

Persons/Hectare	382
● 20 Persons	



CIRCULATION EFFICIENCY

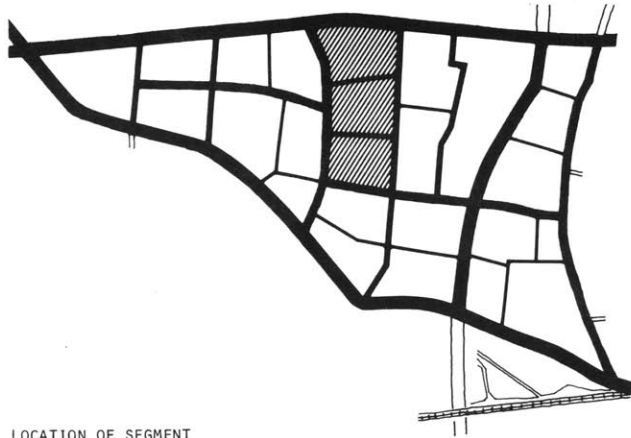
Unit Length m/Ha.	84
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LAND UTILIZATION

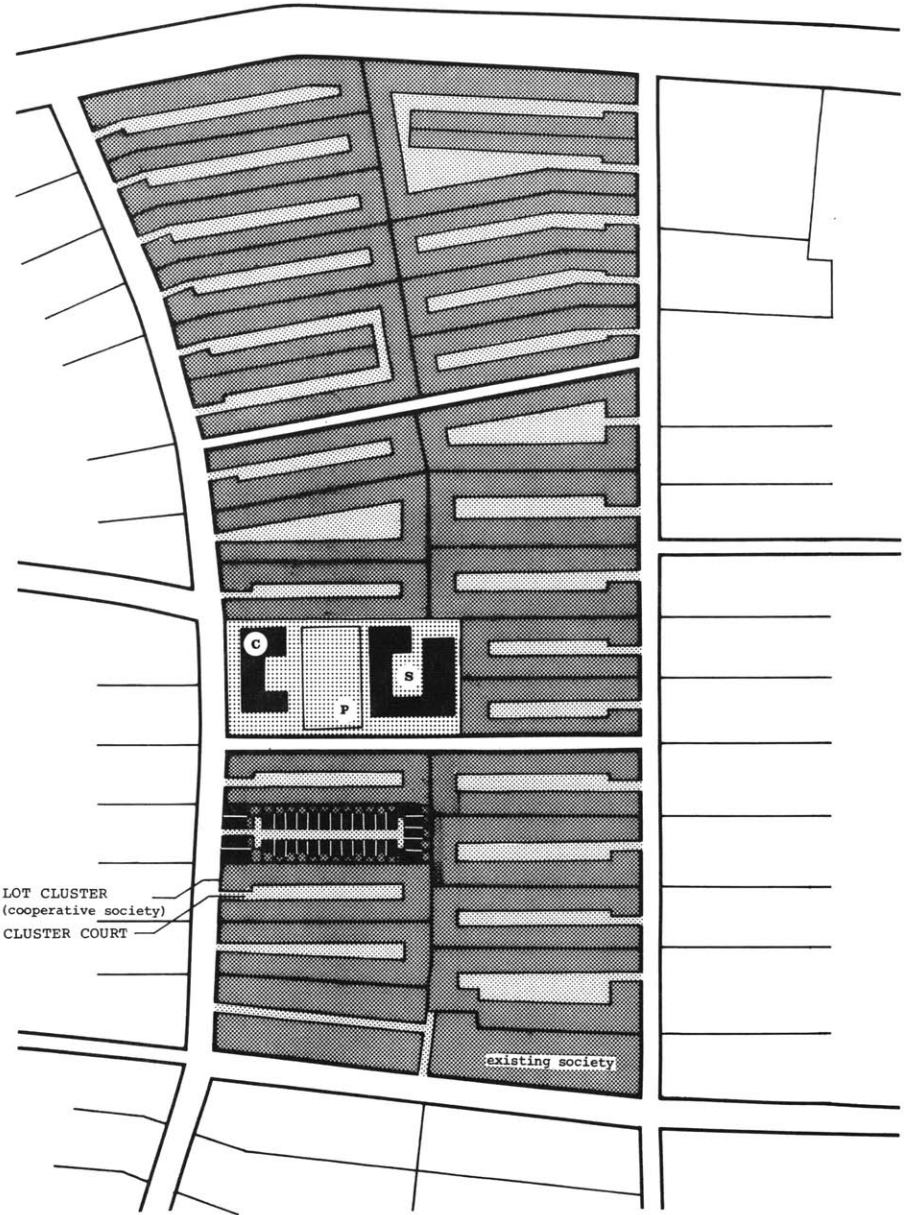
	Hectares	Percentages
PUBLIC (<i>Streets, walkways</i>)	3	13
SEMI-PUBLIC (<i>Schools, playgrounds</i>)	2	9
PRIVATE (<i>Dwellings, lots</i>)	13	78 { 63 15
SEMI-PRIVATE (<i>Cluster courts</i>)	3	
TOTAL	21	100 %

NETWORK EFFICIENCY






$$\frac{\text{Network length (streets, walkways)}}{\text{Areas served (total area)}} = 84 \text{ meters/hectare}$$



LOCATION OF SEGMENT



KEY
 S : SCHOOL
 P : PLAYGROUND
 C : COMMUNITY CENTER

PUBLIC	: streets, walkways, open spaces	
SEMI-PUBLIC	: schools, playgrounds, community centers	
SEMI-PRIVATE	: cluster courts	
PRIVATE	: lots	
	: dwellings	

LOT CLUSTER
 (cooperative society)
 CLUSTER COURT

existing society



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 recognise 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 recognised:

- 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.

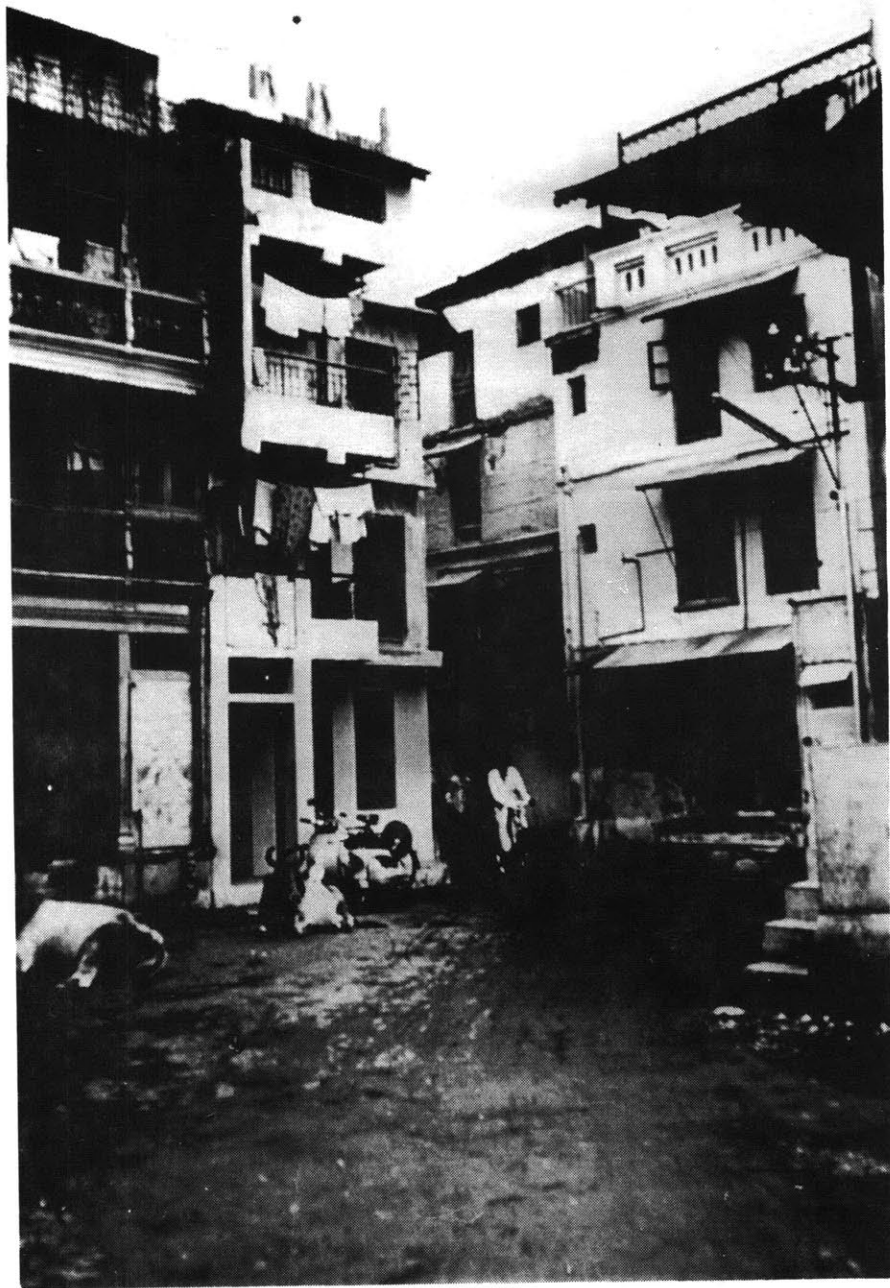
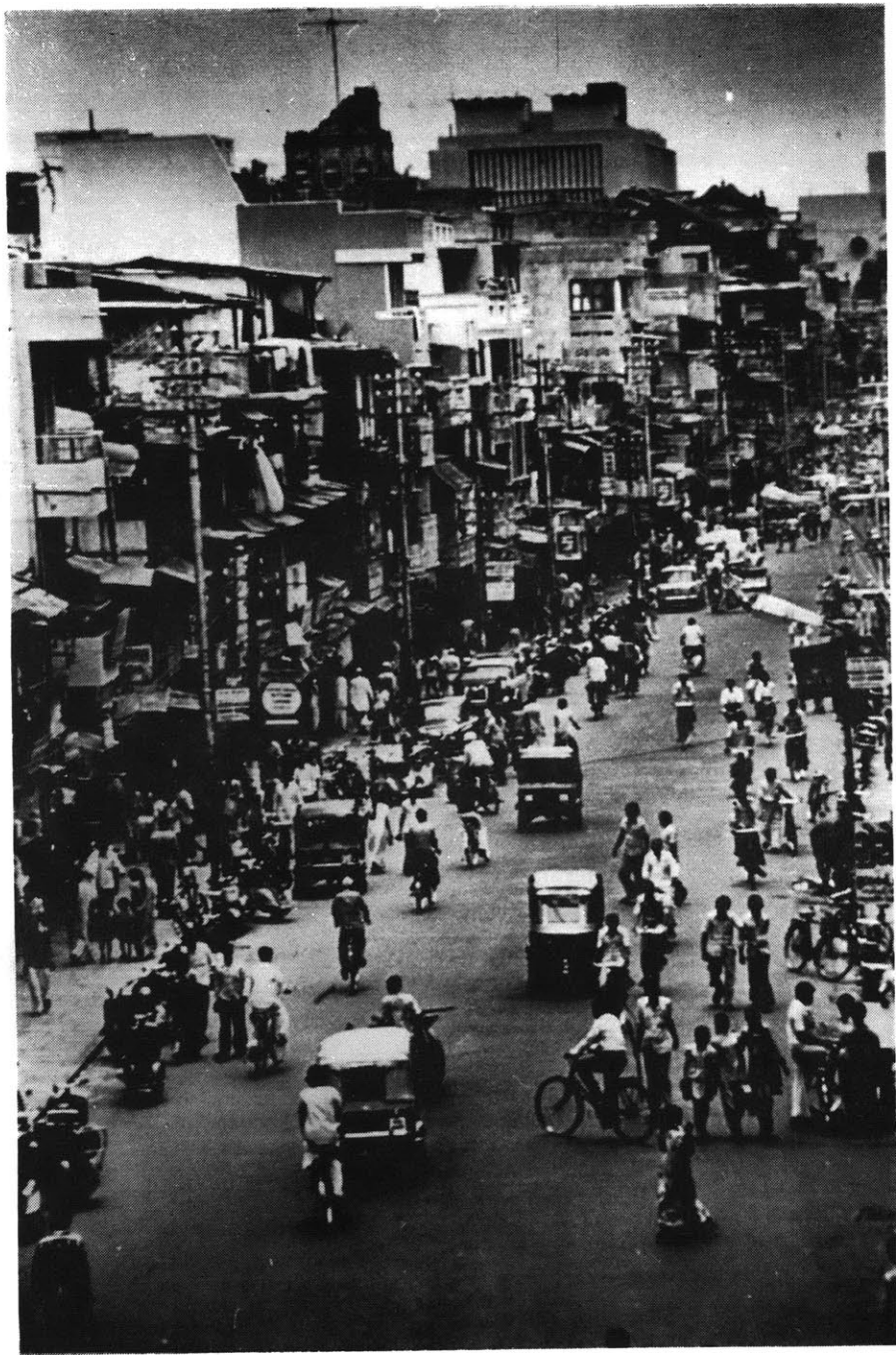
Lines of Access: Dead-end streets, loops and cluster courts, on private/ semi-private land, that serve the abutters by direct access to lots.

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



APPENDIX

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.

