CHAWLS: Popular Dwellings in Bombay

by
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Dip. Arch. School of Architecture, Ahmedabad,
India
1978

SUBMITTED TO THE DEPARTMENT OF ARCHITECTURE IN PARTIAL FULFILLMENT OF THE REQUIREMENTS OF THE DEGREE OF MASTER OF SCIENCE IN ARCHITECTURE STUDIES AT THE MASSACHUSSETS INSTITUTE OF TECHNOLOGY.

June 1981

Signature of author Signature redacted
Mayank Shah, Department of Architecture, June 1981

Certified by Signature redacted
Horacio Caminos, Prof. of Architecture, Thesis Supervisor

Accepted by Signature redacted
Julian Beinart, Chairman, Departmental Committee for Graduate Studies

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Submitted to the Department of Architecture in May, 1981 in partial fulfillment of the requirements for the Degree of Master of Science in Architecture Studies at the Massachusetts Institute of Technology

ABSTRACT

The chawls, usually associated with the working class, are observed to be popular also among the rest of the population of Greater Bombay.

Case Studies representing different types within the category of chawls, built in the past as well as in the present by different developers, are analyzed and evaluated. The positive as well as negative aspects of such dwelling environments with reference to the case studies are brought onto the surface so as to provide a basis for the recommendations. The recommended guidelines with respect to physical as well as social aspects of such dwelling environments are provided and also demonstrated through an example layout.

Thesis Supervisor: Horacio Caminos
Title: Professor of Architecture, M.I.T.

CONTENTS

PREFACE

Although my first introduction to the *Chawls* dates back to about fifteen years ago when I used to spend my school vacation in playing with my friends in a chawl, it caught my due attention after my involvement in housing issues during architecture studies, about ten years later. The opportunity of conducting a research on chawls actualised after coming to M.I.T. under the experienced direction of professor Horacio Caminos, in Urban Settlement Design in Developing Countries Program.

Fieldwork for the study was conducted during the summers of 1979 and 1980 in Bombay. Physical and socio-economic surveys were carried out for the selected case studies during that period.

I gratefully acknowledge the guidance and support of professor Caminos. The assistance, critique and friendship of Reinhard Goethert is sincerely appriciated. Comments and company of Happy, the classes of 1978-80 & 1980-82 and the members of my class is greatly appreciated.

My deep gratitude to Varin Kiatfuengfoo and Mohamed El-Sioufi whose friendship and comments were of a great help. My warm thanks to Hsueh-Jane Chen for her invaluable friendship and support.

I am also obliged to Mr.Parikh, Mr.Naik and Mr.Pandit of Bombay Municipal Corporation, to professionals in Maharashtra Housing Board, CIDCO, BMRDA and to many individuals who were co-operative in preliminary surveys.

I wish to express my indebtness to Avani Trivedi for her invaluable encouragement and friendship.

I am also indebted to J.N.Tata Endowment Trust for partial financial support during the study.

Finally, my inexpressible debt to my parents and family members for their love, patience, encouragement and support.

INTRODUCTION

Of the estimated total of 1138 thousand dwelling units in Greater Bombay, 18% are Shanties, 20% are Apartments and 61% are Chawls. The Chawl-affordable and culturally acceptable form of dwelling, today houses about 3.8 million people, 73% of whom belonging to low income groups.

Such a substatial type of housing having been ignored till now as viable & popular dwelling environment, has been focused upon in this study.

CHAWLS

DEFINITION:

The Chawl is a group of one or two room dwelling units along a corridor, sharing sanitary facilities.
'Chawl' or 'Chaal' means a corridor or a passage in local languages.
A chawl building may be one storied to five storied. Sanitary facilities, mainly lavatories & sometimes bath and washing also, may be common to the residents on one floor or in the entire building. Dwelling units, one or two-room, with or without balcony or verandah, may be arranged in a row on one side or on both sides of the corridor or open court.

ORIGIN:

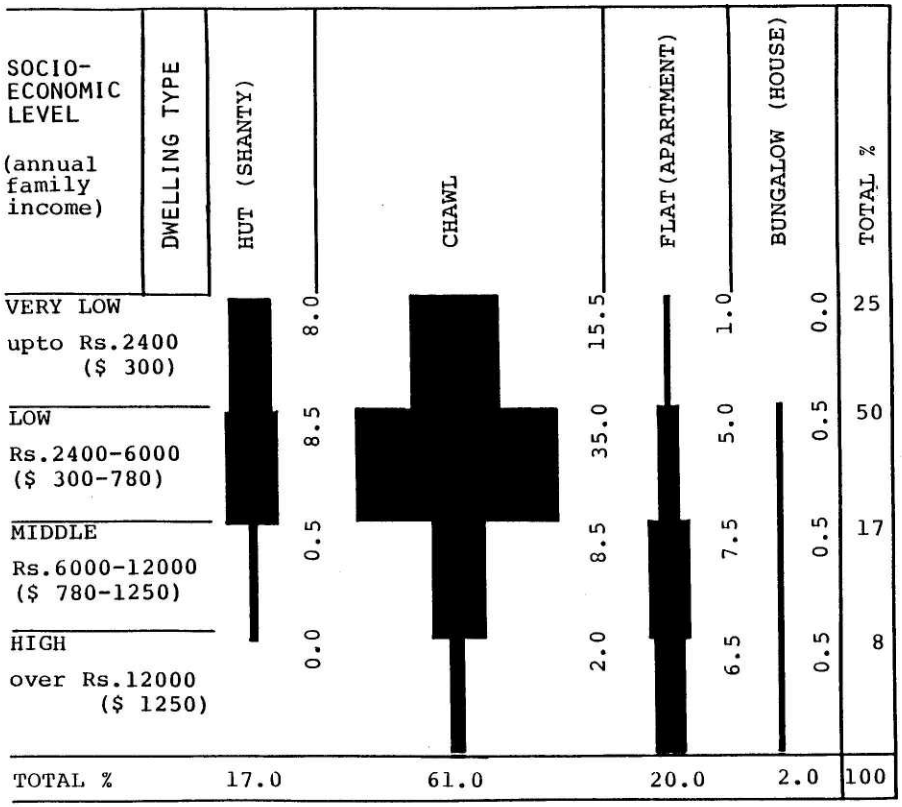
Chawls were initially created for housing industrial workers who were single, male, migrants. This form of housing originated in the latter part of the last century in response to increasing migrants and industrial development, based on early industrial England's back-to-back workers' terraces.

These housing activities for industrial workers were mainly confined to private developers untill the end of the last

century when Public housing agencies (Bombay Improvement Trust and Bombay Development Department) entered the field and provided a considerable number of dwellings, mainly in the form of chawls.

The chawls were later adopted by families and even the middle income groups.

POPULATION OF BOMBAY BY SOCIO-ECONOMIC STATUS & DWELLING TYPE



*SOURCE:Housing Situation in Greater Bombay, P.Ramachandran, 1977 TISS

PRESENT SITUATION:

Out of every five dwelling units today, one is a shanty, one is an apartment and three are chawls. Households with the sizes varying from 1 to 13 and with the income varying from Rs. 250 to 1000 (U.S.$ 30 to 125) per month, are residing in chawls. The chawls are popular not only among the migrants but also among the local households. The chawls are also popular in the other cities of India, coexistant with the industrial activities.

Majority of the chawls comprise one-room dwelling units with shared facilities. Households with an average size of 6.3 persons live in the chawls.

TREND:

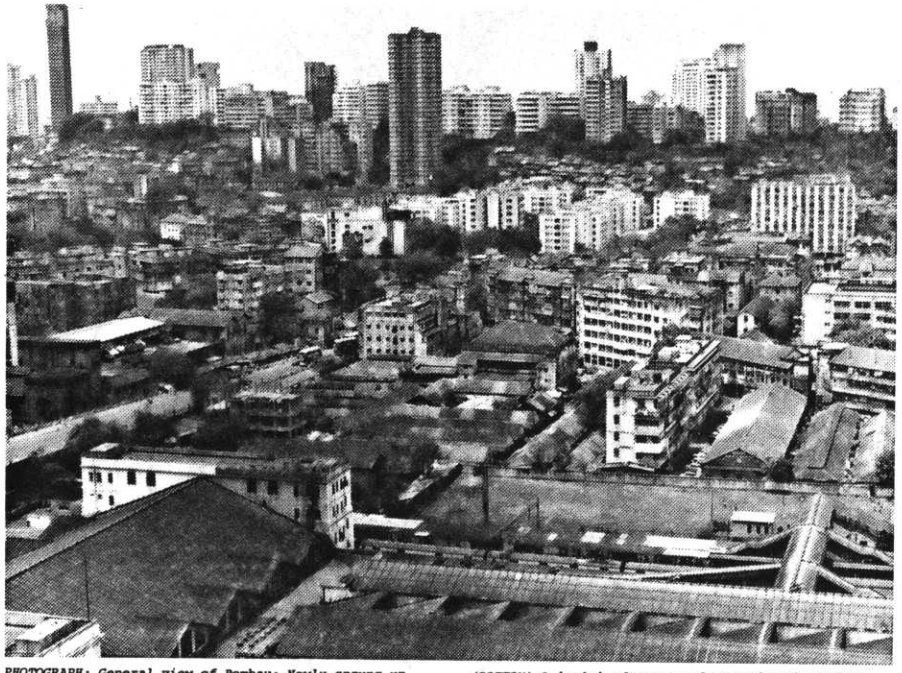
Even when the public housing agencies are now inclined towards providing self-contained dwelling units, a number of private or co-operative housing schemes are adopting the form of chawl.

PROJECTED DEMAND:

'On the assumption that the population of one million which is planned to be settled in New Bombay will have the same pattern of socio-economic distribution and dwelling preferences as in Greater Bombay, 90 to 100 thousand such dwellings are required to be created in New Bombay.'* Apart from that, most of the housing activities in the suburban areas of Greater Bombay will be adopting chawl form of dwelling as it is the only viable, affordable option for the city's poor.

OBJECTIVES:

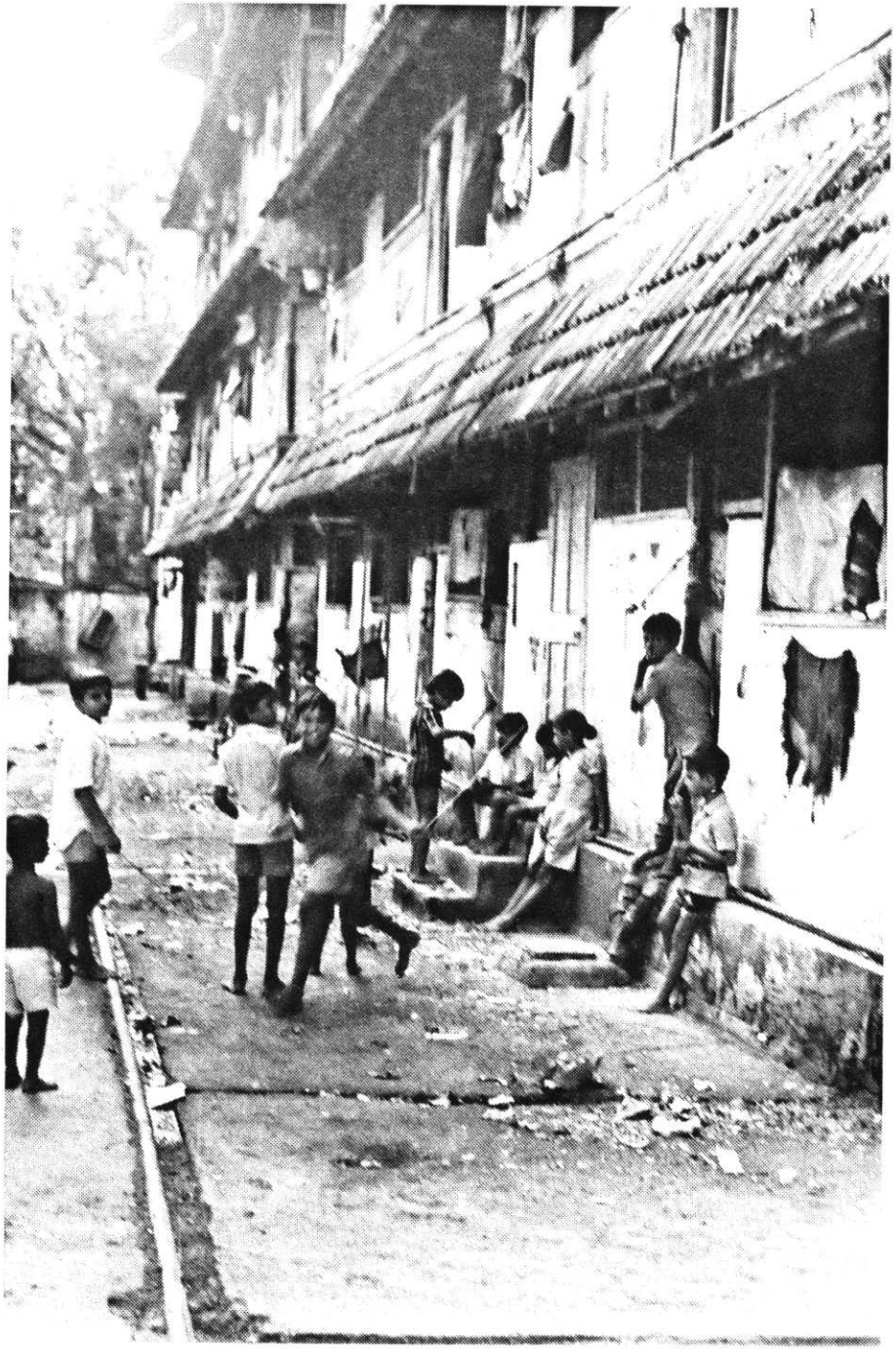
The objectives of this study are to bring onto surface the positive and negative aspects of this type of dwellings through evaluating the selected case studies in Greater Bombay. It also provides suggested guidelines applied to the Example Layout, for improved, physically and socially efficient planning of such type of developments.



PHOTOGRAPH: General view of Bombay; Newly sprung up high rise apartment boxes in the background and a few walk-up and single-storey chawls in the middle right and center. Service industry buildings are also seen in the fore ground.

(BOTTOM) A 'calm' afternoon sleep under the bridge. About 62000 persons live on the pavements of Bombay.

(LEFT) Atmosphere at the chawls; about two-thirds of Greater Bombay's population lives in chawls.

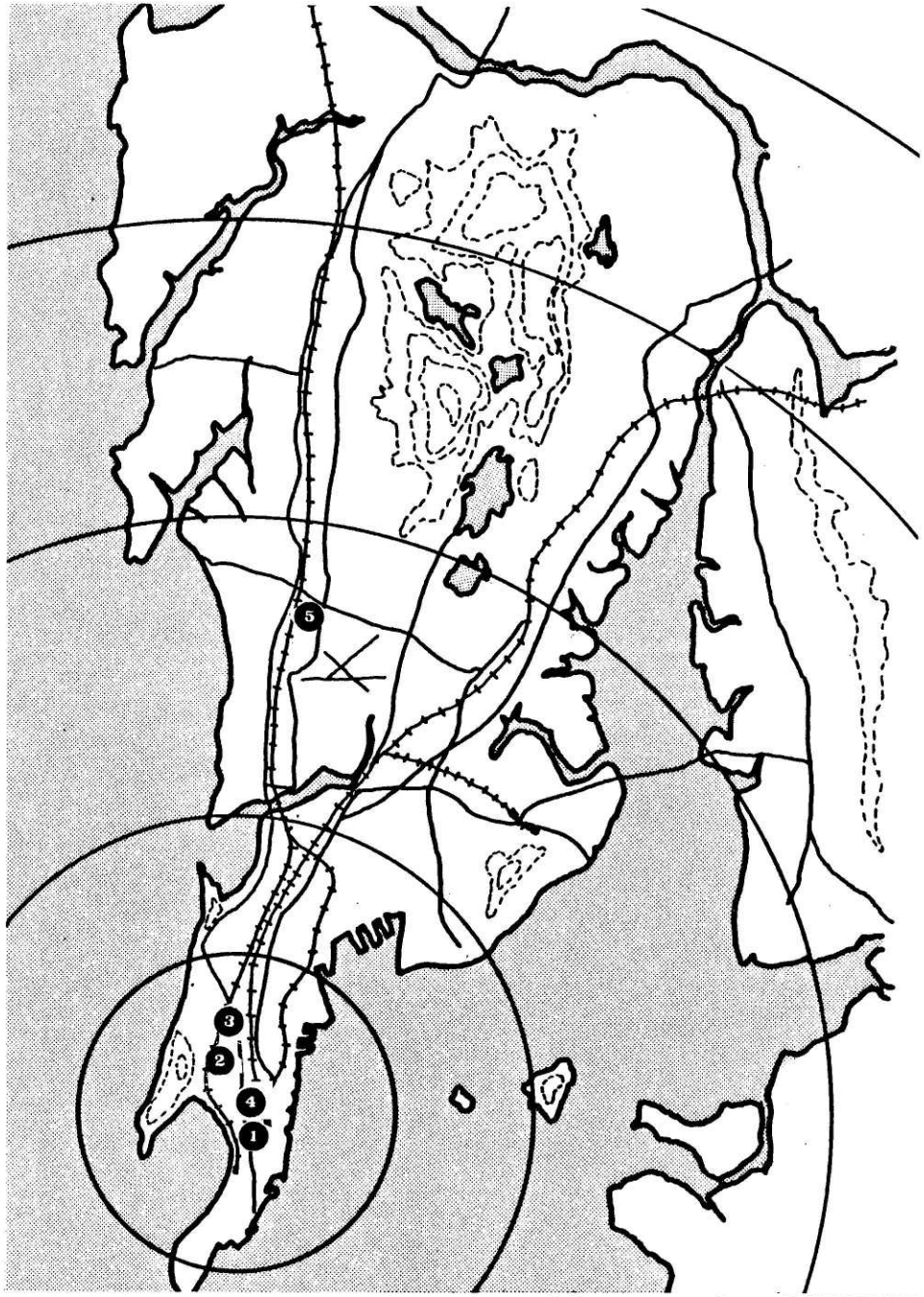


CASE STUDIES

The case studies representing prevalent dwelling systems in the old city as well as in new developments in the suburbs, are selected to provide basis for formulating urban housing guidelines. Examples of different dwelling types within the 'chawl' category and having different characteristics in terms of size, age, etc., are analyzed and evaluated. A total of five case studies accomodating low and lower middle income groups are studied at locality segment, dwelling group or community and dwelling unit scale.

DWELLING/GROUP: Multi-family residential building or group of buildings built on one parcel of land by one developing agency is studied.at this scale.

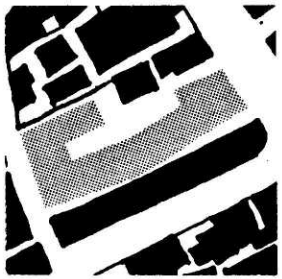
DWELLING UNIT: Typical residential unit for a household or family is selected from the above dwelling group for study.



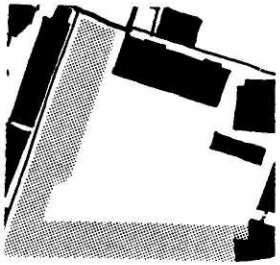
Location of Case Studies: BOMBAY

case studies

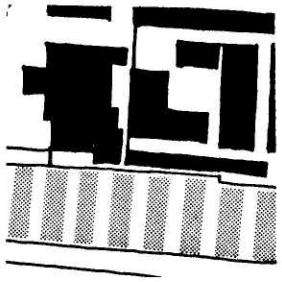
1 Bhiwandiwala Terrace



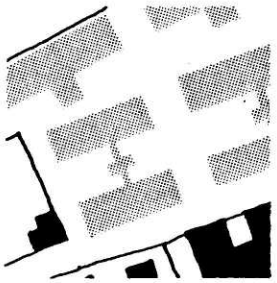
2 Pannalal Terrace



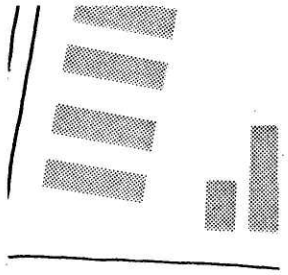
3 Ganjawala Chawls



4 Chandanwadi Chawls

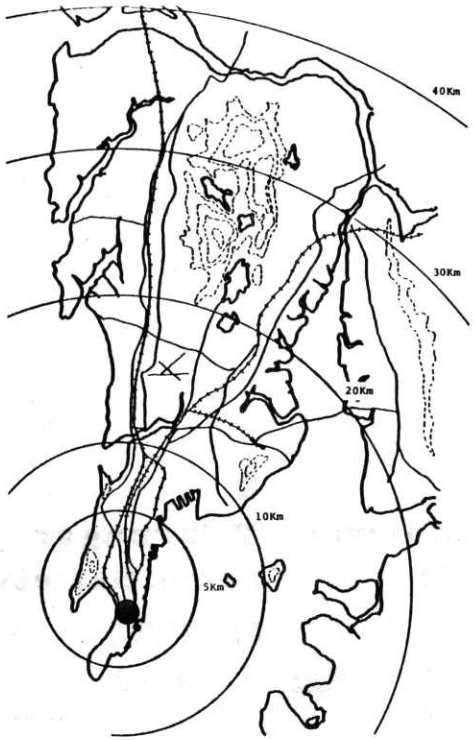


5 Vijaynagar Co-op. Society



	1	2	3	4	5
LOCALITY:	BHULESHWAR	TARDEO	TARDEO	BHULESHWAR	ANDHERI
BUILDER:	PRIVATE	PRIVATE	PUBLIC	PUBLIC	CO-OPERATIVE
INCOME GROUP SERVED:	LOW	MODERATE	VERY LOW	LOW	MODERATE
NUMBER OF FLOORS:	5,(6)STORY	5 STORY	1 STORY	4 STORY	3 STORY
YEAR OF CONSTRUCTION:	1920	1911	1900	1904	1961-65
COMMUNITY:	PARSIS	GUJARATIS	MIXED	MIXED	MARATHI
SIZE: TOTAL DW.UNITS:	180	165	116	584	480
TOTAL POPULATION:	900	917	890	3530	2165

1 Bhiwandiwala Terrace Bombay



LOCALITY: This dwelling example represents the typical process of conversion of one family dwelling units into multi-family units. It was built in 1920 by a Parsi Community Trust in order to provide subsidized housing to this minority group.

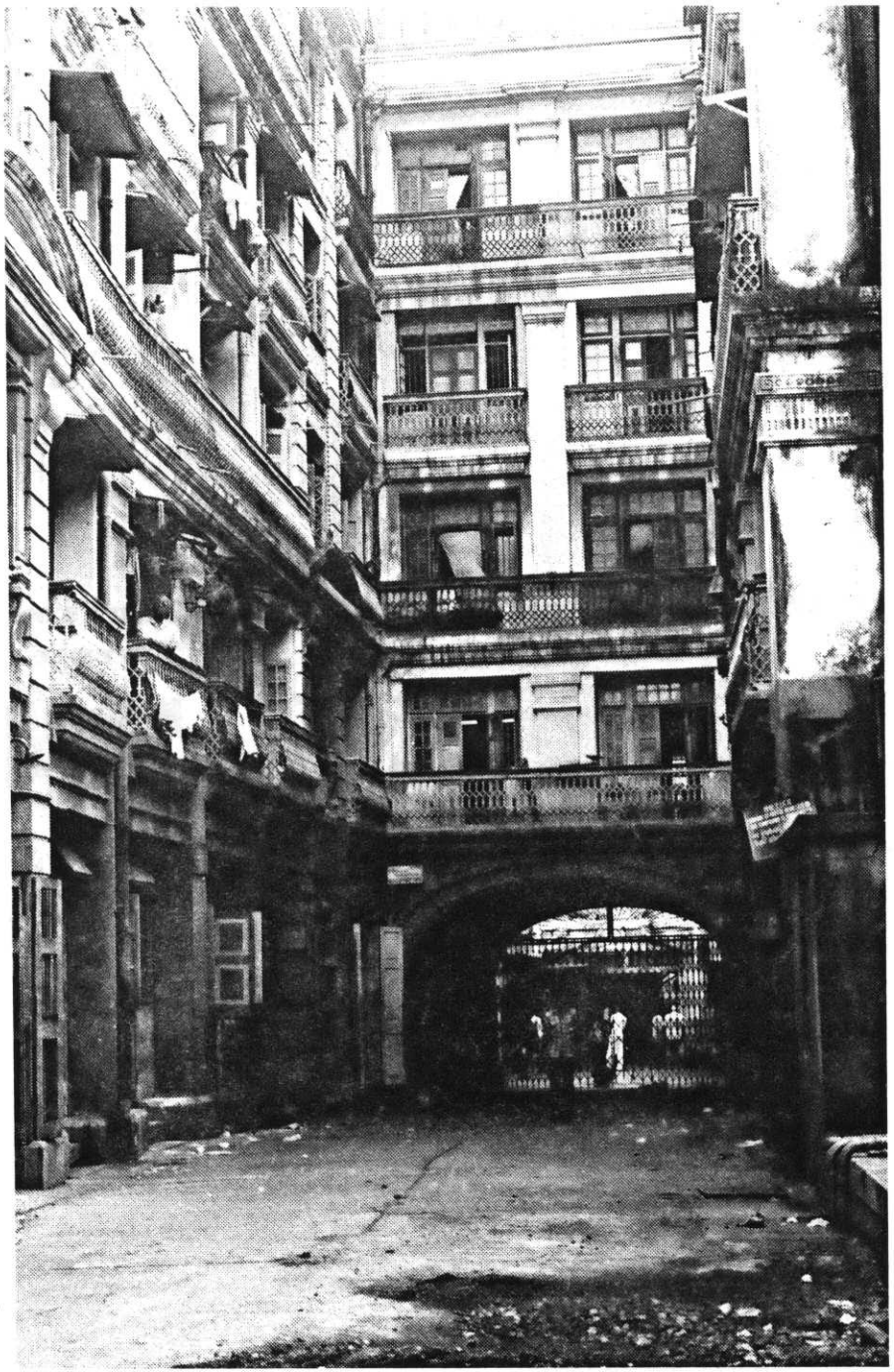
It is situated in the city center, off Princess street-the main street with wholesale/retail drugstores and bookstores. Bhiwandiwala terrace can be approached by Girgaum road and also by Trinity street, both parallel to each other.

As it is located in the city center, both the modes of circulation-vehicular and pedestrain-are intense and always clash with each other during working hours.

Communal facilities in the vicinity include many private and municipal schools, health facilities, cinema houses, retail markets and also religeous institutions.

CASE STUDY SOURCES

Segment Plan:	(accurate) Bombay Municipal Corporation, 1972
Dwelling Group Plan:	(accurate) BMC, 1972 Author, 1980
Dwelling Unit:	(accurate) Field Survey, Author, 1980; Thesis, Avani Trivedi, 1978
Physical Data:	(accurate) Field Survey, Author, 1980
Socio-Economic Data:	(approximate) Field Survey, Author, 1980
Photographs:	Author, 1980
General Informations:	Field Survey, Author, 1980

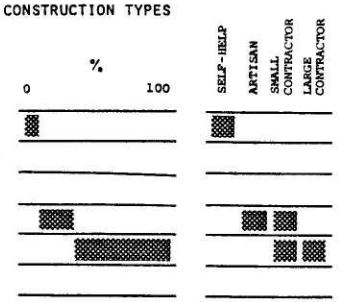


PHOTOGRAPH: The court surrounded by dwelling; the back entrance is kept closed most of the time

1:2500

LOCALITY SEGMENT PLAN

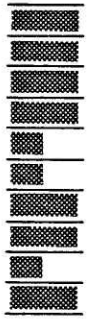
LOCALITY CONSTRUCTION TYPES



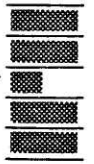
The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type.

Quality of information: approximate

LOCALITY UTILITIES AND SERVICES



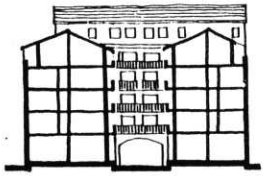
LOCALITY COMMUNITY FACILITIES



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

Quality of information: approximate

SELECTED DWELLING/GROUP



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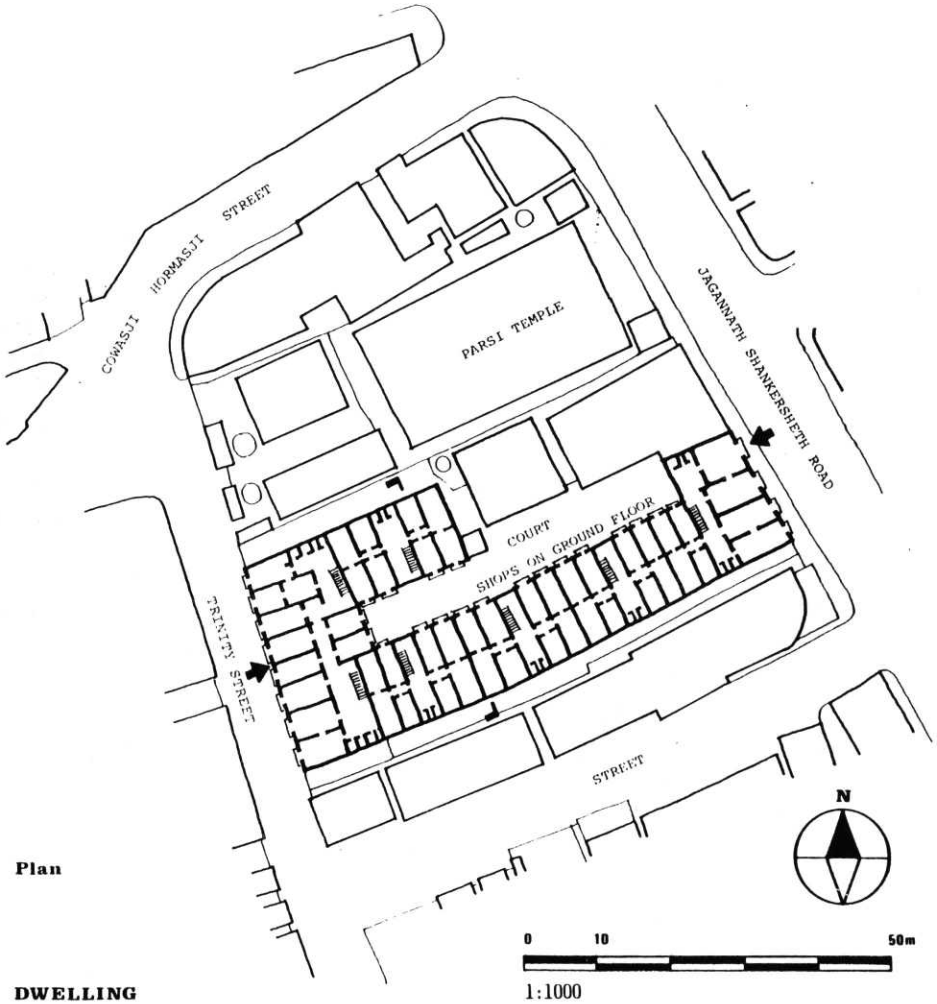


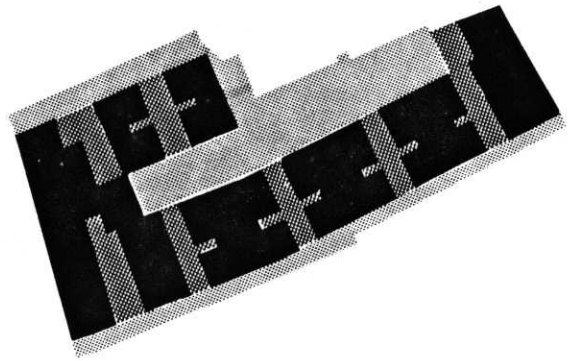
Plan

1:1000

DWELLING

LAND/LOT	sq.m.	%
LOT COVERAGE	505	29
OPEN AREA	1235	71
TOTAL LOT AREA	1740	100

DWELLING	sq.m.	%
PRIVATE FLOOR AREA	5040	77
SHARED FLOOR AREA	1510	23
TOTAL FLOOR AREA	6550	100



KEY

PRIVATE FLOOR AREA: dwellings

SEMI-PRIVATE FLOOR AREA: corridors

SEMI-PRIVATE FLOOR AREA: cluster courts

FLOOR/LAND UTILIZATION PLAN

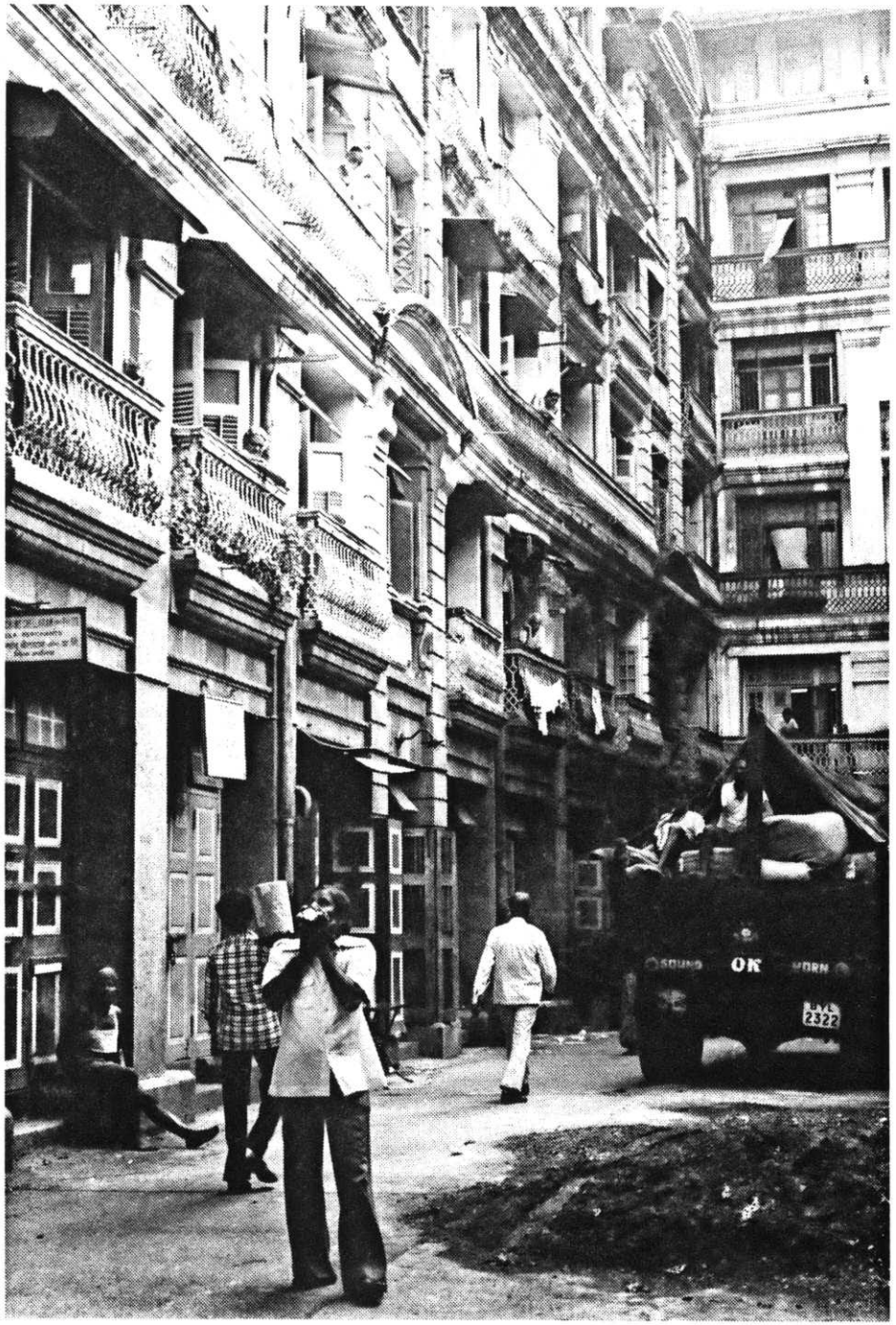
DWELLING: Five to six stories high dwelling is built on a long lot with streets on two sides. Entrance gates on both sides have dwellings above them starting from second storey upto 5 stories. Its location in commercial area permits shop activities on the ground floor. These shops are managed by some of the residents and are causing public use of the court.

