Growth of urban centres in the upper indus plains as influenced by the development of irrigation potentials

Hameed, Azhar

ABSTRACT

The difficult environs of the Upper Indus Plains inhibited any large occupance of the region, which until late in the 19th century possessed much idle wasteland, sparsely peopled riverine tracts, and a few urban centres at trade nodes. The extension of perennial irrigation and colonization with planned new settlements followed, leading to the modernization of the economy and growth of urban centres in number and size. The development of new town morphology brought in a phase of change which is current in present day urban and intra-urban structures.

The analysis has been directed towards the development of some interpretive ideas and hypotheses regarding overall societal change and urban growth in the region. A multivariate analysis of various indicators of urbanism including agro-economic indices for the sixteen administrative districts under study is carried out: modernization and urbanization are shown to be related to the development of irrigation potentials and consequent economic growth in various parts of the region. A further study of the thirtyeight urban centres of more than 20,000 population shows greater urban activity in the towns in the first colony districts and a greater rate of change in the towns belonging to the areas of later and current developments.

A study of five representative individual townscapes shows the phases of change in urban morphology. Rectilinear street patterns and planned layout of modern housing, business, community service and administrative premises are becoming distinct features. The establishment of modern manufacturing units has brought new functions, employment opportunities and industrial suburbs to many urban centres.

A comparison of the urban growth characteristics of this region is made with the developing world, especially those of the Middle East, Southeast Asia and the Subcontinent as a whole. It is shown that resource development in the Upper Indus Plains has lead to a distinctive type of urban growth.

° ° ° ° ° ° ° ° °

GROWTH OF URBAN CENTRES IN THE UPPER INDUS PLAINS AS INFLUENCED BY THE DEVELOPMENT OF IRRIGATION POTENTIALS

A thesis submitted to the Faculty of Social Sciences, University of Durham in candidacy for the degree of Doctor of Philosophy

by

Azhar Hameed,
B.A.(Hons), M.A.

THE GRADUATE SOCIETY, DURHAM CITY, ENGLAND

June, 1972

PREFACE

This research originated in the author's fascinated admiration of the Jinnah Barrage, and later the Taunsa Irrigation Scheme, and the founding of new settlements in these last two Colonization Projects within the Punjab. A first hand experience of witnessing physical growth of the towns led to the choice of the subject -- the origin, basis, pattern, functions and growth of urban centres as a result of agricultural resource development.

The work could not have been accomplished without the grant of a Scholarship by the Government of Pakistan under its Central Overseas Training Scheme and necessary permission to proceed abroad by the Provincial Education Department. On arrival in Britain, the British Council provided a Fee award for the whole duration of the research.

My training in research methods and fulfilment of the research project belong to the period of my studentship at the University of Durham. In matters of exposition and treatment, especially in encouraging me to expand the project into its present form, I received every support from Professor W. B. Fisher. As Supervisor of my project in the Department and as Principal of the Graduate Society, I am dually indebted to him.

My viewpoint on urbanization and urban growth in the developing world emanates from many research seminars and from the discussions which followed under the guidance of Professor J. I. Clarke. I received much stimuli from discussions with other members of the staff especially Dr. G. H. Blake. For the quantitative part of the research, I got helpful suggestions and criticism from Mr. I. S. Evans.

There are many others who have encouraged, given suggestions and provided help in the Department. Among them Dr. S. A. Khater helped in the final production of maps, Mr. D. J. Bennison kindly undertook a reading of the final draft, and in other matters Mr. C. A. Palmer of this Department and Mr. M. Afzal of Theoretical Physics Department have extended full cooperation. I would like to thank Miss Avril Yeats for typing my thesis in addition to her other commitments.

In Pakistan there are many officials, friends and students who have provided me with some of the latest research material and collective thanks are offered for their kind and timely help. Special gratitude is felt for my elder brothers who have encouraged and supported me throughout my educational career.

Finally I acknowledge my indebtedness to Zakia Hameed, my wife, for her forebearance alongwith Zeba and Samia, while the research was being carried out away from home.

A. H.

TABLE OF CONTENTS

Page

ABSTRACT

PREFACE

MEMORANDUM

TABLE OF CONTENTS

List of Tables
List of Figures
List of Plates

List of Vernacular and other Terms
List of Abbreviations

INTRODUCTION 1

Chapter I THE UPPER INDUS PLAINS - PHYSICAL PERSONALITY 16
Delimitation of Area ... 16
Physiography and Drainage ... 17
Climatic and Weather Conditions ... 20
Soils, Land Forms & Vegetation Cover ... 27

Chapter II IRRIGATION ECONOMY, COLONIZATION AND SETTLEMENT PLANS OF THE UIP ... 33
A. Irrigation as Basis of the Economy ... 33
B. The Need for Irrigation Extension and Colonization ... 36
C. The Process of Colonization ... 43
The Link Canals & Storage Dams ... 55
D. Settlement Plans in the UIP ... 58
Towns of the Pre-British Era ... 59
The Colony Settlements ... 60
Town Plans ... 64

Chapter III THE PROCESS OF URBANIZATION IN THE UPPER INDUS PLAINS ... 71
A. Urbanization, Some Theoretical Implications 71
B. Analysis of Economic Factors Leading to Rapid Urbanization in the UIP ... 77
C. The Patterns of Urban Growth in the UIP . 89
D. Quantitative Analysis of Urban Patterns in the UIP 92
(a) Rank-Size Distribution of Urban Centres in the UIP ... 96
(b) Approximation to Model of City-size Distribution ... 97

Chapter IV	SPATIAL VARIATIONS OF URBANISM IN THE UIP: A FACTOR ANALYTIC STUDY OF DEMOGRAPHIC & AGRO-ECONOMIC VARIABLES	... 104
	The Model & Analytical Procedure	... 108
	The Results	... 112
Chapter V	AN ANALYSIS OF TOWN CHARACTERISTICS IN THE UIP	... 122
	Multiple Correlation & Factor Analysis	... 123
	The Results	... 125
Chapter VI	URBAN PHYSICAL PLANNING IN PERSPECTIVE	... 139
	A. Town Planning in the UIP -- Concepts and Practices.	... 140
	B. Specialized Town Building Agencies	... 149
	C. Satellite Towns and Industrial Estates	... 156
	D. Urban Physical Structures (PLATES)	... 161
Chapter VII	EMERGING PATTERN OF MODERN TOWNSCAPES	... 167
	A. Lahore	... 169
	B. Multan	... 183
	C. Lyallpur	... 189
	D. Rahimyar Khan	... 198
	E. Daudkhel	... 202
Chapter VIII	URBAN GROWTH CHARACTERISTICS IN THE UIP: FINDINGS AND COMPARISONS	... 209
	A. General Considerations	... 212
	B. Comparisons and Contrasts with the Developing World	... 217
	1. Comparison with the Middle East	... 218
	2. Comparison with Southeast Asia	... 221
	3. Urban Growth in the Subcontinent	... 224
	C. Urban Growth Characteristics in the UIP	... 228
Chapter IX	SUMMARY AND CONCLUSION	... 235
	Appendices	... 249
	Bibliography	... 254

.. ..