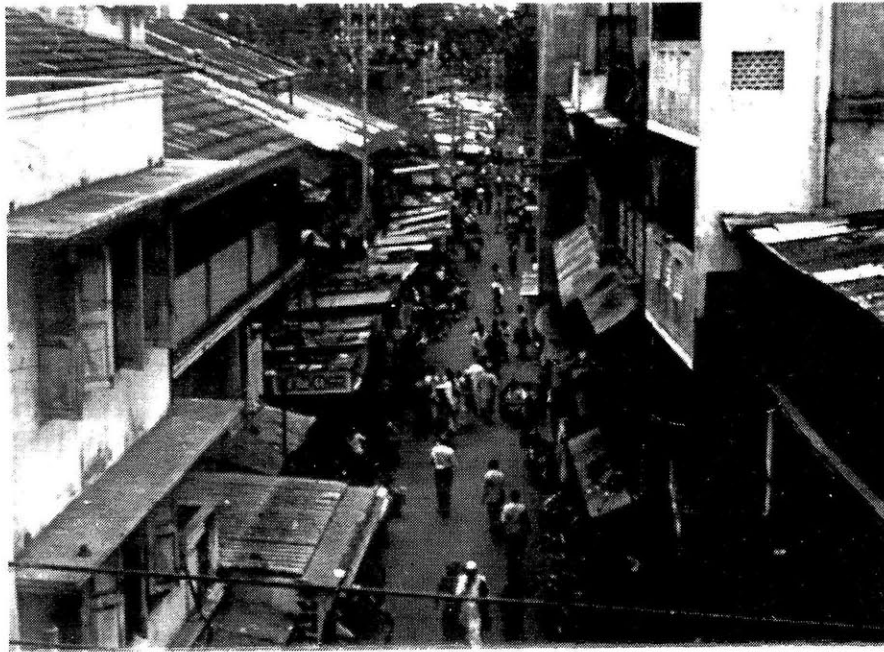
PHOTOGRAPHS (opposite page) VADODARA CITY

(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.



VADODARA, 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 net works. The city is characterized by its hot dry climate, summer temperatures going as high as 110° 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 Gupta period to the Muslim 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 1900 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.

PHOTOGRAPHS (opposite page) CITY CENTER, VADODARA
 (top left) The square with commercial activity along the main road. (bottom left) Secondary commercial street; residences over shops. (bottom right) Traffic congestion, a common sight in central areas.

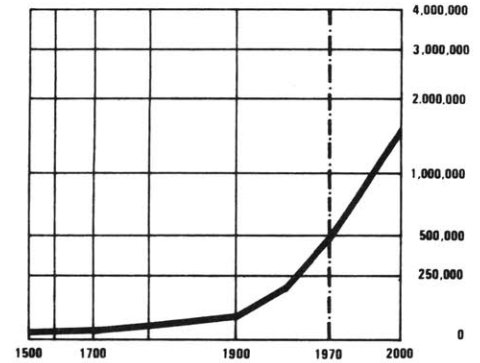
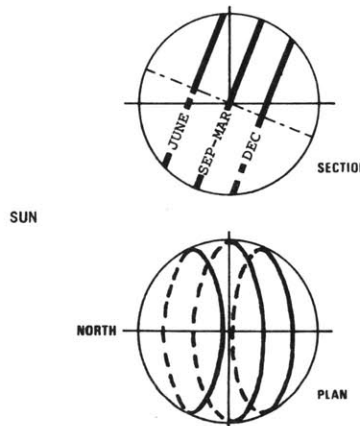
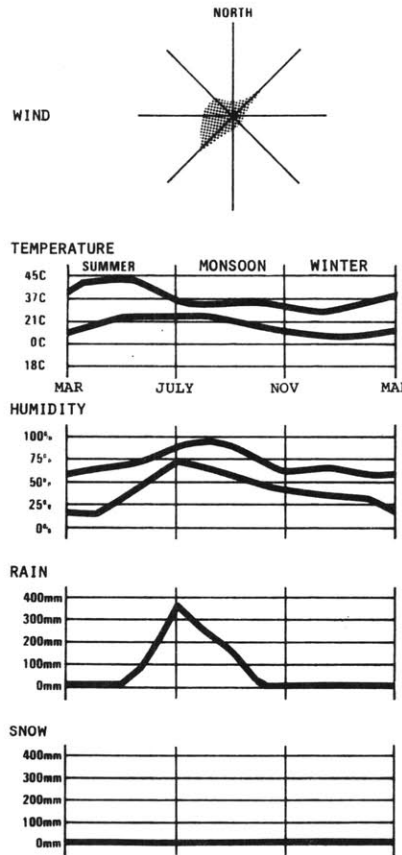
ECONOMY: Vadodara forms an important industrial/commercial and institutional centre in Gujarat. In addition to the large scale industries namely a fertilizer complex, petrochemical complex, oil refinery and others, Vadodara provides a base to 467 registered industries and a multitude of small scale and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

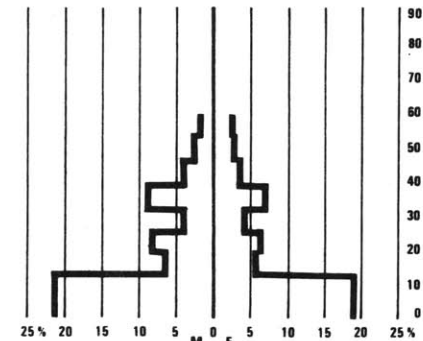
URBAN CONTEXT SOURCES

- Topography/Circulation:** (accurate) Vadodara Municipal Corporation, 1979.
- Land Use Pattern:** (approximate) Vadodara Municipal Corporation, 1979.
- CIPAL**
- Income Pattern:** (approximate) Field survey, V. Yagnik, 1979.
- Density Pattern:** (approximate) Vadodara Urban Development Authority, 1978.
- Climate:** (accurate) Census of India, Vadodara Urban Development Authority, 1978, Climatological and solar Data for India, 1969.
- Photographs:** Vijay Yagnik, 1978 & 1979.
- General Information:** Basic Plan for Baroda, vol. 1 & 2, Vadodara Municipal Corporation, 1978. Vadodara Urban Development Authority, 1979. O.R.G. reports, Vadodara, 1979.

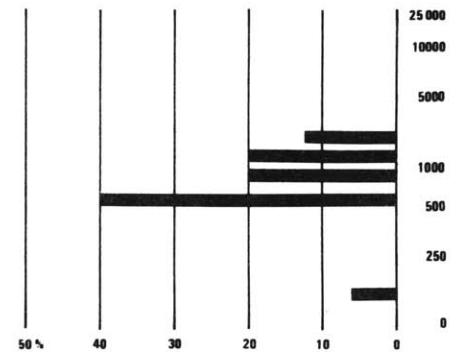
LATITUDE 22 18'



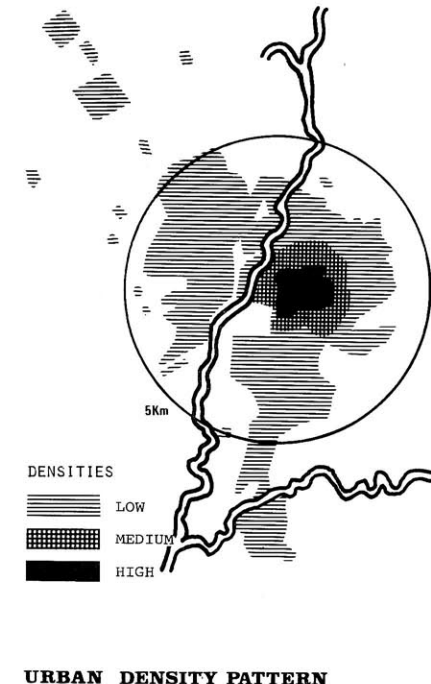
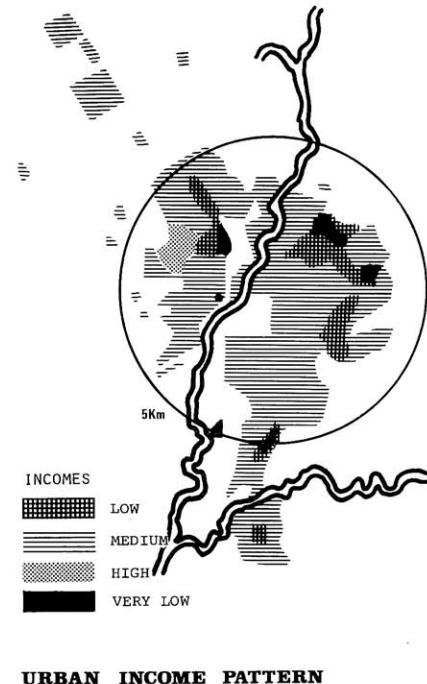
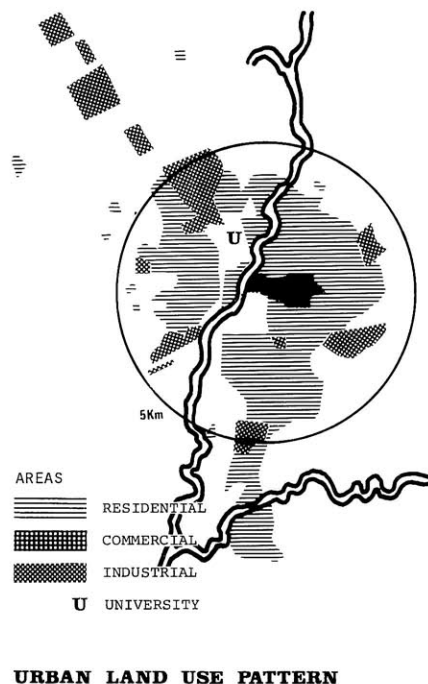
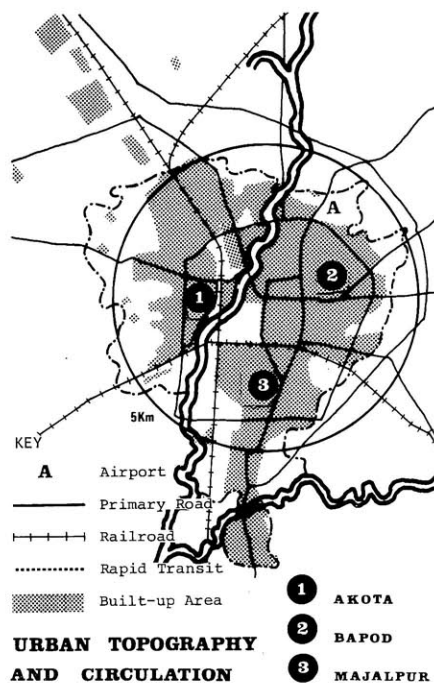
URBAN POPULATION GROWTH
 horizontal: dates vertical: population
 Source: 'Basic Plan for Baroda',
 Vadodara Municipal Corporation, 1976.



URBAN POPULATION DISTRIBUTION
 horizontal: percentages vertical: ages
 males: M females: F
 Source: 'Basic Plan for Baroda'
 Vadodara Municipal Corporation, 1976.



URBAN ANNUAL INCOME DISTRIBUTION
 horizontal: percentages vertical: dollars
 Source: (Approximate) Field survey, V. Yagnik, 1979.



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.

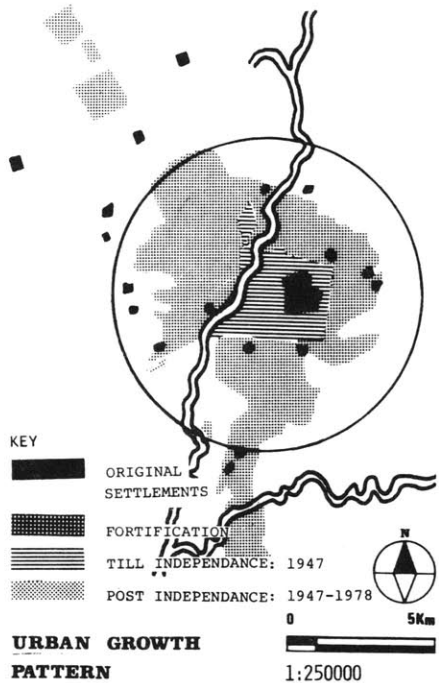
URBAN DEVELOPMENT: During the past seven decades, the population of the city has increased 4.5 times. The earliest comprehensive Development Plan was prepared in 1929 but was brought to effect, with significant modifications in March 1971. The municipal limits were extended in 1975 from 73.15 Km² to 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/underdeveloped. 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. 11% of the total population in the city live in 192 squatter settlements. About 41% of the population live in one room units. The occupancy rate is esti-

mated to be 2.4 persons/room. The percentage of people living in rental houses is 72%. 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 10% of the total housing stock. The following over view 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. Such developments were usually on rental basis. 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,



PHOTOGRAPH: WALLED CITY, VADODARA
The picture shows a traditional residential cluster in the walled city. The winding, dead-end accesses and courts provide spaces for semi-private use.

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 upto 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 semidetached/detached houses or walkups apartments. The Gujarat Co-operative Housing Finance Society, a government agency, provides loans with low interest.

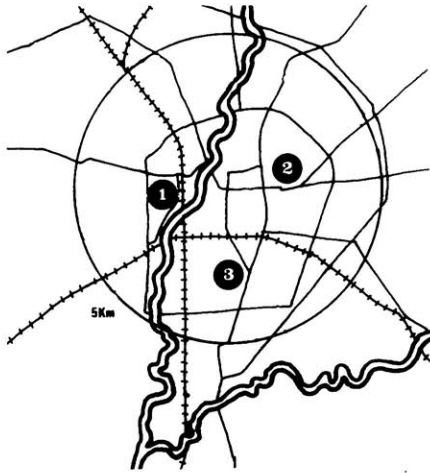
The municipal corporation, as a further incentive, bears a portion of the operational costs of 'internal' streets and basic infrastructure, on private cooperative land. The proportion of public contribution in Vadodara is 25% to 40%, while cooperative contribution is 60% to 75% of the total cost. The roads subsequently become public property. The cooperatives are the prevalent dwelling/land system occupying most of the developing areas in the city periphery. However, due to improper planning, the cooperatives grow haphazardly without any community facilities.

Public Housing: The Housing and Urban Developing 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.

CASE STUDIES

Vadodara



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 represented at four levels: Locality, Locality Segment, Locality Block and Typical Dwelling.