Two four-room dwelling units are divided in four two-room units in response to the increasing demand for housing. In other words, a total of 90 dwelling units are divided to make 180 units. As a result, one family has to pass through another family's unit.

Two latrines, located in the passage since the beginning, are now used by four households instead of two. Showers or bathing places, either private or common, do not exist, instead the 'mori' or washing place in the kitchen is used for the purpose.

Outer stone masonry walls of the building are load bearing; whereas the inner structure is built in timber posts and beams with brick masonry partitions. Physical condition of this 60 years old building is good.

OCCUPANTS: A total of 900 persons, all Parsis, occupy this dwelling. Average family size among the occupants is five and the average family income is Rs. 500 (US$ 60) per month. Most of the family heads are well-educated and are engaged in white collar jobs.



PHOTOGRAPH: The courtyard with shops on ground floor attracting public circulation, loading trucks, etc.

PHYSICAL DATA
(related to land,dwelling and dwelling unit)

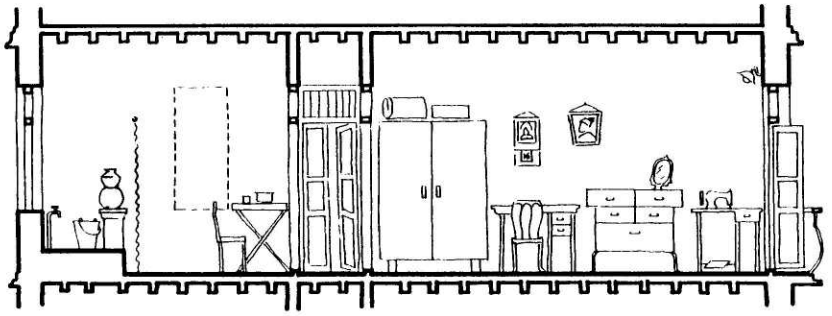
LAND/LOT	
utilization:	PUBLIC
area (sq m):	1740
tenure:	LEGAL RENTAL
DWELLING	
location:	CITY CENTER
type:	CONVERTED CHAWL
number of floors:	5, (6)
utilization:	MULTI-FAMILY
physical state:	FAIR
number of dwelling units:	180
number of people:	900
private floor area (sq.m.):	5040 (77%)
shared floor area (sq.m.):	1510 (23%)
Total floor area (sq.m.):	6550 (100%)
open area (sq.m.):	505 (29%)
lot coverage (sq.m.):	1235 (71%)
Total lot area (sq.m.):	1740 (100%)
total floor area/lot area (FSI):	3.7
density (people/ha of lot area):	5172
(dwelling units/ha of lot area):	1034

shared facilities	dw units/facility	p/facility
wc:	2	10
shower:	-	-
kitchen:	-	-
rooms:	-	-
other:	-	-

DWELLING DEVELOPMENT	
mode:	INSTANT
developer:	COMMUNITY TRUST
builder:	CONTRACTOR
construction type:	TIMBER/MASONRY
year of construction:	1920
DWELLING UNIT	
type:	TWO-ROOM TENEMENT
area (sq m):	28-31
tenure:	SUBSIDIZED RENTAL
average household size:	5
average area per person (sq.m.):	6
facilities	
room:	1
kitchen:	1
shower:	-
washing area 'mori':	1
w.c.:	-
other:	BALCONY (1.2 sq. m)

SOCIO-ECONOMIC DATA
(related to user)

GENERAL: SOCIAL	
user's ethnic origin:	PARSI
place of birth:	GUJARAT
education level:	MEDIUM
NUMBER OF USERS	
married:	2
single:	1
children:	2
total:	5
MIGRATION PATTERN	
number of moves:	1
rural - urban:	1
urban - urban:	-
urban - rural:	-
why came to urban area:	EMPLOYMENT
GENERAL: ECONOMIC	
user's income group:	LOW
employment:	CLERICAL
distance to work:	2 KM
mode of travel:	BUS/WALK
DWELLING UNIT PAYMENTS	
financing:	SUBSIDIZED BY PARSI TRUST
rent/mortgage:	US $ 2
% income for rent/mortgage:	3-4
extra payment:	NONE



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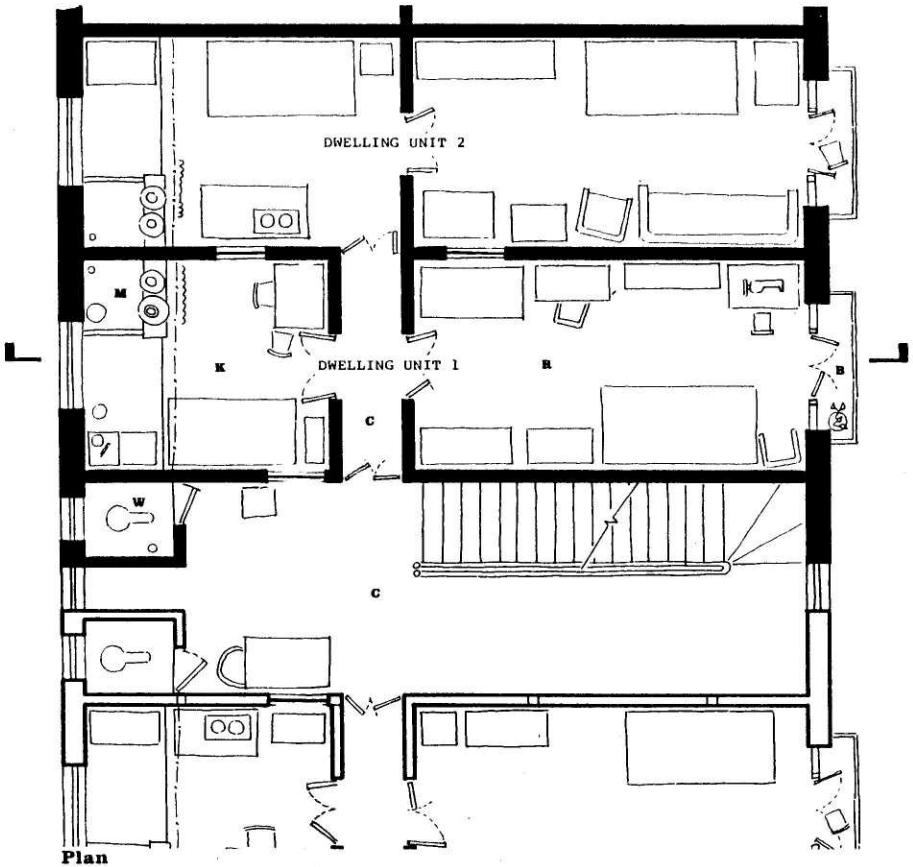


Plan

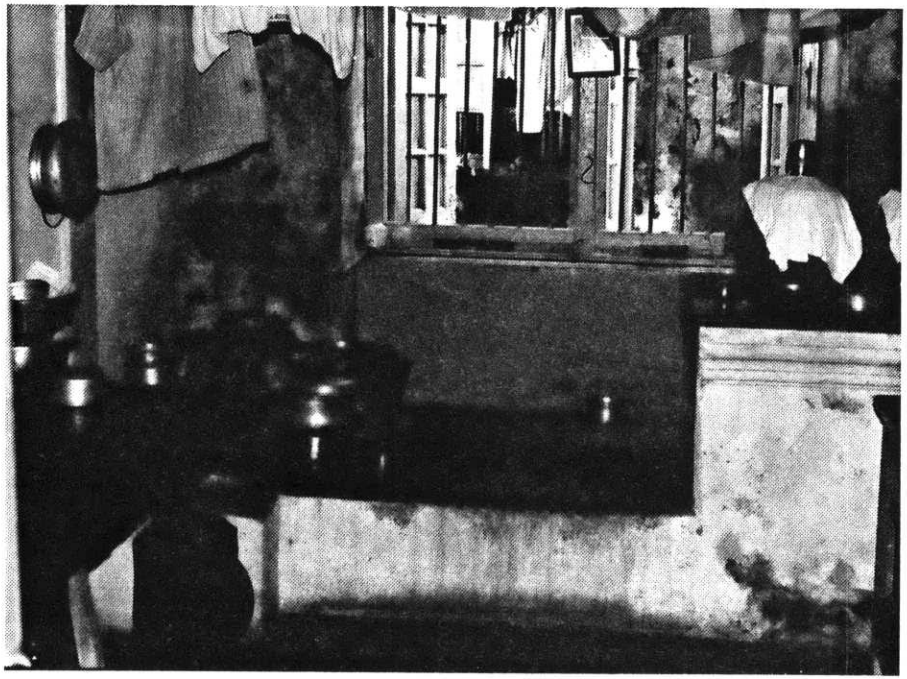
KEY

- **B** Room (multi-use)
- **K** Kitchen/Cooking Area
- **B** Balcony
- **C** Corridor
- **M** Mori (washing area)
- **W** Water Closet

0 1 3 5m

1:100

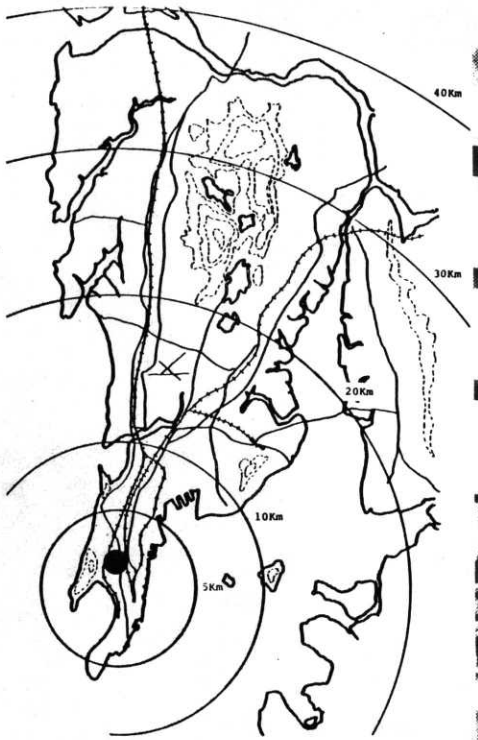
DWELLING UNIT



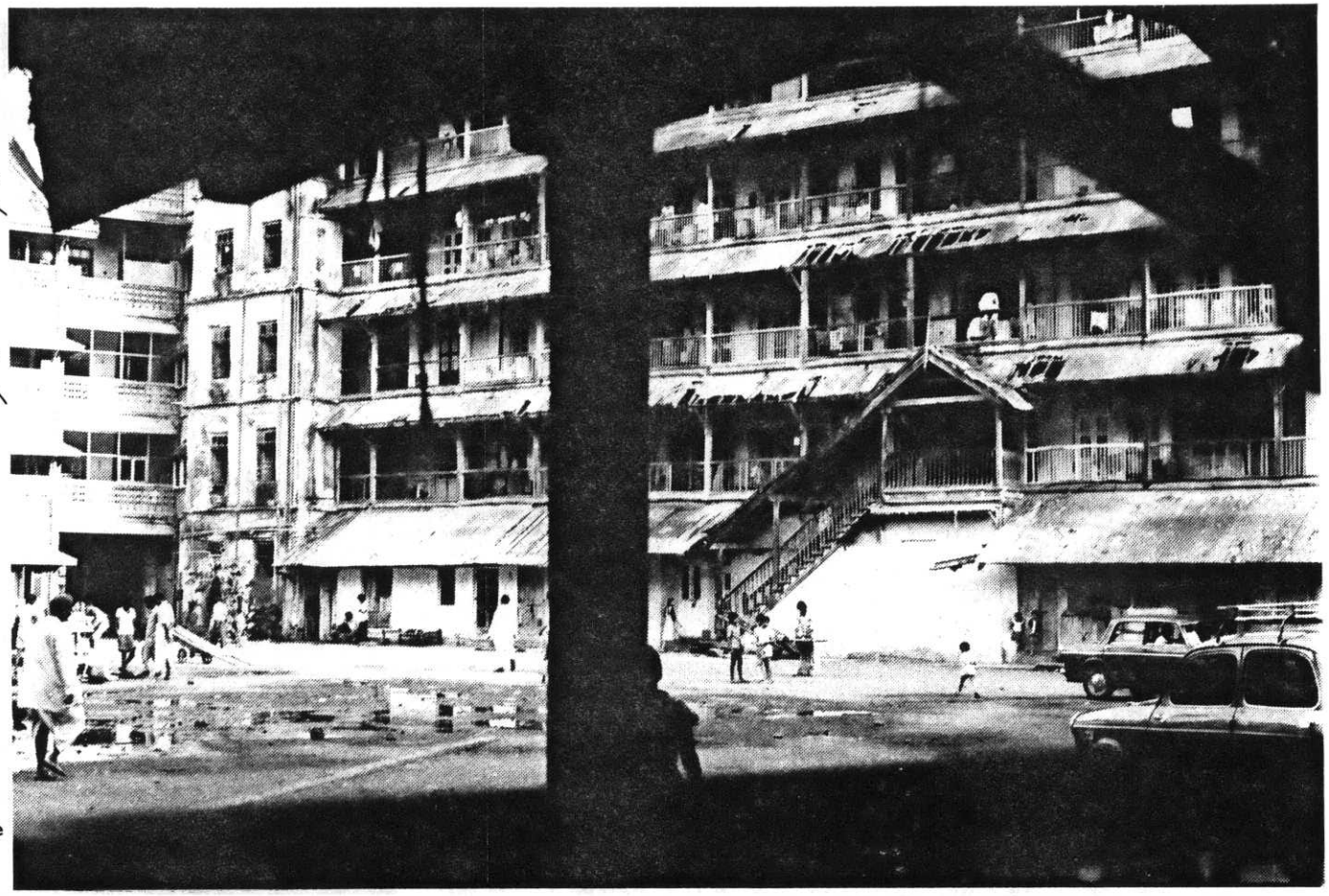
PHOTOGRAPH: (TOP) Entrance to Bhiwandiwala Terrace located on one of the main commercial streets

(RIGHT) Multi-purpose room of a Parsi household
(BOTTOM) Cooking area; raised platform and a 'mori'

2 Pannalal Terrace
Bombay



LOCALITY: The locality is among the oldest and densest developments in the city. Pannalal Terrace, built in 1911, is located at the junction of Lamington Road and Grant Road. The area is the north extension of the commercial center. Both the roads are busy with extensive commercial activities and, vehicular as well as pedestrian traffic. Educational and health facilities are located in the vicinity but are inadequate as they serve large population. Number of cinema houses are concentrated in this locality. Light service industries also exist in the locality.



CASE STUDY SOURCES

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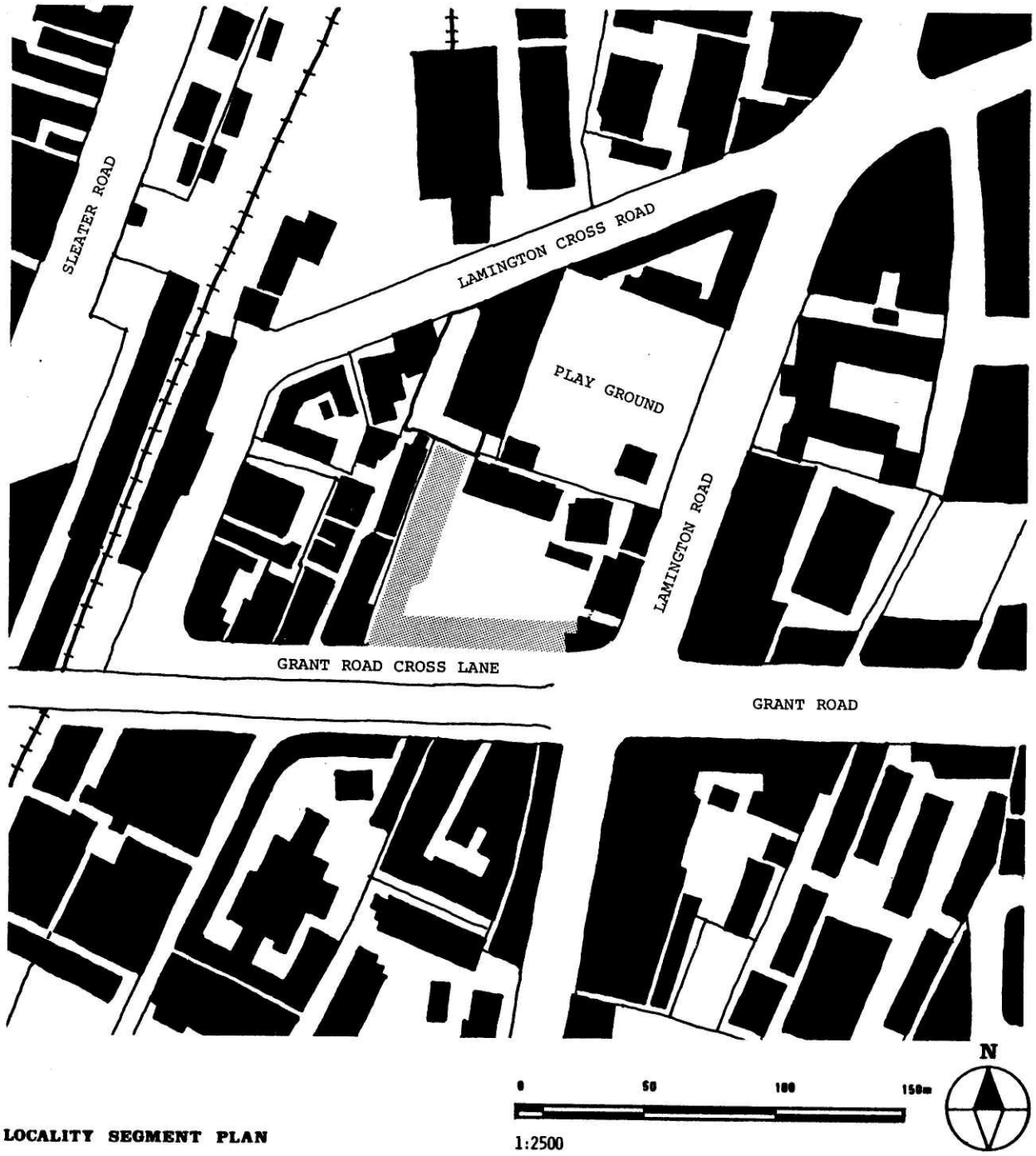
Physical Data:	(accurate) Field Survey, Author, 1980
Socio-Economic Data:	(approximate) Field Survey, Author, 1980
Photographs:	Author, 1980
General Informations:	Field Survey, Author, 1980

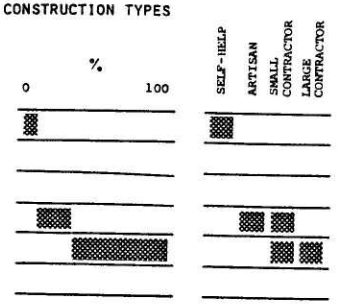
PHOTOGRAPH: A large courtyard between two wings of the building; note the stair flight from ground floor to first floor connecting to the central stair in order to segregate the shopping activities on the ground floor



LOCALITY SEGMENT PLAN

1:2500

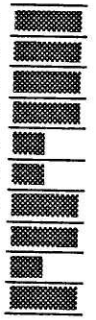
LOCALITY CONSTRUCTION TYPES



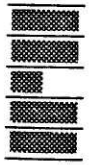
The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type.

Quality of information: approximate

LOCALITY UTILITIES AND SERVICES



LOCALITY COMMUNITY FACILITIES



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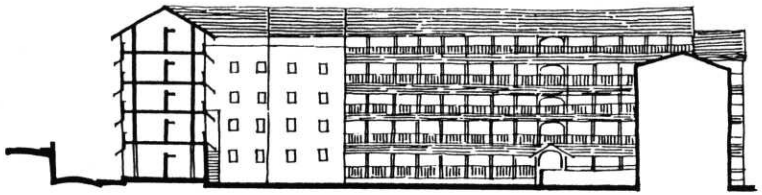
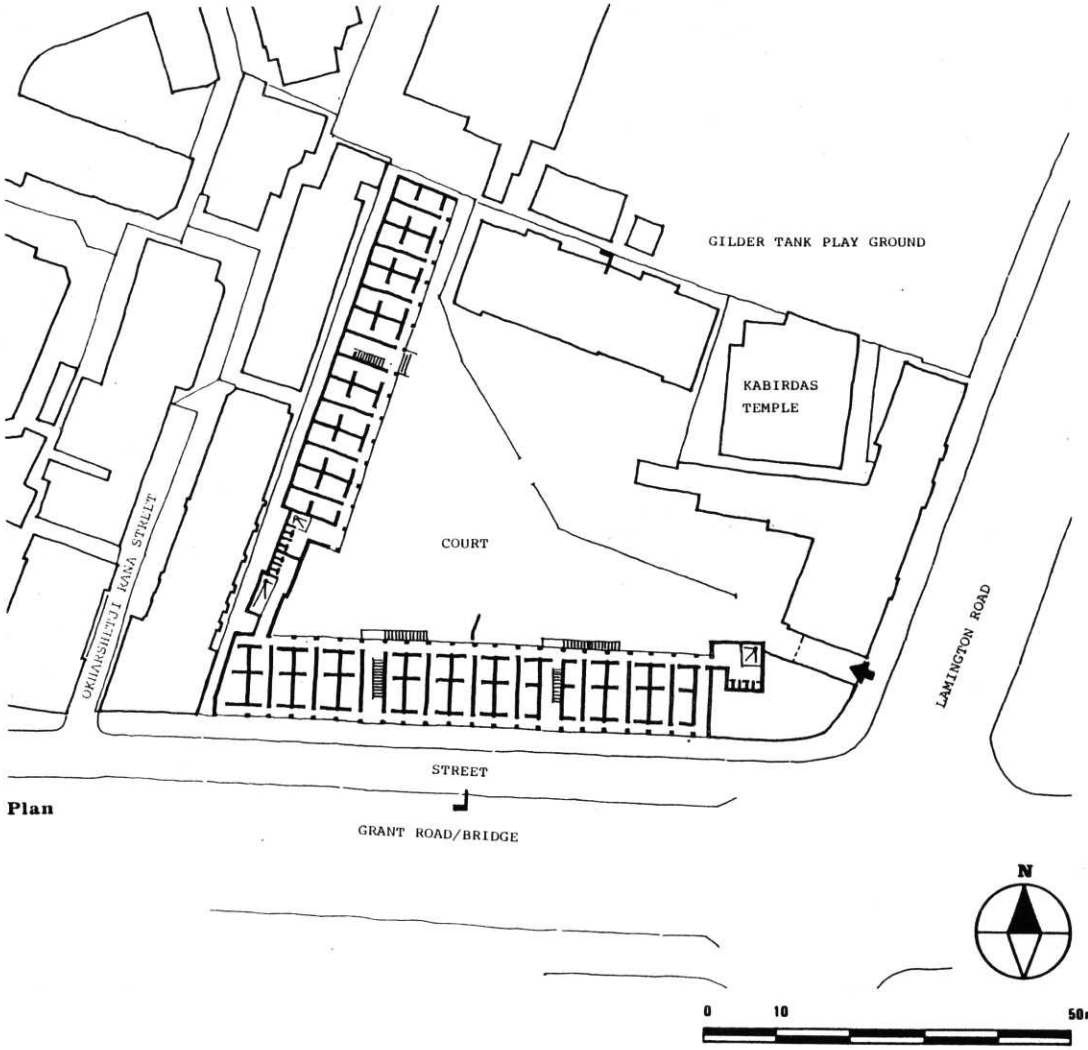
SELECTED DWELLING/GROUP



Section

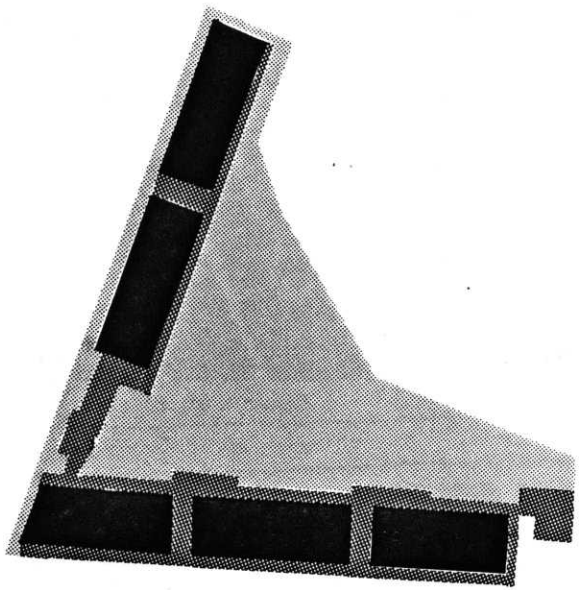
LAND/LOT	sq.m.	%
LOT COVERAGE	1485	54
OPEN AREA	1265	46
TOTAL LOT AREA	2750	100

DWELLING	sq.m.	%
PRIVATE FLOOR AREA	3960	62
SHARED FLOOR AREA	2405	38
TOTAL FLOOR AREA	6365	100



Plan

1:1000



KEY

PRIVATE FLOOR AREA: dwellings

SEMI-PRIVATE FLOOR AREA: corridors

SEMI-PRIVATE FLOOR AREA: cluster courts

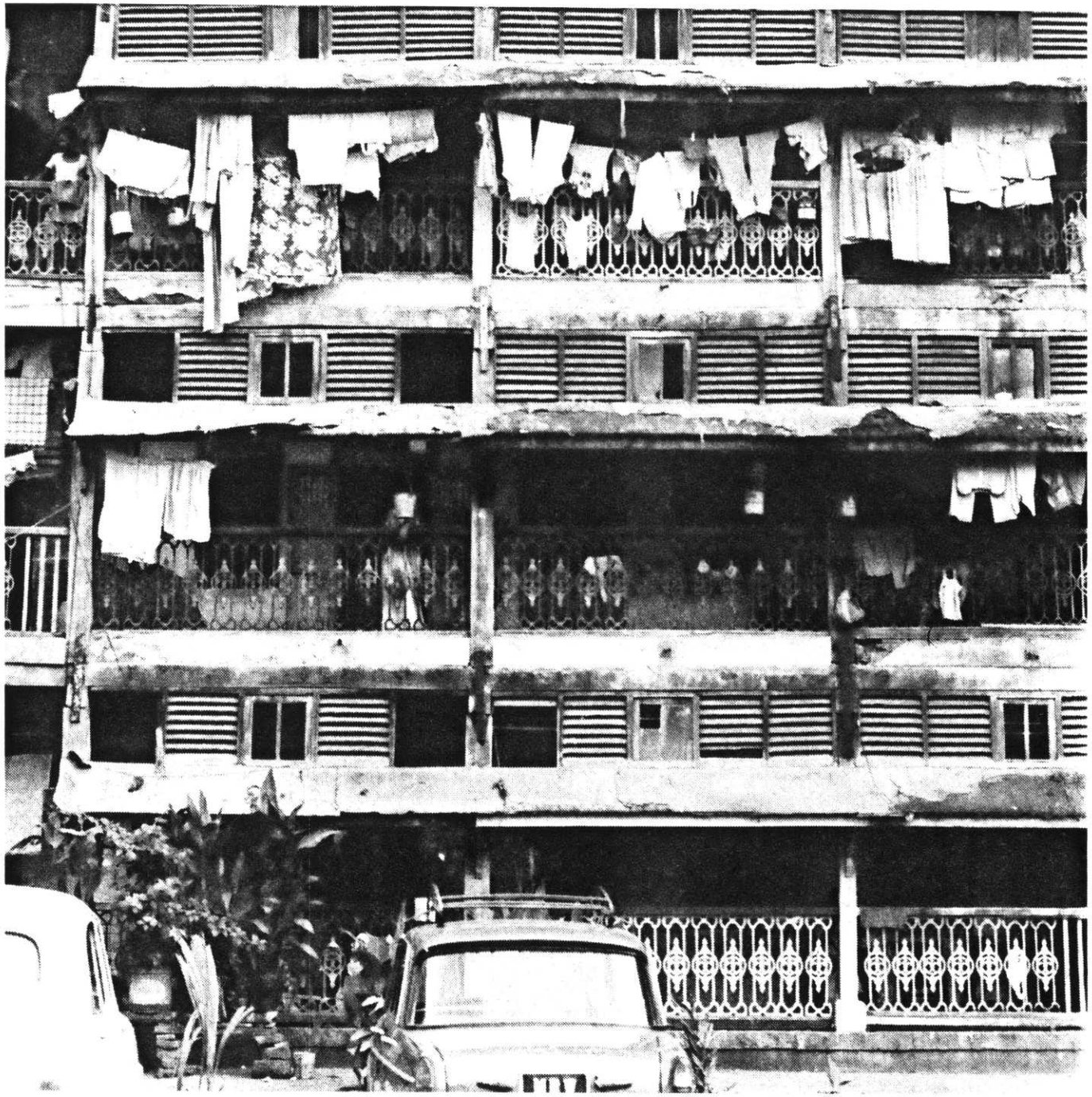
DWELLING

FLOOR/LAND UTILIZATION PLAN

DWELLING: This private development contains 165 dwelling units, in a five story L shape building with one wing facing the street having corridors on either side and the other wing perpendicular to it having one corridor looking over the large courtyard. The ground floor units facing the street are sold away for commercial activities. In order to prevent interference of these commercial activities in the courtyard, their access to court is closed and the central stairs start from the second story which is connected by a flight of stair from ground floor. The two wings of the corridor. The two wings of the building are independent each having stair(s) and common sanitary facilities within. About 4 households share one w.c., whereas, more than 6 households have to share a shower.

The material used for structure is timber and for walls is brick masonry. Physical condition of the building is dilapidated.

OCCUPANTS: About 920 Gujaratis inhabit this dwelling. Most of the residents are self-employed involved in business which brings them a monthly household income of Rs. 700 to 900 (U.S.$ 90 to 120). About 6 to 8% of the income is spent on the rent and about 60% on food.



PHOTOGRAPH: Larger distance from floor to floor allows addition of mezzanine. Note the louvres for ventilating the top portion of the corridor which facilitates rying drying of clothes in monsoon.