MEMORANDUM

In this work all nomenclature relates to the period for which the study is made, unless otherwise specified and as noted blow:

All administrative districts in the region are known after the name of their Headquarter town. Incidentally these are principal towns of the respective districts with the exception of Muzaffargarh, which is number three town in the district.

District of Lyallpur: The administrative district of Lyallpur was created in 1905, any reference to previous data means adjusted figures for the district.

District of Sargodha: This district has been referred to as Shahpur district in earlier reports, after the old town of Shahpur which was its headquarter prior to the new town of Sargodha.

Montgomery: The name refers to the town, district or canal colony as originally established. The name Sahiwal, as adopted since 1963 has not been used in this work as the period of reference for all data is 1881-1961; and also to avoid any mix-up with the old settlement of Sahiwal in Sargodha district.

Upper Bari Doab Canal: The only perennial canal in use prior to the period of study fell divided at the time of the Partition. Its Pakistani part is now known as Central Bari Doab Canal which is fed by a Link Canal and will have full independent source of water supply from 1973 onward.

. . . . . .

LIST OF FIGURES

Figure		Following page.
0. 1	Upper Indus Plains, Base Map. ...	7
1. 1	Upper Indus Plains, Physical Characteristics ...	17
1. 2	River Regime, Mean 10-Daily Discharges ...	19
2. 1a	Canal Colonies, 1881-1960 ...	45
2. 1b	Indus Basin Replacement Works since 1960 ...	56
2. 2	Early Settlements and Historic Routes c.1880 ...	59
2. 3	Rural Settlements Pattern and Canal Distributaries	62
2. 4	Rural Settlement Plans(Lower Chenab Colony) ...	63
2. 5	Rural Settlement Plans(Lower Jhelum Colony) ...	64
2. 6	Chichawatni Town Plan, 1916 ...	67
2. 7	Lyallpur, Initial Plan, 1907 ...	68
3. 1	Upper Indus Plains, Urban Growth Phases 1881-1961..	78
3. 2	Upper Indus Plains, Agricultural Landuse 1960 ...	88
3. 3	Upper Indus Plains, Rank-size Relationship 1881-1961 ...	97
3.4	Upper Indus Plains, City-size Distribution 1961....	97
4.1	Distribution of Districts by Inter-factorial Relationships (main Factors) ...	116
4.2	Spatial Variations of Urbanism, Distribution of Factors, Map (a), (b) and (c) ...	117
4.2	Spatial Variations of Urbanism, Distribution of Factors, Map (d), (e) and (f) ...	119
5.1	Town Characteristics, Distribution of Factors, Map (a) and (b) ...	129
5.1	Town Characteristics, Distribution of Factors, Map (c) and (d) ...	132
5.2a	Town Characteristics, 4-Dimensions of Varimax Scores. ...	135
5.2b	Town Characteristics, 4-Dimensions of Varimax Scores. ...	135
6.1	Model Town Lahore, Plan of the First Modern Suburb 1938. ...	141
6.2	Plan of a New Mandi Town, Taunsa Colonization Project, proposed 1971 ...	147
7.1	Lahore: Growth Phases, Map I Pre-British Environs c.1848, Map II British Period till 1947 and Map III Since Independence to 1971 ...	170
7.2	Lahore: Functional Areas 1970 ...	182
7.3	Multan: Urban Land Use 1970 ...	186
7.4	Lyallpur: Expansion & Street Pattern ...	189
7.5	Lyallpur: Functional Areas 1970 ...	194

LIST OF FIGURES Continued

Figure		Following Page
7.6	Rahimyar Khan: Functional Areas 1968	... 200
7.7	Daudkhal: Residential & Commercial Sectors 1967	... 204
8.1	Upper Indus Plains, Hierarchy Among Top Urban Centres 1901-70	... 216

LIST OF TABLES

Table		Page
1.1	River Discharge Ever Recorded in the Indus Rivers	21
1.2	Average Seasonal Flow of the Indus River System	21
1.3	Mean Monthly Maximum & Minimum Temperatures and Rainfall for Certain Meteorological Stations	23
1.4	Comparative Moisture Data for Meteorological Stations within UIP	28
2.1	Population Density in the Four Regions of the Punjab	38
2.2	Population Density in Selected Districts of the Punjab, 1881	39
2.3	Canal Colony Projects 1880's-1960's	45
2.4	Link Canals under Indus Basin Replacement Works 1960-73	57
3.1a	Number of Muhajirs in the Urban Centres of the Punjab as Enumerated in the Census 1951	86
3.1b	Proportion of Muhajirs in Selected Urban Centres of the UIP, Census 1951	86
3.2	Growth of Urban & Total Population in the UIP 1881-1961	94
3.3	Growth of Urban Centres by Size and Percentage of Urban Population in Each Size-class, 1881-1961	94
3.3a	Summary Statement, Increase in Number of Urban Centres	95
3.4	City Sizes : Frequency Number & Commulative Population	98
4.1	List of 32 Variables with abbreviated names used in the Multivariate Analysis	109
4.2	Percentage of Variance Explained by Each Factor	113
4.3a	Urban Characteristics: Principal Component Factor Matrix	114
4.3b	Urban Characteristics: Varimax Factor Matrix	114
4.4	Urban Characteristics: Varimax Factor Score Matrix	115
5.1	Town Characteristics: List of Variables and their Abbreviated names used in the Multivariate Analysis	124
5.2	Town Characteristics: Percentage of Variance explained by Each Factor	126
5.3a	Town Characteristics: Principal Component Factor Matrix	127
5.3b	Town Characteristics: Varimax Factor Matrix	127
5.4	Town Characteristics: Varimax Factor Score Matrix	128
6.1	Mandi Towns in the Thal Project Area	146
7.1	Major Industrial Zones in Lahore by 1940	174
7.2	Rahimyar Khan: Growth of Population, 1941-1969	199
8.1	Growth Structure of a Colony Town in the Upper Indus Plains	230

VERNACULAR AND OTHER TERMS

Abadi	Settlement, settled area.
Bar	Slightly rising ground of the interfluves.
Bazaar	Shopping area, usually the main shopping area.
Colony	i. Canal Colony: Canalized area and its settlements. ii. Residential quarters in an urban area.
Chak	Village, especially canal colony rural settlements.
District	Territorial unit for purposes of civil administration.
Division	A larger unit comprising a number of districts.
Doab	River Interfluves.
Kacha	An inferior quality, semi-permanent structure.
Kharif	Summer (crop).
Mandi	Market.
Mohallah	Residential quarters.
Muhajirs	Refugees who migrated into Pakistan in 1947 and subsequent years.
Pucca	A superior quality or permanent structure.
Rabi	Winter (crop).
Shahr	Town, urban centre.
Tehsil	Administrative sub-division of a district.

.. ..