LOCALITY: The locality represents the existing situation of a relatively self-contained area. In the study it is confined within the limits of the declared Town Planning Scheme being implemented in the area.

LOCALITY SEGMENT: As all localities differ in size and shape, a representative segment of 400 meters by 400 meters is taken from each locality.

LOCALITY BLOCK: Within each locality segment, a residential block has been selected to allow comparison of land utilization (spatial patterns, densities and circulation). The blocks in almost all cases are bounded on all sides by public circulation.

TYPICAL DWELLING: A typical self contained unit for an individual, a family or a group is selected from the locality block.

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 north western 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 storey 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.

PHOTOGRAPHS (opposite page) CASE STUDIES
(top) Public housing, Bapod area; Plinth Quarters, row houses built in a combined mode of development; roof and plinth provided by the public sector while walls etc. built by self-help/artisans; GHB Housing, seen in the far left, consists of typical walkups built by the Gujarat Housing Board. Squatter settlements can be seen scattered throughout the area. (bottom left) Kalubhai Chawl, Akota; this tenement dwelling type is an accessible housing option for low income groups, mainly industrial workers. The picture shows a shared court on which domestic activities extend. (bottom right) Krishnapuri society; semi-detached houses built on collectively owned land. This dwelling system is proliferating in the expanding areas of the city.

2c BAPOD PLINTH QUARTERS

Public, Low income, Row units

These dwellings were built in a combined mode of development. The public sector provided the community with plinths and corrugated asbestos sheet roofs on wooden posts. The families constructed the walls and other elements by self-help or by hired artisans. Low income groups occupy this development.

3 MAJALPUR KRISHNAPURI SOCIETY

Private, M. 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.

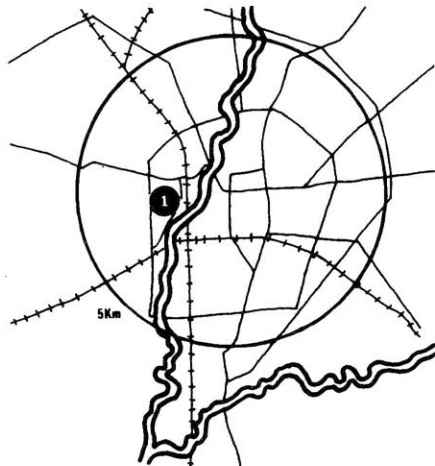


1 AKOTA

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 foothold 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 final 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 yet 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.

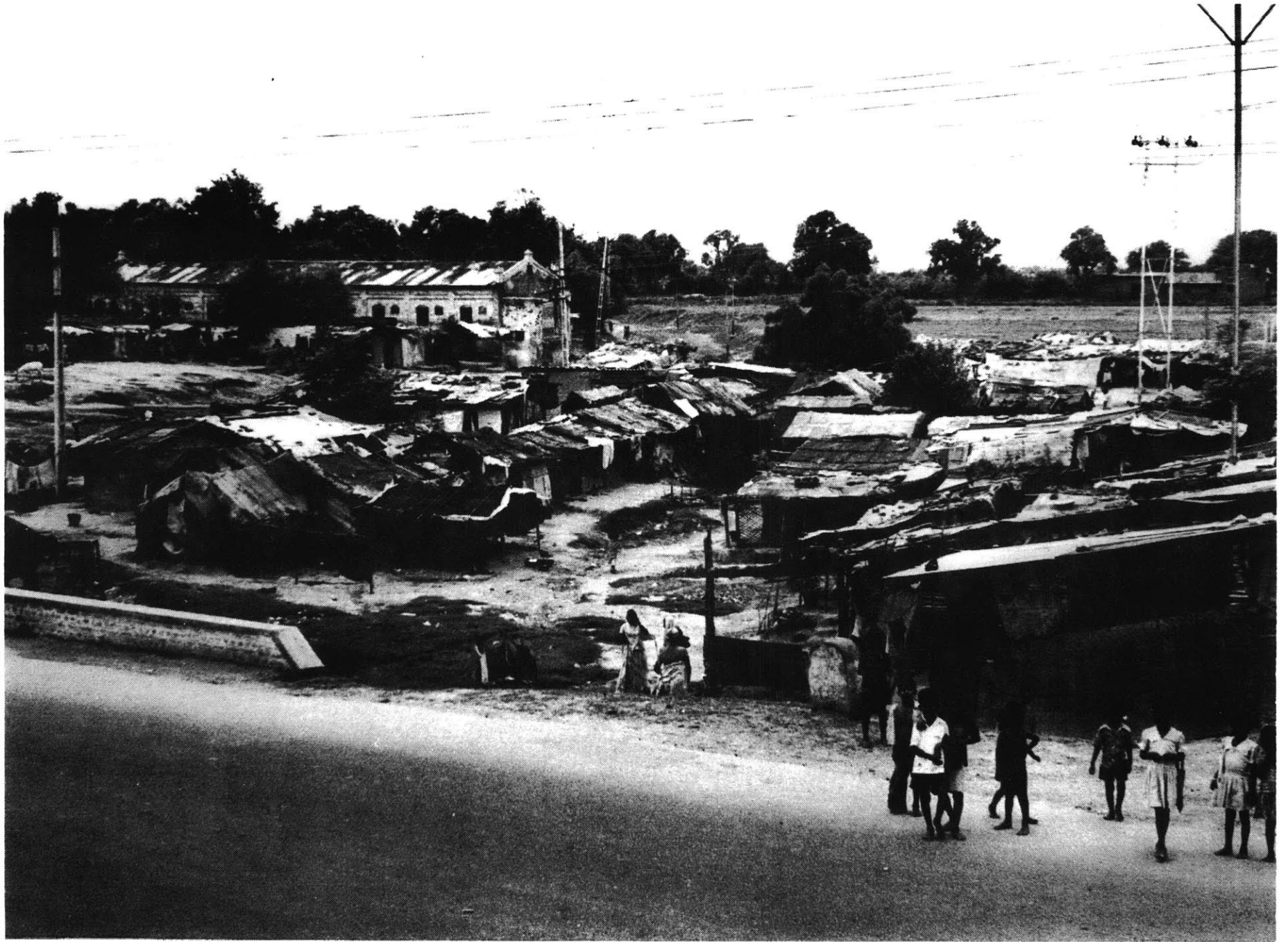
CIRCULATION: The new and old Padra Roads are the existing approach roads to the area. A third approach road is proposed that extends the existing road that links the two Padra Roads, to the city centre. The internal circulation pattern is haphazard and mostly pedestrian dominated. Most of the internal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

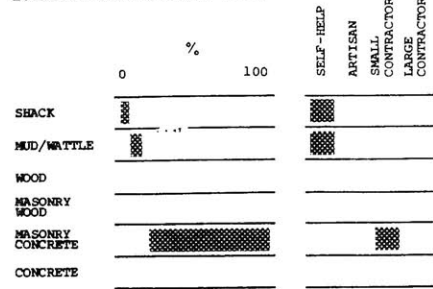
CASE STUDY SOURCES

Segment plan: (accurate) IBID
 Block land Utilization: (accurate) Field survey, Vijay Yagnik, 1979.
 Typical Dwelling: (approximate) IBID.
 Physical Data: (approximate) IBID.
 Socio-Economic Data: (approximate) IBID.
 Photographs: Vijay Yagnik, 1979.
 General Information: Field survey, Vijay Yagnik, 1979.

PHOTOGRAPH (opposite page) AKOTA AREA
 The picture shows the underdevelopment of the area. Except for the New Padara road, seen in the foreground, there are practically no paved roads. While electricity network is extensive, utilities such as water supply, sewage and storm drainage are inadequate. The squatter settlement seen in the picture, are located on public land intended for a municipal school. Kalumiya Chawl can be seen in the background.



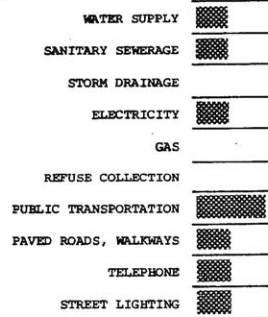
LOCALITY CONSTRUCTION TYPES



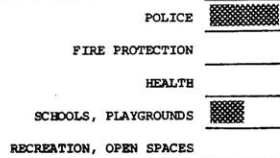
The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type.

Quality of information: approximate

LOCALITY UTILITIES AND SERVICES



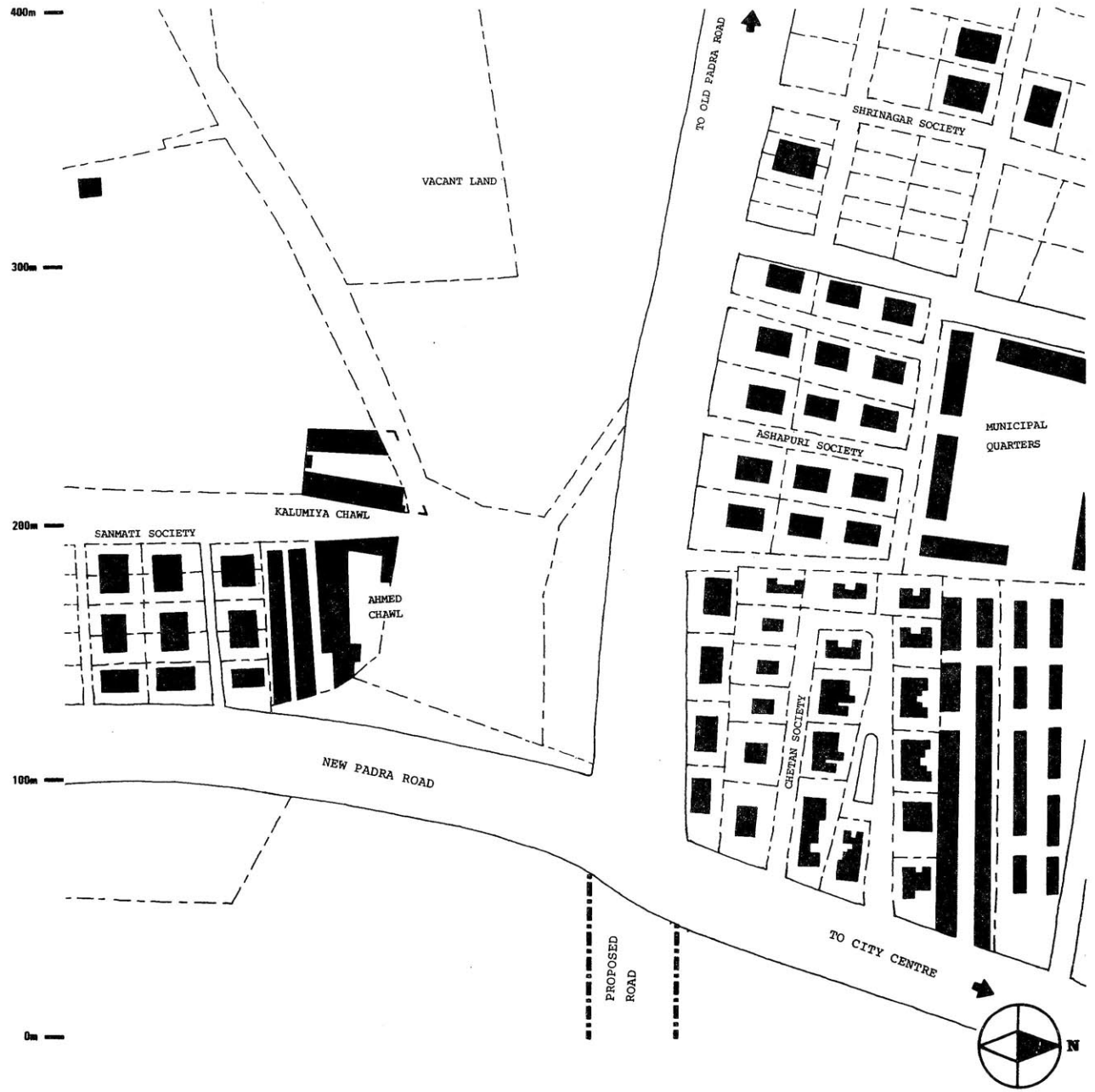
LOCALITY COMMUNITY FACILITIES



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

Quality of information: approximate

[] SELECTED BLOCK



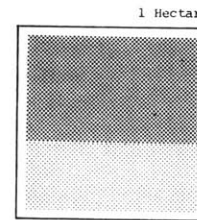
LOCALITY SEGMENT PLAN

1:2500

UTILIZATION DIAGRAMS

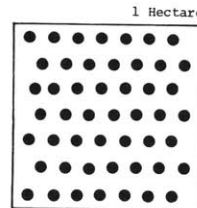


PATTERN



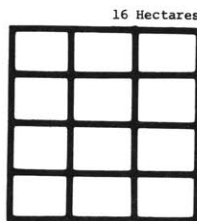
PERCENTAGES

Streets/Walkways	9
Playgrounds	
Cluster Courts	36
Dwellings/Lots	55



DENSITY

Persons/Hectare	982
● 20 Persons	



CIRCULATION EFFICIENCY

Unit Length	170
m/Ha	

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 make-shift 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 dwelling 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