PHYSICAL DATA
(related to land,dwelling and dwelling unit)

LAND/LOT	
utilization:	SEMI-PRIVATE
area (sq m):	2750
tenure:	LEGAL RENTAL
DWELLING	**DWELLING/GROUP**
location:	CITY CENTER
type:	CHAWL
number of floors:	5
utilization:	MULTI-FAMILY
physical state:	DILAPIDATED
number of dwelling units:	165
number of people:	917
private floor area (sq.m.):	3960 (62%)
shared floor area (sq.m.):	2405 (38%)
Total floor area (sq.m.):	6365 (100%)
open area (sq.m.):	1485 (54%)
lot coverage (sq.m.):	1265 (46%)
Total lot area (sq.m.):	2750 (100%)
total floor area/lot area (FSI):	2.3
density (people/ha of lot area):	3334
(dwelling units/ha of lot area):	600

shared facilities	dw units/facility	p/facility
wc:	4.1	23
shower:	6.6	37
kitchen:	-	-
rooms:	-	-
other:	11	11

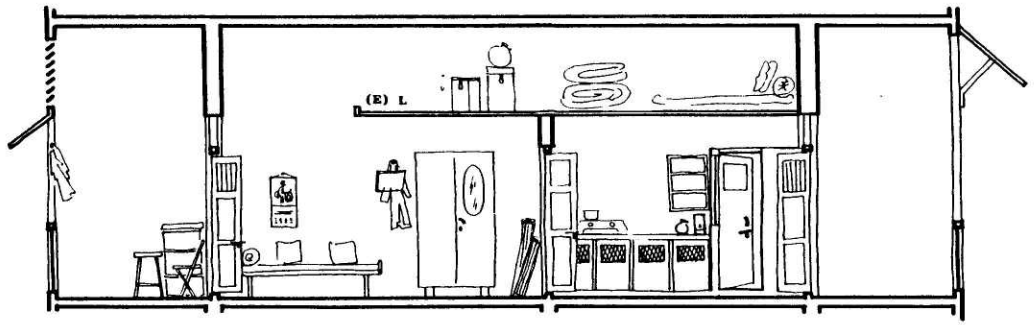
DWELLING DEVELOPMENT	
mode:	INSTANT
developer:	PRIVATE
builder:	CONTRACTOR
construction type:	TIMBER/MASONRY
year of construction:	1911
DWELLING UNIT	
type:	TWO-ROOM
area (sq m):	24
tenure:	RENTAL
average household size:	5.6
average area per person (sq.m.):	4.2
facilities	
room:	1
kitchen:	1
shower:	-
washing area 'mori':	1
w.c.:	-
other:	-

SOCIO-ECONOMIC DATA
(related to user)

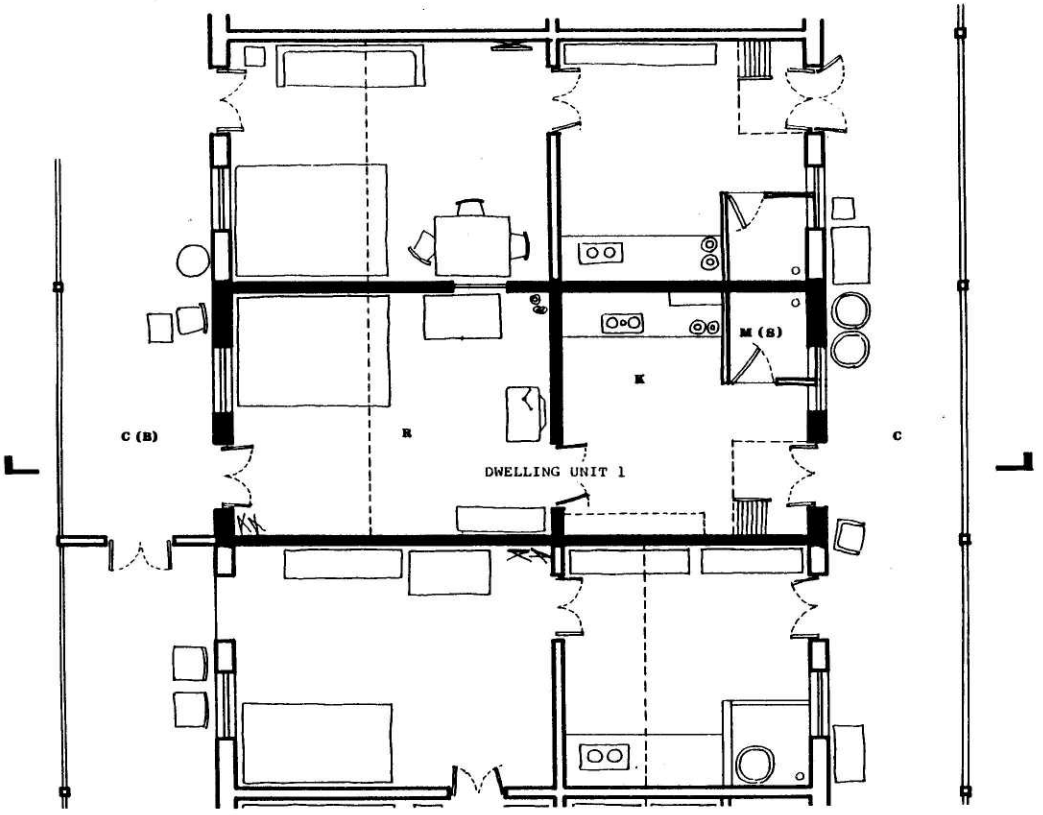
GENERAL: SOCIAL	
user's ethnic origin:	GUJARATI
place of birth:	GUJARATI
education level:	MEDIUM
NUMBER OF USERS	
married:	4
single:	-
children:	2
total:	6
MIGRATION PATTERN	
number of moves:	2
rural - urban:	1
urban - urban:	1
urban - rural:	-
why came to urban area:	EDUCATION/EMPLOYMENT
GENERAL: ECONOMIC	
user's income group:	MIDDLE
employment:	SELF-EMPLOYMED
distance to work:	2
mode of travel:	BUS
DWELLING UNIT PAYMENTS	
financing:	SELF-FINANCE
rent/mortgage:	US $ 6
% income for rent/mortgage:	6-8
extra payments:	US $ 3,000 - 5,000

KEY

- **R** Room (multi-use)
- **K** Kitchen/Cooking Area
- **B** Balcony
- **E** Expansion
- **C** Corridor
- **L** Loft
- **S** Shower
- **M** Mori (washing area)



Section

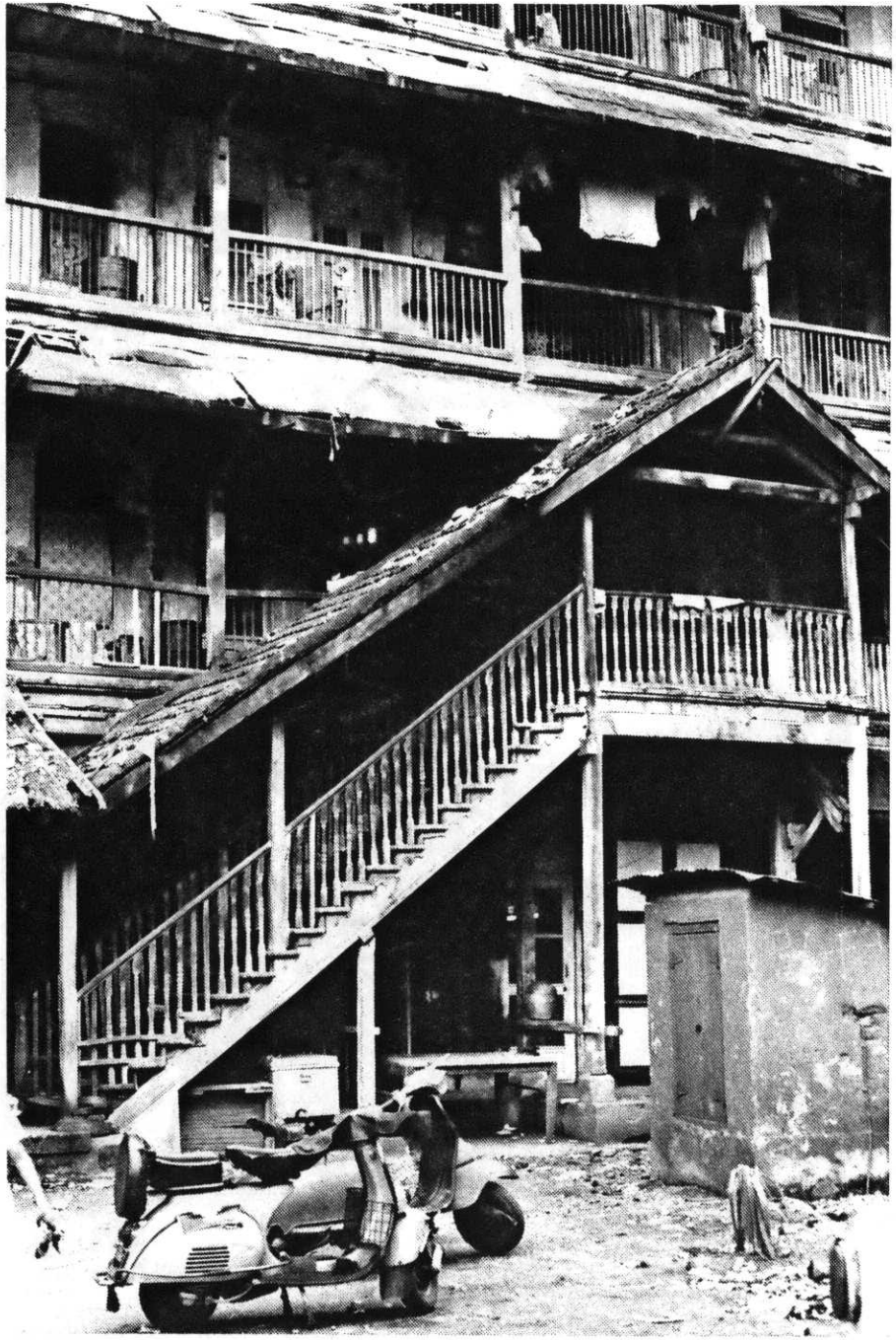


Plan

0 1 3 5m

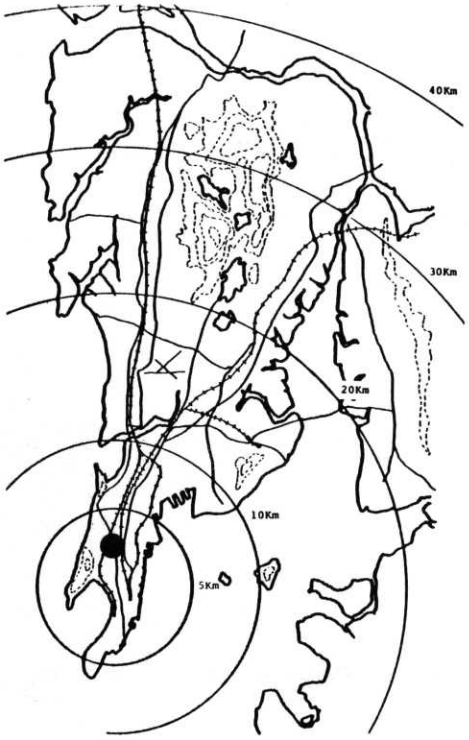
1:100

DWELLING UNIT



PHOTOGRAPH: Delapidated exterior..... Renovated interior, water storage drum and water heating coal stove are seen near the 'mori' which is used for washing utensils, clothes, etc., and also for bathing.

3 Ganjawala Chawls
Bombay

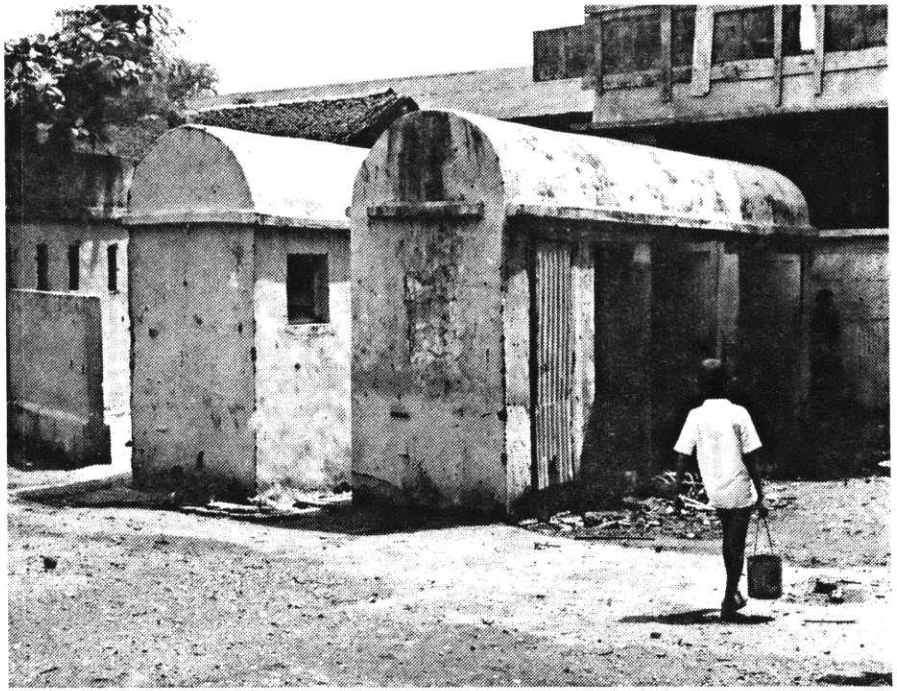


LOCALITY: Ganjawala chawls is one of the oldest cases representing early form of chawl-type dwellings. It is located near service industrial lots and commercial activities extended from the city center. Because of its location near the Bombay Central railway station, industrial activities developed after the establishment of rail links with the mainland.

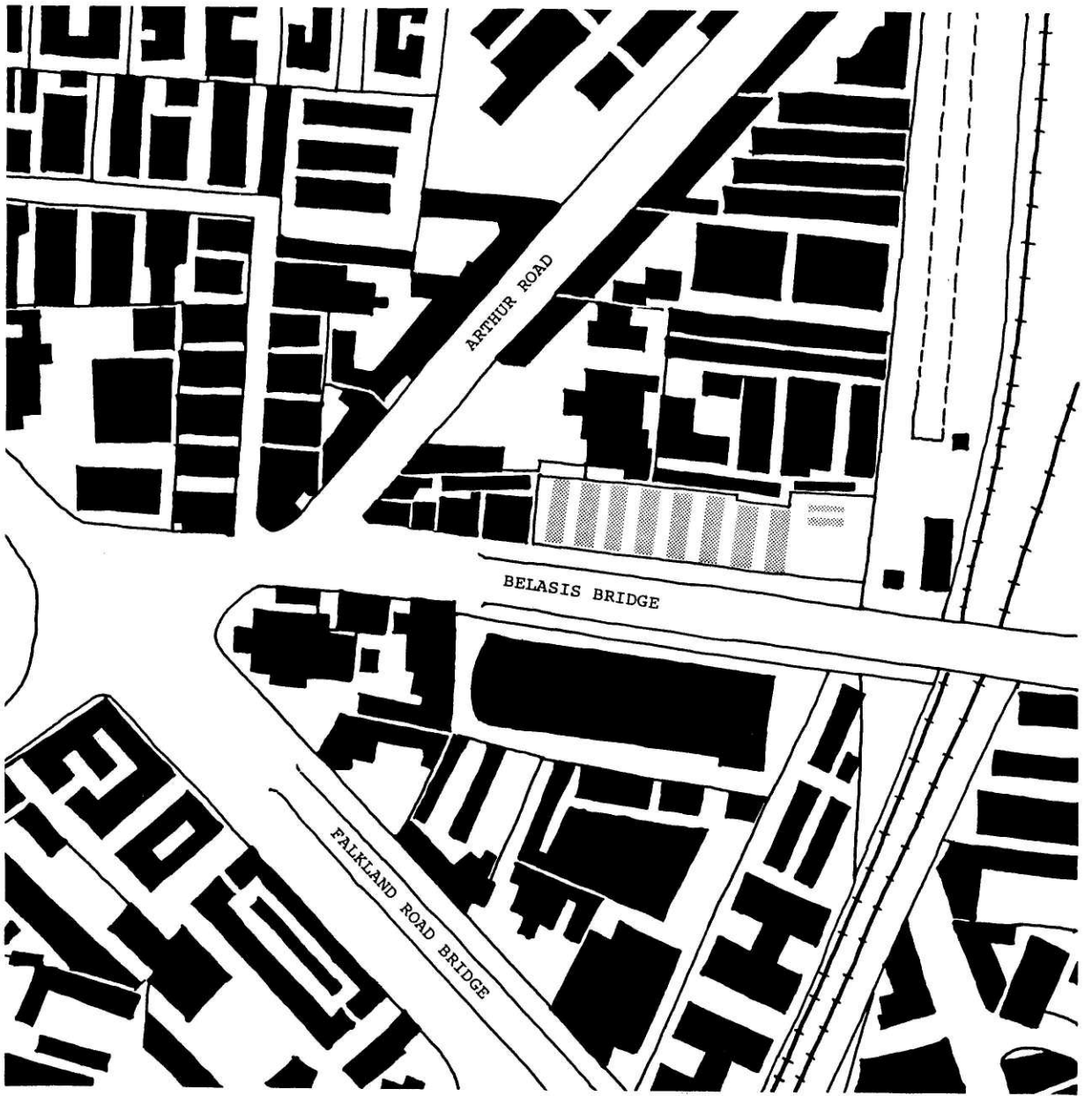
In terms of the communal facilities, the locality has municipal primary and secondary schools, a hospital, market, etc. within the walking distance from Ganjawala chawls. The main roads passing through the area are conjested with pedestrian as well as vehicular circulation. However, the access to Ganjawala chawls is seldom crowded.

CASE STUDY SOURCES

Segment Plan:	(accurate) Bombay Municipal Corporation, 1972
Dwelling Group Plan:	(accurate) BMC, 1972 Author, 1980
Dwelling Unit:	(accurate) Field Survey, Author, 1980; Thesis, Avani Trivedi, 1978
Physical Data:	(accurate) Field Survey, Author, 1980
Socio-Economic Data:	(approximate) Field Survey, Author, 1980
Photographs:	Author, 1980
General Informations:	Field Survey, Author, 1980



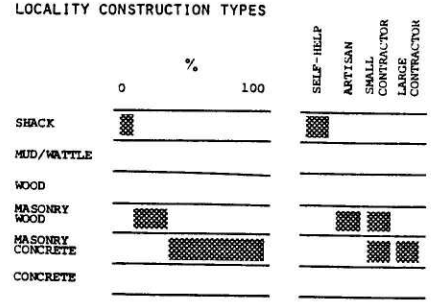
PHOTOGRAPH: (TOP) Approach to the 80 year old, single storied chawls. The construction in the background is being carried out by Bombay Municipal Corporation to house the residents of these delapidated chawls. (BOTTOM) Common lavatories, without water supply, are located in a corner of the site.



LOCALITY SEGMENT PLAN

1:2500

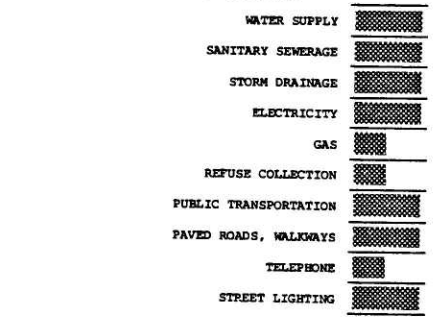
LOCALITY CONSTRUCTION TYPES



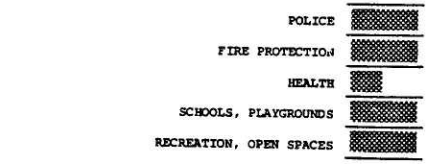
The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type.

Quality of information: approximate

LOCALITY UTILITIES AND SERVICES



LOCALITY COMMUNITY FACILITIES

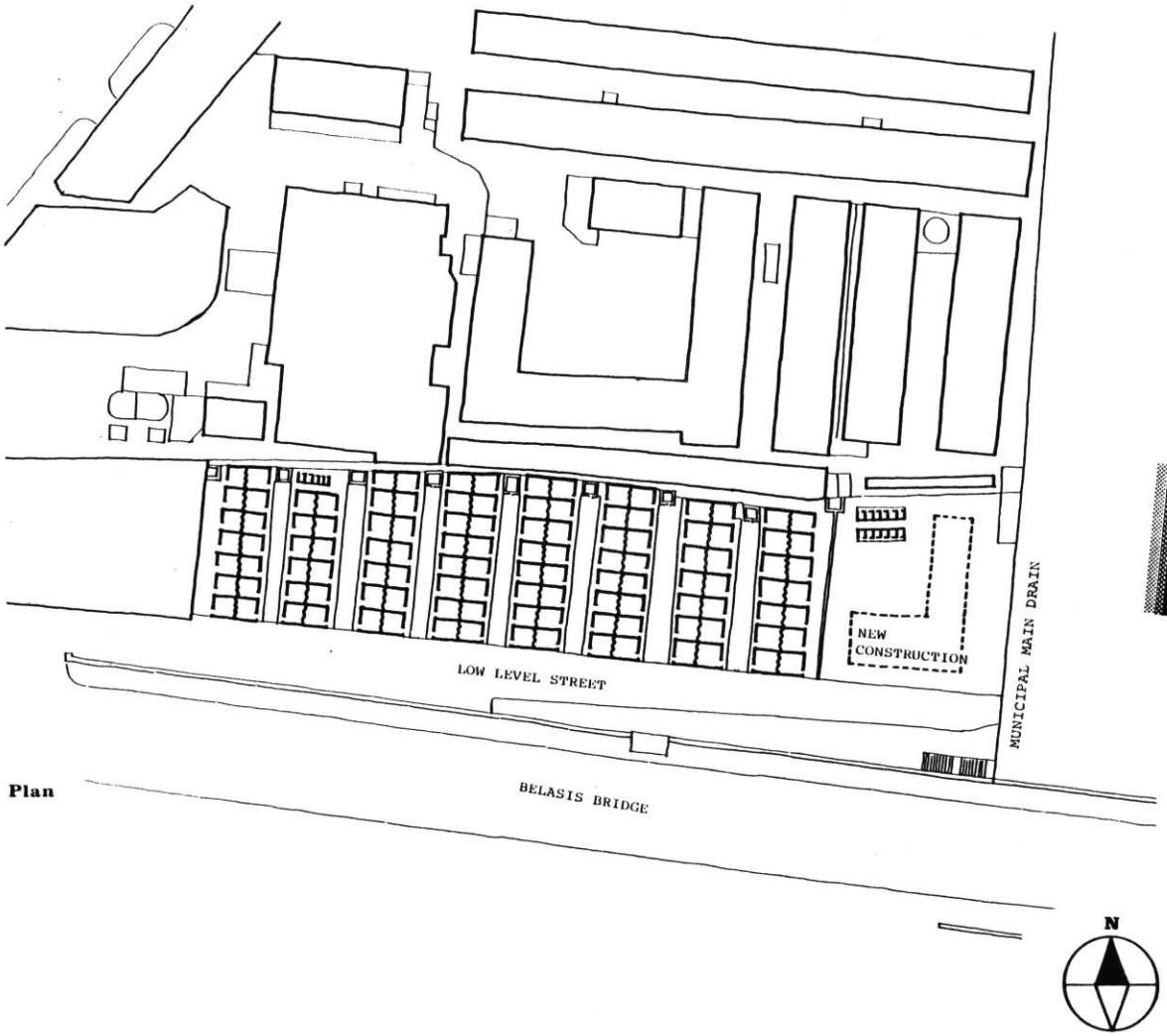


The chart illustrates the approximate availability of utilities, services, and community facilities at three levels: NONE, LIMITED, ADEQUATE.

Quality of information: approximate

SELECTED DWELLING/GROUP

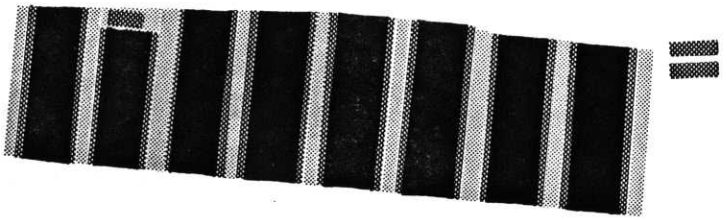
Section



Plan

LAND/LOT	sq.m.	%
LOT COVERAGE	1139	45
OPEN AREA	1391	55
TOTAL LOT AREA	2530	100

DWELLING	sq.m.	%
PRIVATE FLOOR AREA	1391	100
SHARED FLOOR AREA	-	0
TOTAL FLOOR AREA	1391	100



KEY

PRIVATE FLOOR AREA: dwellings

SEMI-PRIVATE FLOOR AREA: corridors

SEMI-PRIVATE FLOOR AREA: cluster courts

0 10 50m

1:1000

DWELLING GROUP

FLOOR/LAND UTILIZATION PLAN

DWELLING: These chawls were built by private developer in the year 1900. The layout was based on early industrial England's back-to-back workers' terraces. The group of chawls has 116 dwelling units, divided 8 rows. Small back-to-back, single-room dwelling units are divided by corrugated tin sheets and covered by clay-tiled roof. One-story structures are built in timber and brick masonry. Except common washing places (fortunately with 24 hours water supply) no facilities existed until Bombay Municipal Corporation (BMC) provided common latrines. B.M.C. is presently building walk-up chawls in the same lot to house the occupants of these dilapidated dwellings.

OCCUPANTS: These chawls house about 890 low-income people, many of them single, male, migrant, industrial workers, fulfilling the original purpose of chawls when initiated. The dwellers' group is heterogeneous, comprising the natives of Uttar Pradesh, Gujarat and rural parts of Maharashtra.

PHOTOGRAPH: Interior of a one-room, back-to-back unit divided by tin sheet; their needs have shrunk, the lady is satisfied for what she has.

PHYSICAL DATA
(related to land,dwelling and dwelling unit)

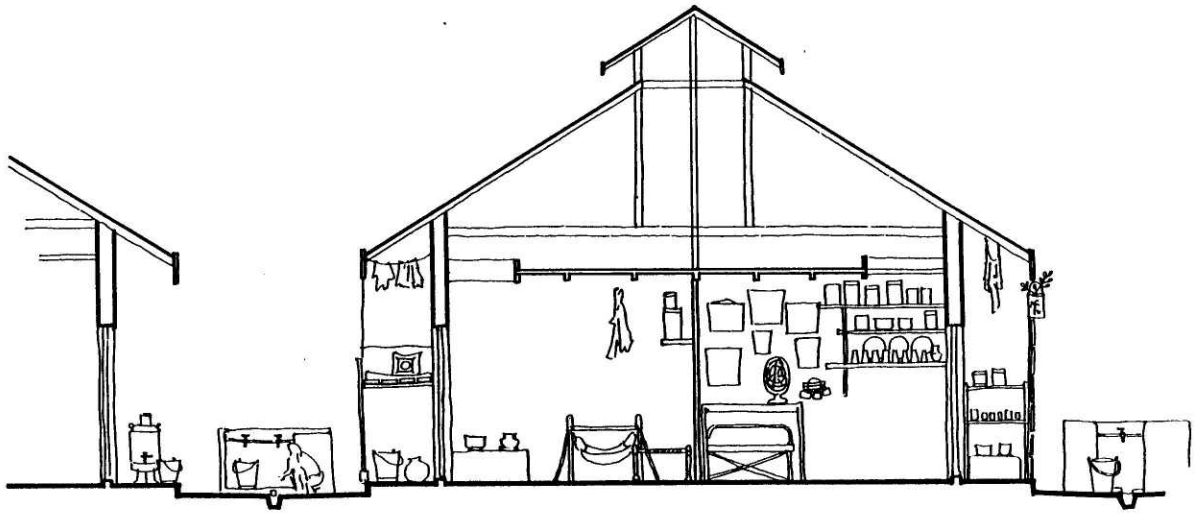
LAND/LOT		
utilization:	SEMI-PRIVATE	
area (sq m):	2530	
tenure:	LEGAL RENTAL	
DWELLING	DWELLING/GROUP	
location:	INNER-RING	
type:	CHAWL	
number of floors:	1	
utilization:	MULTI-FAMILY	
physical state:	DILAPIDATED	
number of dwelling units:	116	
number of people:	890	
private floor area (sq.m.):	1391	(100%)
shared floor area (sq.m.):	-	(0%)
Total floor area (sq.m.):	1391	(100%)
open area (sq.m.):	1139	(45%)
lot coverage (sq.m.):	1391	(55%)
Total lot area (sq.m.):	2530	(100%)
total floor area/lot area (FSI):	0.55	
density (people/ha of lot area):	3517	
(dwelling units/ha of lot area):	458	

shared facilities	dw units/facility	p/facility
wc:	6.4	45
shower:	-	-
kitchen:	-	-
rooms:	-	-
other: washing	12.8	98

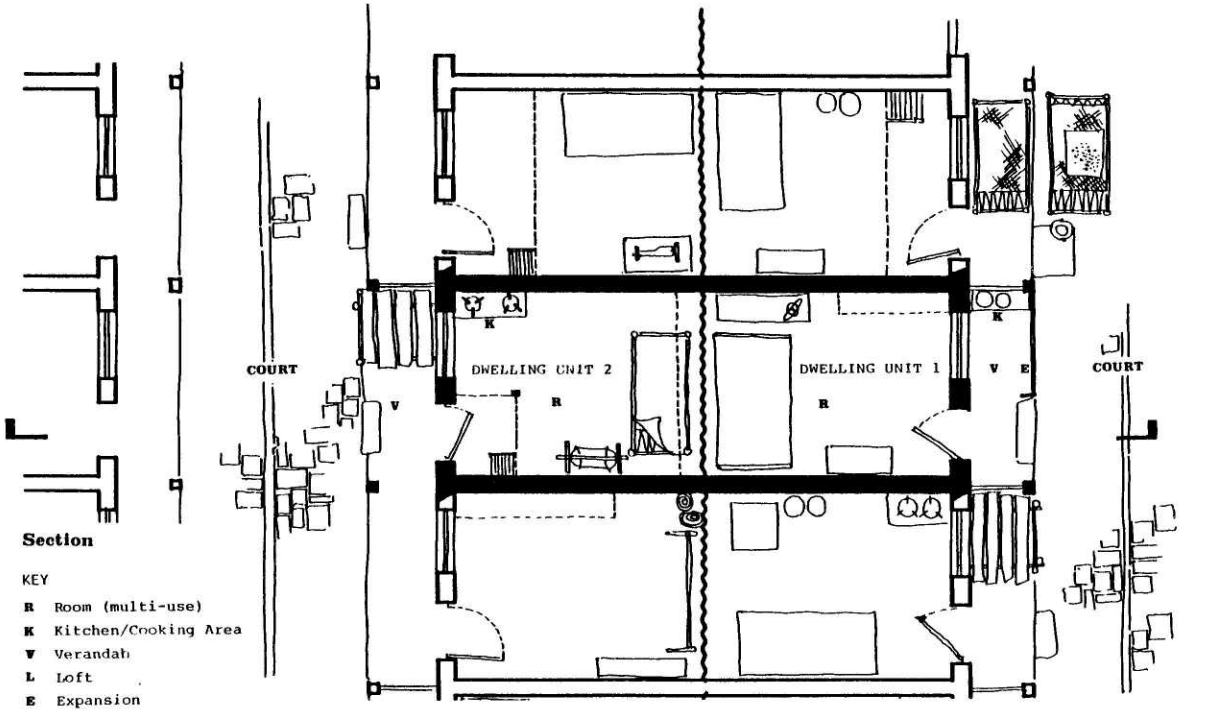
DWELLING DEVELOPMENT	
mode:	INSTANT
developer:	PRIVATE (NOW PUBLIC OWNED)
builder:	SMALL CONTRACTOR
construction type:	(TIMBER/MASONRY/TIN SHEET)
year of construction:	1900
DWELLING UNIT	
type:	ONE-ROOM (BACK TO BACK)
area (sq m):	9.7+2.4=12.1
tenure:	LEGAL RENTAL
average household size:	7.7
average area per person (sq.m.):	1.6
facilities	
room:	1
kitchen:	-
shower:	-
washing area 'mori':	-
w.c.:	-
other:	VERANDAH

SOCIO-ECONOMIC DATA
(related to user)

GENERAL: SOCIAL	
user's ethnic origin:	U. P. HINDU
place of birth:	-
education level:	NONE
NUMBER OF USERS	
married:	4
single:	-
children:	2
total:	6
MIGRATION PATTERN	
number of moves:	1
rural - urban:	1
urban - urban:	-
urban - rural:	-
why came to urban area:	EMPLOYMENT
GENERAL: ECONOMIC	
user's income group:	VERY LOW
employment:	INDUSTRIAL WORKERS
distance to work:	1 KM
mode of travel:	WALK
DWELLING UNIT PAYMENTS	
financing:	SELF-FINANCE
rent/mortgage:	US $ 1
% income for rent/mortgage:	2-4
extra payments:	NONE