LIST OF ABBRREVIATIONS

ADBP	Agricultural Development Bank of Pakistan.
ADC	Agricultural Development Corporation of Pakistan.
ALF	Agricultural Labour Force.
CLF	Civilian Labour Force.
CSO	Central Statistical Office, Government of Pakistan, Karachi.
ECAFE	Economic Commission for Asia and the Far East (UNO).
EDCC	Economic Development and Cultural Change (Journal).
IDBP	Industrial Development Bank of Pakistan.
LBDC	Lower Bari Doab Canal.
NALF	Non-agricultural Labour Force.
PIDC	Pakistan Industrial Development Corporation.
PDR	Pakistan Development Review (Journal)
PGR	Pakistan Geographical Review (Journal).
TDA	Thal Development Authority.
TDR	Total Dependency Ratio.
UBDC	Upper Bari Doab Canal.
UIP	Upper Indus Plains (Study Area).
WAPDA	Water & Power Development Authority of West Pakistan.
WPIDC	West Pakistan Industrial Development Corporation.

.. ..

Geographers know that the development of the Punjab has depended very largely on those large scale perennial canal systems which are only possible with a coordinated and strong government in general control.

I was impressed by some of the advantages which are possessed by the Punjab in the modern layout of the canal colonies and the tidiness of the agriculture which is everywhere evident. There was atleast the semblance of scientific progress in the countryside which is so often absent from other parts of India. Similarly there was the general feeling in Lahore, and still more in Karachi, of modern cities bursting with new-born energy, which is not always found in other parts of India.

PROFESSOR L. DUDLEY STAMP.

In a meeting of Royal Geographical Society held on 8.12.1947. Reported in GEOGRAPHICAL JOURNAL Vol.110 p.219.

INTRODUCTION

Recent studies in geography have turned from emphasis on individual elements of spatial structure to an analysis of the spatial causal and functional relationships between these elements (Haggett & Chorley, 1969).[1] This quest for explanation is a search for characteristics that are common to many phenomena (Chisholm, 1971),[2] and may lead to the formulation of general theories, rather than emphasis on particular or individual traits. Such orientation is in line with developments in other social sciences that are concerned with the ecology of whole ecosystems and subsystems which comprise functionally interacting components.

In urban geography, Davies (1970)[3] distinguishes four systems that are of current interest, these with certain overlaps, are: spatial aspects of urbanization, the city as a unit, the areal influence of cities (city and hinterland) and the city as an area. Though no general hypothesis has yet been put in relation to urban growth patterns, descriptive conceptualization has brought into forefront occurrence of 'industrial', 'pre-industrial' and 'colonial' cities in different socio-economic environments. Whereas attributes of industrial cities are obviously linked with industrial growth, pre-industrial cities denote urban manifestations of non-industrial economy. Thus barely two centuries ago all cities could be held to be of pre-industrial type.[4] Now such pre-industrial cities abound in developing parts of the world,

many of which are in transition and undergoing industrialization and rapid socio-economic change.

However, in the same epoch of industrialization and economic development, but prior to any noticeable change in traditional urban centres, a number of cities in the developing regions of the world attained prominence under a colonial type of economy. This later category, better termed as 'colonial' cities, shows greater affinity with the developed parts of the world, rather than with the native environment.[5]

The interest of geographers in human progress and resource development has a special relevance in the context of the developing world (Dickenson & Clarke 1972, Fisher 1968).[6] Despite much recent interest in urbanization in the developing countries,[7] very little is known of the complex processes which are responsible for the perpetuation of 'pre-industrial' or prevalence of 'colonial' cities.

These or other similar concepts are ascribable to 'self-isolated approach' (Bowen-Jones, 1972)[8], since until very recently each one of them has originated in the developed world and looks for universality in terms of economically advanced society.

There may be other important varieties and patterns of urban growth. This stresses the need for case studies which will allow clearer understanding of the pattern in relation to an exposition of restricted rates of socio-economic change. It is believed by the present writer that an evaluation of observed forms and structure of spatial pattern in a specific region could lead to a fuller understanding of alternative ways of development, or change

of direction in urban profiles. Exposition of these complex and inter-related processes, in a region where the present phase of rapid urbanization is of markedly recent origin, may also serve as a case study of the process in parts of the developing world, where urbanization is largely unsustained by industrial technology or an advanced economy.

Specific studies have shown that large-scale urban growth in the developing world is characterised first by its recent occurrence, and also by the phenomenon of primacy of a few large cities in a substantial number of countries. Though the rapidity of the process has much semblance to the urban growth that was experienced by European countries during the period of their incipient industrialization,[9] there are other aspects of the emerging pattern which remain much less identified. Among the forces responsible for such anomalies are differential growth patterns and modernization of economies, that is, the capability of self-sustaining growth over a long period.[10]

Implicit in the concept of urban growth is the notion that some settlements grow more rapidly and attain identifiably newer forms and structure, which appear as quite distinct and readily discernible from the earlier pattern. Such change in the growth of settlements comes about either through a change in the economic character of the settlements or with the founding of new settlements in the areas of potential growth. Thus, if urbanization is a way of ordering a population so that it may attain a certain level of subsistence and security in a given

environment,[11] the utilization or 'making available' certain resources becomes a prerequisite of such development.

Political implications apart, colonization of empty lands and founding of new settlements has remained a distinct socio-economic endeavour, and the process has led to many adoptions and adaptations in difficult environments. Such an environment is the Indus Basin where aridity is overwhelmingly the dominant feature. Thus availability of water has always been a prime factor in influencing distribution of population and growth of settlements. Considering urbanization in West Pakistan in relation to aridity, Kureishy (1967)[12] has compared theoretical and observed town frequencies for the whole of West Pakistan for the years 1901 and 1961. He concluded that, there is "remarkable improvement in the town size frequencies of West Pakistan, notably in the Indus Plain, with the advent of irrigation and its extension over the period 1901-61", and that "the future extension of irrigation in these plains will further accentuate the process of improvement, to the practical elimination of the effects of aridity as a distorting factor."

For ecological reasons, therefore, the Plains had a low population density, and less than a hundred years ago, there was only one city, Lahore, with a population exceeding 100,000 in the whole northwest of the Subcontinent. Then, as improvement in irrigation techniques and establishment of canal colonies were adopted as a state policy in the upper parts of the Plains, new towns were planted and earlier settlements rejuvenated on a vast scale. Much more than that, the pattern of economy was remodelled, new lines of

communications spread and a spirit of enterprise and endeavour infused into a traditional peasant society. In this transformation of the society is manifest the establishment of colony settlements, and the raison d'etre of the present study.

This study considers basically the contemporary scene; and a pivotal theme throughout is settlement pattern and evolution of townscapes under induced circumstances, with some guidelines provided by the local or district administration. There is as yet no such treatment already available for this or any other region in Pakistan, though brief comments on the impact of irrigation development and colonization in the Punjab are met in many studies. Largely as a matter of non-relevance and also for reasons of scope the present research makes no attempt to uncover medieval or earlier traits of urbanism in the region. There is clear historical evidence of restricted growth followed by economic decadence, in the period immediately before the era of colonization. Though relics of old inundation canals indicate their extensive use, for obvious reasons their support to the economy could not have been considerable.