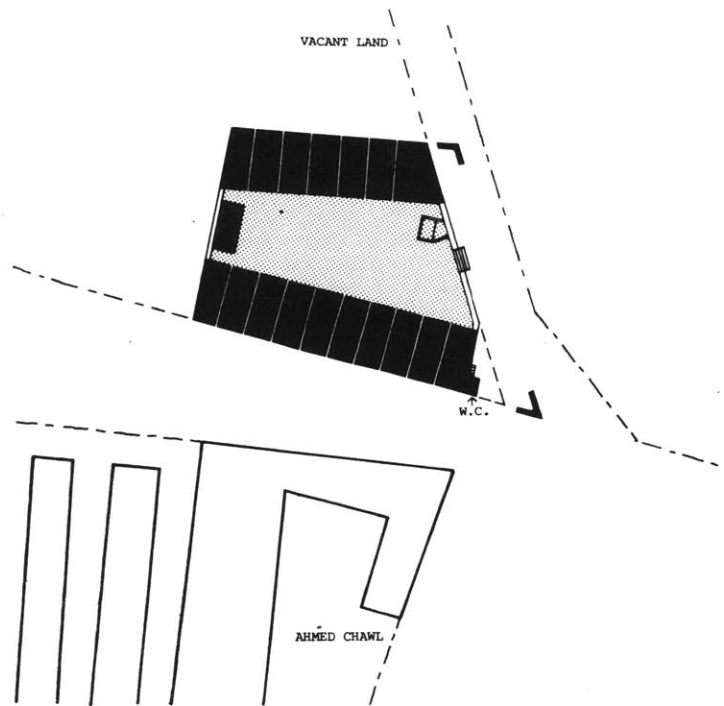
DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	18	0.11	164
DWELLING UNITS	18	0.11	164
PEOPLE	108	0.11	982

AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	0.01	9%
SEMI-PUBLIC (open spaces, schools, community centers)	-	-
PRIVATE (dwellings, shops, factories, lots)	0.06	55%
SEMI-PRIVATE (cluster courts)	0.04	36%
TOTAL	0.11	100%

NETWORK EFFICIENCY

Network length (streets, walkways) = 170 m/Ha
Areas served (total area)

LOTS
Average area, dimensions = 28.7 m²

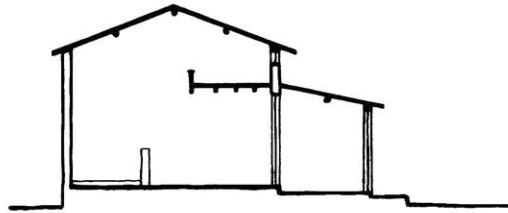


PATTERN

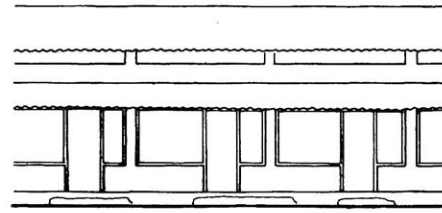
Public:	streets/walkways	
Semi-Public:	playgrounds	
Semi-Private:	cluster courts	
Private:	lots	
	dwellings	

LOCALITY BLOCK LAND UTILIZATION

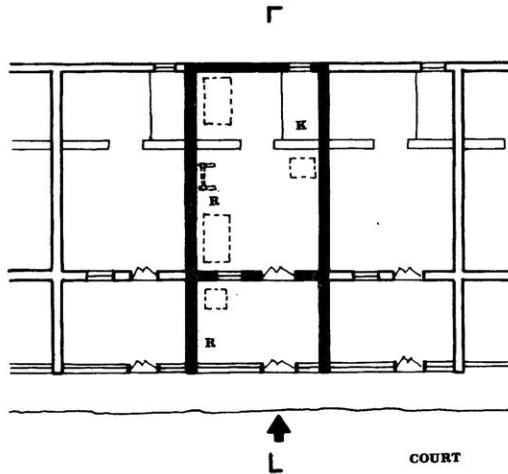




SECTION



ELEVATION



PLAN

COURT

KEY

- K Kitchen/Cooking Area
- R Room (multi-use)

PHYSICAL DATA
(related to dwelling and land)

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

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

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

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

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

DWELLING FACILITIES
 wc: 1 PER 18 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: -
 children: 4
 total: 8

MIGRATION PATTERN
 number of moves: 1
 rural - urban: 1940
 urban - urban: -
 urban - rural: -

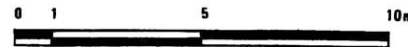
why came to urban area: EMPLOYMENT

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: 3%

PHOTOGRAPHS (opposite page) KALUMIYA 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.



1:200

TYPICAL DWELLING



2 BAPOD

a:Kishanwadi

POPULAR, VERY LOW/LOW INCOME, SQUATTERS

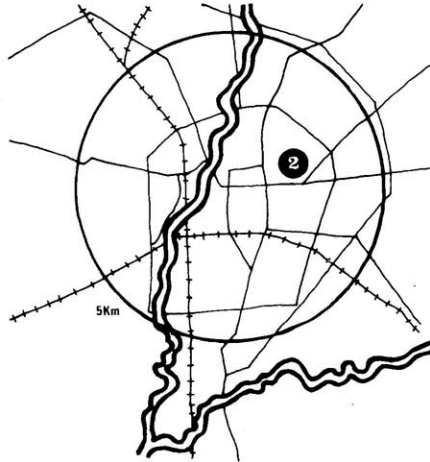
b:GHB Housing

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 zone. 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: In spite 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 trend 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 walk-ups 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 3000 shanties occupying about 5 hectares of land. Sporadic groups of small shops have emerged along Ajwa Road. Community facilities are non existent.

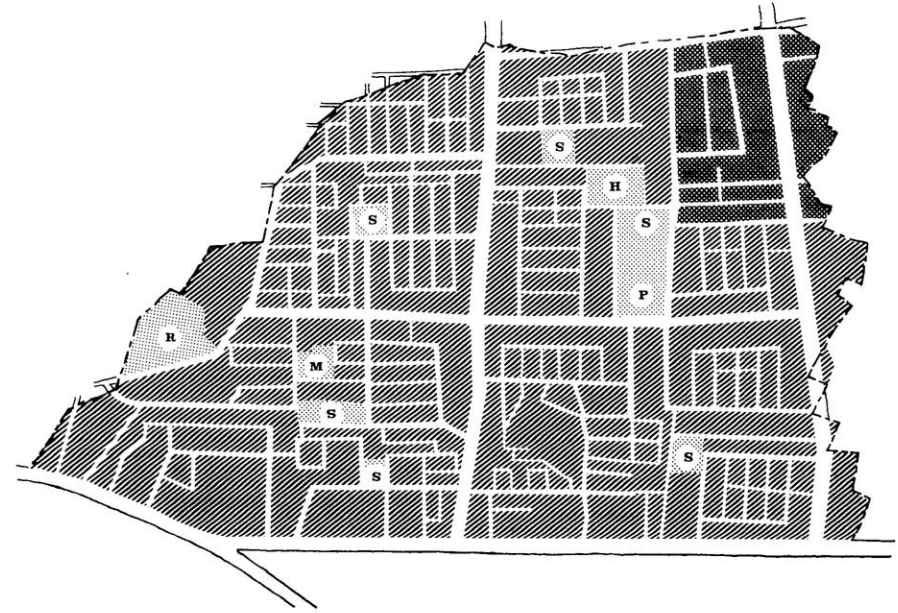
CIRCULATION: Ajawa road forms the primary approach from the city. Internal circulation is restricted to the developed parts of the area. Except for the streets within the Gujarat Housing Board development, most of the streets are unpaved.

POPULATION AND INCOME: About 20,000 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.

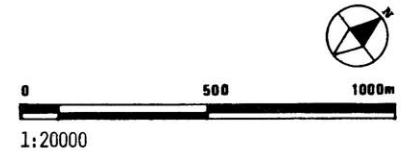
CASE STUDY SOURCES

plan: (approximate) Vadodara Municipal Corporation, Gujarat Slum Clearance Board, 1979.
 Segment plan: (approximate) IBID.
 Block land Utilization: (accurate) Field survey, Vijay Yagnik, 1979.
 Typical Dwelling: (approximate) IBID.
 Physical Data: (approximate) IBID.
 Socio-Economic Data: (approximate) IBID.
 Photographs: Vijay Yagnik, 1979.
 General Information: Field survey, Vijay Yagnik.




BAPOD: DECLARED TOWN PLANNING SCHEME 5, 1975



LAND USE PLAN



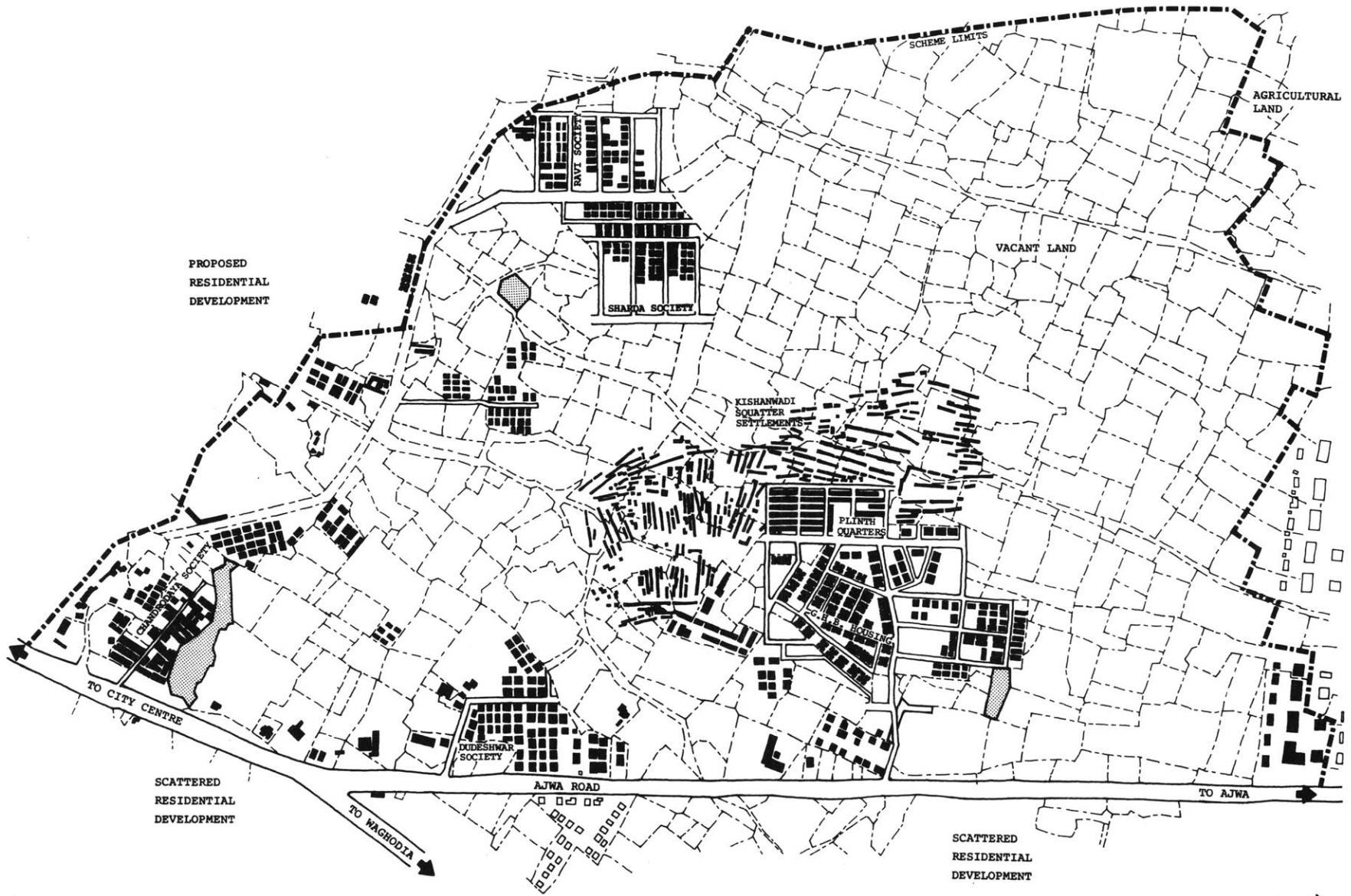
KEY
 S SCHOOLS
 P PARKS
 M MARKET
 H HEALTH
 R RECREATION

AREAS
 RESIDENTIAL
 INDUSTRIAL
 OPEN SPACES

LAND UTILIZATION		Hectares	percentages
			(1) (2) (3)
PUBLIC (Streets, walkways)	84	40	(16+24)
SEMI-PUBLIC (Schools, playgrounds)	24	12	
PRIVATE (Dwellings, lots)	102	48	[48
SEMI-PRIVATE (Cluster courts)			0
TOTAL	210	100%	

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

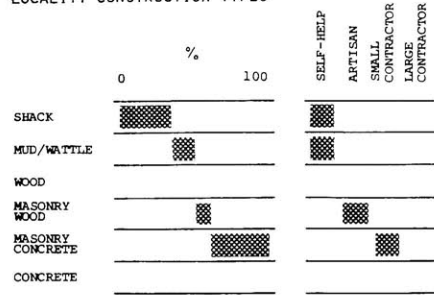
CIRCULATION RATIO
 Circulation length (streets) = 423 m/Ha
 Area served (total area)



LOCALITY PLAN



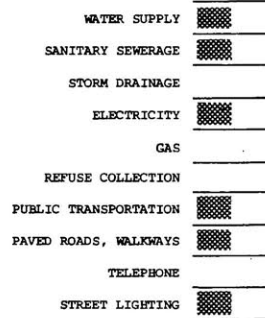
LOCALITY CONSTRUCTION TYPES



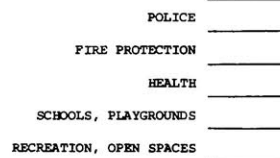
The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type.