Section



Section

KEY

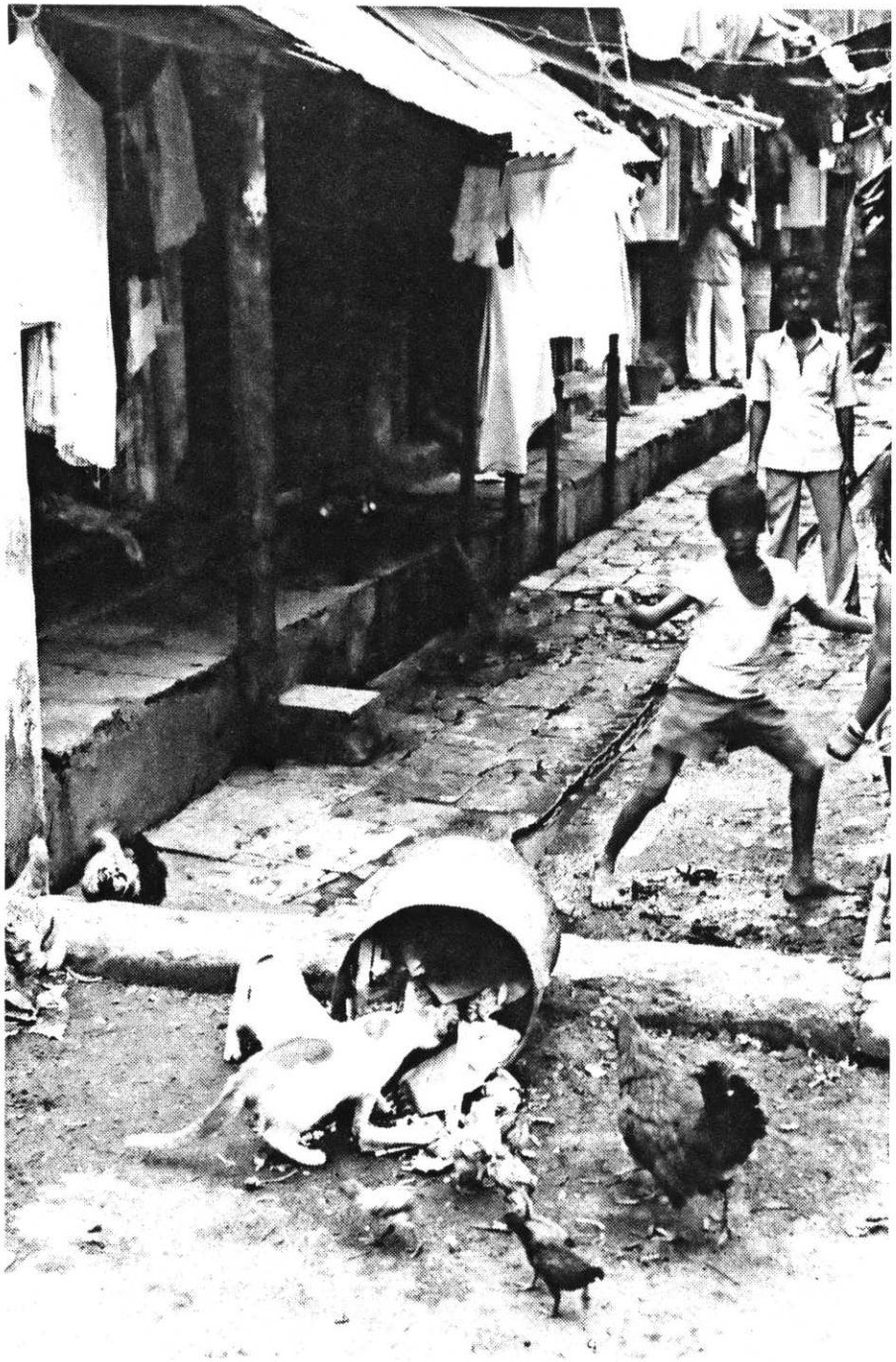
- **R** Room (multi-use)
- **K** Kitchen/Cooking Area
- **V** Verandah
- **L** Loft
- **E** Expansion

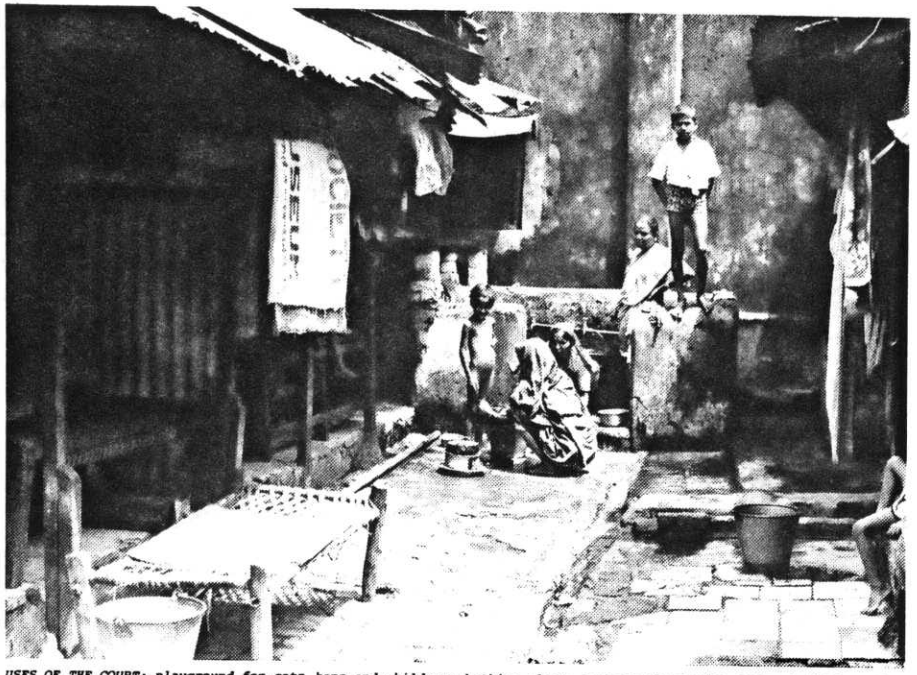
Plan

0 1 3 5m

1:100

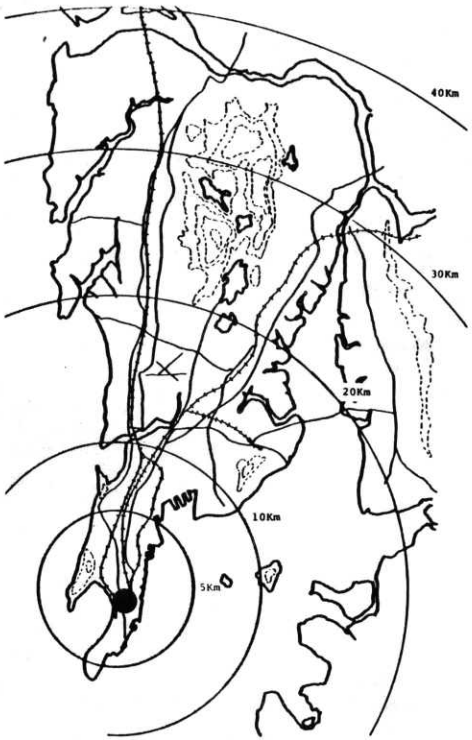
DWELLING UNIT





USES OF THE COURT; playground for cats hens and children; bathing place; a place for drying grain, knitting, etc.

4 Chandanwadi Chawls Bombay



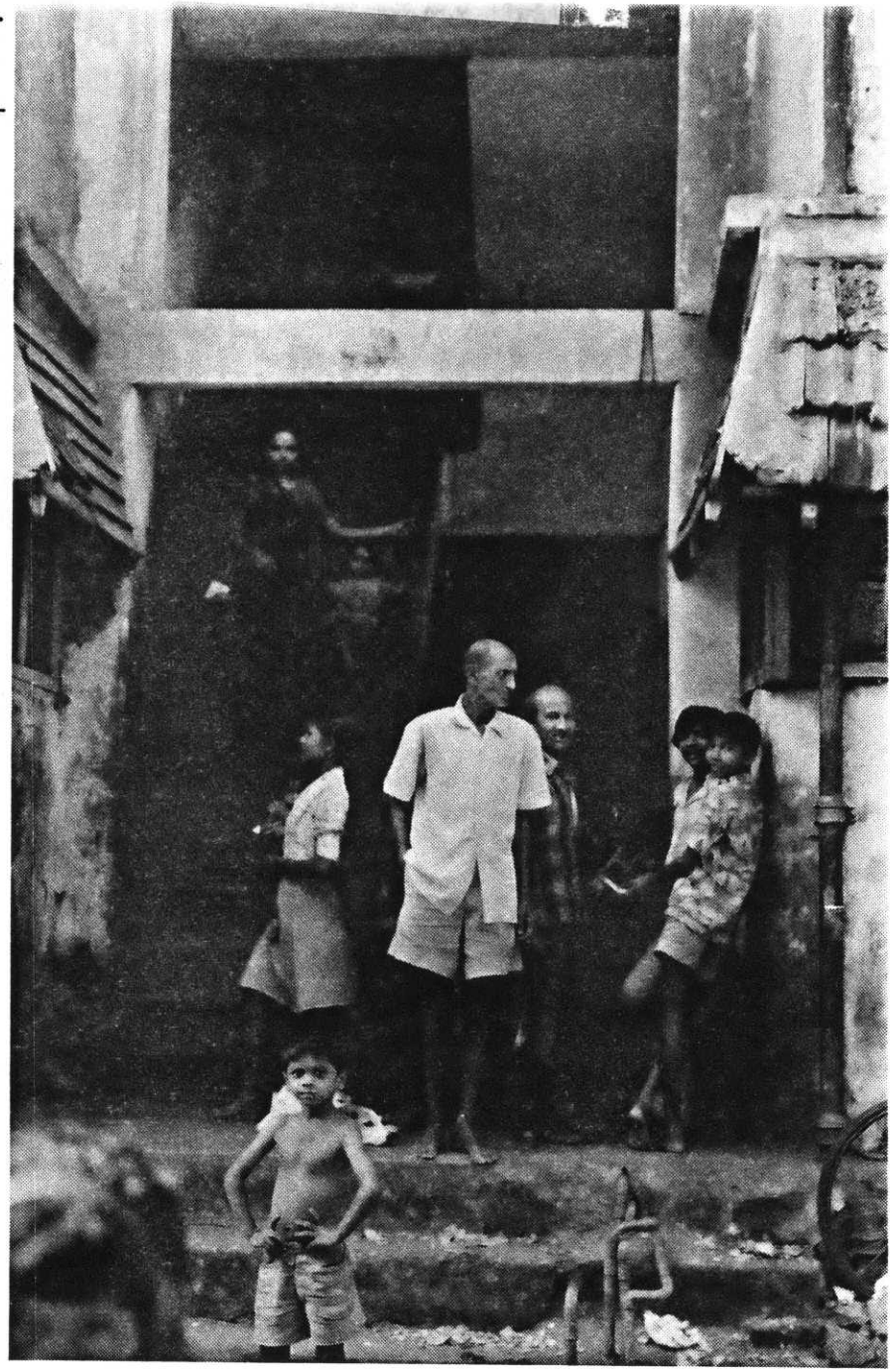
LOCALITY: This case is selected to represent the public housing efforts for low income groups. These chawls are located in the same area as the first case, across Princess street-the main commercial street of the area.

Bombay Improvement Trust (B.I.T.) built this groups of six buildings in the year 1904. B.I.T. was formed in 1898 for the purpose of providing housing to the city's poor. Until then, the housing activities were confined to the private enterprises. These chawls are now owned by the Bombay Municipal Corporation.

Service industries also exist in this largely commercial and residential area. A municipal primary school and municipal dispensary are located just opposite the dwelling group under study, apart from many other communal facilities in the locality. Chandanwadi is name of the street where a large number of basket weavers live.

CASE STUDY SOURCES

Segment Plan:	(accurate) Bombay Municipal Corporation, 1972
Dwelling Group Plan:	(accurate) BMC, 1972
Dwelling Unit:	(accurate) Field Survey, Author, 1980; Thesis, Avani Trivedi, 1978
Physical Data:	(accurate) Field Survey, Author, 1980
Socio-Economic Data:	(approximate) Field Survey, Author, 1980
Photographs:	Author, 1980
General Informations:	Field Survey, Author, 1980

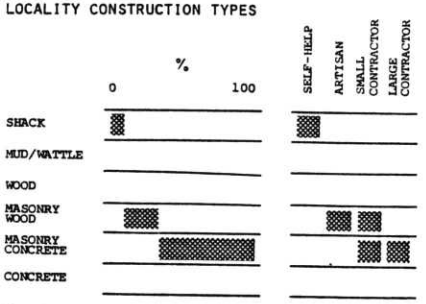


PHOTOGRAPH: Entrance staircase right on the street, but so many watching eyes won't let a stranger in.

LOCALITY SEGMENT PLAN

1:2500

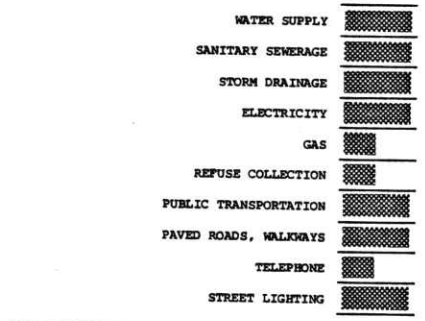
LOCALITY CONSTRUCTION TYPES



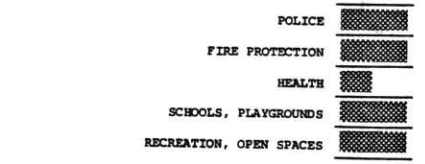
The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type.

Quality of information: approximate

LOCALITY UTILITIES AND SERVICES



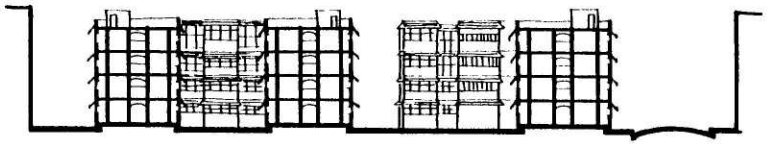
LOCALITY COMMUNITY FACILITIES



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

Quality of information: approximate

SELECTED DWELLING/GROUP



Section

Plan

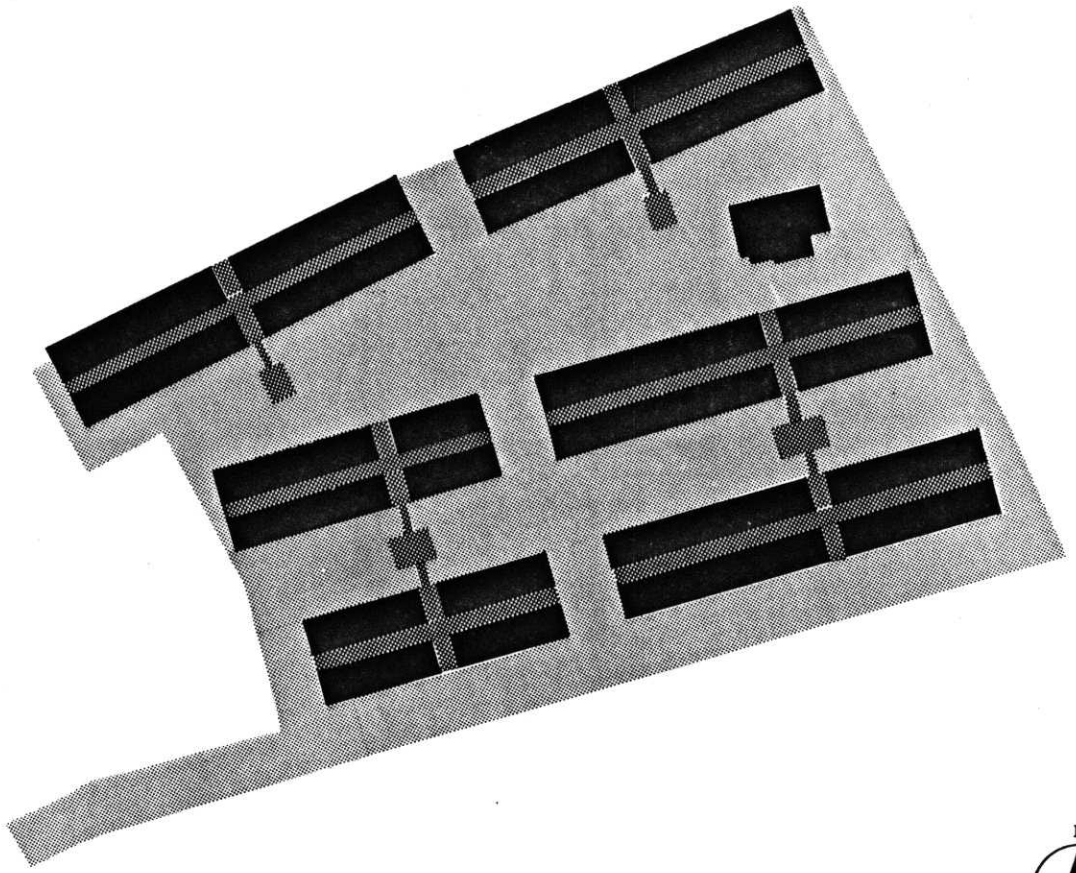
DWELLING GROUP

DWELLING: Six buildings are arranged in three rows-one behind another, parallel to the street. This group of dwellings also has a second entrance through an access road from the other side. Each building is four stories high, having a central corridor with single room dwelling units on either side. The stair is in the center opposite the common sanitary facilities in a narrow block extending out of the building facade. Each building has 80 to 128 dwelling units, i.e. 20 to 32 units on a floor. Four units share one w.c., one shower and a washing place.

OCCUPANTS: A heterogeneous group of Gujaratis, Christians, Marathis, etc., live in these chawls; each group occupying a seperate building. These chawls serve more than 3,500 people, most belonging to low income group. Occupation of the dwellers varies, with the majority involved in clerical and factory jobs. Monthly household income of the occupants ranges from Rs. 400 to 800 (US$ 50 to 100). About 3% of the income spent on rent and about 70% on food.

LAND/LOT	sq.m.	%
LOT COVERAGE	7785	70
OPEN AREA	3360	30
TOTAL LOT AREA	11145	100

DWELLING	sq.m.	%
PRIVATE FLOOR AREA	7884	59
SHARED FLOOR AREA	5556	41
TOTAL FLOOR AREA	13440	100



KEY

PRIVATE FLOOR AREA: dwellings

SEMI-PRIVATE FLOOR AREA: corridors

SEMI-PRIVATE FLOOR AREA: cluster courts

0 10 50m

1:1000

FLOOR/LAND UTILIZATION PLAN

PHYSICAL DATA
(related to land,dwelling and dwelling unit)

LAND/LOT	
utilization:	SEMI-PRIVATE
area (sq m):	11145
tenure:	LEGAL RENTAL
DWELLING	
location:	CITY-CENTER
type:	CHAWL
number of floors:	4
utilization:	MULTI-FAMILY
physical state:	FAIR
number of dwelling units:	584
number of people:	3530

private floor area (sq.m.):	7884	(59%)
shared floor area (sq.m.):	5556	(41%)
Total floor area (sq.m.):	13440	(100%)
open area (sq.m.):	7785	(70%)
lot coverage (sq.m.):	3360	(30%)
Total lot area (sq.m.):	11145	(100%)
total floor area/lot area (FSI):	1.2	
density (people/ha of lot area):	3167	
(dwelling units/ha of lot area):	-	

shared facilities	dw units/facility	p/facility
wc:	4	24
shower:	6	36
kitchen:	-	-
rooms:	-	-
other:	-	-

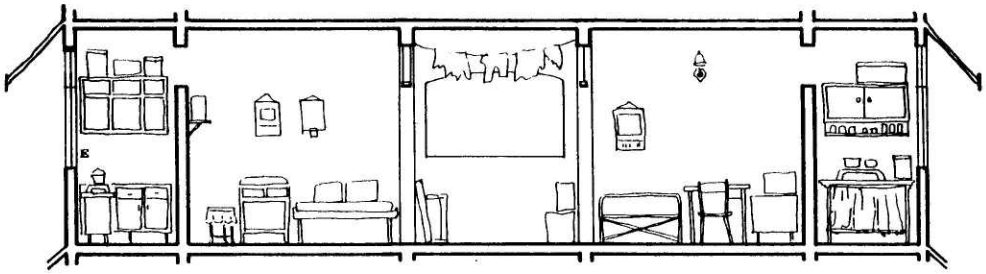
DWELLING DEVELOPMENT	
mode:	INSTANT
developer:	PUBLIC (BIT)
builder:	LARGE CONTRACTOR
construction type:	MASONRY/CONCRETE (SKELETON)
year of construction:	1904
DWELLING UNIT	
type:	ROOM
area (sq m):	10+3.4
tenure:	LEGAL RENTAL
average household size:	6
average area per person (sq.m.):	2.25
facilities	
room:	1
kitchen:	-
shower:	-
washing area 'mori':	1
w.c.:	-
other:	BALCONY

SOCIO-ECONOMIC DATA
(related to user)

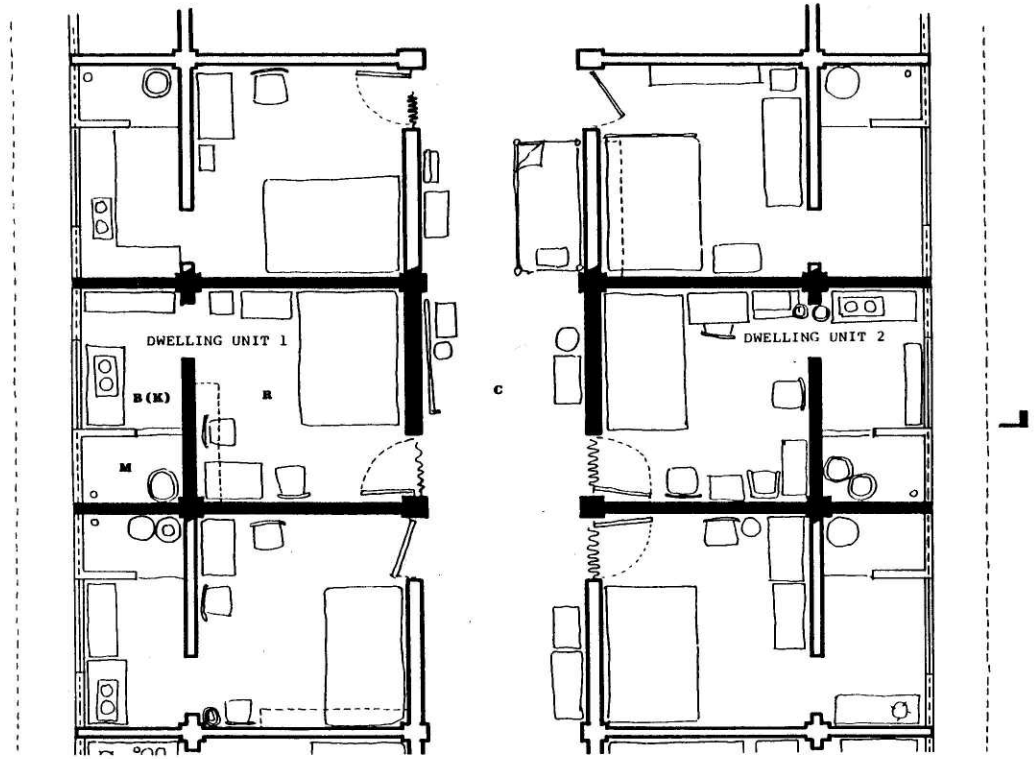
GENERAL: SOCIAL	
user's ethnic origin:	CHRISTIAN
place of birth:	GOA
education level:	MEDIUM
NUMBER OF USERS	
married:	2
single:	1
children:	3
total:	6
MIGRATION PATTERN	
number of moves:	1
rural - urban:	1
urban - urban:	-
urban - rural:	-
why came to urban area:	EMPLOYMENT
GENERAL: ECONOMIC	
user's income group:	LOW
employment:	CLERICAL
distance to work:	4 KM
mode of travel:	BUS
DWELLING UNIT PAYMENTS	
financing:	SELF-FINANCE
rent/mortgage:	US $ 2
% income for rent/mortgage:	3
extra payments:	NONE

KEY

- **R** Room (multi-use)
- **K** Kitchen/Cooking Area
- **B** Balcony
- **C** Corridor
- **M** Mori (washing area)
- **E** Expansion



Section



Plan

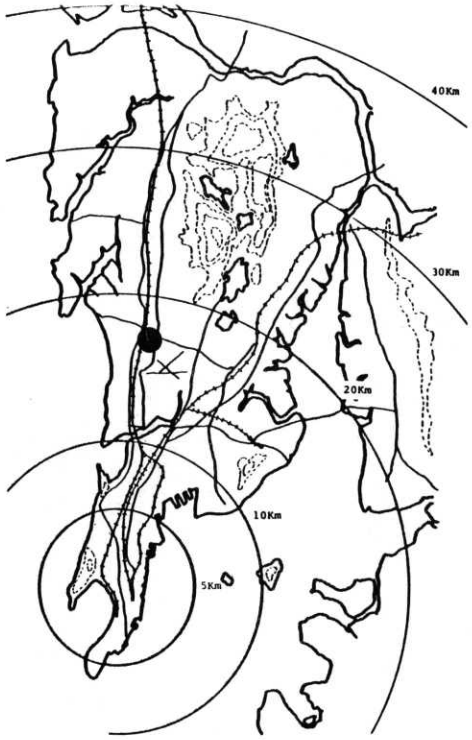
0 1 3 5m

1:100

DWELLING UNIT

PHOTOGRAPHS: USES OF THE COURT; elders sit and chat while the children play

5 Vijaynagar Co-op. Society Bombay

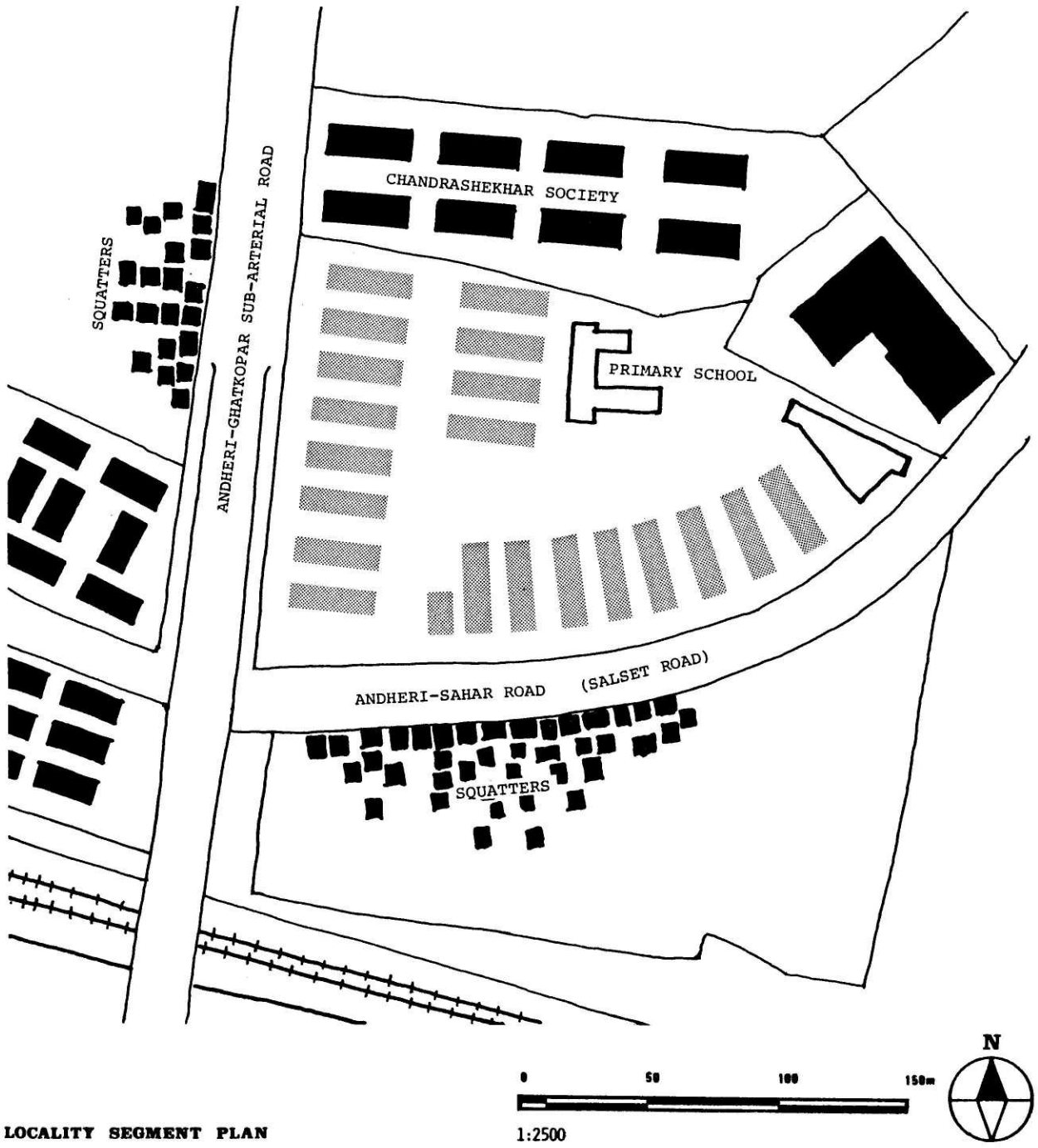


LOCALITY: This case is the typical of the new developments occuring in the suburban areas of bombay. Although it is built (in 1965) by a private enterprise to form a co-operative housing society of a homogeneous ethnic group, it doesn't differ from the other public housing schemes in the suburbs. Located in Andheri, one of the eastern suburbs of Bombay, it is surrounded by a railway station, a vegetable market and a bus-terminal within short distances. Vehicular traffic and density are low, compared to the other case studies. The site is occupied by 20 identical blocks in rows, and it also contains a primary school and a community hall within the boundary.

CASE STUDY SOURCES

Segment Plan:	(accurate) Bombay Municipal Corporation, 1972
Dwelling Group Plan:	(accurate) BMC, 1972 Author, 1980
Dwelling Unit:	(accurate) Field Survey, Author, 1980; Thesis, Avani Trivedi, 1978
Physical Data:	(accurate) Field Survey, Author, 1980
Socio-Economic Data:	(approximate) Field Survey, Author, 1980
Photographs:	Author, 1980
General Informations:	Field Survey, Author, 1980

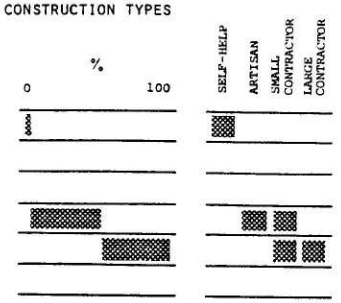
PHOTOGRAPH: (TOP) Partly paved front courtyard (BOTTOM) Bed in the corridor is used by the college going son to study during day and to sleep during night.



LOCALITY SEGMENT PLAN

1:2500

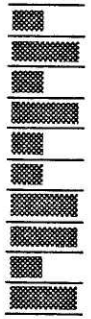
LOCALITY CONSTRUCTION TYPES



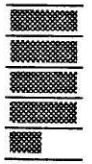
The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type.