The nearest approaches to the subject from the urban geographical viewpoint which would provide effective cross references are few in number. Professor Kazi Saeed's pioneer work on settlement and agricultural geography serves as a stimulus for all studies. Kureishy's (1957) thesis on urbanization in West Pakistan provides classification of urban centres on the basis of what he regards a dominant activity, but is of less relevance. His later articles,

however, treat the impact of irrigation development on the growth of settlements in the Indus Basin, and have been made use of in relevant chapters. Two recent studies of Lahore and Lyallpur by Chaudhry (1966) and Bokhari (1968) provide insight into internal pattern of the individual cities and have been of help for the chapter on selected townscapes.[13]

A major contribution to the thesis stems from personal acquaintance with the area, many study trips to current development projects and new towns, material collected personally, and discussions with authorities concerned. Specific reference to such sources is made at appropriate places in the text. However two specific field trips for research to the Thal new towns, Quaidabad, Jauharabad, Liaquatabad and Daudkhel in 1966 and 1967 and an earlier similar trip to Rehimyar Khan in Dec., 1964 may be mentioned here. The author's tenure over 8 years as Lecturer in Geography at Multan, which is the nearest city to the area of current colonization, provided him with a sustained opportunity at first hand to witness growth of small settlements in a once desolate area. To this personal experience and fascination belong some of the appreciation of the human effort which has realized a transformation of the environment since colonization began in the region.

THE AIMS AND CONTEXT OF STUDY

This study is undertaken to evaluate by means of detailed and exclusive analysis many changes in the urban form and structure resulting from basic economic and technological developments in the Upper Indus Plains. (For

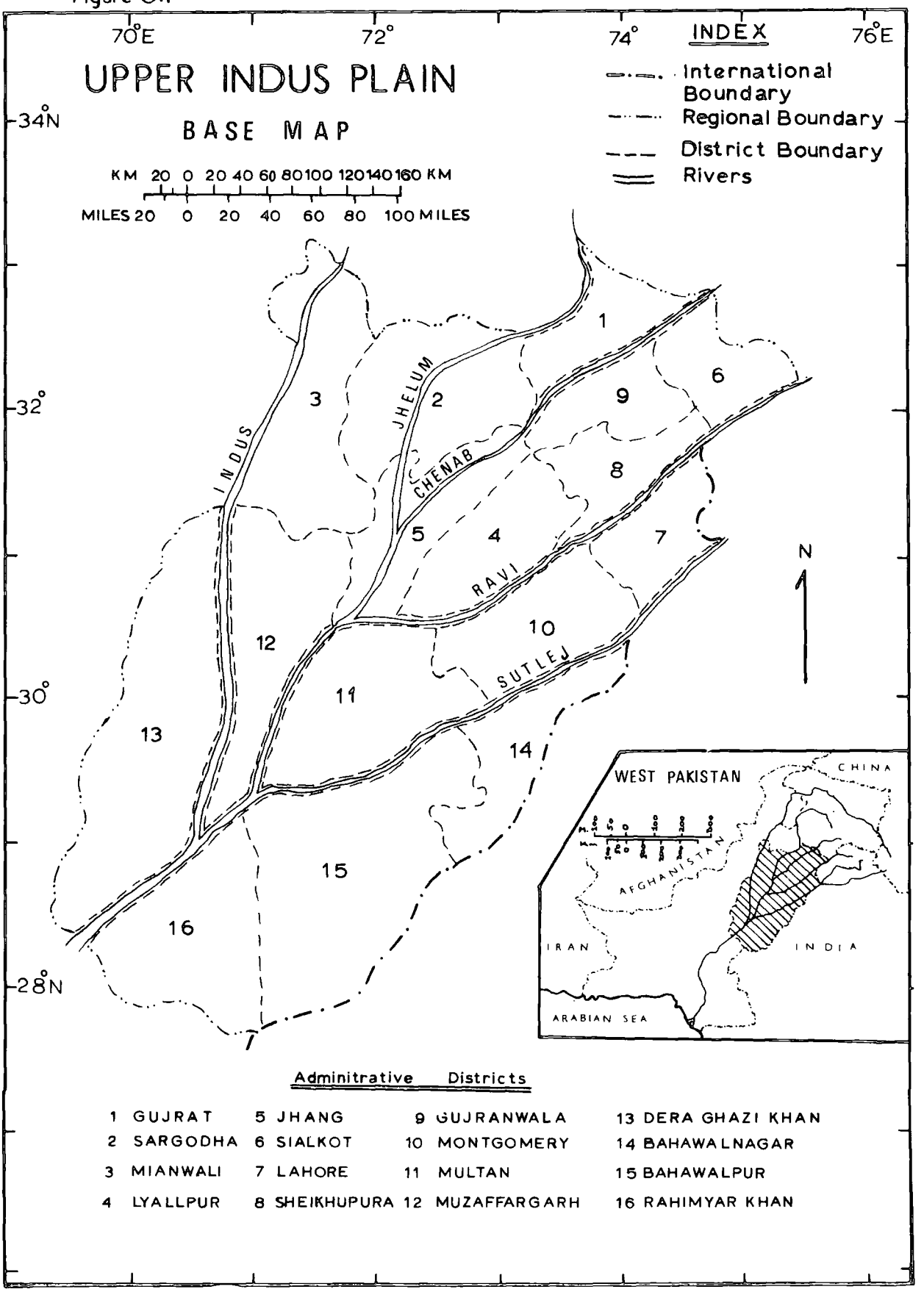
a reference to the area, see Figure 0.1, Base Map). The main aims of the study are:

1. To establish and classify urban growth patterns in a region where human enterprise has been responsible for great changes in an environment which is not conducive to development.
2. To put into a frame of reference evolving urban morphology under induced circumstances and a spontaneous rather than imposed economy and planning.
3. To present a sub-type of town growth in South Asia which shows signs of uniqueness of concept and planning in an historico-cultural context, and to compare town growth as evidenced in this study with urban growth trends in other developing regions of the world, especially in the Middle East and countries of South and Southeast Asia.

The 'new' towns studied here, are to be reckoned as a category different from those 'new towns' that are alternative and corrective to city overgrowth and congestion on the one hand, and unduly sparse or scattered settlements on the other. These are also results of a purposeful founding and planning and as such are very much influenced by early town building movements of the century.

Temporal and spatial differences in city forms are a reflection of technological stage, economic resources and social norms. These are best evidenced in town morphology: the size and extent of town structures, whether private or public, including their construction material as

Figure O.1



Azhar 1/70

well as the means of access to them i.e., infrastructure for communications and traffic, depend on the availability and development of resources. What concerns us here relates to modern urban development and the evolution in town morphology which has continued and progressed with the enhancement of functions, population increase and economic growth evident through better standards of living. The author wishes to assert that no claim is made that a superior degree in urban form, or internal structure characterise the urban centres under study. These centres belong to agricultural Asia and their characteristics must be seen very definitelyin Asian context.

Chapter I delimits the area of study, the Upper Indus Plains, and describes its physical personality as a background emphasizing subtropical semi-arid features of the riverine plains. Chapter II deals with irrigation economy and the process of colonization as a prelude to the growth of urban settlements in the region. The need and motives of agricultural expansion, progress of irrigation projects and introduction of settlement plans as state policy are treated in this chapter.