Quality of information: approximate

LOCALITY UTILITIES AND SERVICES



LOCALITY COMMUNITY FACILITIES



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

Quality of information: approximate

SELECTED
 BLOCK



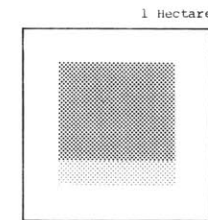
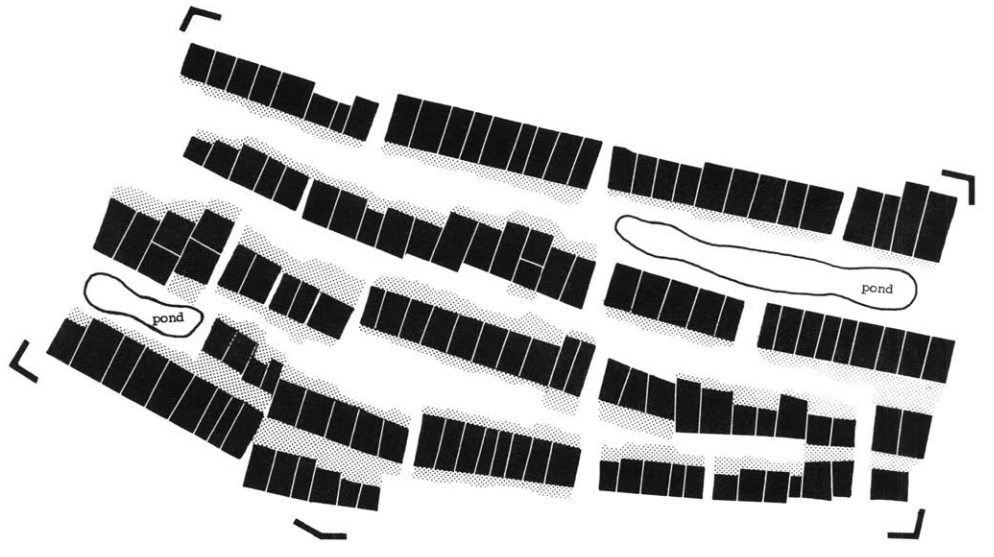
LOCALITY SEGMENT PLAN



UTILIZATION DIAGRAMS

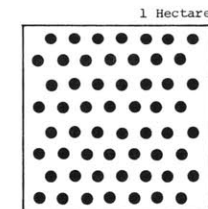


LOCALITY SEGMENT PLAN: The segment is representative of the existing developments in Bapod area. Two public housing projects, squatter settlements and a few cooperative societies occupy the area. The dwelling types include, shanties, row houses, walkups and few semidetached/detached units. The layout 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.



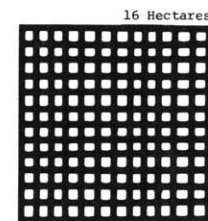
PERCENTAGES

Streets/Walkways	59
Playgrounds	8
Cluster Courts	8
Dwellings/Lots	33



DENSITY

Persons/Hectare	1094
● 20 Persons	1094



CIRCULATION EFFICIENCY

Unit Length	600
m/Ha	

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

DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	140	0.64	219
DWELLING UNITS	140	0.64	219
PEOPLE	700	0.64	1094

AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	0.38	59%
SEMI-PUBLIC (open spaces, schools, community centers)	-	-
PRIVATE (dwellings, shops, factories, lots)	0.21	33%
SEMI-PRIVATE (cluster courts)	0.05	8%
TOTAL	0.64	100%

NETWORK EFFICIENCY

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

LOTS

Average area, dimensions = 27 m²

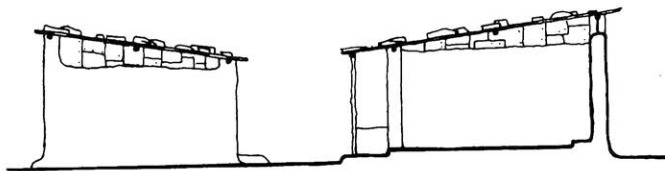
PATTERN

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

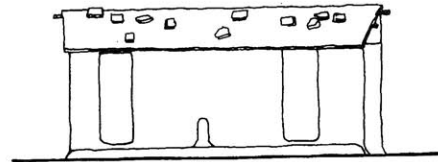


LOCALITY BLOCK LAND UTILIZATION - A

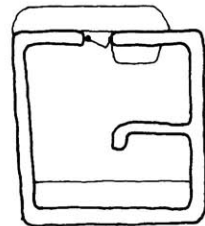
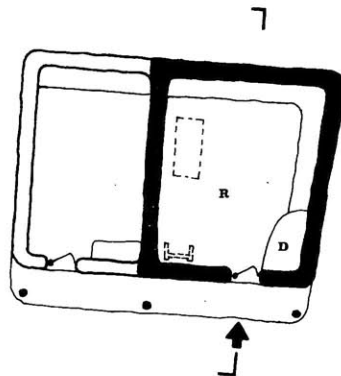
1:1000



SECTION



ELEVATION



PLAN

PHYSICAL DATA
(related to dwelling and land)

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
 floors: EARTH
 walls: MUD, RAW WOOD
 roof: CORRUGATED SHEETS

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

SOCIO-ECONOMIC DATA
(related to user)

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

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

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

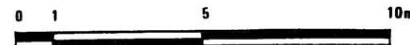
GENERAL: ECONOMIC
 user's income group: VERY LOW
 employment: CASUAL LABOUR
 distance to work: 2 KM
 mode of travel: WALKING/BUS

COSTS
 dwelling unit: -
 land - market value: -

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

KEY

D Dining/Eating Area
 R Room (multi-use)



1:200

PHOTOGRAPHS (opposite page) KISHANWADI, BAPOD
 (top) The view shows the expanse of squatter develop-
 ments, with utilities/facilities. (bottom left & right)
 Unpaved walkways are defined by shacks built out of
 salvaged materials. The physical conditions are
 worsened during moonsoons due to flooding.

TYPICAL DWELLING - A



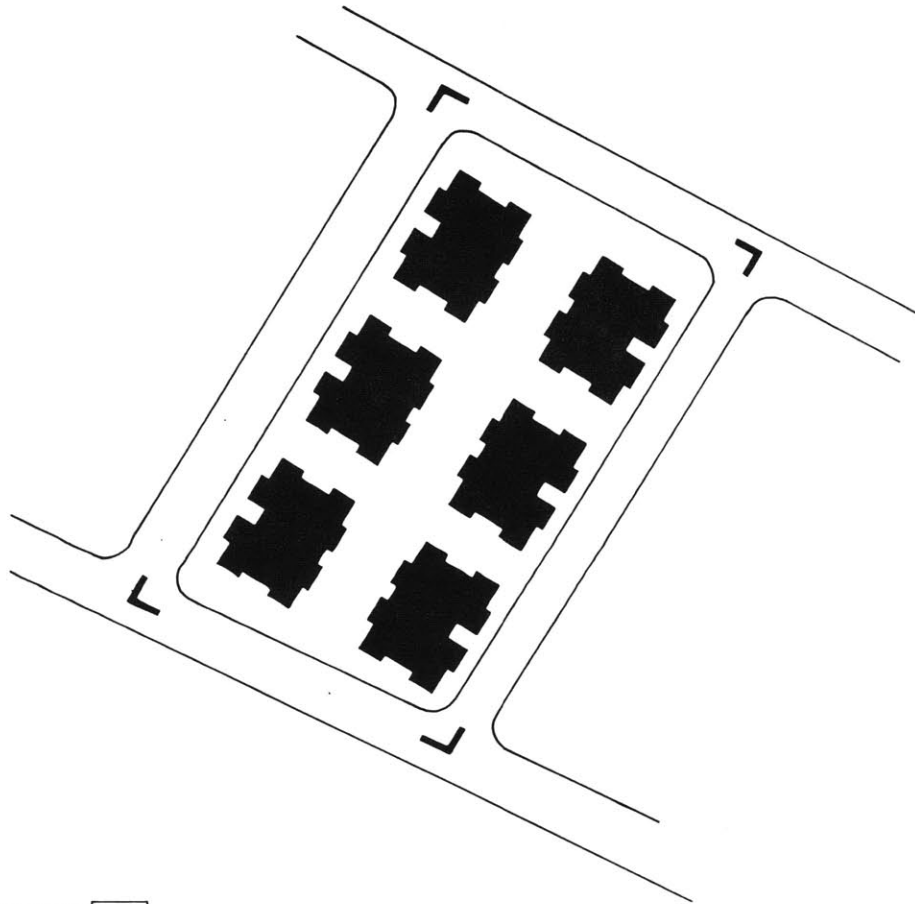


UTILIZATION DIAGRAMS



PHOTOGRAPH (opposite page) GHB HOUSING, BAPOD
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.

PATTERN



PATTERN

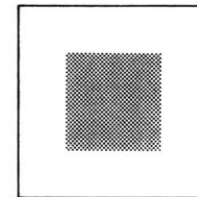
- Public: streets/walkways
- Semi-Public: playgrounds
- Semi-Private: cluster courts
- Private: lots
- dwellings

LOCALITY BLOCK LAND UTILIZATION - B



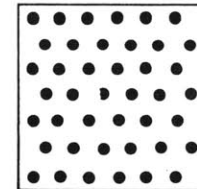
1:1000

1 Hectare



Streets/Walkways	75
Playgrounds	-
Cluster Courts	-
Dwellings/Lots	25

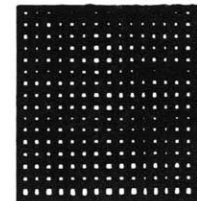
1 Hectare



DENSITY

Persons/Hectare	
● 20 Persons	850

16 Hectares



CIRCULATION EFFICIENCY

Unit Length m/Ha	763
---------------------	-----

LOCALITY BLOCK B: 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 w.c. 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	Total Number	Area Hectares	Density N/Ha
LOTS	-	-	-
DWELLING UNITS	72	0.39	180
PEOPLE	340	0.39	850

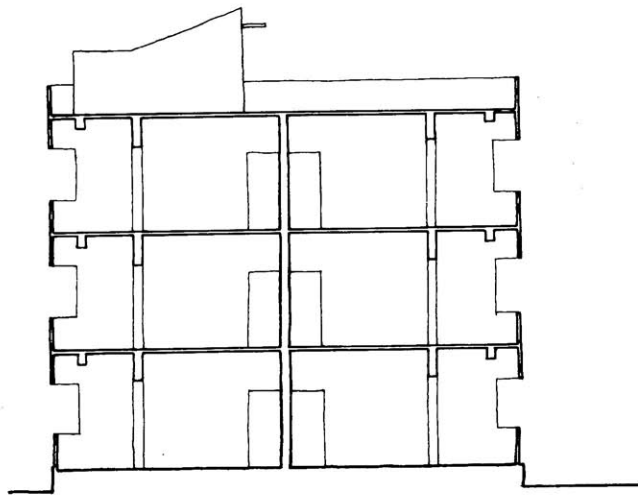
AREAS	Hectares	percentages
PUBLIC (streets, walkways, open spaces)	0.29	75%
SEMI-PUBLIC (open spaces, schools, community centers)	-	-
PRIVATE (dwellings, shops, factories, lots)	0.10	25%
SEMI-PRIVATE (cluster courts)	-	-
TOTAL	0.39	100%

NETWORK EFFICIENCY

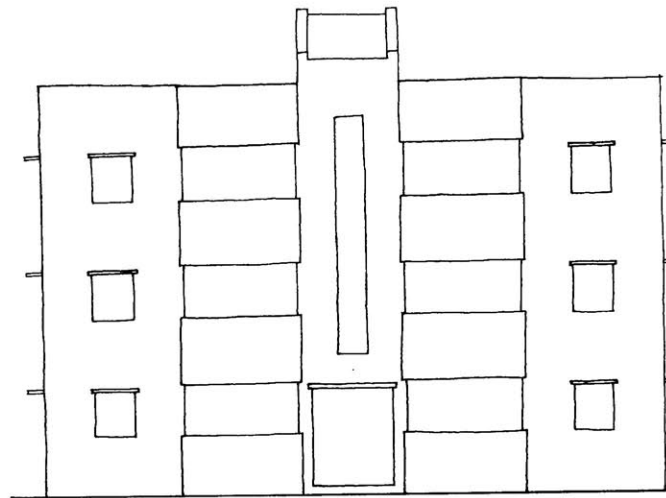
Network length (streets, walkways) = 763 m/Ha
Areas served (total area)

LOTS

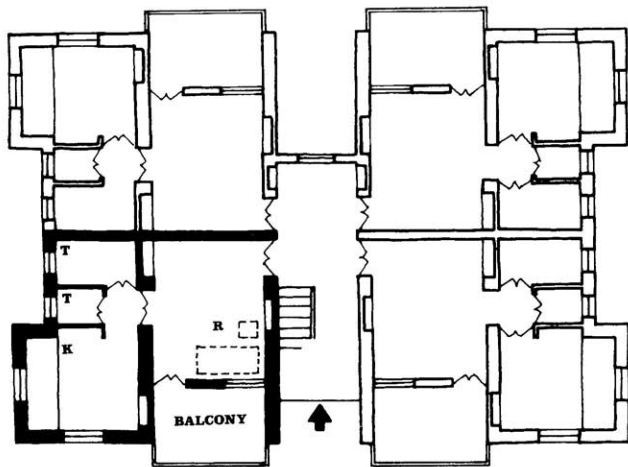
Average area, dimensions = -



SECTION



ELEVATION



PLAN

KEY

- K Kitchen/Cooking Area
- T Toilet/Bathroom
- R Room (multi-use)

PHYSICAL DATA
(related to dwelling and land)

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

LAND/LOT
 utilization: PUBLIC
 area (sq m): -
 tenure: LEGAL OWNERSHIP

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

DWELLING DEVELOPMENT
 mode: INSTANT
 developer: PUBLIC
 builder: LARGE CONTRACTOR
 construction type: MASONARY/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

SOCIO-ECONOMIC DATA
(related to user)

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

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

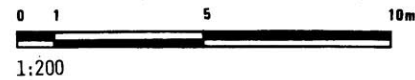
MIGRATION PATTERN
 number of moves: 2
 rural - urban: -
 urban - urban: 1960, 1966
 urban - rural: -
 why came to urban area: EMPLOYMENT

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
 % income for rent/mortgage: 12%

PHOTOGRAPHS (opposite page) GHB HOUSING, BAPOD
 (top & bottom left) Poor quality and design of
 utilities has caused deterioration of public areas.
 (bottom right) In spite of individual service connect-
 ions, water supply is inadequate. The picture shows a
 communal tap which also caters to squatters.