Quality of information: approximate

LOCALITY UTILITIES AND SERVICES



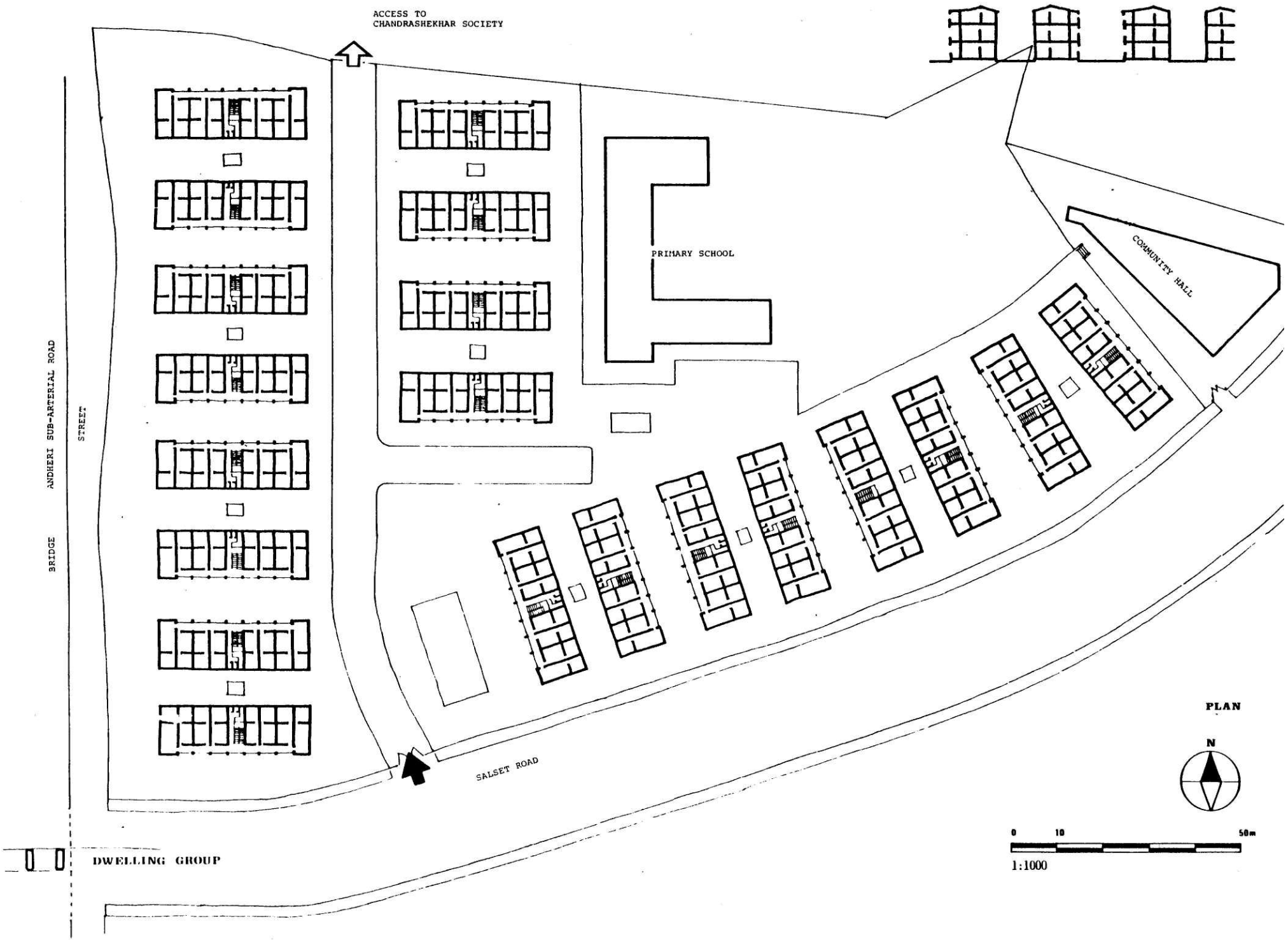
LOCALITY COMMUNITY FACILITIES



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

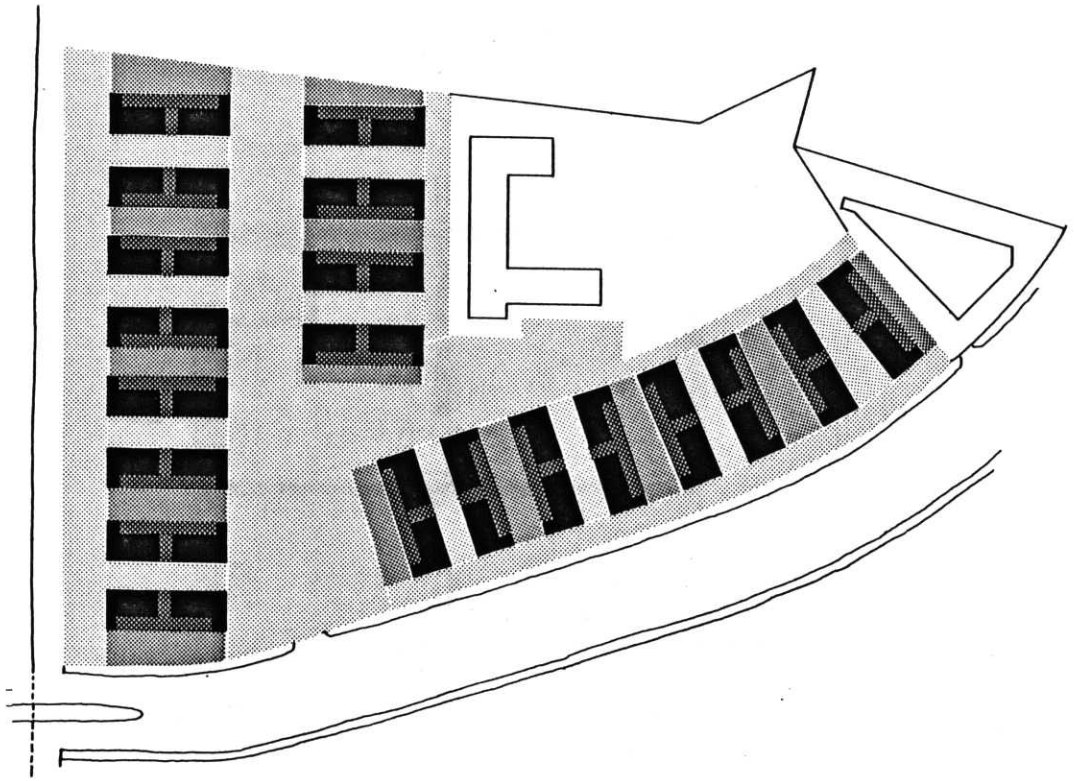
Quality of information: approximate

SELECTED DWELLING/GROUP


ACCESS TO
CHANDRASHEKHAR SOCIETY
PRIMARY SCHOOL
COMMUNITY HALL
BRIDGE
ANDHERI SUB-ARTERIAL ROAD
STREET
SALSET ROAD
DWELLING GROUP
PLAN
N
0
10
50m
1:1000

LAND/LOT	sq.m	sq.m.	%
LOT COVERAGE		15497	71
OPEN AREA		6300	29
TOTAL LOT AREA		21797	100

DWELLING	sq.m.	%
PRIVATE FLOOR AREA	12384	66
SHARED FLOOR AREA	6516	34
TOTAL FLOOR AREA	18900	100



KEY

PRIVATE FLOOR AREA: dwellings

SEMI-PRIVATE FLOOR AREA: corridors

SEMI-PRIVATE FLOOR AREA: cluster courts

N

0 10 50 100m

1:2000

FLOOR/LAND UTILIZATION PLAN

DWELLING: The dwelling is a three storied, reinforced concrete and brick masonry building with slightly sloped concrete roof. Each building contains 24 dwelling units, 8 on each floor, with stair and sanitary facilities, two w.c.s and a washing place on each floor. Two room dwelling units, are provided with a cooking platform, bathroom, and a loft. Water storage tanks and pumps facilitate 24 hour water supply.

OCCUPANTS: The occupants belong to the Marathi Brahmin community. The total number of people residing in this co-operative society is about 2,200. Many of them are officers, falling in middle income groups, monthly income of a household varies from Rs. 700 to 1,000 (U.S.$ 85 to 125). The deposit of Rs 3,000 (U.S. $ 375) at the time of registration in 1961, and a monthly installment of Rs 70 (U.S.$ 9) for 15 years was required from each household after occupation in 1965, towards ownership of the dwelling unit. The land, however, is owned by the whole society. (see appendix for co-operative housing systems)

PHYSICAL DATA
(related to land,dwelling and dwelling unit)

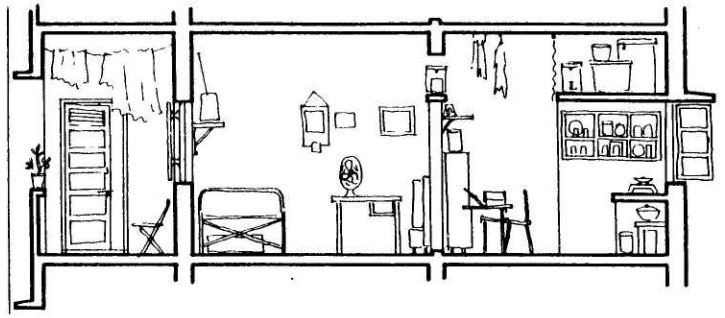
LAND/LOT		
utilization:	SEMIPRIVATE	
area (sq m):	21797	
tenure:	COOPERATIVE	
DWELLING	GROUP	
location:	SUBURB	
type:	CHAWL	
number of floors:	3	
utilization:	MULTI-FAMILY	
physical state:	-	
number of dwelling units:	480	
number of people:	2165	
private floor area (sq.m.):	12384	(66%)
shared floor area (sq.m.):	6516	(34%)
Total floor area (sq.m.):	18900	(100%)
open area (sq.m.):	15497	(71%)
lot coverage (sq.m.):	6300	(29%)
Total lot area (sq.m.):	21797	(100%)
total floor area/lot area (FSI):	0.86	
density (people/ha of lot area):	993	
(dwelling units/ha of lot area):	220	

shared facilities	dw units/facility	p/facility
wc:	4	18
shower:	-	-
kitchen:	-	-
rooms:	-	-
other:	-	-

DWELLING DEVELOPMENT	
mode:	INSTANT
developer:	PRIVATE
builder:	LARGE CONTRACTOR
construction type:	SKELETON (MASONRY CONCRETE)
year of construction:	1961-65
DWELLING UNIT	
type:	TWO-ROOM
area (sq m):	25.8
tenure:	OWNERSHIP (HIRE/PURCHASE)
average household size:	4.5
average area per person (sq.m.):	5.7
facilities	
room:	1
kitchen:	1
shower:	1
washing area 'mori':	-
w.c.:	-
other:	-

SOCIO-ECONOMIC DATA
(related to user)

GENERAL: SOCIAL	
user's ethnic origin:	MARATHI BRAHMIN
place of birth:	MAHARASHTRA
education level:	HIGH
NUMBER OF USERS	
married:	2
single:	1 (WIDOW)
children:	2
total:	5
MIGRATION PATTERN	
number of moves:	1
rural - urban:	1
urban - urban:	-
urban - rural:	-
why came to urban area:	EDUCATION/EMPLOYMENT
GENERAL: ECONOMIC	
user's income group:	MIDDLE
employment:	CLERICAL
distance to work:	30 KM
mode of travel:	TRAIN
DWELLING UNIT PAYMENTS	
financing:	SELF-FINANCE
rent/mortgage:	US $ 9/MONTHLY INSTALLMENT
% income for rent/mortgage:	9-12
extra payments:	DEPOSIT US $ 375 (IN 1961)



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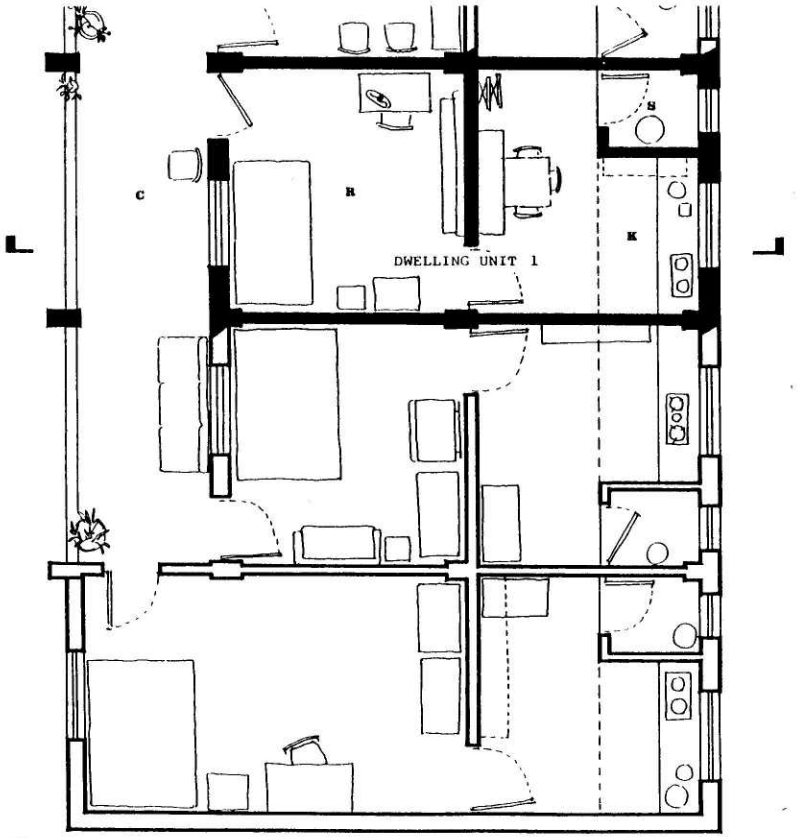


KEY

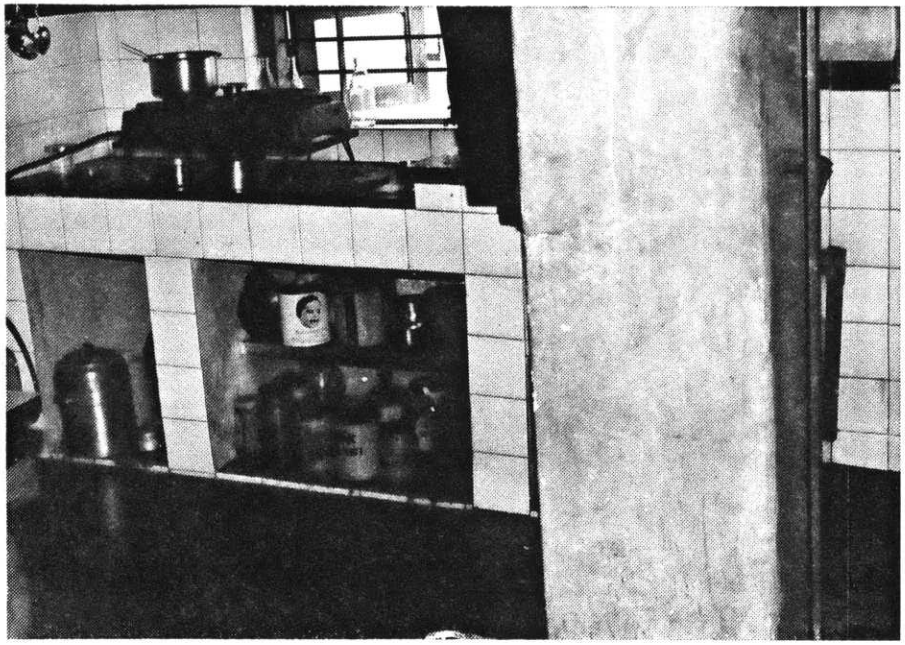
- R Room (multi-use)
- K Kitchen/Cooking Area
- C Corridor
- L Loft
- S Shower

Plan

0 1 3 5m

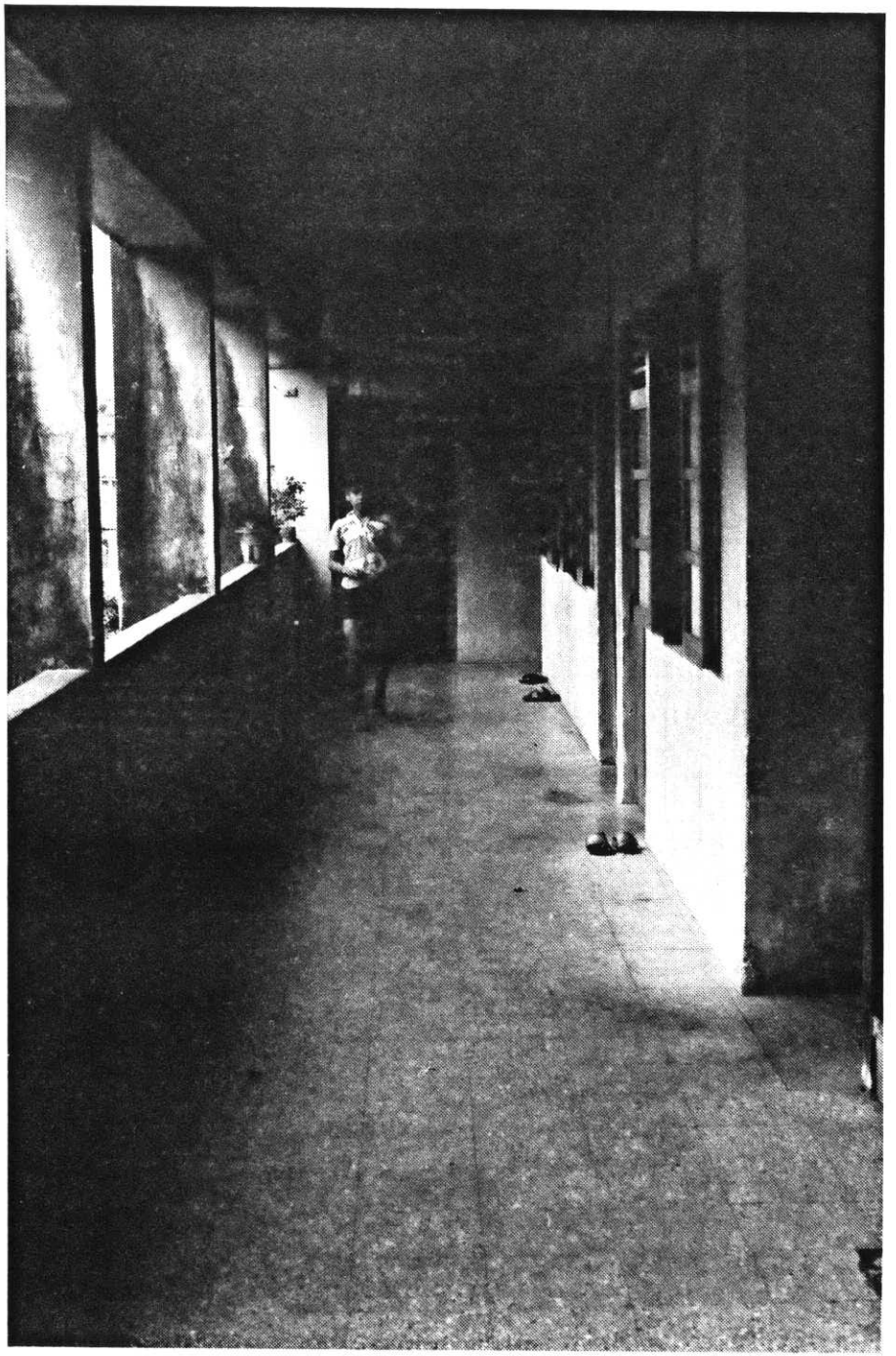
1:100

DWELLING UNIT



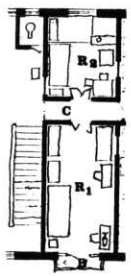
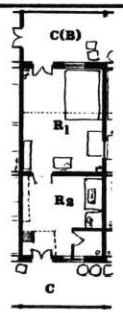
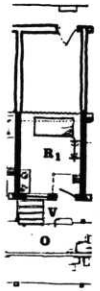
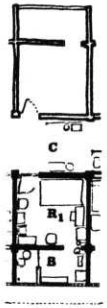
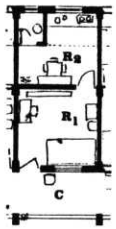
PHOTOGRAH: (TOP) Clothes drying in the kitchen is not an unusual sight in Bombay during Monsoons. Storage of grain, cooking oil, etc., is kept on the dividing wall between the room and the kitchen.

(BOTTOM) Kitchen platform and bathing place were provided and ceramic tile finish was added later. (RIGHT) View of the corridor with eight dwelling units on a floor.

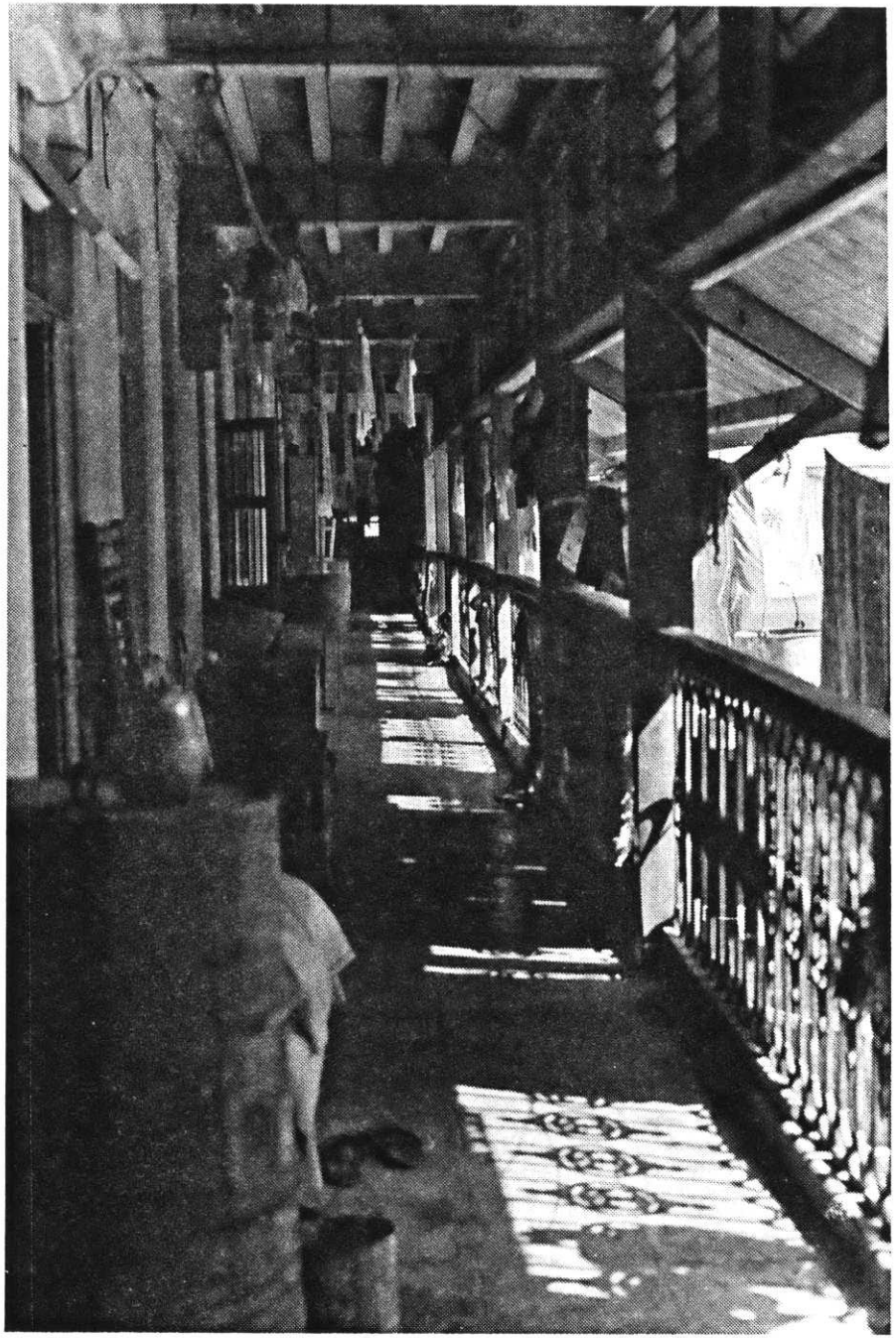


CASE STUDY ANALYSIS

space/activity chart

CASE STUDY NUMBER		1	2	3	4	5
PLAN		 o	 o	 o	 o	 o
ROOM 1 R_1	AREA (sq.m)	16.5	13.5	9.7	9	15
	ACTIVITIES	SLEEP READ	SLEEP READ EAT	SLEEP READ EAT COOK	SLEEP READ EAT	SLEEP READ EAT
ROOM 2 R_2	AREA (sq.m)	10.8-13.8	10.5			10.9
	ACTIVITIES	COOK CLEAN GRAIN EAT WASH UTENSILS CLOTHES BATHE SLEEP	COOK EAT WASH UTENSILS CLOTHES BATHE SLEEP			COOK CLEAN GRAIN EAT WASH UTENSILS CLOTHES SLEEP
BALCONY VERANDA B/V	AREA (m^2)	1.2	4.5*	2.4	4.5	
	ACTIVITIES	READ	STORAGE SLEEP READ	STORAGE SLEEP READ	STORAGE SLEEP READ COOK*	
LOFT	AREA (sq.m)		4.5*	5*		3
	ACTIVITIES		STORE SLEEP	STORE SLEEP		STORE
SANITARY FACILITIES	BATH	IN UNIT*	IN UNIT*		COMMON	IN UNIT
	WASH	IN UNIT	IN UNIT/COMMON	COMMON	COMMON	COMMON
	W.C.	COMMON	COMMON	COMMON	COMMON	COMMON
CORRIDOR C	WIDTH (m)	1	1.85		2.4	2
	ACTIVITIES	STORAGE PLAY	STORAGE CLEAN GRAIN KNIT/CHAT READ PLAY SLEEP		STORAGE PLAY SLEEP	STORAGE CLEAN GRAIN KNIT/CHAT READ PLAY SLEEP
COURT o	AREA (sq.m)		2080	960	6750	7300
	ACTIVITIES	SHOPS PLAY PARKING KITE FLYING GATHERING	PLAY PARKING KITE FLYING GATHERING	PLAY SLEEP PARKING KITE FLYING GATHERING BATHE (open)	PLAY SLEEP PARKING KITE FLYING GATHERING	PLAY PARKING KITE FLYING GATHERING
ROOF	ACTIVITIES				KITE FLYING PLAY GATHERING SLEEP	
STREET	ACTIVITIES			PLAY KITE FLYING		

NOTE: * converted or added by majority of residents -into kitchen -into mezanine -into bathroom



PHOTOGRAPH: View of the corridor of Pannalal Terrace in mid-day, (photograph by Avani Trivedi, 1978)

comments : space/activity chart

DWELLING UNIT

-Number of rooms are one or two but never more. The second room is always used as cooking area which is also a room for entertaining women guests.

ALTERATION & EXPANSION

-One room units extend most of the activities outside. Generally, more space is added to one room units by constructing a mezanine or enclosing balcony/verandah. Enclosed balcony or verandah is invariably used for cooking as it needs most light and ventilation The housewife spends most of her time in the kitchen.

-Because of tight space in the units, which are anyway sparsely furnished most of the inexpensive storage is kept in corridors. Lofts, in such a case, become very useful. As can be seen in the chart, in cases 2 & 3 many users have extended lofts to form mezanines which are used for sleeping.

-As a next step for growth, another unit is baught because of the increase in number of married members of the household or the increase in income. This extra unit may or may not be adjoining to existing unit and is used mainly for sleeping only. Cooking, eating, etc. takes place in the former unit.

FACILITIES

-'Mori' or washing place in the unit, in many cases, is enclosed and used as bathing area also apart from washing clothes and utensils.

-The common facilities are invariably over-loaded (one w.c. used by more than 6 families as in case 3), causing ill-maintenance. One reason for this is, often, as many as 12 persons live in one unit but the facilities are provided in proportion to the number of dwelling units, as mentioned in the by-laws.

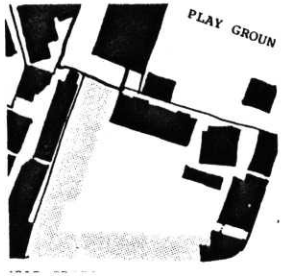
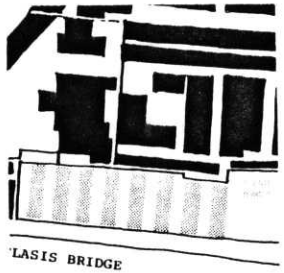
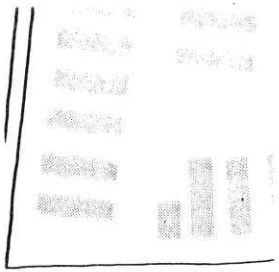
SHARED AREAS

-As clearly seen in the chart, in spite of case number 4 having more width than case number
having wider corridor than case 2, more activities take place in case 2. Cleaning grain or knitting accompanied by chatting and gossiping, are the favorite activities of the women residents which can not take place in the dark, noisy corridor, as in case 4.

-Sleeping in the semi-open spaces like corridor, balcony, etc. is very common because of the hot-humid climate and tight, inadequately ventilated units. The central, double loaded corridor doesn't serve for this purpose.

-Activities in the courts in all the cases are more or less same, except in the first case where shopping activities, loading-unloading, etc. dominate during day. However, the efficiency of utilization and maintainability varies in different cases. Public use of the court is observed in case one and case five where access to the other lot passes through the court which makes it difficult to control. In case four and five the courts between the 'backs' of the buildings are misused and ill-maintained.

-Roof terrace, if exists, is widely used for variety of activities like; sleeping in summer, playing, kite flying-exciting sport for the entire family, drying grain, spices etc., social gathering, festvities, etc., etc.

CASE STUDY SUMMARY	1 Bhiwandiwala Terrace	2 Pannalal Terrace	3 Ganjawala Chawls	4 Chandanwadi Chawls	5 Vijaynagar Co-op. Society
LOCALITY:	BHULESHWAR	TARDEO	TARDEO	BHULESHWAR	ANDHERI (EAST)
BUILDER:	PRIVATE	PRIVATE	PUBLIC	PUBLIC	CO-OPERATIVE
INCOME GROUP SERVED:	LOW	MODERATE	VERY LOW	LOW	MODERATE
YEAR OF CONSTRUCTION:	1920	1911	1900	1904	1961-65
RESIDENT COMMUNITY:	PARSIS	GUJARATIS	MIXED	MIXED	MARATHI BRAHMIN
SIZE: TOTAL DW. UNITS:	180	165	116	584	480
TOTAL POPULATION:	900	917	890	3530	2165
PATTERN					
TOTAL LOT AREA:	1740 (100%)	2750 (100%)	2530 (100%)	11145 (100%)	21797 (100%)
LOT COVERAGE:	71%	46%	55%	30%	29%
OPEN AREA:	29%	54%	45%	70%	71%
NUMBER OF FLOORS:	5,(6)	5	1	4	3
TOTAL FLOOR AREA:	6550 (100%)	6365 (100%)	1391 (100%)	13440 (100%)	18900 (100%)
PRIVATE FLOOR AREA:	77%	62%	100%	59%	66%
SHARED FLOOR AREA:	23%	38%	0%	41%	34%
FLOOR SPACE INDEX:	3.7	2.3	0.55	1.2	0.86
NET DENSITY: DW.UNITS/Ha:	1034	600	458	524	220
PEOPLE/Ha:	5172	3334	3517	3167	993
No OF UNITS/FACILITY:	2/1 w.c. (no shower)	4/1w.c. 6.5/1shower	6.5/1w.c. (no shower)	4/1w.c. 6/1shower	4/1w.c. (private shower)
No OF PERSONS/FACILITY:	10/1 w.c.	23/1w.c. 37/1shower	45/1w.c.	24/1w.c. 36/1shower	18/1w.c.
No OF UNITS ON A FLOOR SERVED BY A STAIR:	4	12	16	32	8
LENGTH/WIDTH OF CORRIDOR:	3.3	1.8	1.1	1.4	1.9
OPENING AREA/FL.AREA OF CORRIDOR:	0.08	1	open court	0.17	1.15
GROUPING OF UNITS: No OF UNITS IN A BUILDING	180	120	16	68	24
IN A CLUSTER	180	165	16	584 (cluster undefinable)	480(cluster undefinable)

CONCLUSIONS

The significance of chawls in Bombay's housing situation, as said earlier, is remarkable. Physical and social environment of this dwelling system is analyzed through the selected case studies representing the past and present efforts in Greater Bombay. The chawls have always been a rental housing system until recently when a few co-operatively owned housing societies were developed in chawl form. However, it is apparent from the studied examples that the earlier private developments were physically more efficient than the present efforts. The semiprivate open spaces and related social aspects are neglected in the present designs of housing schemes, as seen in the last case study. One of the reasons for inefficient physical layout would be the complexity of the present by-laws and interpretation of the same.

The semiprivate areas, open as well as covered are of prime importance in such dwelling environments because of the extension of varied household activities outside the dwelling unit which is invariably too small. Moreover, the social or community activities which take place in the semiprivate courtyards are requisite to ensure social integration and cohesion. The goal should be to recognise and to promote communal living.

Analyzing the situation through case studies, it is revealed that smaller group sizes are socially better integrated and have a strong social control, as in the cases with 116 and 165 dwelling units. It is also observed that comparatively smaller size of middle income groups and larger size of low income groups are socially more successful than vice versa. People with the same ethnic or cultural origin or from the same native place usually unite together to form a close, homogeneous group. However, the cultural differences tend to reduce in an urban environment where people from different background have to live in close proximity with each-other.

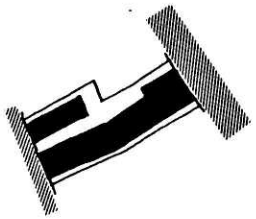
Generally, the chawl dwellers have a very strong social control where a stranger would be immediately spotted and asked for the reason of his being there. However, in a very large group of dwellings, as in case five, social control loosens out, where not everyone knows everyone. The semiprivate areas are maintained and used better if they are well controlled.

People start storing goods in the corridors in the initial stage of extension. Later, when more space is desired, mezzanine floor is added or the balcony is enclosed. With the increase in the number of married members more number of rooms are desired. Their first preference for growth would be to rent the adjoining unit or to rent a unit in the same building-may it be on another floor, and the next preference would be to rent a dwelling unit in the locality.

Having a kitchen has a priority over having a balcony or a verandah in the dwelling unit. The users desire more space rather than more facilities within the dwelling unit.