An objective study of the process of urbanization in the third chapter takes into account various economic factors responsible for rapid growth. Statistical analysis of emerging patterns, rank-size relationship and approximation to city-size models are made here.

A quantitative study of facets of urbanism in the region is made in Chapter IV. A principal components analysis of demographic and agro-economic characteristics

attempts to establish the underlying variations in the sixteen districts of the region. This is followed in Chapter V by a multivariate analysis of town characteristics. All towns and cities in the region having a population of over 20,000 are evaluated on the basis of morphology, accessibility and civic amenttics.

Physical planning and housing, role of government and private agencies in the modernization of internal structure, and growth of satellite towns and industrial estates is the subject matter included in Chapter VI.

Chapter Seven, "Evolution of Modern Townscapes", undertakes specific study of three representative types of towns and cities in the region. It brings into focus trends in morphology, economy and functional zoning as introduced during the British period and carried forward in post-independence period.

The experience within the Upper Indus Plains as regards development of resource potentials under a uniform administration, and concomitant growth of urban centres, is considered in Chapter Eight. This region's close social, cultural and historical affinities with the Middle East, Southeast Asia and the Subcontinent as a whole, are the basis for comparisons with recent studies from these areas. Special attention is paid to growth characteristics of emerging pattern and the 'colonial' city of the developing world.

Finally Chapter IX draws the findings of individual chapters together. A brief look to the future growth trends

is presented for the Indus Plains as a whole.

SOURCES OF MATERIAL AND METHODOLOGY

To extract relevant data, out of the multi-disciplinary material pertaining to irrigation, agricultural economy, demography, history of colonization and physical planning, especially when specific geographic studies of settlements are practically non-existent, would make the list very long. However, three distinct sources of material which have been used for this study are 1) Official records and communications, 2) Semi-official and relevant studies by administrators, economists and reporters, whose writings have had influenced the formation of government policies and 3) published and unpublished studies and research material of the Universities.

1) Official Sources:

(a) Government of Britain, H.M.S.O. Publications, especially Reports of the Indian Irrigation Commission.

(b) Government of India, Census of India, decennial reports, 1881-1941, all volumes on the Punjab (reports and tables), and volumes of general reports on British India.

(c) Punjab Government (British Period), Manuals of Irrigation, Colony Manuals, Annual Reports of the Colonies and special reports on individual projects.

(d) Government of Pakistan,

i) Census of Pakistan, 1951 and 1961; all volumes on the Punjab/West Pakistan and the Bulletins related to West Pakistan;

ii) Census of Pakistan, 1961, District Reports for all the sixteen districts of the region;

iii) Census of Housing 1961;

iv) Census of Pakistan 1961, Non-Agricultural Labour Force, Vol. 6, Part I & II.

v) Census of Agriculture 1960, Vol. 2 West Pakistan.

vi) Pakistan Five Year Development Plans, 1955-70 and other reports of the Planning Commission.

(e) Various UNO reports on ECAFE Region, especially those pertaining to Multi-purpose River Development Schemes;

(f) United Nations Demographic Year Books

2) Semi-Official and individual reports and studies:

(a) Government sponsored, independent reports on the economy and social uplift of the province or parts thereof;

(b) Books and publications of public servants and statesmen in their private capacity.

3) Published and unpublished studies and research material:

(a) Various articles on Settlement and urban aspects in Pakistan by Pakistan Geographical Association;

(b) Articles on the aspects of agricultural economy and irrigation development in the Subcontinent in

the publications of Royal Society, Royal Geographical Society, Asiatic Society; particularly those related with economy and life in the Indus Basin;

(c) Unpublished research dissertations and theses in the University of the Punjab and British Universities.

Finally it is felt appropriate to put on record the 'source-places' of much of the above material in Britain and the courteous response which the author received on his visits during April 1970, Aug-Sept. 1970, April and August 1971 and April 1972.

1. The India Office Library,
2. The Commonwealth Office,
3. The Royal Commonwealth Library,
4. The British Museum Library
5. The National Lending Library (Boston Spa).

The list would be incomplete without the mention of the Centre of Middle Eastern and Islamic Studies at Durham, the three University Libraries, and the efficient book procuring service of the Science Library which managed to provide each and every request for the material.

Town Plans obtained personally from the Town Planning Department and various Town Improvement Trusts and Municipal offices have helped in the analysis and presentation of important material in the thesis. Geography and cartography are interdependent and cartographical representation of townscapes therefore provides a work-piece of schematic

importance for the understanding of spatial and zonal inter-relations. Departmental facilities at the University of Durham have provided opportunity for the cultivation and exploitation of cartographic techniques.

Computation of statistical data for much of the study was done in the Department, whereas facilities for the running of computer programmes for the two chapters were provided by the University Computing Unit.

One obvious shortcoming of the research is that major analysis of growth statistics ends with 1961 data. It remains the last census for the country to date, as internal socio-political shake-up has caused unprecedented disruption and delay even for essential activities. The new census is now scheduled to be held in September 1972.[14] Decennial population data for 1881-1961 are however most relevant for the major theme of the thesis, since to this period belong the continued colonization and initiation of irrigation in the last of the remaining districts. For the intervening period since 1961 other official reports on economy and growth have been used and population estimates for large urban centres have been updated from the latest available UN Demographic Year Book.

REFERENCES

1. HAGGETT, P. & CHORLEY, R.J. (1969) Socio-Economic Models in Geography, Methuens, pp.19-41.

2. CHISHOLM, M. (1971) Research in Human Geography, SSRC Publication, Heinemann, pp.1-17.

3. DAVIES, W.K.D. (1970) Approaches to Urban Geography: An Overview, in CARTER, H. & DAVIES, W.K.D. (Eds) Urban Essays: Studies in Geography of Wales, Longman, London, pp.1-21.

4. A generalized observation. See SJOBERG, G. 'Cities in Developing and Industrialized Societies: A Cross Cultural Analysis', in HAUSER, P.M. & SCHNORE, L.F. (Eds) The Study of Urbanization, John Wiley & Sons, New York, pp.213-263.

5. There are several generalized expositions of Western colonial impact on city growth in the Developing World. In particular see:

   McGEE, T.G. (1971) The Urbanization Process in the Third World, G. Bell & Sons Ltd., London.

   BELLAM, M.E.P. (1970) 'The Colonial City: Honiara, A Pacific Islands' Case Study', Pacific Viewpoint, Vol.2/1, May, 1970, pp.66-96.

   MURPHY, R. 'Traditionalism & Colonialism: Changing Urban Roles in Asia', Journal of Asian Studies, Vol.29/1, pp.67-84.

6. DICKENSON, J.P. & Clarke, C.G. (1972), 'Relevance and newest Geography', Comment in AREA, IBG, Vol.4/1 pp.25-27.

7. FISHER, W. B. (1968), 'Geographical Contributions to Development Surveys', Advancement of Science, Vol.25/124, December, 1968, pp.158-170.

7. Among recent publications, see collected articles in

   BREESE, G. (Ed) (1969) The City in Newly Developing Countries, Prentice-Hall Inc., Englewood Cliffs, N.J.