TYPICAL DWELLING - B



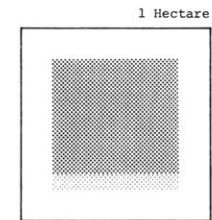
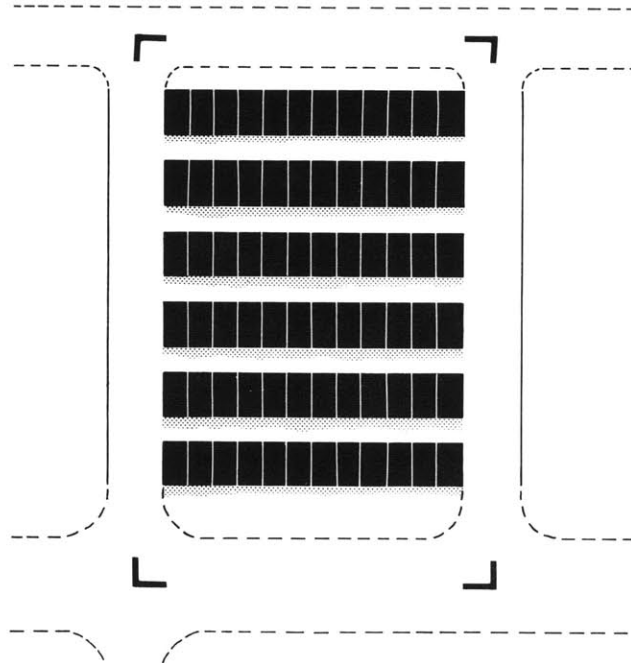


UTILIZATION DIAGRAMS



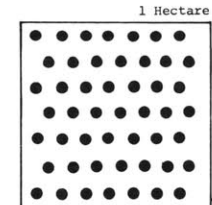
PATTERN

PHOTOGRAPHS (opposite page) PLINTH QUARTERS, BAPOD
 (top) A view of the development. The structure on the extreme left is the communal toilet.
 (bottom left) A small temple, such as this, serves the socio-cultural needs of the people and reflect the spontaneous nature of such functions.
 (bottom right) 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.



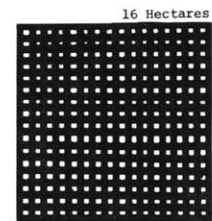
PERCENTAGES

Streets/Walkways	54
Playgrounds	6
Cluster Courts	40
Dwellings/Lots	40



DENSITY

persons/Hectare	
● 20 Persons	971



CIRCULATION EFFICIENCY

Unit Length 1021
 m/Ha

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 dwelling 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

	Total Number	Area Hectares	Density N/Ha
LOTS	72	0.35	206
DWELLING UNITS	72	0.35	206
PEOPLE	340	0.35	971

AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	0.19	54%
SEMI-PUBLIC (open spaces, schools, community centers)		
PRIVATE (dwellings, shops, factories, lots)	0.14	40%
SEMI-PRIVATE (cluster courts)	0.02	6%
TOTAL	0.35	100%

NETWORK EFFICIENCY

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

LOTS
 Average area, dimensions = 19 m²

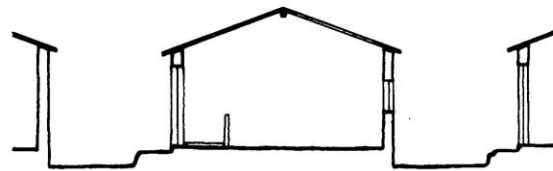
PATTERN

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

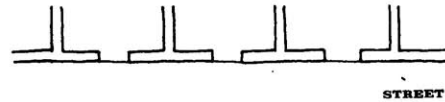


LOCALITY BLOCK LAND UTILIZATION - C

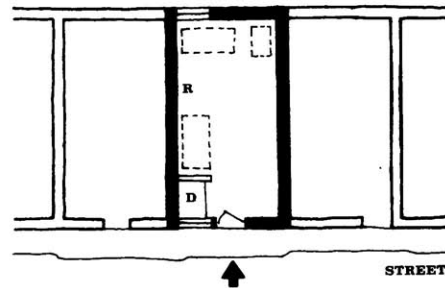
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SECTION

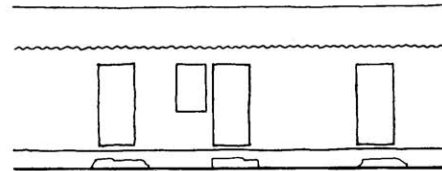


STREET



STREET

PLAN



ELEVATION

PHYSICAL DATA
(related to 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, MASONARY
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

SOCIO-ECONOMIC 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 - urban: -
urban - rural: -
why came to urban area: EMPLOYMENT

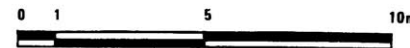
GENERAL: ECONOMIC
user's income group: LOW
employment: ENTREPRENEURIAL
distance to work: 2 KM
mode of travel: WALKING/BICYCLE

COSTS
dwelling unit: -
land - market value: -

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

KEY

D Dining/Eating Area
R Room (multi-use)



1:200

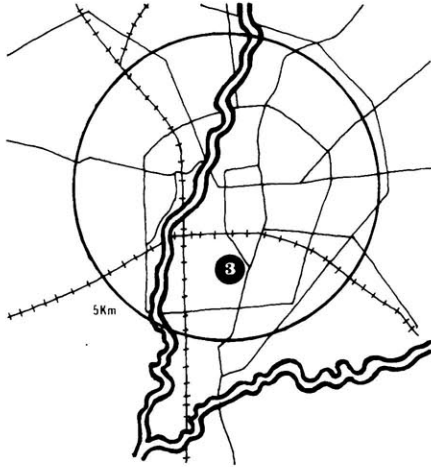
TYPICAL DWELLING - C

PHOTOGRAPH (opposite page) PLINTH QUARTERS, RAPOD
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 Dhabhoi. 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.

LAY OUT: The existing layout is haphazard as only 15% of the site, defined by the limits of the declared Town Planning Scheme-18 for the area, is developed. Resubdivision of agricultural land, into urban plots is taking place by way of sporadic cooperative societies, creating an irregular discontinuous layout. The other dwelling system on the site, though very few in number, is the 'chawl' or tenement. Squatter settlements can be found in small groups on some of the vacant land.

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.

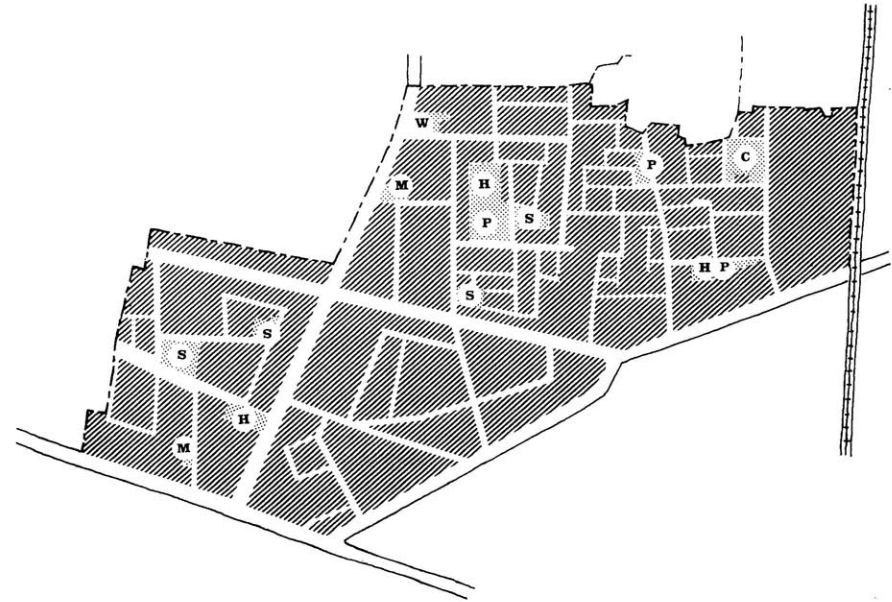
CIRCULATION: External circulation comprises of the National Highway No.8 which leads to the city centre. The internal circulation is characterized by streets within cooperative societies. Due to unplanned progressive development, the internal streets are unaligned. The Municipal Corporation subsidizes 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 'Chawls' or tenements.

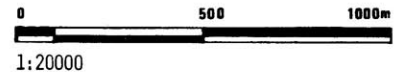
CASE STUDY SOURCES

- Plan: (accurate) Vadodara Municipal Corporation, 1979.
- Segment plan: (accurate) IBID
- Block Land Utilization: (accurate) Field survey, Vijay Yagnik, 1979.
- Typical Dwelling: (approximate) IBID.
- Physical Data: (approximate) IBID.
- Socio-Economic Data: (approximate) IBID.
- Photographs: Vijay Yagnik, 1979.
- General Information: Field survey, Vijay Yagnik, 1979.

MAJALPUR: DECLARED TOWN PLANNING SCHEME 18, 1974



LAND USE PLAN



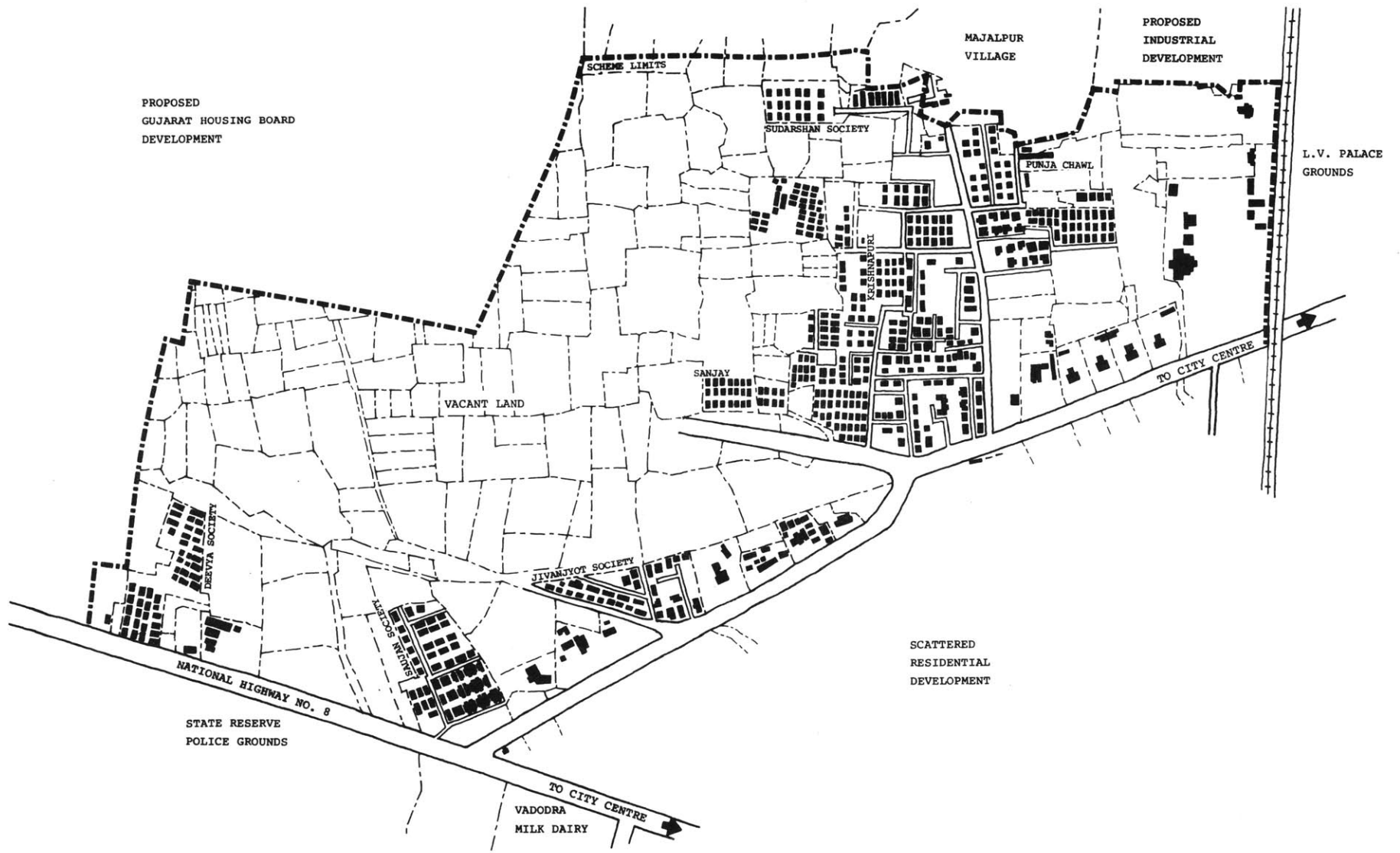
- KEY**
- S SCHOOLS
 - P PARKS
 - M MARKET
 - H HEALTH
 - C COMMUNITY CENTER
 - W WARD OFFICE

- AREAS**
- RESIDENTIAL
 - INDUSTRIAL
 - OPEN SPACES

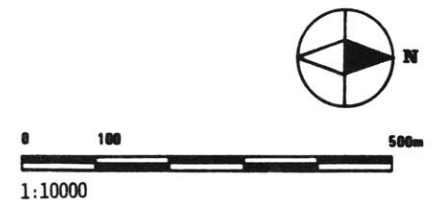
LAND UTILIZATION	Hectares percentages	
	(1)	(2) (3)
PUBLIC (Streets, walkways)	70	52 (33+19)
SEMI-PUBLIC (Schools, playgrounds)	14	7
PRIVATE (Dwellings, lots)	106	41 { 41 0
SEMI-PRIVATE (Cluster courts)		
TOTAL	190	100%

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

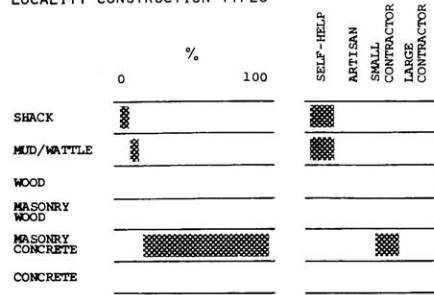
CIRCULATION RATIO
 Circulation length (streets) / Area served (total area) = 549 m/Ha



LOCALITY PLAN



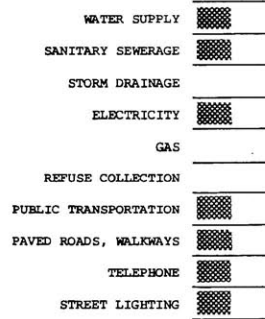
LOCALITY CONSTRUCTION TYPES



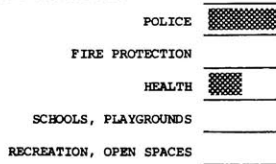
The chart shows (1) approximate percentage of each construction type within the total number of dwellings, and (2) building group that generally produces each type.