LAYOUT EVALUATION

1 Bhiwandiwala Terrace



-PERIPHERAL LAYOUT,TWO POINTS OF ENTRANCE

-SHOPS FACING THE COURT, THEREFORE PUBLIC USE OF THE COURT; NO PRIVACY IN SEMI-PRIVATE AREA

-SETBACK AREA NOT WELL-MAINTAINED BECAUSE OF UNDEFINED OWNERSHIP OF LAND

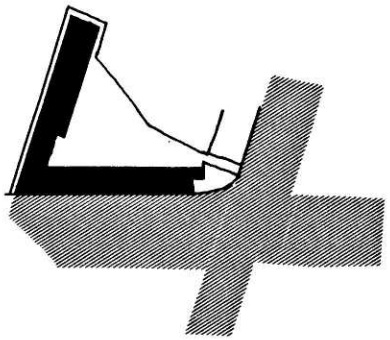
-A PASSAGE ACROSS THE WIDTH OF THE BUILDING SERVES FOUR UNITS

-LIGHT IN THE PASSAGE IS POOR

-OFFERS NO PRIVACY, AS ONE UNIT IS ACCESSIBLE ONLY THROUGH ANOTHER UNIT

-DENSITY AND FLOOR SPACE INDEX REGULATIONS ARE NOT FULFILLED IN THIS 60 YEAR OLD EXAMPLE

2 Pannalal Terrace



-PERIPHERAL LAYOUT,ONE ENTRANCE TO THE COURT

-SHOPS ON GROUND FLOOR FACE THE STREET AND THEIR ACCESS TO THE COURT IS CLOSED

-BUILDING PARTICIPATES IN THE STREET AS WELL AS IN THE COURT DUE TO THE CORRIDORS ON EITHER SIDE

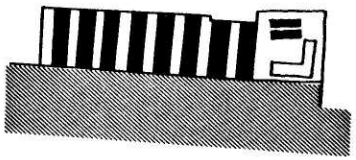
-SETBACK AREA UNUTILIZED

-CORRIDOR FACING THE STREET IS SELDOM USED FOR CIRCULATION AND THEREFORE OFFERS MORE PRIVACY AND SERVES AS A BALCONY

-INDEPENDENT LENGTH OF CORRIDOR SERVES 12 UNITS

-AS THIS CHAWL IS ABOUT 70 YEARS OLD IT DOES NOT COMPLY WITH THE PRESENT DWELLING UNIT DENSITY AND F.S.I. REGULATIONS

3 Ganjawala Chawls



-DWELLING BLOCKS PERPENDICULAR TO THE ACCESS LANE

-DIRECTLY ACCESSIBLE AND VISIBLE COURTS THEREFORE LACK OF PRIVACY IN COURTS

-COMPACT LAYOUT, NO WASTED AREAS

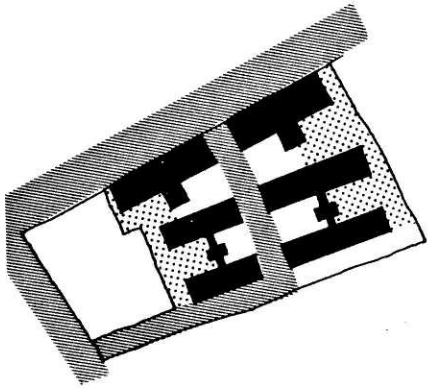
-CORRIDOR IS ABSENT; ONE STORIED BACK-TO-BACK UNITS ARE DIRECTLY ACCESSIBLE FROM THE COURT; LACK OF INTERMIDIATE SEMIPRIVATE AREA

-OFFERS MINIMUM PRIVACY IN ONE ROOM DWELLING UNITS

-A NUMBER OF ADDITIONS; MEZZANINES, DECK RAISED ON THE VERANDAH, ETC.

-ONE OF THE OLDEST CHAWLS IN BOMBAY; HAS LOW F.S.I. BUT DWELLING UNIT AREA IS LESS THAN THE MINIMUM AREA PERMITTED AND THE DENSITY IS HIGHER THAN REQUIRED

4 Chandanwadi Chawls



-TWO POINTS OF ACCESS, THE COURT BECOMES A THOROUGHFARE

-TOO LARGE UNDIVIDED GROUP OF DWELLINGS AND MIXED ETHNIC GROUPS RESULT IN LACK OF SOCIAL COHESION

-LARGE PARTS OF LAND WASTED BETWEEN THE SANITARY BLOCK AND A PAIR OF BUILDINGS WHICH BECOMES A GARBAGE DUMP

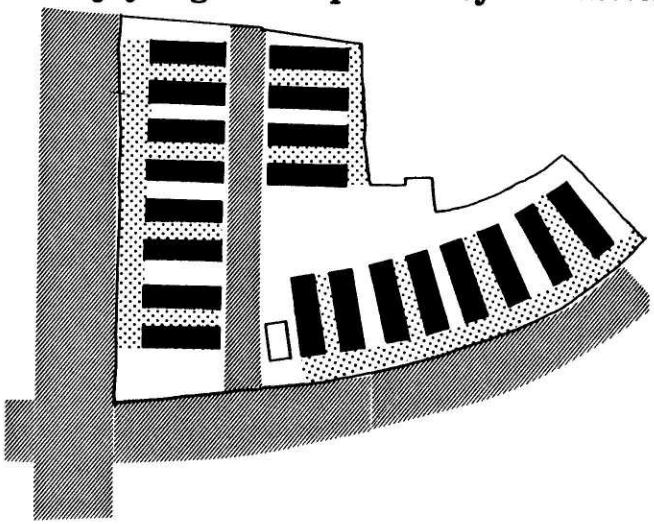
-DOUBLE LOADED CORRIDOR SERVING 32 DWELLING UNITS AT A LENGTH IS DARK AND NOISY AND OFFERS LIMITED PRIVACY

-F.S.I. STANDARDS ARE ABIDED BY BUT DENSITY OF DWELLING UNITS IS TOO HIGH IN THESE PUBLIC CHAWLS

ISSUES

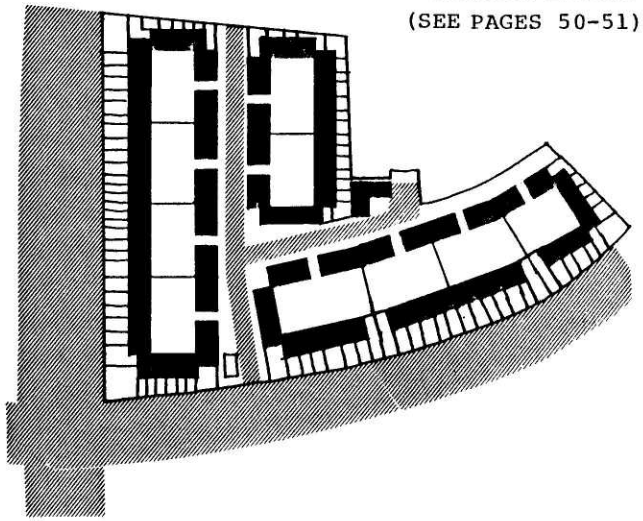
5 Vijaynagar Co-op. Society

EXISTING



REVISED LAYOUT

(SEE PAGES 50-51)



streets/accesses /thoroughfares

undefined/wasted area

DWELLING GROUP PLAN

LAYOUT WITH RESPECT TO STREET/ACCESSES

-ACCESS LANE PASSING THROUGH THE SITE TO ANOTHER DEVELOPMENT; THOROUGHFARE NOT SEGREGATED FROM SEMI-PRIVATE AREAS

-TOO LARGE A DEVELOPMENT WITHOUT DEFINITE CLUSTERS

-ACCESS LANE TO ANOTHER PLOT IS DEMARKED AND SEGREGATED FROM THE WELL-DEFINED SEMIPRIVATE COURTS

-SMALL, SOCIALLY AND PHYSICALLY MANAGE-ABLE CLUSTERS ENSURE PRIVACY AND PREVENT VANDALISM

UTILIZATION OF COURTYARD

-LOSS OF SOCIAL CONTROLS INSPITE OF HOMO-GENEOUS ETHNIC GROUP

-A CONSIDERABLE PERCENTAGE OF LAND IS WASTED OR UNDEFINED BETWEEN THE BACKS OF BUILDINGS

-REQUIRED SETBACK AREAS ARE ALLOCATED TO INDIVIDUAL HOUSEHOLDS AS PRIVATE LOTS HAVING PHYSICAL CONTRLS, LIKE FENCE, ETC.

CHARACTERISTICTS OF CORRIDOR

-CORRIDORS IN THIS CASE SERVES 8 UNITS, THEREFORE BETTER UTILIZATION AND MAINTE-NANCE OF THE CORRIDOR

-CO-OPERATIVE SHOP, COMMITTEE OFFICE, ETC, ARE LOCATED IN SEMIPUBLIC AREA OVER-LAPPING WITH THOROUGHFARE AREA SO AS TO PROTECT PRIVACY OF SEMIPRIVATE COURTS

-STAIR AND WATER-CLOSETS ARE LOCATED CENTRALLY ON EACH FLOOR

-LAYOUT OF THE DWELLING UNITS WITHIN THE DWELLING BLOCK IS KEPT UNTOUCHED

-AS IT IS BUILT PRESENTLY, THIS DEVELOP-MENT FULFILS ALL THE PRESENT BUILDING CODES AND DEVELOPMENT CONTROL RULES

BY-LAW FULFILMENT

-AND THEREFORE THIS EXAMPLE IS SELECTED FOR DEMONSTRATING RECOMMENDED GUIDELINES THROUGH A REVISED LAYOUT FOR THE SAME

-F.S.I. OR THE RATIO OF BUILT-UP AREA TO THE AREA OF THE LOT,AND THE DWELLING UNIT DENSITY ARE MORE THAN IN THE EXISTING LAYOUT, AS THIS LAYOUT ACCOMMODATES 90 MORE DWELLING UNITS IN THE AREA GAINED FROM ELIMINATION OF WASTED AREAS

RECOMMENDATIONS

DENSITY AND F.S.I.

Net dwelling unit density should preferably be between 200 to 300 per hectare. However, it depends on the development control rules and also on the land value and paying capacity of the user groups, apart from many other aspects. This range is applicable to new development areas or suburban areas and to low-moderate income group housing. It is also guided by the Floor Space Index permitted by law. Most of the developments for low income groups fail to achieve success due to mismatching of F.S.I., density and minimum area standards and land values. Especially in the case of private developers, when they try to achieve maximum returns by using full F.S.I. but can not increase density. This results in increased area for dwelling unit which is not affordable by the target low income groups.

SEMI-PRIVATE AREAS:

Shared or semi-private areas are the priority spaces in such developments. The maintenance and usability of these areas determine the quality of such developments.

Providing well defined and well controlled semi-private courtyards, providing adequate light and ventilation in the corridors, stairs and sanitary facilities area, providing slightly generous shared areas, etc. promote good maintenance and better usability of these areas, especially in long run. Suggested width of corridor = 2.5m minimum, 3.0m desirable.

Preferably corridor should be single loaded, with one longer side open to outer open space. Corridor length should be preferably to serve 9 to 12 dwelling units but not more. Lesser the number of people sharing better the usability and maintenance.

Common facilities, should be provided to the ratio of 1 per 3 double-room dwelling units or per 4 single room units.

USER GROUP

Ethnic/cultural background of the target user groups should be carefully studied in order to determine social compatibility before grouping them in a cluster. It is suggested that a group or cluster size should be between 50 to 100 dwelling units - with low income groups on larger side of the size bracket and the moderate on the smaller side, in order to ensure a cohesive social group and strong social control.

SAFETY/STABILITY

The legal right to occupy or to own a dwelling unit gives stability or safety to the users. Co-operative housing society, hire-purchase schemes, etc. should be utilized wherever possible. Co-operative housing schemes, however, should be enforced in its true sense of non-profit users' organization.

DWELLING UNIT

Area of the dwelling unit, being the function of the user's capacity to pay rent, depends greatly on the user income-group. The dw. unit area could be as small as 12 sq.m. and still function well, as most of the household activities extend outside.

Note: This low dw. unit area is not permitted in the by-laws.

Facilities desired to be in the dwelling unit include a cooking and a washing place. W.c.s are always preferred to be away and common. Provision of bathroom in the dw. unit should be decided according to socio-economic level of the users.

BASIS FOR RECOMMENDATIONS

CASE STUDY OBSERVATIONS

USER GROUP

- The cases with 116 and 165 were observed to have a strong social control and cohesion, where everybody knows everybody. Especially, low income people have well united group which provides social safety
- In case of moderate income groups smaller sizes are observed to function better.

SEMI-PRIVATE AREAS

- Lower the number of dwelling units sharing a corridor better is the usability and maintenance.

  Cases with single loaded corridors with 8 to 12 units are observed to be used better
- However, light in the corridors also play a very important role. Even though only 4 units share a corridors or a passage in the first case, corridor is hardly used for extending household activities because of the poor light.
- Higher the number of people sharing a facility, poorer the maintenance.
- The majority desire sharing w.c. facilities. None of the cases have w.c. within the unit.

DWELLING UNIT

- No separate cooking area exists in case #3 & 4; balcony is covered and used as a kitchen in the fourth case.
- Almost all desire a separate kitchen with a water tap and a 'mori' (a washing place)

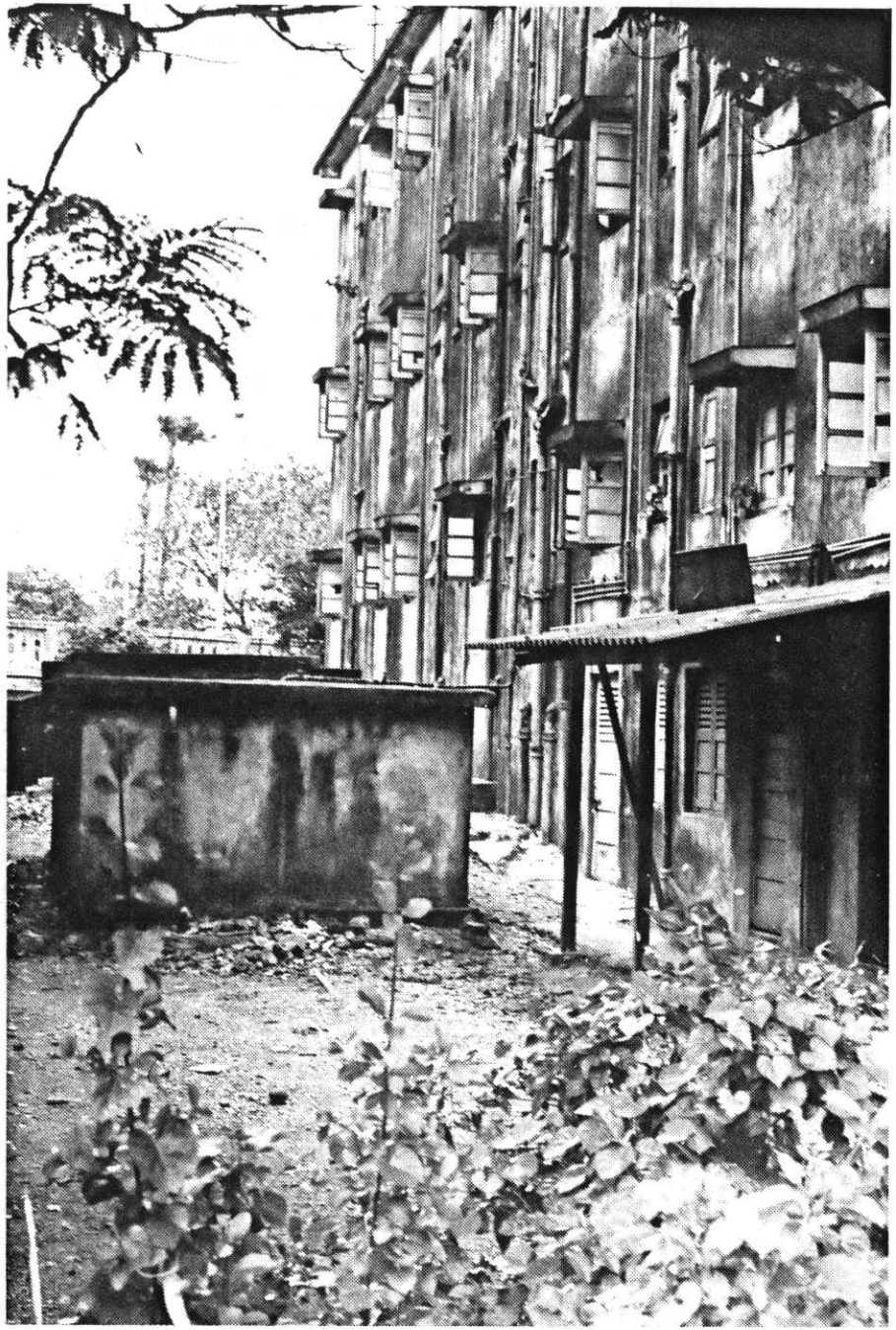
BUILDING CODES

DENSITY AND F.S.I.

- Development control rules permit Floor Space Index from 1.00 in the suburbs to 1.66 in the city, in general case. However, it varies according to different zones.
- Net dwelling unit density or tenement density permitted, generally varies from 100 in the suburbs to 432 in the city depending on the zones.

- One bathroom, one w.c., and one washing place for every four single-room dw. units, or for every 3 double-room dw. units should be provided.
- Opening of the corridor to an outside open space should occur at every 55 feet or less.

- One-room chawls should be atleast 18 sq.m. in area.
- In case of two-room chawls the living room should be atleast 14 sq.m. and the kitchen should be 10 sq.m. minimum.
- In case of one-room chawls, no cooking area less than 6 sq.m. shall be screened off.



PHOTOGRAPH: Wasted, ill-maintained land between the backs of two dwelling blocks in Vijaynagar society.

EXAMPLE LAYOUT

Recommendations based on positive as well as negative aspects of the existing situation are applied to this example for providing realistic physical demonstration base.

EXISTING SITUATION /SELECTION CRITERIA

Vijaynagar Society represents the current trend of housing developments, may it be public or private. As the land availability in the city is practically nil, all the recent developments take place in the suburbs.

Vijaynagar is located in Andheri (east), a suburb approximately 25km north of the city center. The triangular site is bounded by public streets on two sides and a similarly developed lot on the third side. Andheri railway station, a bus terminus and a market are nearby, apart from other communal facilities in the vicinity. The site now has 480 dwelling units in twenty identical 3 storied structures housing about 2165 people belonging to moderate income group of Marathi Brahmin community.

This case is selected for demonstrating layout implications, as it is built presently following the by-laws and development control rules, so as to provide comparable grounds for evaluation.

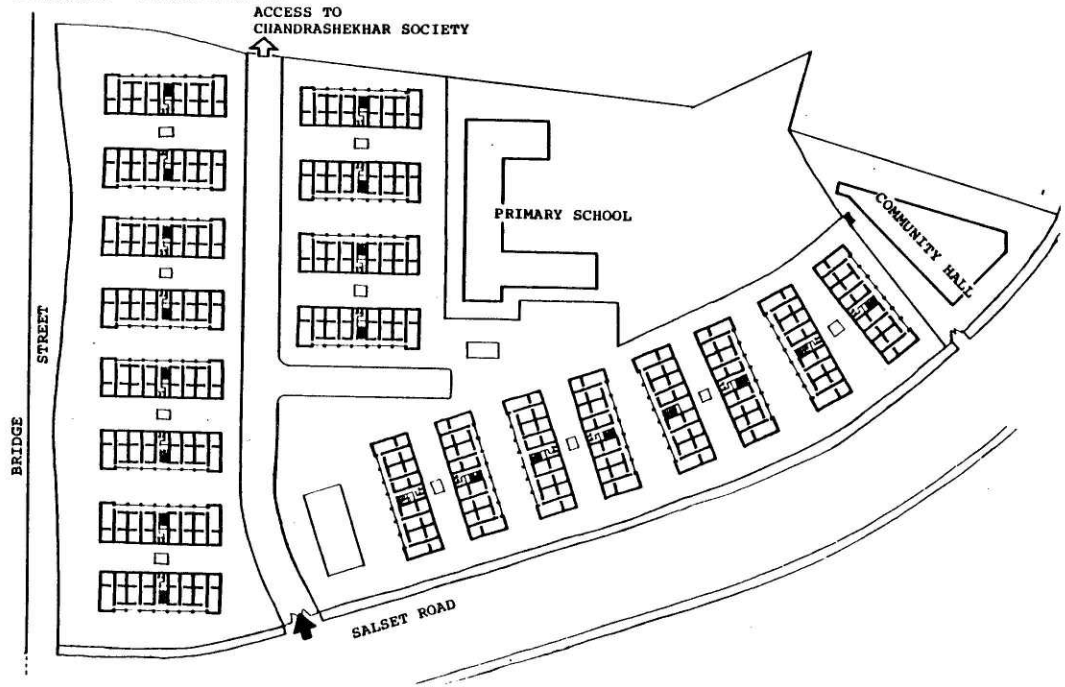
CONSTANTS FOR THE REVISED LAYOUT:

- physical characteristics of the site
- access lane passing through the site
- primary school and community hall area is untouched and also excluded from area calculations
- compliance with the by-laws
- target income group and community
- dwelling unit area
- layout of dwelling units and sanitary facilities within one dwelling block
- height of the dwelling blocks

note: Net dwelling unit density is increased by a small fraction in order to achieve full permitted Floor Space Index instead of increasing dwelling unit area (which is done by most private developers for maximum returns) which fails to cater to the target low/moderate income groups.

BASIC LAYOUTS

EXISTING



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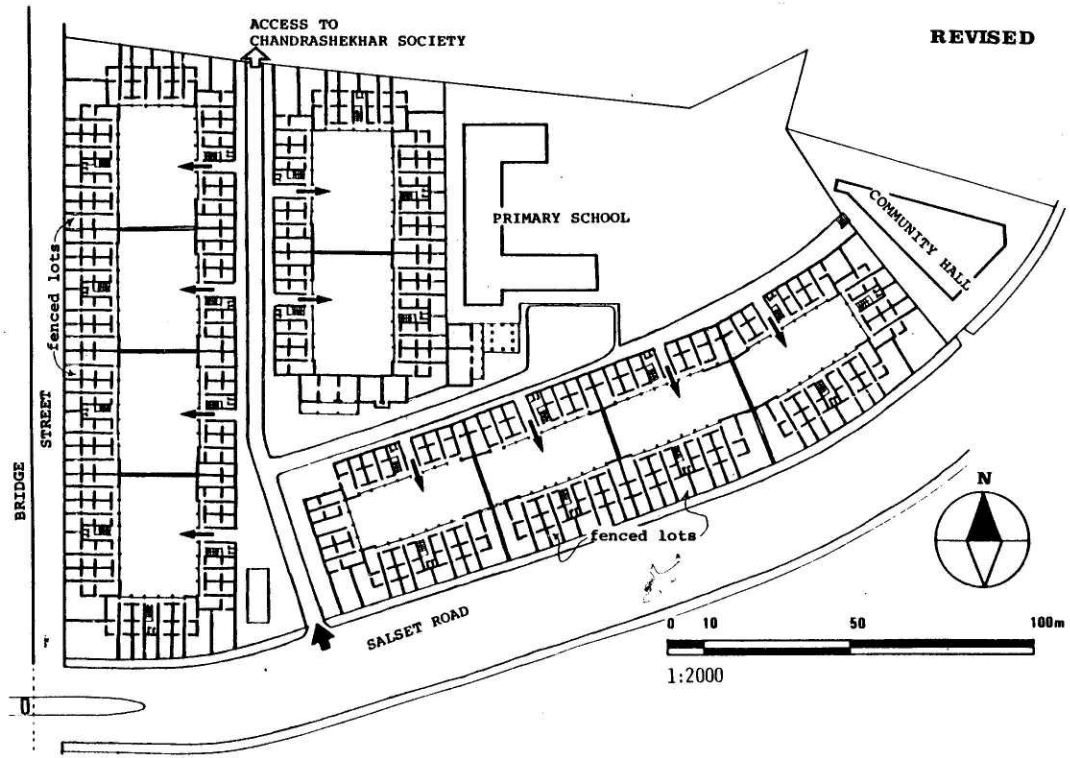
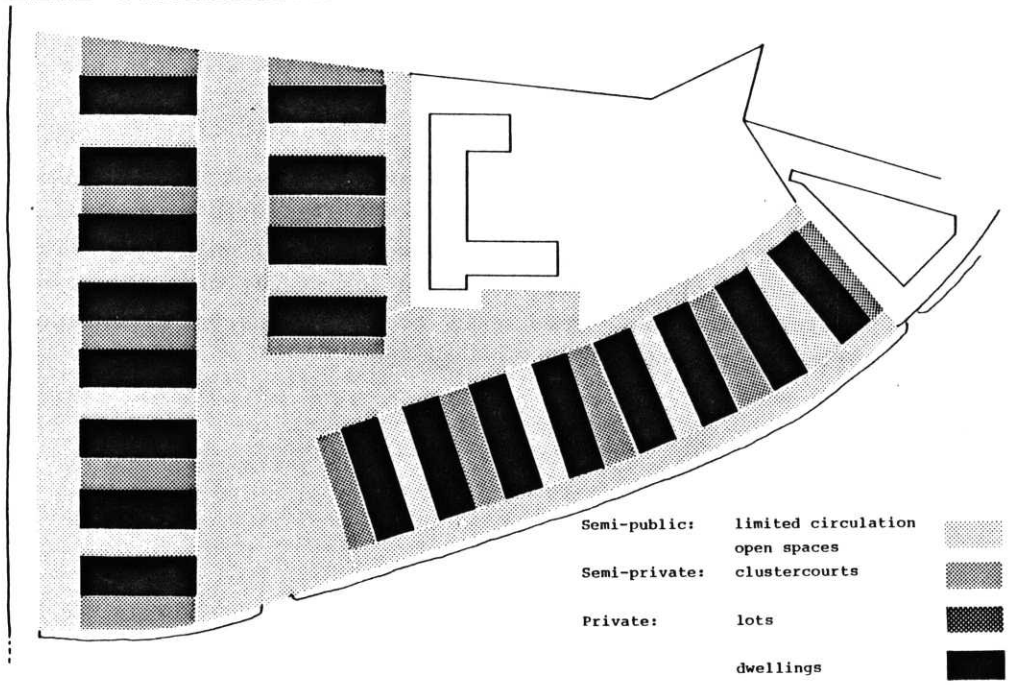


LAND UTILIZATION

EXISTING



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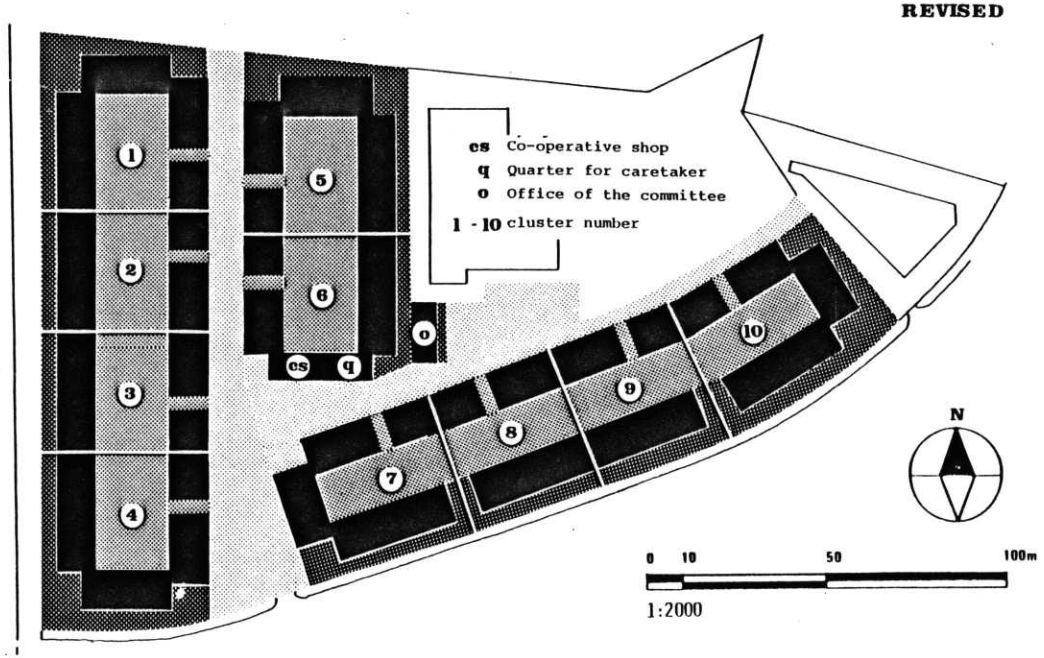


LAYOUT	DWELLING UNIT			DWELLING/GROUP		LAND UTILIZATION		
	total number	area sq.m.	net density	Units sharing a court	n° of floors	semi-public	semi-private	private
EXISTING	480	25.8	220u/ha	480(*)	3	54%	17%	29%
REVISED	572	25.8	262u/ha	48-68	3	26.5%	28.5%	45%

(*indefinite cluster)

COMMENTS

As seen clearly in the revised layout land utilization plan, undefined land is eliminated and private/semi-private land parcels are well controlled. The required setback area is utilized as private lots, having physical controls, which can be better used as extensions of living areas.

The total dwelling group is divided unambiguously in 10 sections to form small, socially and physically manageable clusters. The clustercourts are well controlled having one entrance each. The stairs of the dwelling blocks can only be approached through the central court thereby preventing vandalism or any stranger sneaking in without noticing.

The access lane serving another lot is seggregated and passes through between the backs of the blocks without interfering the semi-private or private areas. The co-operative store, committee office, parking, etc., are centrally located in the semi-public area to achieve the same result.

Analyzing the benefits numerically, semi-public area is reduced to 26.5% in the revised layout from 54% in the existing layout whereas the private & semi-private areas are increased to 16% and 11.5% more than the same in the existing layout, respectively; as a result of prividing better controlled & well defined land parcels. The existing situation fails also in terms of forming cohesive social groups because of its large undivided size of 480 dwelling units, whereas the revised layout allows a choice of having 48 to 68 dwelling units in a manageable well united cluster.

Concluding; these guidelines provide a firm basis for evaluating such dwelling environments in urban areas and a foundation for developing new urban settlements,

POST SCRIPT

Proximity to employment opportunities is an important aspect for achieving goals of such developments, as most of the low income people are engaged in labor jobs on daily or free-lance basis. In case of Bombay, the port workers and whole-sale market laborers form the majority living in city center chawls; not to forget the original purpose, most of the chawls in the city as a whole cater to industrial workers.

The next priority is to provide convenient, cheap mode of public transportation-which is essential for the people living at a distance who cannot be accommodated in the city center.

On the other hand, employment opportunities should be created in a dispersed manner to distribute concentration and to cater to the people living at a distance from the city center. This is often essential in case of big cities where the land and transportation networks are saturated and over-burdened.

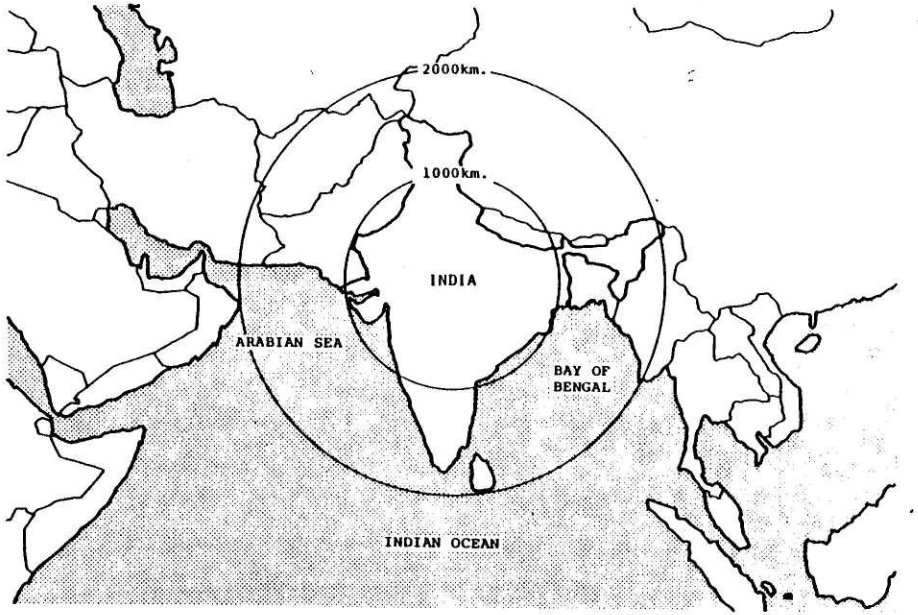
In such a case, the attention on chawls as the only viable, legal dwelling option for the urban poor should be strengthened and not rejected as is the trend today in public housing agencies. Due to prestige reasons the public agencies today are inclined towards providing self-contained dwelling units which cannot serve the mass low income groups of Bombay.

The constraints of the by-laws and development control rules further contribute to limiting the housing supply for the low income groups. High area per person standards and low permitted densities discourage private builders to provide housing to the low income people. As for example; in order to achieve maximum returns or profits, the builders utilize the full permitted Floor Space Index, and in order to abide by the density regulations they provide more area per dwelling unit-thereby increasing the cost of the dwelling unit and also the shared cost of land, which the poor can not afford.