8. BOWEN-JONES, H. (1972) Urbanization and Economic Development, in The Exploding City, Edinburgh University Press, pp.94-105.

9. HOSELITZ, B. F. (1962) 'The Role of Urbanization in Economic Development: Some International Comparisions', in TURNER, R., (ED) India's Urban Future, University of California Press, Berkeley, pp.157-181.

10. LERNER, D. (1967) 'Comparative Analysis of Processes of Modernization' in MINER, H., (Ed) The City in Modern Africa, Pall Mall, London, pp.21-38.

11. LAMPARD, E.S. (1955) 'The History of Cities in the Economically Advanced Areas', Economic Development and Cultural Change, Vol.3/2, pp.81-136.

12. KUREISHY, K.U. (1967) 'Urbanization of West Pakistan in Relation to Aridity', Pakistan Geographical Review, Vol.21/2 July, 1967, pp.1-13.

13. Full references to all such works are given at appropriate places in the relevant chapters.

14. 'DAWN' the daily newspaper, Karachi, dated 29.3.1972. Even if the 1971 Census would have been held earlier, its processed reports would not be available for some time, as is usual with such works. The reports of 1961 census were published in 1964-65.

CHAPTER: I

THE UPPER INDUS PLAINS - PHYSICAL ENVIRONS

DELIMITATION OF AREA

The area under study, the UPPER INDUS PLAINS, covers 182,840 square kilometres (70,600 sq. miles) and lies between latitudes 28° N to 33°N and longitudes 69°-20' E to 75°-20' E. This distinct geographical region occupies the north-western portion of the Indo-Pakistan Subcontinent, south of the Himalayas. It is an area of broad plains with a slight and gradual slope from north-east towards the south-west.

The northern rim of the plains is formed first by the foothills of the Siwalik Ranges, and the Salt Range bordering on the Potwar Uplands. The western boundary is formed by the Suleiman Range, whilst the Thar Desert skirts all along the south-east. The departure from a strict physical boundary is met along some 100 miles of its eastern limit, where geographically the plains extend into East Punjab area of India. Here the international boundary provides a working limit.

In terms of political boundaries the area under study extends over the greater part of the historical Punjab Province and the State of Bahawalpur now merged with it. In the present day context, it comprises sixteen

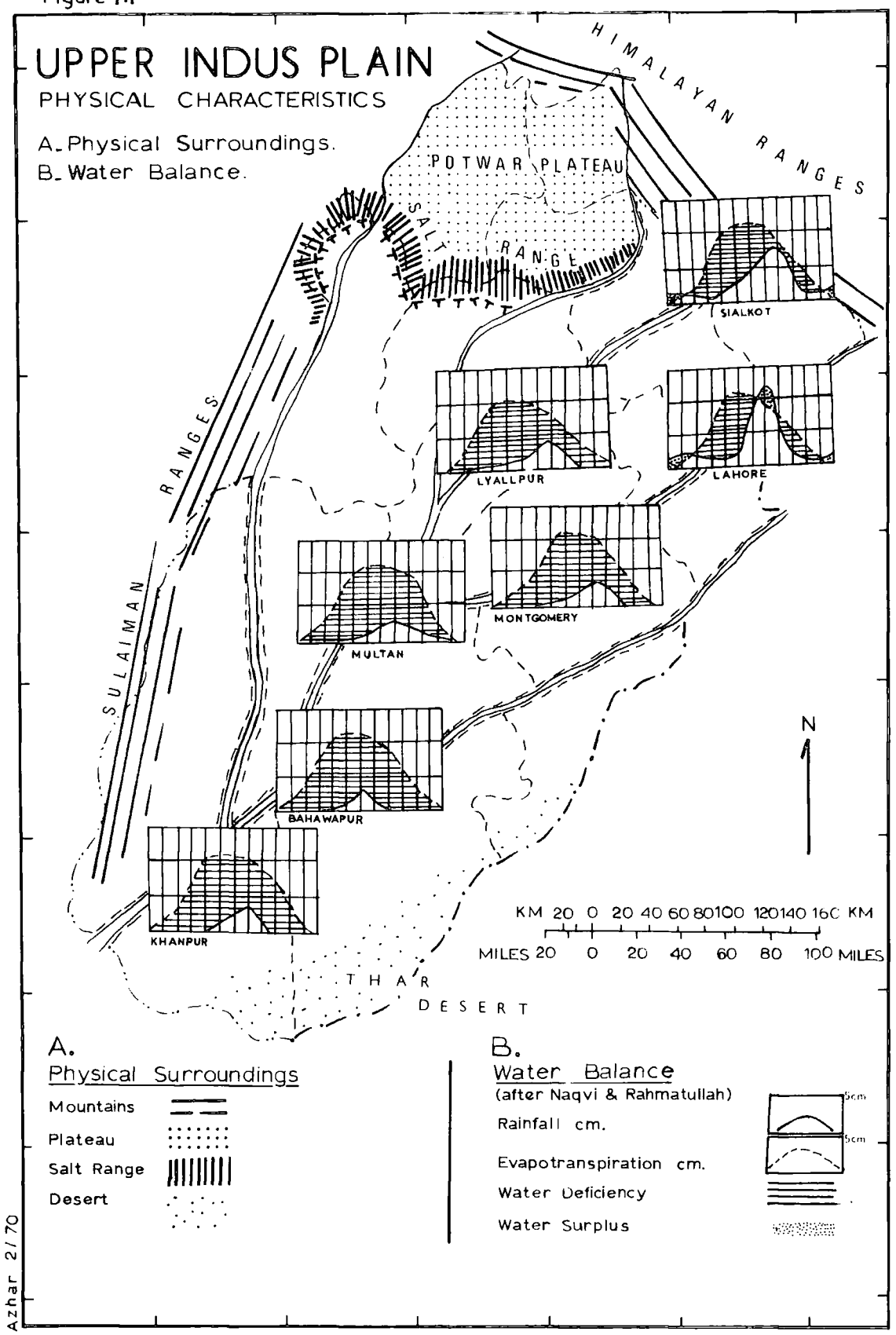
districts of the province of the Punjab in Pakistan, leaving out three Potwar Upland Districts namely Campbellpur, Rawalpindi and Jhelum. Although the Potwar Uplands are a part of the provincial administration, they are excluded from the study as they form a compact and distinct region of their own.[1]

PHYSIOGRAPHY AND DRAINAGE

The Upper Indus Plain is the north-western portion of a major geomorphic unit, the Indo-Gangetic Plain. These Plains have emerged as a result of infilling of a foredeep warped down between the Gondwana or peninsular block of the south and Himalayan chain in the north. The major river, the Indus, and four of its important tributaries, the Jhelum, Chenab, Ravi and Sutlej traverse the UIP in a fan shape. Entering from the north, at intervals, each of these tributaries flows in a south-westerly direction and join together before their ultimate merger with the Indus itself. General physical characteristics of the Plains and the surrounding area are depicted in Figure 1.1.