Quality of information: approximate

LOCALITY UTILITIES AND SERVICES



LOCALITY COMMUNITY FACILITIES



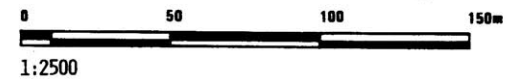
The chart illustrates the approximate availability of utilities, services, and community facilities at three levels: NONE, LIMITED, ADEQUATE.

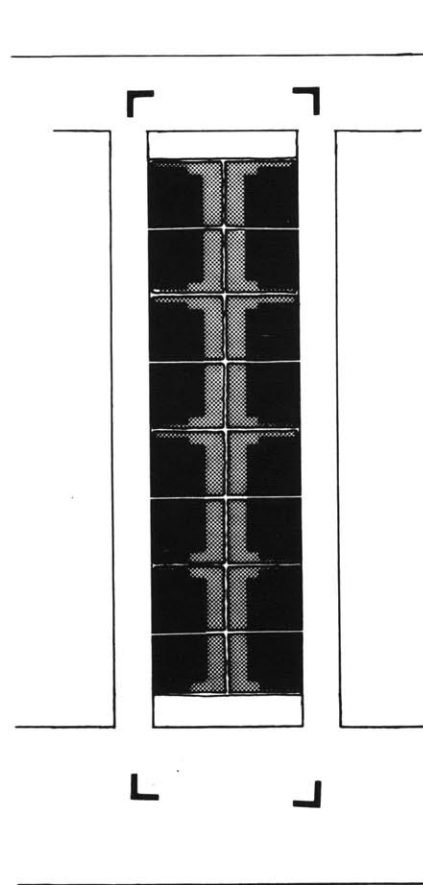
Quality of information: approximate

[] SELECTED BLOCK



LOCALITY SEGMENT PLAN

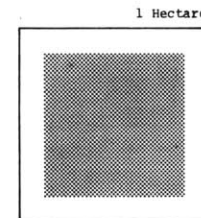




UTILIZATION DIAGRAMS

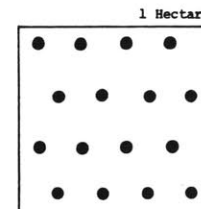


PATTERN



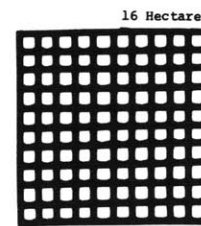
PERCENTAGES

Streets/Walkways	42
Playgrounds	
Cluster Courts	
Dwellings/Lots	58



DENSITY

Persons/Hectare	333
● 20 Persons	333



CIRCULATION EFFICIENCY

Unit Length	506
m/Ha	

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 squate 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

DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	16	0.24	67
DWELLING UNITS	16	0.24	67
PEOPLE	80	0.24	333

AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	0.10	42%
SEMI-PUBLIC (open spaces, schools, community centers)	-	-
PRIVATE (dwellings, shops, factories, lots)	0.14	58%
SEMI-PRIVATE (cluster courts)	-	-
TOTAL	0.24	100%

NETWORK EFFICIENCY

Network length (streets, walkways) = 506 m/Ha
 Areas served (total area)

LOTS

Average area, dimensions = 87.5 m²

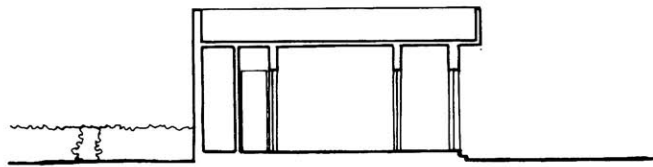
PATTERN

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

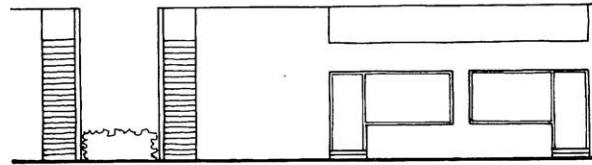


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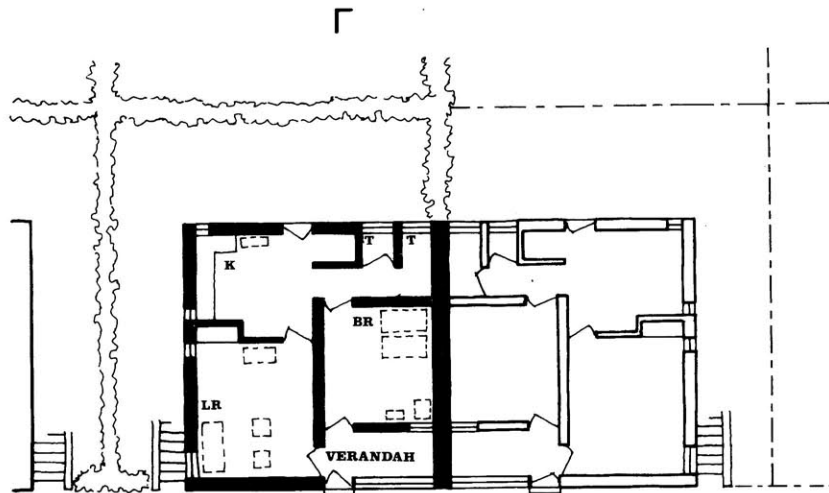
LOCALITY BLOCK LAND UTILIZATION



SECTION



ELEVATION



PLAN

STREET

KEY

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

PHYSICAL DATA
(related to dwelling and land)

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

LAND/LOT
 utilization: PRIVATE
 area (sq m): 87.5
 tenure: LEGAL OWNERSHIP

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

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

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

DWELLING FACILITIES
 wc: 1
 shower: 1
 kitchen: 1
 rooms: 2
 other: VERANDAH

SOCIO-ECONOMIC DATA
(related to user)

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

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

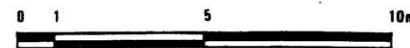
MIGRATION PATTERN
 number of moves: 2
 rural - urban: 1940
 urban - urban: 1962
 urban - rural: -
 why came to urban area: BUSINESS

GENERAL: 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: -

DWELLING UNIT PAYMENTS
 financing: COOPERATIVE LOANS
 rent/mortgage: US \$ 15.7/MONTH
 % income for rent/mortgage: 15%

PHOTOGRAPHS (opposite page) KRISHNAPURI SOCIETY, NAJALPUR
 (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-utilization of urban land. (bottom) The access streets become thoroughfares, and are not conducive to social and physical control. Note grills on verandahs.

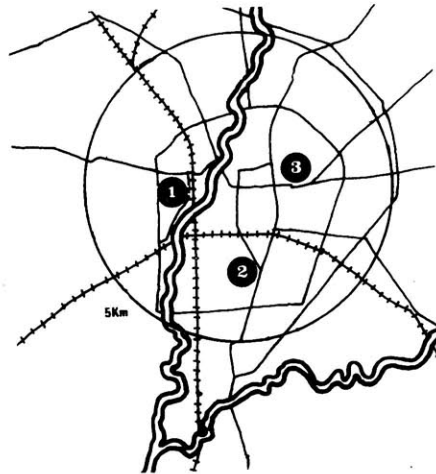


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LAND UTILIZATION SUMMARY

PATTERNS, PERCENTAGES, DENSITIES, 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 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/controls 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-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.

CASE STUDIES

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.

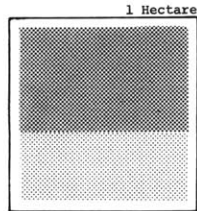
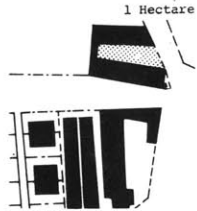
CIRCULATION EFFICIENCY

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

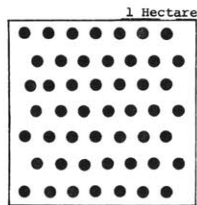
**1 AKOTA
KALUMIYA CHAWL**

Private, Low income, Tenements

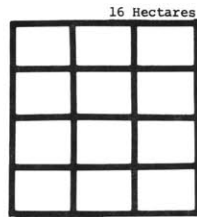
Low percentage of land for streets. Adequate land for lots. Semi-private land, a positive element. High density.



Streets/Walkways 9%
Playgrounds --
Cluster Courts 36
Dwellings/Lots 55



Persons/Hectare
● 20 Persons 982

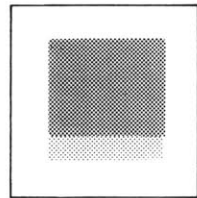
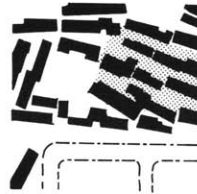


Unit Length 170
m/Ha

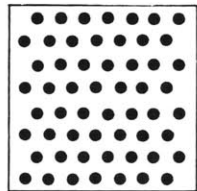
**2a BAPOD
KISHANWADI**

Popular, Low income, Squatter

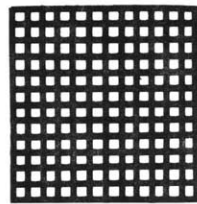
Percentage of land for streets not actual representation of utilization due to undefined lot lines. Low private area.



Streets/Walkways 59%
Playgrounds --
Cluster Courts 8
Dwellings/Lots 33



Persons/Hectare
● 20 Persons 1094

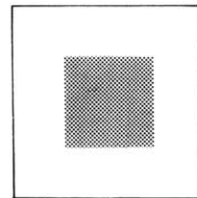
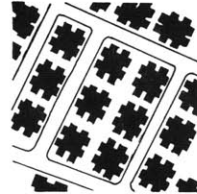


Unit Length 600
m/Ha

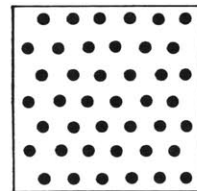
**2b BAPOD
GHB HOUSING**

Public, Middle income, Walkups

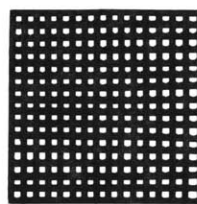
Very high percentage of public land, low percentage of private land. Wasteful layout, undefined controls/responsibility.



Streets/Walkways 75%
Playgrounds --
Cluster Courts 6
Dwellings/Lots 25



Persons/Hectare
● 20 Persons 850

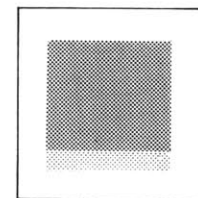


Unit Length 763
m/Ha

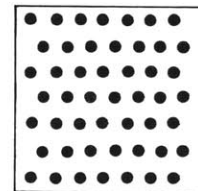
**2c BAPOD
PLINTH QUARTERS**

Public, Low income, Row units

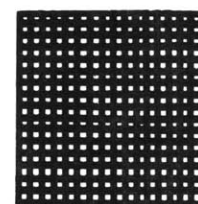
High percentage of public land and excessive circulation length/Ha. High density



Streets/Walkways 54%
Playgrounds --
Cluster Courts 6
Dwellings/Lots 40



Persons/Hectare
● 20 Persons 971

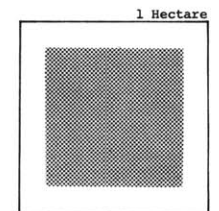
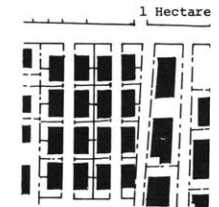


Unit Length 1021
m/Ha

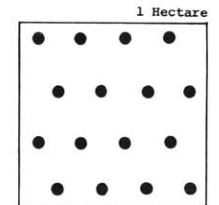
**3 MAJALPUR
KRISHNAPURI SOC.**

Private, M. income, semi-detached houses

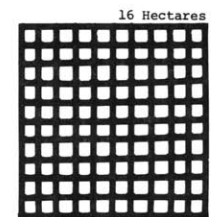
High percentage of public areas for circulation. Low percentage of private areas. Low density.



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



Persons/Hectare
● 20 Persons 333



Unit Length 506
m/Ha

GLOSSARY

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

DWELLING BUILDER. Four groups are considered: SELF-HELP BUILT: where the dwelling unit is directly built by the user or occupant; ARTISAN BUILT: where the dwelling unit is totally or partially built by a skilled craftsman hired by the user or occupant; payments can be monetary or an exchange of services; SMALL CONTRACTOR BUILT: where the dwelling unit is totally built by a small organization hired by the user, occupant, or developer; 'small' contractor is defined by the scale of operations, financially and materially; the scale being limited to the construction of single dwelling units or single complexes; LARGE CONTRACTOR BUILT: where the dwelling unit is totally built by a large organization hired by a developer; 'large' contractor is defined by the scale of operations, financially and materially; the scale reflects a more comprehensive and larger size of operations encompassing the building of large quantities of similar units, or a singularly large complex. (U.S.D.P.)