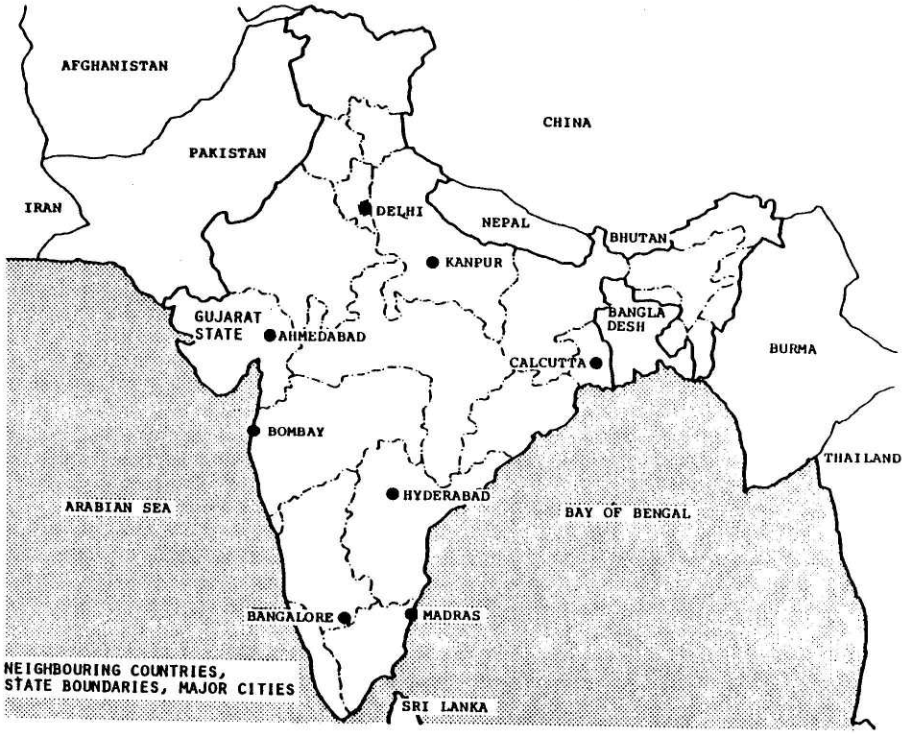
General attitude towards chawls as a non-healthy non-viable dwelling system needs to be revised. There is a possibility that the above outlook may be because of dilapidated, ill-maintained, chawls which is often the result of inefficient physical planning. This study provides base for reconsideration of this dwelling form option.

APPENDIX

INDIA NATIONAL CONTEXT



LOCATION OF INDIA



NEIGHBOURING COUNTRIES, STATE BOUNDARIES, MAJOR CITIES

1. PRIMARY INFORMATION

Country:	Republic of India	
Capital:	New Delhi	
Population:	547,949,809 (1971)	
	20% urban, 80% rural	
Population growth:	2.48% per year	
Area:	3,280,483sq.km.	
Languages:	Hindi, English; there are 14 other official languages.	
Currency:	Rupee (8.90 Rupees = U.S. $ 1, 1976)	
Per Capita Income:	Rs. 338 (1973)	
Religion:	84% Hindu, 11% Muslim	
Government:	Democracy	
Major Cities:	Calcutta	7,005,362*
(1971)	Bombay	5,968,546
	Delhi	3,629,842
	Madras	2,470,288
	Hyderabad	1,798,910
	Bangalore	1,648,232
	Ahmedabad	1,585,544
	Kanpur	1,273,016

* Inside municipality boundaries.

2. GEOGRAPHY:

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

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

3. PEOPLE:

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

According to the 1961 census 1,652 languages were reported as mothertongues. However, the 14 pricipal languages described in the Indian Constitution are collectively spoken by about 87% of the people. The Indo-Aryan languages are spoken by 73% of the population in the northern regions whereas 24.5% speak the Dravidian languages in the south. English is widely used in government, business and education throughout the country.

4. HISTORY:

The known history of the Indian people spans some five millennia. Between 3000 and 1500 B. C. a number of settlements developed in the Indus River Valley(now in Pakistan) into complex urban centres based on commerce, trade and agriculture. Aryan tribes originating in Central Asia absorbed parts of this culture as they spread out over the South Asian subcontinent. During the next few centuries India flourished under several successive empires. The Muslim Arabs came to Western India in the seventh and the eighth centuries, A. D. The Mughals reigned from 1526 to 1707, A. D. and were constantly challanged by the Rajputs, the Sikhs and the Marathas.

The first British outpost in South Asia was established in 1619. Later in that century, permanent trading stations were opened by the East India Company at Madras, Bombay and Calcutta; the British gradually expanded their influence from these footholds. Following the first war of independence in 1857, the East India Company was withdrawn and a direct rule of the British Crown was established.

The Indian National Congress, formed for the purposes of promoting political reforms, was transformed into a mass movement for independence by Mahatma Gandhi in 1920, adopting parliamentary and extra-parliamentary means: non-viloent resistance and non-cooperation. After partition of the Indian subcontinent into India and Pakistan, India became independent on August 15, 1947, with Jawaharlal Nehru as the Prime Minister. India's Constitution was promulgated on January 26, 1950 and the country was declared to be a Democratic Republic.

India is a member of the United Nations, the Commonwealth of Nations, the Asian Development Bank, the International Atomic Energy Agency, the International Bank for Reconstruction and Development, the Colombo Plan and the International Monetary Fund.

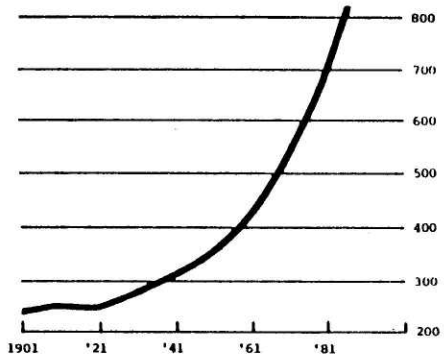
5. GOVERNMENT:

India is a Sovereign Democratic Republic with a parliamentary form of government. The President, elected by an indirect electoral college, is the executive head of the Indian Union. His term of office is five years and is eligible for re-election. He also acts as the Supreme Commander of the armed forces and appoints the Prime Minister, the Attorney General, Governors of the States of the Union, the Chief Justice and other Justices of the Supreme Court as well as the High Courts, and appoints and receives diplomatic representations. The President is aided and advised by a Cabinet of Ministers, headed by the Prime Minister. Members of the Cabinet are chosen from among the two houses of the Parliament and are responsible to it.

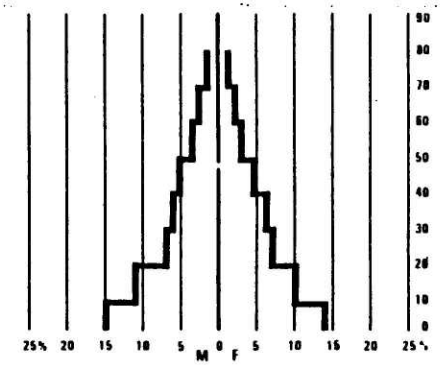
The Parliament consists of the President and the two houses - the Rajya Sabha, or the Council of States, and the Lok Sabha, or the House of the People. The Parliament usually holds three sessions a year. One of the principal functions of the Parliament is to make laws on the matters the Constitution specifies to be within its domain. Among its constitutional powers are the fixing or changing of the state boundaries, making amendments to the Constitution, controlling the nation's finances, and removing the Cabinet by a vote of non-confidence.

The Rajya Sabha consists of a maximum of 250 representatives, 13 of whom are nominated by the President and the rest are elected indirectly by the members of the state and territorial legislatures. One-third of the members retire every two years, with each member completing a six-year term. Members of the Lok Sabha are elected directly by the people, all for a five-year term. Lok Sabha seats are allocated to states in proportion to their population. In 1973 there were 523 members of the Lok Sabha, including 3 nominated by the President.

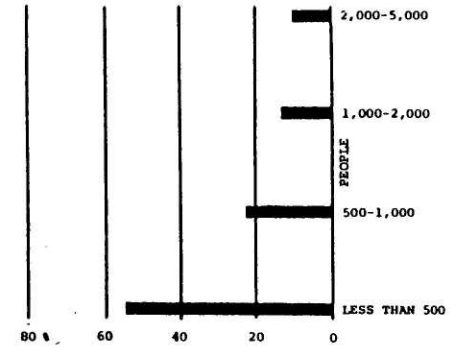
By early 1974 there were 21 States and 9 Union Territories. The governmental stru-



NATIONAL POPULATION GROWTH
horizontal: dates vertical: population in millions
Source: INDIA, A Reference Annual, 1974
Government of India



NATIONAL POPULATION DISTRIBUTION (1971)
horizontal: percentage vertical: ages
Source: INDIA, A Reference Annual, 1974
Government of India



RURAL POPULATION DISTRIBUTION
horizontal: percentage vertical: village population
Source: INDIA, A Reference Annual, 1974
Government of India

cture at the state level is similar to that of the Central government. The President appoints a Governor for a five-year term, who is aided and advised by a Cabinet of Ministers headed by a Chief Minister. Subject to legislation by the Parliament, the President governs the Union Territories through appointed administrators. The District is the major geographical and administrative subdivision within the state, and usually has 4 to 5 million people, with the District Collector as the chief administrator. The 'Panchayati Raj' system, as a means of decentralizing administration at the very local levels, involves a three-tier structure of self-governing bodies at the village, block and district levels which are known as the 'Gram Panchayat', 'Block Panchayat' or 'Panchayat Samiti' and 'Zila Panchayat' or 'Zila Parishad', respectively. In large towns and cities, the local self-governing bodies are the Municipality, or the Municipal Corporation, Committee or Board.

The Judiciary is a single, integrated, hierarchical system, with the Supreme Court at the top, the High Courts at the state level and lower courts at the district and local levels. The Supreme Court is the ultimate interpretor of the Constitution and of the laws of the land. Its jurisdiction is divided into three categories- Original, Apellate and Advisory, and its decisions are binding on all the courts. The Chief Justice and a maximum of 13 other Judges of the Supreme Court are appointed by the President. At the village level, judicial bodies called the 'Nyaya Panchayat' try cases of minor offenses in many states. However, they have limited powers and may only impose moderate fines as punishments.

6. ECONOMY:

India has a mixed economy having a small but important and growing public sector and a large private sector which contributes nearly 75% of the national income. The public sector owns the country's infrastructure, strategic resources, and basic heavy industry. The private sector includes a large small-scale industrial sector and the traditional sector which accounts for 75 to 80% of the population and 50 to 60% of the national product consisting mainly of a subsistence level agriculture and the household and village handicraft production. Surplus labour results in high rates of unemployment and under-employment. Vocational and training programmes are encouraged by the government to produce skilled manpower in order to support the growing industrial sector. Complete information on India's natural resource base is not available. Relatively large quantities of water for irrigation and hydro-electric power generation are potentially available. The annual growth of the Gross National Product- at constant prices- between 1961 and 1972 showed an average rate of about 4%. For the same period, Per Capita Income rose at an average rate of 3.7% annually.

7. DEVELOPMENT PLANNING:

Two major objectives of the Fifth Five-Year Plan (1974-1979) are: removal of poverty and destitution - by raising the consumption standards of the lowest 30% of the population from Rupees 25 per capita per month to Rupees 40 per capita per month - and attainment of economic self-reliance. The plan aims at an accelerated growth of agricultural (4%) and industrial (10%) output with an overall average rate of growth of 5.5% in the national product. The plan's proposals, on a priority basis, are:

- speedy completion of the projects and programmes already underway and spilling over from the Fourth Plan; the fullest and the most rapid utilization of the capacity already created.
- achieve as soon as possible the minimum targets in the main sectors of the economy upon which development or utilization of capacity in other sectors is dependent.
- provide for the minimum level of: elementary education for children upto the age of 14; public health facilities including preventive medicines, adequate nutrition and family planning devices; safe drinking water for all villages; all-weather roads to villages with population of 1,500 and more; homesites for landless farmers; electrification for 30 to 40% of the rural population; and slum improvement.

8. EDUCATION:

Under the provisions of the Constitution, education is primarily the responsibility of individual states, with some specific powers and responsibilities reserved for the Central government. This accounts for the lack of uniformity in the country's educational system. The predominant pattern of education is comprised of eight years of elementary education, followed by three years of secondary education which is in turn followed by three years of university education leading to the first professional degree. A uniform pattern of ten years of primary and elmentary education followed by two years of secondary -or, as it is sometimes called, 'higher secondary'- education, and three years of university education is being adopted in many states. Regional languages are the common media of instruction upto secondary education, whereas English replaces them, for the most part, at the university level. In 1971, 29.45% of the total population, 39.45% of the males, and 18.70% of the females - including the 0 to 4 years age group - were literate. A number of measures have been adopted by the Central and state governments to encouraqe education to adults and women. Vocational and training programmes have been introduced to lower the currently unsatisfactorily high ratio of libral arts graduates to technically trained personnel.

9. LIVING CONDITIONS:

Consumer goods and preferences vary widely throughout the country. For a large sector of the population, particularly rural and urban poor, little money is left after expenditures for food, clothing and shelter, which are mostly obtained from what is locally produced and available. However, with increasing communication and extensive transportation networks, wider distribution of consumer goods has been possible.

Housing continues to be inadequate in all India. In 1969, government estimates showed a shortage of 84 million housing units; 12 million in urban areas, and 72 million in rural areas. Basic services: water supply, sewage disposal and electricity are inadequate in both rural and urban areas.

Poor environmental conditions have created serious health hazards. The main objective of the national health programme is the control and eradiction of communicable diseases. The overall medical economy is a mixed one, having a general system of private practice and an extensive national and state support of medical facilities, training and specialized programmes. The ratios of doctors to population were 1:5,150 in 1968, 1:4,550 in 1972, and 1:4,300 estimated by the end of 1974. In addition to several medical facilities following the western pattern, several highly developed indigenous systems of medicine exist and serve an unknown but probably substantial number of tradition-oriented Indians.

BOMBAY

72°50'E, 19°5'N

URBAN CONTEXT

BOMBAY IN INDIAN ECONOMY: With an estimated population of 9.2 million today, and 5.96 million according to 1971 Census, Greater Bombay is the second largest urban agglomeration of the country, next only to the Calcutta Conurbation. It can be reckoned first, if the population within the municipal limits alone is considered. It ranks twelfth among the leading urban centers of the world.

As a leading international port, it handles 46% of the external trade of the country. Bombay contributes nearly 15 percent of the industrial income of the nation. With more than 400 banks and 5000 joint stock companies it is also the leading banking and financial center of the nation. Bombay accounts for 42 percent of the total revenue from air-borne and sea-borne trade of India and 34% of the national income-tax revenue.

In the state of Maharashtra, Bombay dominates in all the fields. It has 11.5 percent of state's total population and 66% of state's industrial workers. The city's index of primacy against the second largest city of Maharashtra is 6.9, and in the whole of Western India it is 3.8.

HISTORY: Bombay's eminence in the regional scene is closely linked with its history. The British East India Company developed a florishing trade with the Deccan with the dependable harbor site of Bombay as a base. Bombay's economic base in the pre-industrial days was dependent on a direct access to the cotton-growing lands of the country because of the Gateway of India being at the shortest distance from the West through the Suez Canal. The growth and spread of the textile industry with the aid of indigenous capital, and under the impact of Western technology and skill, gave the necessary impetus for growth of industries and commerce. The laying of the rail-links in the middle of the last century, connecting the city with other parts of the country paved the way to open up the agriculturally rich interior and provided the arteries through which the resources could be funnelled.

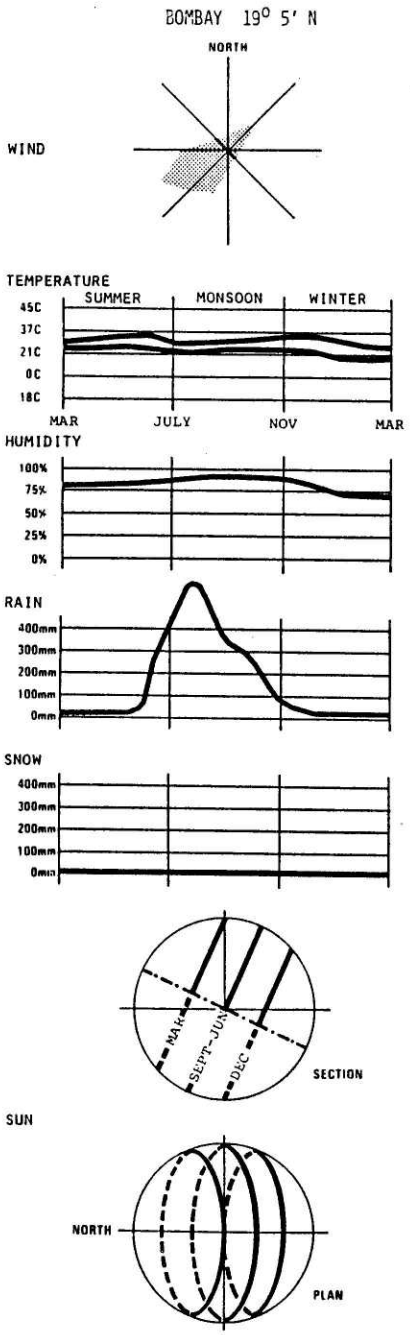
The achievement of political freedom brought added importance to Bombay with the diversion of air-borne and sea-borne trade and traffic, hitherto converging on Karachi to this city; Bombay naturally emerged as the leading sea and air terminal of India. Independence also brought in its wake an influx of large refugee populations to the city and its outskirts.

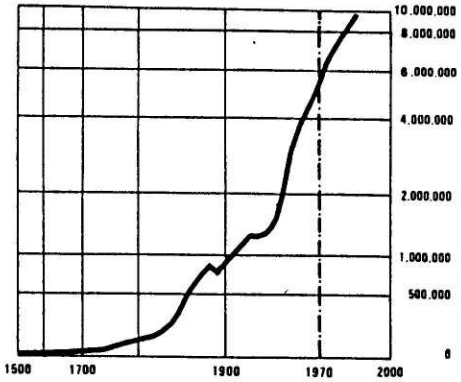
Bombay is built on a group of seven islands originally lush with palm groves and paddy fields and occupied by communities of 'koli' fishermen & farmers. Its link with the mainland of Konkan was through another group of islands- the Salsette group lying athwart Ulhas estuary. Though many ancient ports such as Sopara, Thana, Kalyan and Chaul in the neighborhood were there for centuries as contact points with Arabs and Africans, the Portuguese were the first to recognize the worth of a sheltered harbor site in one of the islands. According to some, the name Bombay is a corrupt form of Bombaim, or Boa Vida, meaning 'lucky harbor' in Portuguese.

The Portuguese built a quinta and a few churches in the main island of Bombay and used it as a trading post. With the transfer of the islands to the British king as dowry, and the subsequent leasing of the islands to the East India Company for a pittance of 30 pounds per year, the growth of Bombay as a port city began.

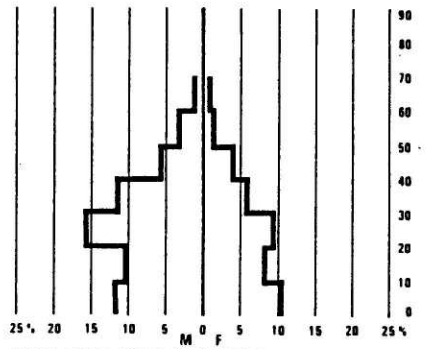
During the late 18th and early 19th centuries the islands were interconnected, and intervening seas and creeks filled and reclaimed. Each phase of reclamation was followed by the laying of the east-west running roads. With the building of the Mahim and Sion causeways, communications with the Salsette were improved by the middle of the last century. New docks were laid along the eastern waterfront and the harbor bay was deepened with further increase in population and commercial activities. After the great fire of 1803 in which old fort town was destroyed, a new township was built. Malabar hill became the Governor's resort.

In 1853, when Bombay-Thana rail link of 33km was being laid down, Baroda, Jabalpur, Nagpur and Raichur were rail-linked with Bombay, leading to further growth of the city northwards. Soon the city was cable-linked with

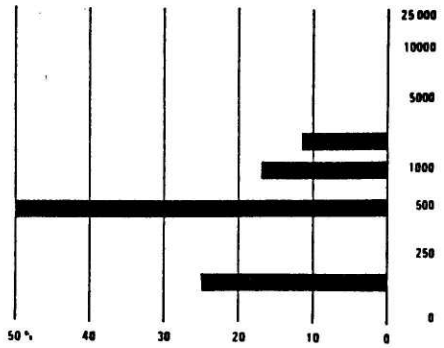




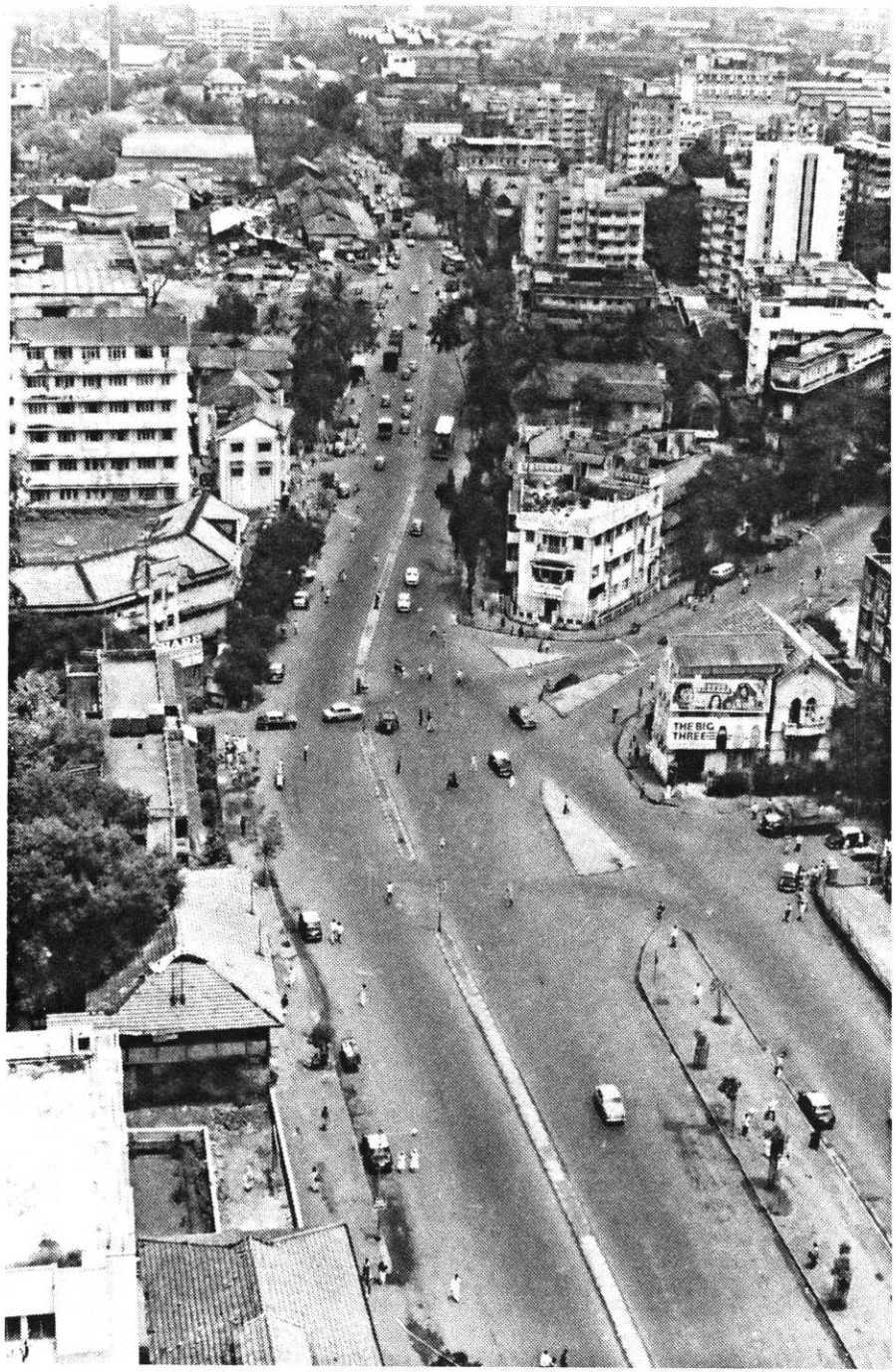
URBAN POPULATION GROWTH
horizontal: dates vertical: population
Source: BOMBAY: AN EXPLODING METROPOLIS
A.B. ARUNACHALAM



URBAN POPULATION DISTRIBUTION
horizontal: percentages vertical: ages
males: M females: F
Source: MIGRANTS IN GREATER BOMBAY
K.C. ZACHARIAH, 1968, D.T.R.C.



URBAN ANNUAL INCOME DISTRIBUTION
horizontal: percentages vertical: dollars
Source: HOUSING SITUATION IN GREATER BOMBAY
P. RANACHANDRAN, 1977, T.I.S.S.



Europe, strengthening international commercial relations. By the turn of the century, cotton-spinning industry was established in the areas then outside the city limits. The ready market for yarn in China, and the excellent access by rail to the raw material producing hinterland in Gujarat, Khandesh and Berar raised the growth of this industry to a spectacular level. In 1900, there were 136 units. Bombay became the Manchester of the East, employing nearly a hundred thousand workers, largely drown from the districts of Konkan and Satara.

In the nineteen thirties, the oil-mills, structural machine building and small engineering units were established. The post-independence policy of promotion of indigenous industrial output gave rise to a wide range of light and medium engineering, chemical and drug industries, refineries and associated petrochemicals, including fertilizers.

The entire eastern water-front extending from Colaba to Trombay started humming with port activities. Many business houses and financial institutions came into existance, and warehousing & bulk handling facilities increased. A wholesale trade area emerged in an area north of the Fort, adjoining the docks. Soon the city engulfed the urban realm of the whole island and spread further beyond Salsette, developing suburbs and absorbing them all into a well-knit city of metropolitan dimensions.

GEOGRAPHY: The western sea-board location just off the mainland, facing the industrially and commercially better developed West had always been an advantage to Bombay. Though somewhat eccentrically located, the absence of natural harbors on the Arabian Sea coast and the shortening of sailing distances to the West through Suez route were added advantages. Bombay is practically the only natural harbor on the western coast of India.

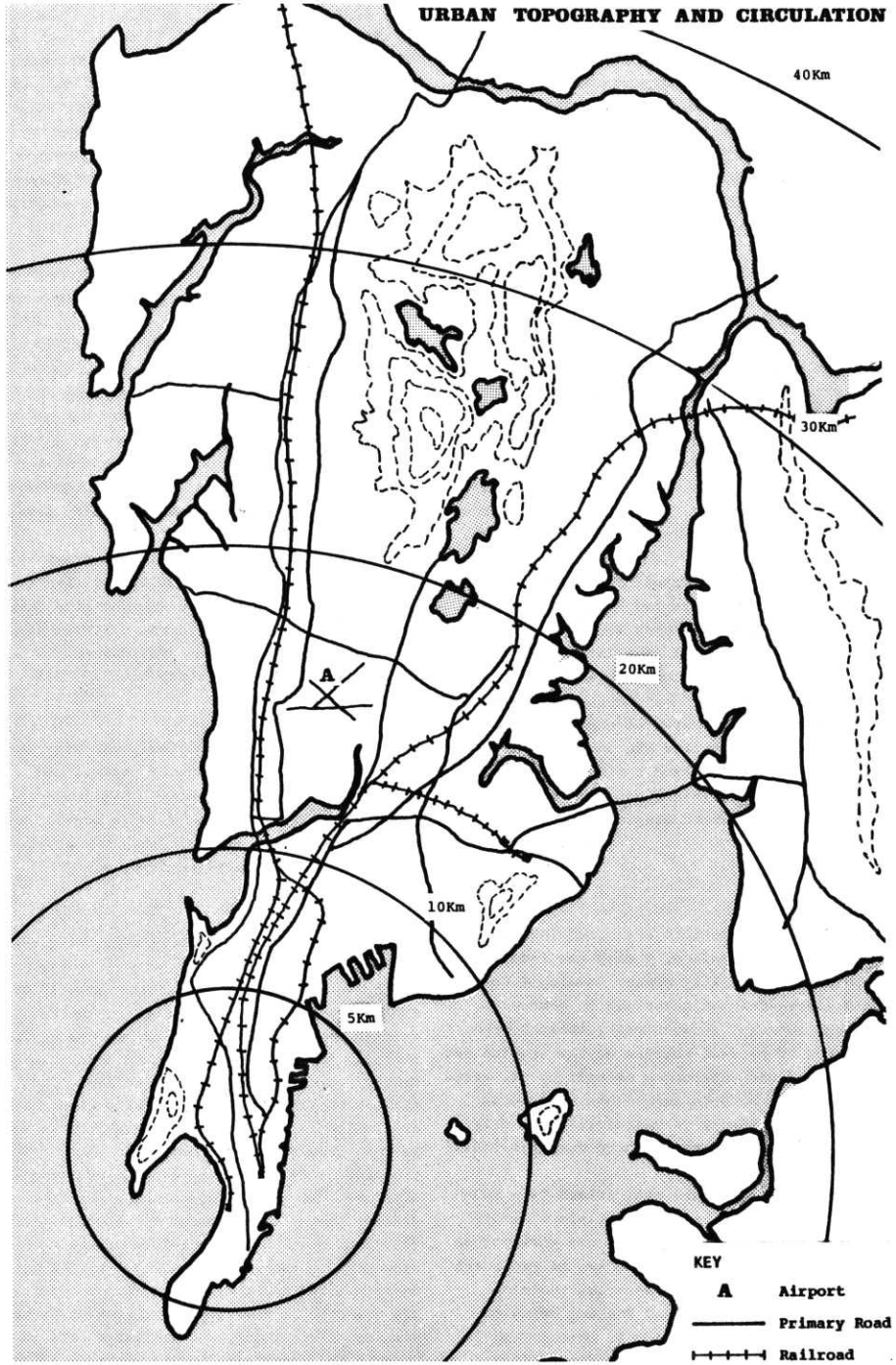
In terms of site, the city island is a hill-flanked valley, the central plain of which stretches about 17 km almost due north-south with a maximum breadth of 5 km. At the north end is the Mahim Bay separating the city island from Salsette and Trombay group of islands. Salsette has a hill core in the north center; its southern spurs enclose three lake basins- Tulsi, Vehar & Powai. Suburban Bombay has developed on the Salsette-Trombay group of islands. The hill core is skirted on either side by extensive lowlands that are breached heavily on all sides by creeks and inlets; extensive areas even today are liable to tidal inundations. Trombay and Salsette are now linked with wide reclamation of marshes inbetween.

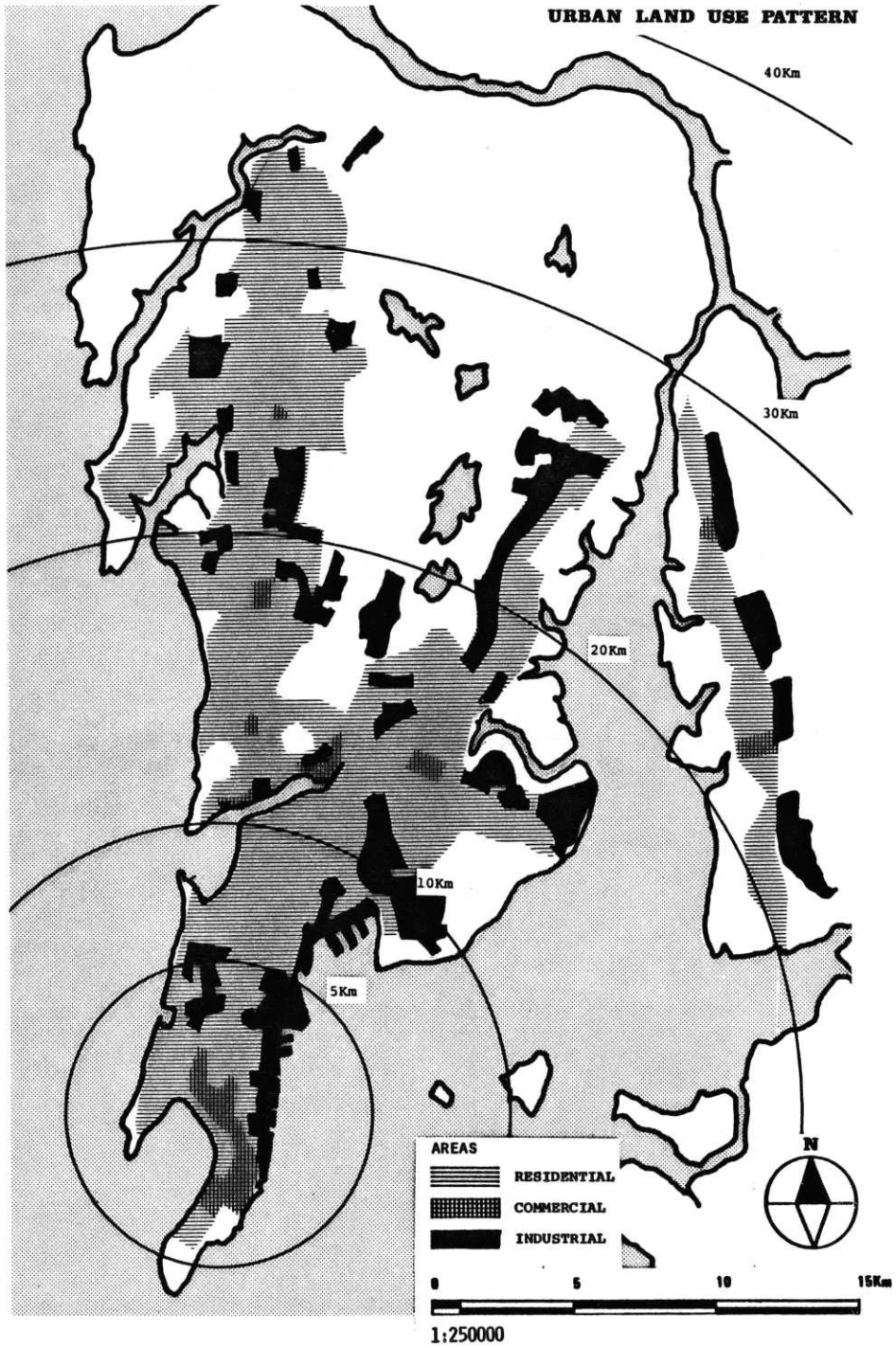
Climatically, Bombay is not a comfortable city. The cool weather season from December to February, when the mercury dips at 20°C, is the best season of Bombay. The sky is clear and the sea breezes abundant. March to May constitute summer season, followed by four months of rains. The weather is very uncomfortable because of high humidity. The wettest month of Bombay is July with about 61cm of rain. The total rainfall in Bombay amounts to 180cm spread over 74 rainy days.