The Plains have an aggradational surface, over which each river occupies a broad flood-plain, the banks of which mark the extreme limit of river course on either side. From here the level gradually rises towards the centre of the doab (interfluve) tracts and then falls again to the level of the next river. These slightly rising tracts between the valleys are locally known as the bar which may attain a relative height of 5 to 8 metres above the river level.

Figure 1.1



Azhar 2/70

The monotony of this vast nearly level surface is slightly disturbed by the small Sangla and Kirana outcrops in the central part. These are a few straggling outcrops of the deep seated Archean base. The hills lie on a subterranean ridge, which is supposed to extend from Delhi northward up to the Salt Range, and which is sometimes called the Shahpur-Delhi Ridge. This subterranean ridge is important in that it divides the Plains into two underground water basins, the north-eastern of which holds most of the subsoil water.[2]

The Indus river enters the Plains from the Attock-Kalabagh Gorge (240 metres above m.s.l.) and immediately broadens out over a gentle gradient. While flowing in a southerly direction, all along the western side of the Plains, the river has formed a much braided channel. Here the river bed is everywhere broad (20 Km to 25 Km), though due to fluctuations in river regime the actual flow may split up into lesser channels during the winter months.

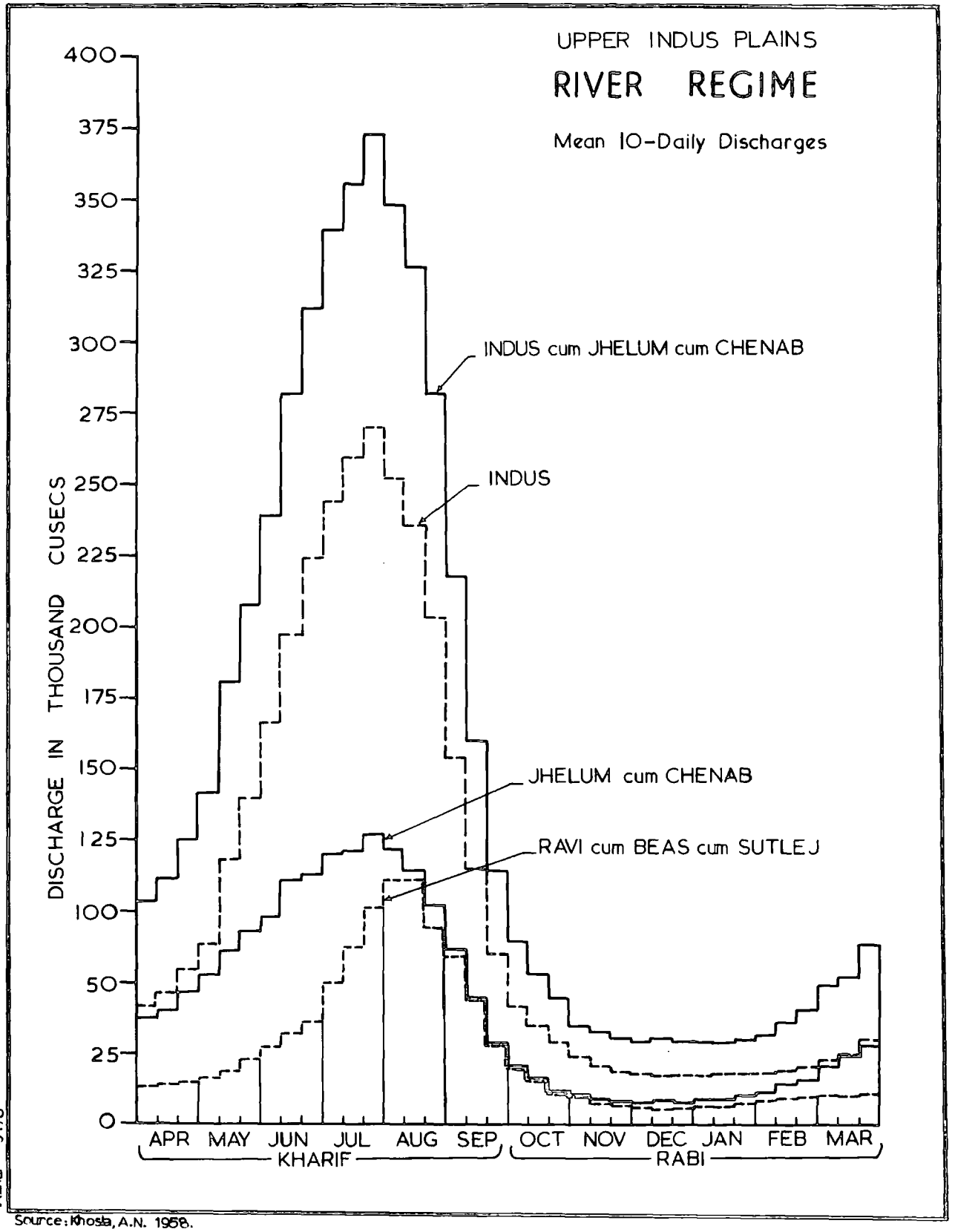
Like the Indus, all the Punjab rivers have their catchment areas in mountainous Kashmir. The smallest of these rivers, the Beas, join the Sutlej in East Punjab but its valley lies totally outside the study area. Both the Sutlej and the Ravi (in part) form the political boundary before finally entering West Pakistan. The waters of these three rivers have been placed under the control of India, under the Indus Water Agreement[3] of 1960.

Emerging from their deep and confined channels in the mountain country all the rivers expand in width as the

velocity diminishes due to gentle gradient. In northern parts the mean elevation is nearer to 300 metres above sea level but it drops off within a short distance. Thereafter, the gradient becomes very gentle (1:5,000) and the extreme southwestern areas of the Plain which are over 700 Kilometres away, have a mean elevation of less than 90 metres above m.s.l.

The Indus River System,[4] is almost entirely snowfed. Apart from smaller western tributaries (Rivers Kabul, Kurram and Gomal, originating in Afghanistan), all the important rivers have their catchment areas among the Karakoram and the western Himalayan Ranges which are interspersed with some of the larger mountain glaciers in the world. The flow of water in the river fluctuates with the rhythm of the seasons. Figure 1.2 depicts a typical river regime and examplifies fluctuations in the flow month by month. With the approach of summer, as the snow melts, volume in all the rivers begins to increase. By late summer, downpour of the Monsoons is added to this increased flow. The waters swell and all the rivers have a tendency to overflow their banks. Spreading waters add a layer of silt but at many occasions the disaster from floods and damage to the crops might take away more than the benefit of fertility which the silt brings with it. As the rainy season ends, volume of water shrinks back to the channels and by winter months the level of flow is so diminished that a device of barrage and flow control has to be applied for a judicious use of water.

Figure 1.2



Source: Khosla, A.N. 1958.

It is not only because of general paucity of water and fluctuations in the river flow that a critical balance has to be maintained, especially during winter months, between the available water supplies and the seasonal requirements of agriculture. Table 1.1 gives the absolute maximum and minimum discharge of the principal rivers ever recorded and illustrates the extent of fluctuation. In Table 1.2 the average seasonal flow illustrates the paucity of river water for six winter months (column 2) as against excess water during three monsoon months (column 4).