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

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

TOR: the government or non-profit organizations involved in the provision of dwellings. The housing process (promotion, financing, construction, operation) is carried out by the Public Sector for service (non-profit or subsidized housing). **PRIVATE SECTOR:** the individuals, groups or societies, who have access to the formal financial, administrative, legal, technical institutions in the provision of dwellings. The housing process (promotion, financing, construction, operation) is carried out by the Private Sector for profit. (U.S.D.P.)

DWELLING DEVELOPMENT MODE. Two modes are considered: **PROGRESSIVE:** the construction of the dwelling and the development of the local infrastructure to modern standards by stages, often starting with provisional structures and underdeveloped land. This essentially traditional procedure is generally practiced by squatters with de facto security of tenure and an adequate building site. **INSTANT:** the formal development procedure in which all structures and services are completed before occupation. (U.S.D.P.)

DWELLING FLOORS. The following numbers are considered: **ONE:** single story; generally associated with detached, semi-detached and row/group dwelling types. **TWO:** double story; generally associated with detached, semi-detached and row/group dwelling types. **THREE OR MORE:** generally associated with walk-up and high-rise dwelling types. (U.S.D.P.)

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

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

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

DWELLING PHYSICAL STATE. A qualitative evaluation of the physical condition of the dwelling types: room, apartment, house; the shanty unit is not evaluated. **BAD:** generally poor state of structural stability, weather protection, and maintenance. **FAIR:** generally acceptable state of structural stability, weather protection, and maintenance with some deviation. **GOOD:** generally acceptable state of structural stability, weather protection, and maintenance without deviation. (U.S.D.P.)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Webster, 1971)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

- occupied by a railroad, the land used by a public utility. Rights-of-way may be shared (as streets; pedestrians and automobiles) or exclusive (as rapid transit routes; subways, railroads, etc.) (Merriam-Webster, 1971; U.S.D.P.)
- ROADWAY (HIGHWAY).** Portion of the highway included between the outside lines of gutter or side ditches, including all slopes, ditches, channels, and appurtenances necessary to proper drainage, protection, and use. (DePina, 1972)
- ROW/GROUPED HOUSING.** Dwelling units grouped together linearly or in clusters. (U.S.D.P.)
- RUNOFF.** That part of precipitation carried off from the area upon which it falls. (DePina, 1972)
- RUNOFF-RAINFALL RATIO.** The percentage (ratio) of stormwater runoff that is not reduced by evaporation, depression storage, surface wetting, and percolation; with increased rainfall duration, runoff-rainfall ratios rise increasing runoff flow. (U.S.D.P.)
- SAND.** Loose, distinguishable grains of quartz/feldspar, mica (ranging from 2mm to 0.02mm in diameter). (U.S.D.P.)
- SANITARY SEWERAGE.** The system of artificial usually subterranean conduits to carry off sewage composed of: *excreta*: waste matter eliminated from the human body; *domestic wastes*: used water from a home/community containing 0.1% total solids; and some *industrial wastes*, but not water from ground, surface, or storm. (U.S.D.P.)
- SEMI-DETACHED DWELLING.** Two dwelling units sharing a common wall (duplex). (U.S.D.P.)
- SEPTIC TANK.** A tank in which the organic solid matter of continuously flowing sewage is deposited and retained until it has been disintegrated by anaerobic bacteria. (Merriam-Webster, 1971)
- SERIES CIRCUIT.** Fixtures connected in a circuit by a single wire. When one fixture is out, the circuit is broken. Fixtures with different amperages cannot be used efficiently in the same circuit. (ROTC ST 45-7, 1953)
- SETTLEMENT.** Occupation by settlers to establish a residence or colony. (U.S.D.P.)
- SEWAGE.** The effluent in a sewer network. (U.S.D.P.)
- SEWER.** The conduit in a subterranean network used to carry off water and waste matter. (U.S.D.P.)
- SEWER BUILDING CONNECTION.** The pipe connecting the dwelling with the sewer network. (U.S.D.P.)
- SEWERAGE.** Sewerage system: the system of sewers in a city, town or locality. (Merriam-Webster, 1971)
- SHAPE.** Form/configuration of the site surface as defined by its perimeter/boundaries. (U.S.D.P.)
- SHOPPING.** (Facilities for) searching for, inspecting, or buying available goods or services. (U.S.D.P.)
- SILT.** Loose, unconsolidated sedimentary rock particles (ranging from 0.02mm to 0.002mm in diameter). (U.S.D.P.)
- SITE.** Land (that could be) made suitable for building purposes by dividing into lots, laying out streets and providing facilities. (Merriam-Webster, 1971)
- SITE AREAS.** Two types are considered: *GROSS AREA*: includes the whole site or the bounded piece of ground. *USABLE AREA*: includes only the portion of the site that can be fully utilized for buildings, streets, playgrounds, recreation facilities, gardens, or other structures. (U.S.D.P.)
- SITE AND SERVICES.** The subdivision of urban land and the provision of services for residential use and complementary commercial use. Site and services projects are aimed to improve the housing conditions for the low income groups of the population by providing: a) *SITE*: the access to a piece of land where people can build their own dwellings; b) *SERVICES*: the opportunity of access to employment, utilities, services and community facilities, financing and communications. (U.S.D.P.)
- SIZE.** Physical magnitude or extent (of the site), relative or proportionate dimensions (of the site). (Merriam-Webster, 1971)
- SLOPE.** Degree or extent of deviation (of the land surface) from the horizontal. (Merriam-Webster, 1971)
- SMOKE.** The gaseous products of burning carbonaceous materials made visible by the presence of carbon particles. (Merriam-Webster, 1971)
- SOIL.** Soil structure: the arrangement of soil particles in various aggregates differing in shape, size, stability, and degree of adhesion to one another. (Merriam-Webster, 1971)
- SOIL INVESTIGATION.** It is the process to find the soil structure and other characteristics. It may include the following stages: initial soil survey, exploratory boring, construction boring. (U.S.D.P.)
- SOIL PIPE.** The pipe in a dwelling which carries the pipe discharge from water closets. (U.S.D.P.)
- SOIL SURVEY (INITIAL).** An on-site examination of surface soil conditions and reference to a *GENERAL SOIL MAP*. It is used to reveal obvious limitations/restrictions/hazards for early planning consideration. (U.S.D.P.)
- STACK.** The vertical pipe in a dwelling of the soil-, waste-, or vent-pipe systems. (ROTC ST 45-7, 1953)
- STANDARD.** 1) Something that is established by authority, custom or general consent as a model or example to be followed. 2) Something that is set up and established by authority as a rule for the measure of quantity, weight, extent, value or quality. (Merriam-Webster, 1971)
- STANDPIPE.** A pipe riser with tap used as a source of water for domestic purposes. (HUD/AID, Minimum Standards, 1966)
- STORM DRAINAGE.** Storm sewer: a sewer (system) designed to carry water wastes except sewage (exclusively storm water, surface runoff, or street wash). (Merriam-Webster, 1971)
- STREET LIGHTING.** Illumination to improve vision at night for security and for the extension of activities. (U.S.D.P.)
- SUBDIVISION REGULATIONS.** Regulations governing the development of raw land for residential or other purposes. (Abrams, 1972)
- SUBGRADE.** The layer of natural soil or fill (compacted soil) upon which the pavement structure including curbs is constructed. (DePina, 1972)
- SUBMAIN OR BRANCH SEWER.** A collector pipe receiving sewage from lateral sewer only. (U.S.D.P.)
- SUBSISTENCE INCOME.** The minimum amount of money required for the purchase of food and fuel for an average family to survive. (U.S.D.P.)
- SULLAGE.** Drainage or refuse especially from a house, farmyard, or street. (Merriam-Webster, 1971)
- TAP (also FAUCET).** A fixture for drawing a liquid from a pipe, cask, or other vessel. (Merriam-Webster, 1971)
- TAX EXEMPTION.** A grant by a government of immunity from taxes: (a ten-year tax exemption on new housing in New York stimulated new construction in the 1920's; to ease its housing shortage, Turkey granted a ten-year tax exemption on new buildings). (Abrams, 1966)
- TAX INCENTIVE.** Favorable tax treatment to induce the beneficiary to do something he would not otherwise be likely to do. (U.S.D.P.)
- TAX STRUCTURE - TAXATION.** The method by which a nation (state, municipality) implements decisions to transfer resources from the private sector to the public sector. (U.S.D.P.)
- TELEPHONE.** An electrical voice communication network interconnecting all subscribing individuals and transmitting over wires. (U.S.D.P.)
- TENURE.** Two situations of tenure of the dwelling units and/or the lot/land are considered: *LEGAL*: having formal status derived from law; *EXTRALEGAL*: not regulated or sanctioned by law. Four types of tenure are considered: *RENTAL*: where the users pay a fee (daily, weekly, monthly) for the use of the dwelling unit and/or the lot/land; *LEASE*: where the users pay a fee for long-term use (generally for a year) for a dwelling unit and/or the lot/land from the owner (an individual, a public agency, or a private organization); *OWNERSHIP*: where the users hold in freehold the dwelling unit and/or the lot/land which the unit occupies; *EMPLOYER-PROVIDED*: where the users are provided a dwelling unit by an employer in exchange for services, i.e. domestic live-in servant. (U.S.D.P.)
- TITLE.** The instrument (as a deed) that constitutes a legally just cause of exclusive possession (of land, dwellings, or both). (Merriam-Webster, 1971)
- TOILET.** A fixture for defecation and urination, esp. water closet. (7th Collegiate Webster, 1963)
- TOPOGRAPHY.** The configuration of a (land) surface including its relief and the position of its natural and man-made features. (Merriam-Webster, 1971)
- TRANSPORTATION.** Means of conveyance or travel from one place (the site) to another (other parts of the urban context). (Merriam-Webster, 1971)
- TRAP.** A fitting that provides a water seal to prevent sewer gases and odors being discharged through fixtures. (ROTC ST 45-7, 1953)
- TREATMENT WORKS.** Filtration plant, reservoirs, and all other construction required for the treatment of a water supply. (ROTC ST 45-7, 1953)
- UNIT.** A determinate quantity adopted as a standard of measurement for other quantities of the same kind. (Merriam-Webster, 1971)
- URBAN TRANSPORTATION.** Means of conveyance of passengers or goods from one place to another along ways, routes of circulation in a metropolitan context. (U.S.D.P.)
- URBANIZATION.** The quality or state of being or becoming urbanized; to cause to take on urban characteristics. (U.S.D.P.)
- USE TAX.** The tax on land aimed primarily at enforcing its use or improvement. (U.S.D.P.)
- USER INCOME GROUPS.** Based upon the subsistence (minimum wage) income per year, five income groups are distinguished: *VERY LOW (below subsistence level)*: the income group with no household income available for housing, services, or transportation; *LOW (1 x subsistence level)*: the income group that can afford no or very limited subsidized housing; *MODERATE (3 x subsistence level)*: the income group that can afford limited housing and rent only with government assistance; *HIGH (5 x subsistence level)*: the income group that can afford housing without subsidy, by cash purchase, through mortgage payments, or by rent; *VERY HIGH (10 x subsistence level)*: the income group that represents the most economically mobile sector of the population. (U.S.D.P.)
- USUFRUCT.** The right to profit from a parcel of land or control of a parcel of land without becoming the owner or formal leasee; legal possession by decree without charge. (U.S.D.P.)
- UTILITIES.** Include: water supply, sanitary sewerage, storm drainage, electricity, street lighting, gas, telephone. (U.S.D.P.)
- UTILITY/SERVICE.** The organization and/or infrastructure for meeting the general need (as for water supply, wastewater removal, electricity, etc.) in the public interest. (U.S.D.P.)
- VALVE.** A water supply distribution component which interrupts the supply for maintenance purposes. (U.S.D.P.)
- VENT.** A pipe opening to the atmosphere, which provides ventilation for a drainage system and prevents trap siphonage or back pressure. (ROTC ST 45-7, 1953)
- VIBRATION.** A quivering or trembling motion (such as that produced by: heavy traffic, industry, aircraft, etc. (Merriam-Webster, 1971)
- VIIEWS.** That which is revealed to the vision or can be seen (from the site). (Merriam-Webster, 1971)
- WALK-UP.** Dwelling units grouped in two to five stories with stairs for vertical circulation. (U.S.D.P.)
- WASTE PIPE.** A pipe (in a dwelling) which carries water from wash basins, sinks, and similar fixtures. (ROTC ST 45-7, 1953)
- WATER SUPPLY.** Source, means, or process of supplying water, (as for a community) usually involving reservoirs, pipelines, and often the watershed from which the water is ultimately drawn. (Merriam-Webster, 1971)
- WATERSHED.** The catchment area or drainage basin from which the waters of a stream or stream system are drawn. (Merriam-Webster, 1971)
- WATERWORKS.** The whole system of reservoirs, channels, mains, and pumping and purifying equipment by which a water supply is obtained and distributed to consumers. (Merriam-Webster, 1971)
- WATT.** Watts (w) measure the power of the flow of energy through a circuit. Wattage is the product of volts times amperes. Both watts and horsepower denote the rate of work being done. 746w = 1hp. (ROTC ST 45-7, 1953)
- ZONING ORDINANCE.** The demarcation of a city by ordinance into zones (areas/districts) and the establishment of regulations to govern the use of land and the location, bulk, height, shape, use, population density, and coverage of structures within each zone. (U.S.D.P.)

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EXPLANATORY NOTES

QUALITY OF INFORMATION

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

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

QUALITY OF SERVICES, FACILITIES AND UTILITIES

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

METRIC SYSTEM EQUIVALENTS

Linear Measures

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

Square Measures

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

DOLLAR EQUIVALENTS

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