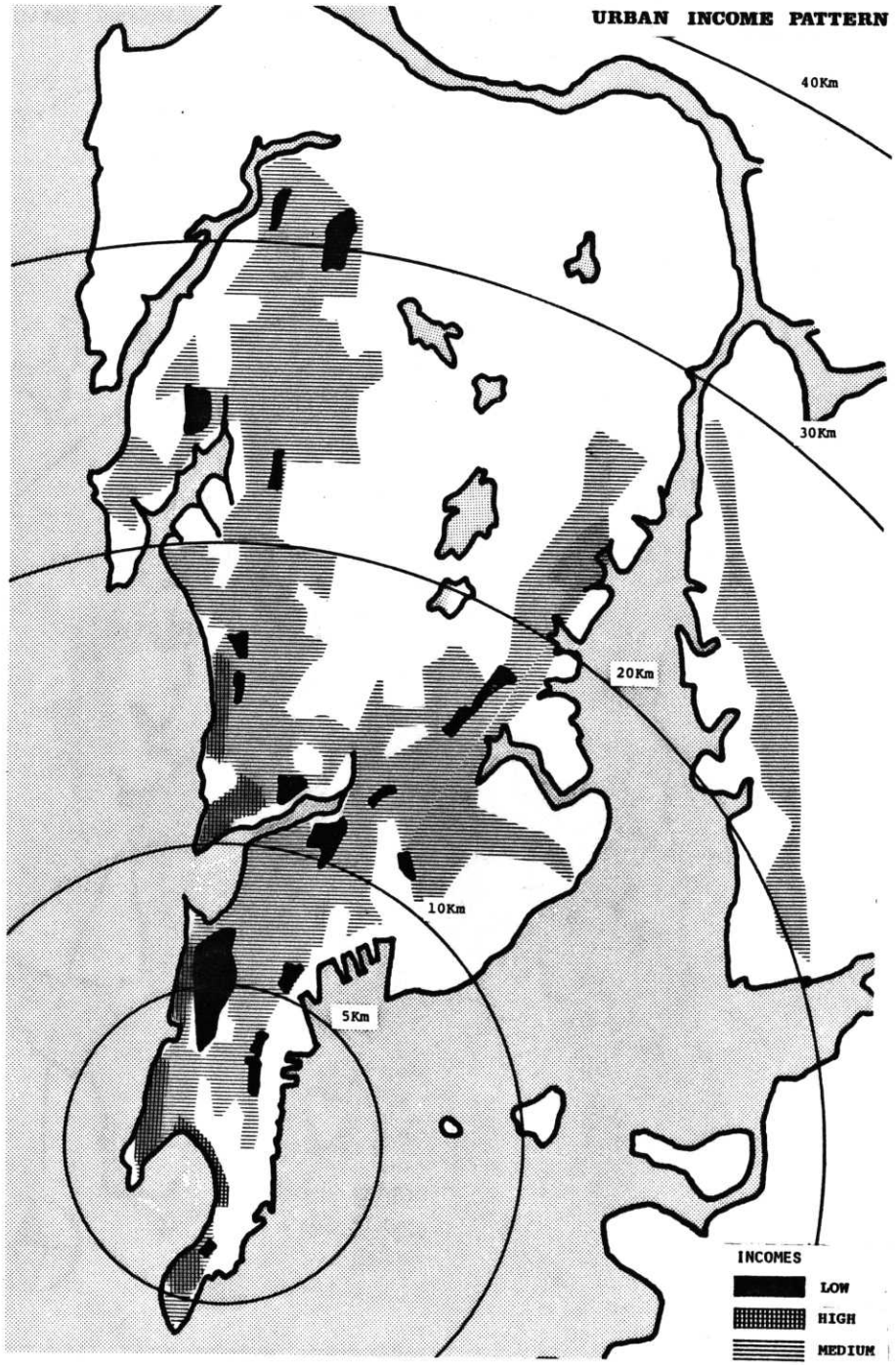
THE CITY AND ITS REGION: The city draws its work force from its region, giving rise to a large number of dormitory suburbs like Dombivli and Kalyan on the Central railway, Bassein and Virar on the Western railway. Dombivli has shown a growth rate of 384% during the last decade.

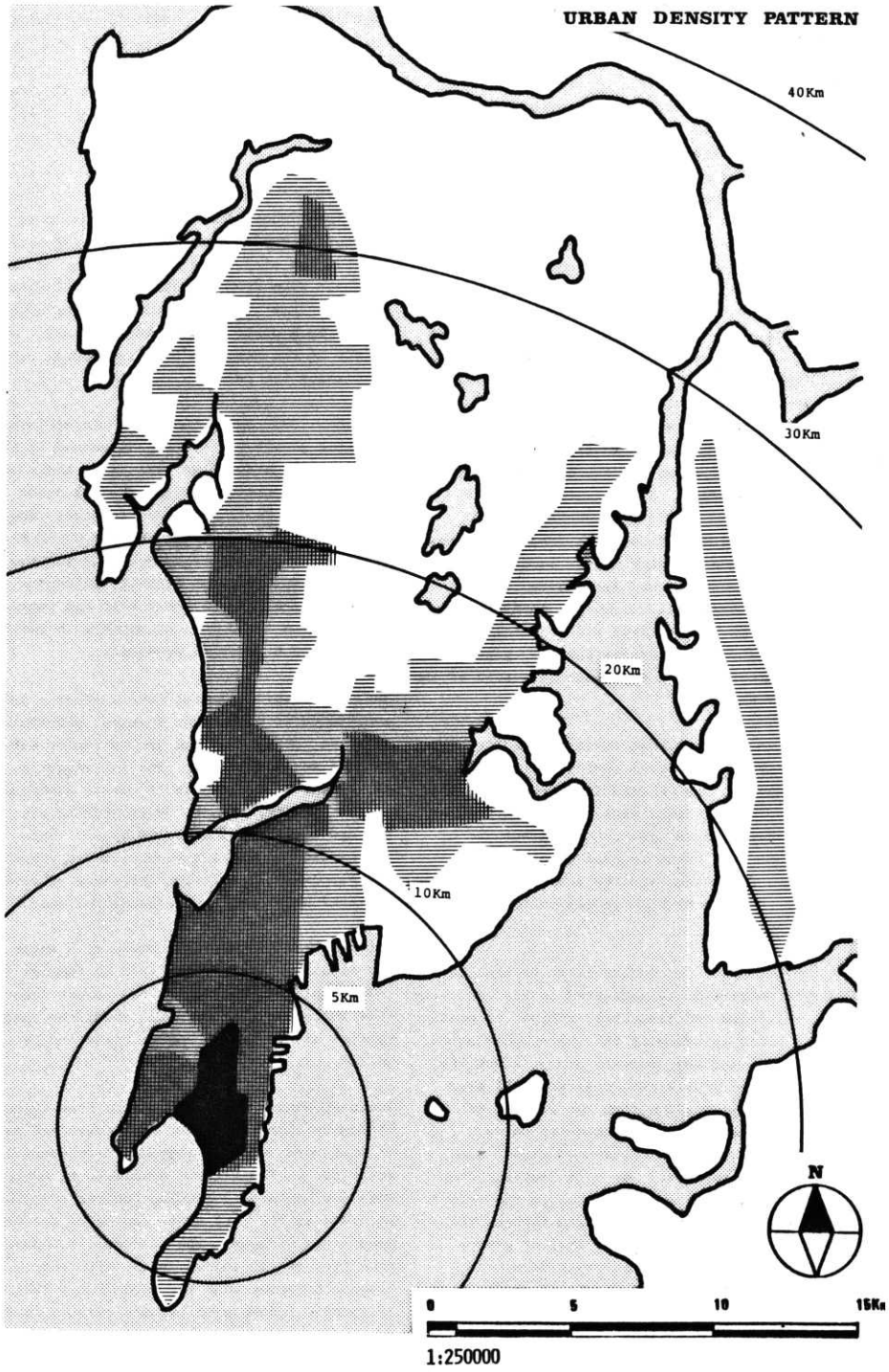
Bombay draws its perishables-fish, vegetables, flowers, milk, etc.-from its region. The daily milk supplies from the rail heads along the central and western railways augment the heavily strained city milk supplies provided by the bottling plants at Aarey and Worli.

DEMOGRAPHY: Population Growth: According to Fryer's account, the population of Bombay during the Portuguese period was about 10,000 and it rose to about 60,000 during the early British period. At the turn of the century, the city island had 770 thousand people which steadily grew to 1.16 million by 1931, 2.32 million by 1971. During the same period, the population in what now constitutes the suburban zone grew from 150 thousand in 1901 to 240 thousand in 1931, 770 thousand in 1951 and 2.9 million in 1971. The present population of Greater Bombay is estimated to exceed 9 million. Thus, the population of Greater Bombay has grown during the period 1901-1971 by 543 %. On the whole the population of Bombay proper did not grow so fast as the population of its suburbs. A great number of migrants were absorbed by the industries in the suburban areas


URBAN TOPOGRAPHY AND CIRCULATION
40Km
30Km
20Km
10Km
5Km
A
KEY
A Airport
Primary Road
Railroad


URBAN LAND USE PATTERN
40Km
30Km
20Km
10Km
5Km
AREAS
RESIDENTIAL
COMMERCIAL
INDUSTRIAL
N
0 5 10 15Km
1:250000


URBAN INCOME PATTERN
40Km
30Km
20Km
10Km
5Km
INCOMES
LOW
HIGH
MEDIUM


URBAN DENSITY PATTERN
40Km
30Km
20Km
10Km
5Km
N
0
5
10
15Km
1:250000

giving rise to a variety of substandard housing colonies.

Population Distribution: Of the total population of 5.96 million(1971), nearly 52% liva in the city island, 28% in the inner suburbs and 20% in the outer suburbs. The western suburbs have a larger population (1.7 million) than the eastern suburbs (1.2 million).

The spatial patterns of population distribution reveals the city center, coincident with the with the British fort, possessing relatively low residentioal densities. To its immediate north are the old core areas that record the highest residential densities exceeding 2000 per hectare. A fairly significant drop in densities is noticeable just beyond the Mahim and Sion causeways. Barring two small pockets of high density adjoining Bandra and Kurla railways stations, the densities fall rapidly northwrds.

The general distance-decay of urban population densities from the city center exists, with an almost continuous trend northwards, approximating to an expontial curve. The paramount influence of the railways and arterial roads on this density pattern is obvious, particularly in absence of an east-west extension of the residential areas.

During the forties, the north of the city recorded rapid residential infilling. At the same time, many of the residential areas adjoining the city center, like Bhuleshwar, Umarkhadi and Mandvi, became less conjested because of the successive urban renewal schemes, both public and private, and the steady infiltration of the area by high rental commercial functions.

Socio-Cultural: The cosmopolitan nature of the city's population is reflected in its constituent religious and linguistic groups. It provides a broad spectrum of the Indian population. The Hindus are the dominant group, about 70% of the total population, scattered all over the city. The Muslims form the largest minority group with a concentration in wards B & E and in the suburban sections of Bandra and Kurla. The Buddhists, the next largest group, have the heaviest concentration in the industrial wards of central and north Bombay. The Christians and Jains are in smaller groups. The Marathi speaking population forms the majority, but all other liguistic groups from from the country are present in Baombay cosmopolitan character of Bombay's population and residential living patterns of the varied groups strongly reveal the regional, linguistic and religious activities. Social grouping of homogenous cultural units of people is evident in the building societies, Wadis and Mohallas.

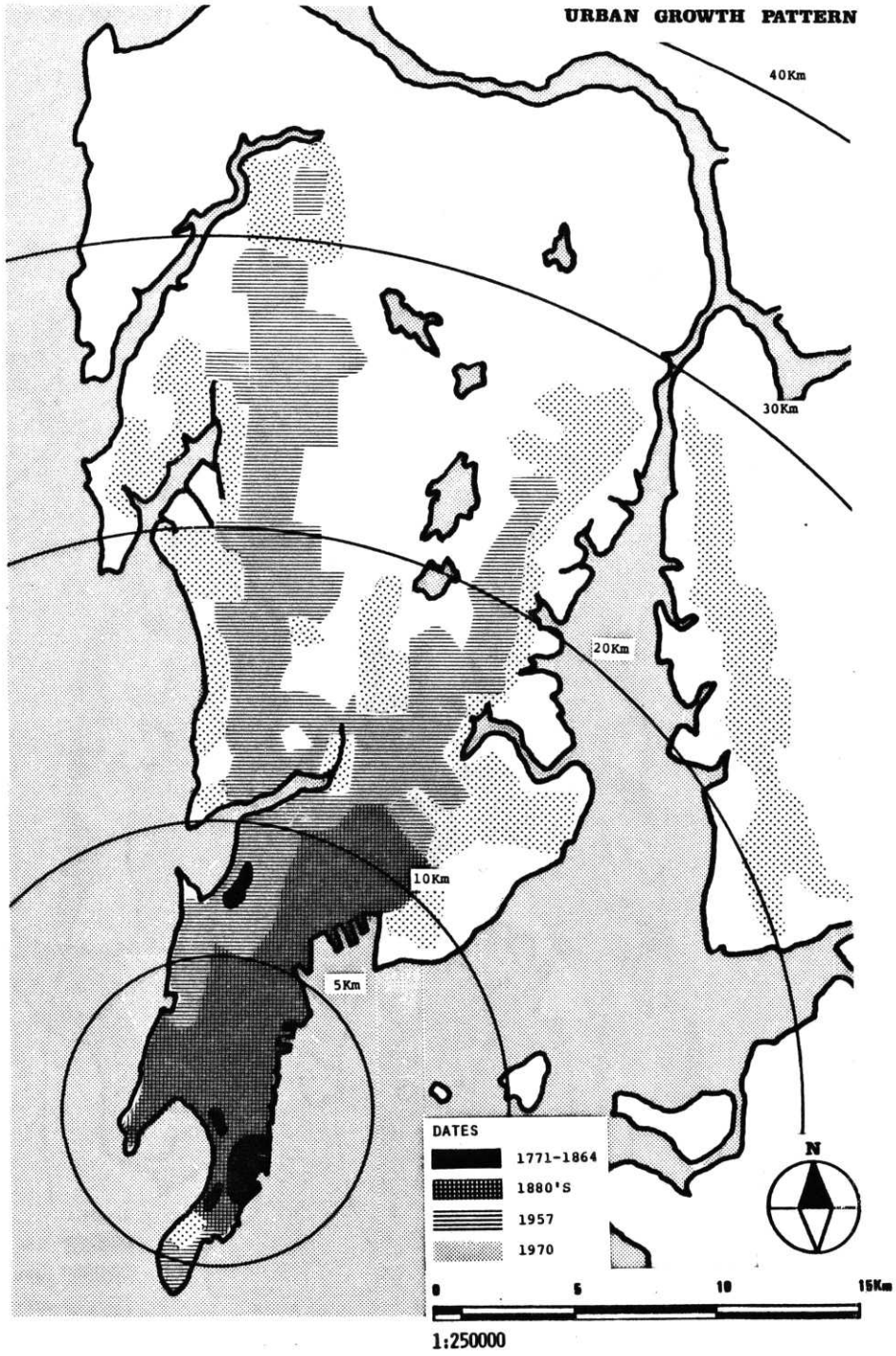
MIGRATION: About 63% of the population of greater Bombay is enumerated as being born outside the city. Forty-two percent of the migrants were from the other parts of Maharashtra, 52% from the other states of the country and 6% from other nations of the world. Two-thirds of the migrants come from rural areas, especially the young.

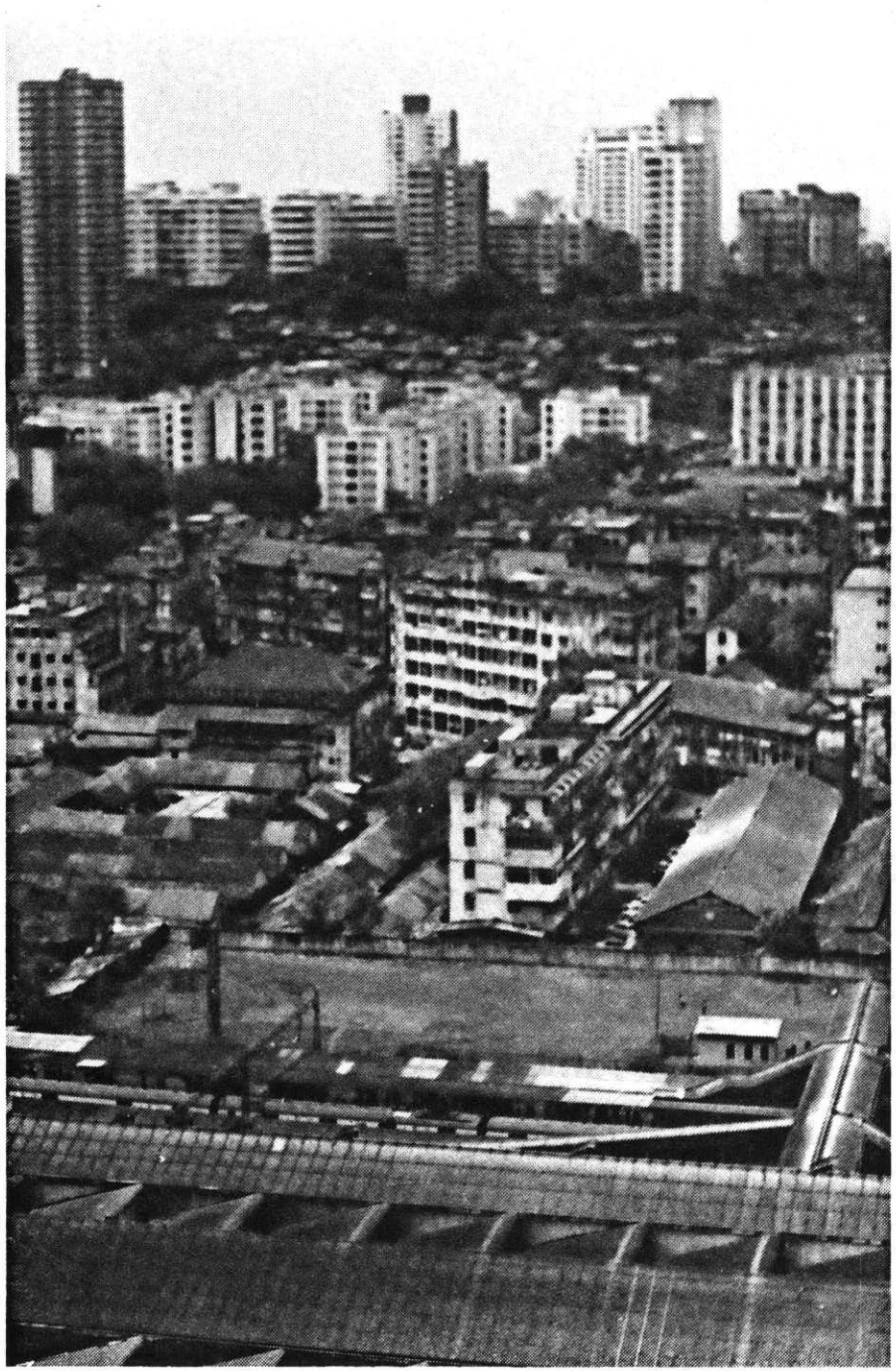
CULTURAL GROUP AND OCCUPATION: The different cultural groups are clearly discerned in their residential clusters as well as in their occupational preferences. Panjabis and Sikhs as skilled workers in transport services, engineering industries workshops; the Ultar-Bharatiyas in transport, teaching, dairying and perishable supplies; the Sindhis, Gujaratis and Rajasthanis mainly in whole sale and retail trade services and the southerners in administrative and managerial services.

The sex ratio in Greater Bombay shows a preponderance of males over females, particularly so in the working age groups (about 650 females to 1000 males). The sex ratio is most adverse in the case of out of state migrants particularly the Uttar-Bharatiyas, and the least among Gujarati group. The strong ties of migrant population to their farm-lands and their high frequency of visits to their home land is the cause for that.

Literacy rate in Greater Bombay as a whole is 64%-higher in males (71%) than in females (54 (54%). Literacy rates are the lowest (about 50%) in central Bombay which shows the concentration of illiterate labour class in the city center.

Socio-Economic: About 37% of the population of Bombay constitutes the work-force and 4% of this work-force is engaged in industrial activities. The highest densities of employees per hectare, exceeding 400 per 1000, are recorded in the city center areas of Colaba, Mandri and Girgaum. 75% of Bombay's population lies in low income group, with yearly household income upto Rs. 6000 (U.S.$ 750); 17% middle income with incomes varying from





Rs. 6000 to Rs. 12000 (U.S.$ 750 to 1500) and the rest 8% form the higher income group with incomes above Rs. 12000 per annum.

AMENITIES: Transportation: The backbone of public transport in Greater Bombay is the suburban rail system, catering mainly to the long distance commuters and the B.E.S.T. buses provide feeder services.

Community behaviour in Greater Bombay shows that 39% in railway, 39% in buses, 10.6% in cars, 9.3% in taxi, and other in miscellaneous. Over 2000 suburban trains daily carry the commuters living in the suburban Bombay to work places and back. The peak hour traffic can carry 150 thousand passengers per hour. With staggered working hours, the suburban trains now run to full capacity even during the non-peak hour times. Nearly 40% of the employment is concentrated within a radius of 3 km from the city center and about 60% within a 10 km radius.

Power & Water Supply: The city consumes more than 60% of the power generated in Maharashtra state. Two thermal plants located at Thakurli (136 mw) and Trombay (336 mw), one nuclear plant located at Tarapur (190 mw) and three hydel units located in the ghats at Bhivpuri, Khopoli and Bhira (together 276 mw) supply electric power to the city and its region. The total power consumption in the city exceeds 1200 mw.

The need of domestic and industrial water is met from the reserviors-Tulsi, Vehar, Powai Tapsa and Vaitarna. Together they supply 218 million gallons per day. About 55 million gallons are used up by industries and the rest is available for domestic use giving about 20 gallons per day per head. Plans are afoot to further augment the water-supply from Ulhas river and its tributaries in the immediate hinterland.

HEALTH AND EDUCATIONAL: Bombay has 125 general hospitals, 74 dispensaries 10 TB hospitals and 13000 hospital beds, apart from a large number of medical practitioners. This facility accounts for about 25% of the total in the state, yet, it is inadequate and concentrated in central Bombay.

The same is the case with the educational facilities. 435,000 children are at secondary school level, and 88000 are at higher education level. It is a seat of two universities apart from a number of specialized research institutions like TIFR, BARC, Institute of Demography, TISS, and others.

RECREATION: Parks and open grounds are quite inadequate in the city. The old residential area is the worst hit, while, the northern suburbs have a number of reserved, open spaces and parks. Recreation centers as well as points of entertainment such as cinema houses are crowded in south Bombay.

Housing: About 1.3 million housing units, apart from a large number of slums, house the population of Bombay and its suburbs. Over 20,000 tenements are being added every year by various bodies such as the Maharashtra Housing Board, Municipal corporation. Co-operative bodies of private builders and others. The estimated deficiency in housing is about 200,000 units. To provide minimum standard housing to residents of Bombay, the city needs about a million dwelling units. Further, 38% of buildings in Bombay are as old as 60 years and above. In 1971, there were over 200,000 single-room tenements where more than 1.5 million persons were living under subhuman conditions.

A sizeable population lives on pavements and in slums. The 1971 census enumerated 59,000 pavement dwellers and about 1.2 million slum dwellers. There are as many as 466 hutments or squatter settlements that have been identified within the municipal limits of Bombay

The slums of Bombay usually develop along railroads quarry sites and the water and drainage mains. These slum dwellers are not necessarily workers in transit or socially the lowest order of urban strata.

The chawls house more than 60% of Bombay's population. 61% of the total dwelling units in Greater Bombay are chawls, 20% are shanties, 18% are apartments and 2% are miscellaneous, including bungalows, out houses, etc.

BY-LAWS FOR CHAWLS

Interpretation of terms:

'CHAWL' - means a building so constructed as to be suitable for letting separate tenement each consisting of a single room or of two rooms,but not more than two rooms, and with common sanitary arrangement.

'TENEMENT' - means a room or rooms in the occupation of or meant for the ooccupation of one tenant.

Building codes:

Water-closet, Bathroom, Urinal

5 (b) 3 sq.ft. superficial area opening upon an external space; at least one louvered ventilator, 3 sq.ft. in area, opening into external open space.

(d) shall not be constructed within 5 feet from the boundary of the owner's premises.

6A No water-closet,etc.,shall be placed in front of the main entrance of a chawl so as to be visible to persons using the stair or entrance Or, it shall be completely screened by a partition or so from the floor to the ceiling.

42 (e) Fenestration- 1/10 of floor area,or 1/7(aggregate door & window)

(i) No room in a chawl shall be built so that any part of it is more than 25 feet from any such window or door.

(ii)Any room in a tenement containing four rooms or more may be sub-divided by a partition wall not exceeding 2/3rd of the height from floor to ceiling if such room is otherwise satisfactorily ventilated.

43 In back to back rooms and other single, two or three room tenements in addition to any other means of ventilation required in these by-laws, every such room shall have a ventilation, at least 3 sq. ft. in area near top of each of two walls of such room and opposite to each other if practicable.

44 (i) Corridor in Chawls

Every corridor should be open at least from each end within 55 feet in length, or at intervals of every 55 feet.

SINGLE ROOM TENEMENT CHAWLS

48 In addition to other by-laws applicable,

(a) there shall be no back to back rooms in such chawls

(b) no single room tenement wherein cooking is to be done shall be less than 180 sq.ft. in area.

(c) a portion of such room, not less than 60 sq.ft. in area, shall be screened off to form a kitchen as provided in by-law 42(d)

(d) there shall be provided one nahani(mori),not less than 3 ft.x3 ft. in internal area, in every kitchen.

(e) a water tap shall be provided in each such tenement in accordance with the water by-laws in force from time to time.

(f) one loft may be provided in each such kitchen,3 ft. in width.

(g) one water-closet(3'X4'), one bathroom (16 sq,ft.), one general washing place (24sq.ft.) and one metal dust-bin with cover should be provided for every four single-room tenements.

(h) washing place shall have a roof on it.

(i) any four tenements on any floor shall have the above req.as(g) situated on the same floor in proximity to such tenements.

(j) every such tenement shall be provided with at least one access from any one stair through open veranda, gallery, or passage.

(k) every such veranda, gallery or passage shall not be less than 6 feet in clear width and shall abutt on an interior or exterior open space of requisite width.

DOUBLE ROOM TENEMENT CHAWLS

49 In addition to other by-laws applicable to such buildings, the following shall apply;

(a) no double room tenement shall contain a living room less than 140 sq.ft. in area and a kitchen room less than 100 sq.ft. in area and shall be subject to by-law 42 (d).

(e) a water-closet, a bathroom, a washing place, and a dust-bin shall be provided for every three double-room tenements on the same floor.

DEVELOPMENT CONTROL RULES
FOR GREATER BOMBAY
(as amended upto Aug.1,1978)

Zone	F.S.I.	Number of tenements per net hectare
R1,	1.33	198
R2	1.33	247
R3	1.33	309
R4	1.66	247
R5	1.66	309
R6	1.66	370
R7	1.66	432
R8	2.45	345
R9	3.50	432
R10	1.00	100 to 125

Floor Space Index (F.S.I.)

total built up floor area

area of the site

- in Mahim Creek reclamation area 494 tenements/ha.shall be permitted.

SOURCE

BUILDING REGULATIONS
AND BY-LAWS

MUNICIPAL CORPORATION OF
GREATER BOMBAY

CO-OPERATIVE HOUSING SOCIETY - an overview

Bombay today has more than 8000 Co-operative Housing Societies.

ORIGIN AND BACKGROUND

The first co-op society act was passed in 1904 and untill 1947, only 52 co-op societies were formed. It was after independence, 1947, that the refugees and the industrialization in the city, created a massive shortage of housing. As an individual, it was impossible to construct due to hign costs of land and building, due to which the government encouraged collective efforts for which the loans were provided. However, the government laon assistance was meagre.

In 1950, a conference of commercial banks, insurance companies and other groups decided to float the Bombay Housing Finance Society which began functioning in 1952 with an initial capital of rupees 8 million, with the nationalization of the Life Insurance Corporation in 1955, it became the principal financer of the Bombay Housing Finance Society.

Till 1965 there were no conditions on loans, like maximum carpet area, or the income of the number of restriction on the costs of construction which helped only the richer section. In 1965, Mirdha Committee, laid down the conditions, one of which was to raise the initial 35% of costs, due to which it did not help the needy sections anyway. In late fifties, private builders began to intervene in the co-oprative housing schemes substantially.

According to the Maharashtra Co-operative Housing Finance Society, "the private builders went for co-ops, as government incentives provided finance at a comparatively lower rate of interest and exemption from stamp duty & registration fees in respect of ducuments executed. Its spirit was destroyed." In 1960, Maharashtra Co-op Society Act was declared for orderly development of co-operative movement. Though in 1970 and 71 two more ammendents were added, the situation did not improve.

From 1972 to 1979 loan disbursement by the finance society fell sharply from Rs. 130 million per annum to Rs. 65 million.

Shortage of loan facilities was not the problem. The central problem was the shortage of land on Bombay island, massive speculation, artificial shortage, etc.

To supposedly help the situation, the State Govt. enacted the Land Ceiling Act in 1976, to take control of all unbuilt-upon land above 500 sq.m. and to make it available to needy parties, like housing societies. The result was; that it freezed all transactions of land above the ceiling limit, thus making the little available land more dear due to the trememdous demand concentration on land. The bureaucratic procedure of aquisition of surplus land has so far took control of only 171 hectares out of 19,915 hectares estimated surplus land in Maharashtra

As one of the rules, only 20% of costs is to be taken from members before construction. Maximum cost per flat should be Rs. 40000/-

PRESENT SITUATION

About 40-60% of flats(apartments) in societies are ulimately bought by professionsl investors and given out to leave and licence tenants, who have no right of occupation beyond an 11-month contract, unless it is renewed. Almost every residential building now-a-days is registered as co-op housing society.

TYPES OF CO-OP HOUSING SOCIETIES:

1. Tenant ownership housing society, where the land is owned by the society while the construction is carried out by individuals.
2. Tenant co-partnership housing society, where both, land and building, are owned by the society while its member occupants do not own, but hold the right of occupation which is transferable, as long as they fulfil the rules of the society.
3. According to the Maharashtra Ownership of Flats Act, 1963 flats privately constructed and then sold individually can be converted into co-operative society; after the sale of 10 flats or could be registered as companies. Since the facilities available are more, builders register as co-operatives.

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)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

COMMUNITY. The people living in a particular place or region and usually linked by common interests: the region itself; any population cluster. (U.S.D.P.)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

DWELLING UNIT AREA. The dwelling unit area (m^2) 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 odorous and sometimes noxious. (Merriam-Webster, 1971)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

LAND UTILIZATION. A qualification of the land around a dwelling in relation to user, physical controls and responsiblity. *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/OPTIMALIZE. 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 FACILITES. Includes: public transportation, police protection, fire protection, refuse collection, health, schools, and playgrounds, recreation and open spaces, other community facilities, business, commercial, small industries, markets. (U.S.D.P.)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

SOIL. Soil structure: the arrangement of soil particles in various aggregates differring 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)

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

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

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

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

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

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

WATT. Watts (w) measure the power of the flow of energy through a circuit. Wattage is the product of volts times amperes. Both watts and hosepower 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 serveics, facilities and utilities are avaliable 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 acre
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. dollar equivalents: 1 U.S. Dollar = 8.00 Rupees