CLIMATIC AND WEATHER CONDITIONS

The Upper Indus Plains are affected by a phase of Monsoon Climate, which however, becomes quite feeble while reaching its western extremity. Rainfall over most of the region remains under 300 mm. and is less than 90 mm. over the extreme south-western parts. The amount of precipitation thus remains not only generally inadequate but is also highly variable from year to year. Moreover, because of high temperatures during summer months, the small amount of precipitation that comes to the ground is not very effective for moistening the soils.

Two recent studies (Nasrullah Khan 1968, Naqvi & Rahmatullah 1962) classifying the various climatic conditions of Pakistan, have estimated the water surplus and water deficiency for various parts of the country. However, before looking into such quantitative meteorological studies a

TABLE 1.1

RIVER DISCHARGE EVER RECORDED IN THE INDUS RIVERS
(in cusecs)

River	Site of Discharge	Maximum	Date	Minimum	Date
Indus	Kalabagh	917,015	12- 7-1942	17,304	17-12-1936
	Ghazighat	827,998	7- 8-1950	15,836	5- 2-1941
Jhelum	Mangla	760,000	29- 8-1928	3,943	9- 1-1917
Chenab	Marala	718,000	29- 8-1929	3,618	25- 1-1939
Ravi	Madhopur	650,000	5-10-1955	1,300	...
Beas	Pang	46,529	4- 8-1927	1,925	7- 3-1932
Sutlej	Ferozepur	353,960	15- 8-1925	2,651	23- 3-1932

*Source: AHMAD, Kazi, S., 'Water Supply in the Indus Basin and Allied Problems, Pakistan Geographical Review, Vol.13/1 (1958) p.5

TABLE 1.2

AVERAGE SEASONAL FLOW OF THE INDUS RIVER SYSTEM
(in million acre-feet)

River	Winter (Oct-Mar)	Early Kharif (Apr-Jun)	Monsoon (July-Sept)	Annual
Indus ...	12.9	27.9	48.7	89.5
Jhelum ...	4.5	9.9	8.2	22.6
Chenab ...	3.7	6.7	13.1	23.5
Ravi ...	1.2	1.9	3.3	6.4
Beas ...	2.4	1.9	8.5	12.8
Sutlej ...	2.0	3.2	8.4	13.6
Total	26.7	51.5	90.2	168.4

*Source: KHOSLA, A.N. 'Development of the Indus River System' India Quarterly, Vol. 14/3 (1958), p.238

brief review of the general weather conditions of the UIP may be made here.

According to both Koppen's and Thornthwaite's classifications the area falls under Tropical Arid category, and Ahmad (1951) taking the local physiography into account, categorised it as Sub-Tropical Continental Lowlands having semi-arid to arid characteristics.[5] The mean maximum and minimum temperature and rainfall data is given in Table 1.3 in which the stations are roughly arranged from NE to SW. The general weather conditions experienced over the region are divided into four well marked seasons.

1) Cold Weather Season (December-March)
2) Hot Weather Season (April-June)
3) Monsoon Rain Season (July-September)
4) Post Monsoon Season (October-November).

1) The Cold Weather Season (December-March) is characterised by lower temperatures and low humidity. Mean temperatures range between $7^{o}C$ in the north-east to $9^{o}C$ in the south-west, whereas on some January nights the thermometer may touch freezing point in the northern districts. It is during this period that northern districts are affected by low pressure waves called 'western disturbances' which are remnants of temperate cyclones from the Mediterranean. Some of these may arise as secondary depressions over Iran or some even arise locally, possibly from waves in the westerlies in the upper troposphere or much lower.[6] Nevertheless, the

TABLE 1.3

MEAN MONTHLY MAXIMUM & MINIMUM TEMPERATURES AND RAINFALL FOR CERTAIN METEOROLOGICAL STATIONS IN THE UPPER INDUS PLAINS

Temp. C°
RNF. mm

		January	February	March	April	May	June	July	August	September	October	November	December	ANNUAL
SIALKOT	Max.	18.7	20.8	26.7	33.6	39.0	40.6	36.3	34.6	34.8	33.0	27.0	20.8	30.5
	Min.	5.7	7.5	12.3	18.2	23.5	26.8	26.4	25.7	23.2	16.7	9.5	5.7	16.8
	Rnf.	49.8	42.4	38.4	25.4	25.1	60.7	212.1	236.2	37.0	9.0	4.0	18.0	808.0
LAHORE	Max.	20.0	22.3	28.1	34.7	39.8	41.1	37.6	36.1	36.1	34.4	28.3	22.4	31.8
	Min.	4.5	6.9	11.8	17.3	22.3	26.1	26.7	25.9	22.8	15.4	8.5	4.8	16.1
	Rnf.	26.0	25.0	20.0	14.0	15.0	42.0	138.0	131.0	56.0	6.0	3.0	12.0	488.0
KHUSHAB	Max.	19.8	21.8	27.4	33.7	39.8	41.4	39.0	37.7	37.0	34.2	28.2	22.1	31.9
	Min.	4.8	7.8	13.2	19.3	24.6	27.9	28.0	27.3	24.5	17.4	9.9	5.3	17.5
	Rnf.	18.0	23.0	26.0	23.0	19.0	36.0	99.0	89.0	35.0	4.0	2.0	11.0	386.0
LYALLPUR	Max.	19.8	21.8	27.6	33.7	39.1	41.1	38.6	36.7	36.7	34.0	27.9	21.5	31.5
	Min.	4.4	7.3	12.0	17.7	23.3	27.6	28.7	26.9	24.0	16.9	9.5	5.7	16.9
	Rnf.	10.0	14.0	14.0	12.0	11.0	31.0	73.0	91.0	38.0	3.0	3.6	6.0	320.0
MONTGOMERY	Max.	20.1	22.5	28.8	35.4	40.8	42.1	39.4	37.8	37.4	35.0	28.6	22.2	32.5
	Min.	5.4	8.0	13.3	19.2	24.9	28.6	28.7	27.6	24.4	17.5	10.9	6.2	17.9
	Rnf.	12.0	13.0	11.0	9.0	9.0	25.0	61.0	74.0	43.0	2.6	1.0	7.0	255.0
MULTAN	Max.	20.0	22.7	28.8	35.2	40.4	41.4	39.1	37.2	37.1	34.7	28.3	22.1	32.3
	Min.	5.6	8.2	14.0	19.7	25.2	30.4	29.7	28.3	25.4	17.6	16.5	6.3	18.3
	Rnf.	9.0	10.0	10.0	7.0	8.0	14.0	51.0	46.6	14.6	2.6	2.0	6.6	179.0
RAHIMYAR KHAN	Max.	21.7	24.8	28.7	35.3	42.4	43.1	39.2	39.4	38.9	35.9	35.3	23.4	34.3
	Min.	6.8	9.6	12.0	16.8	22.7	28.4	28.3	28.3	24.5	16.6	8.4	6.7	17.2
	Rnf.	6.0	8.0	7.0	7.0	4.0	6.0	30.6	32.6	11.6	-	-	6.0	117.0

Source: AHMAD, K.S. A Geography of Pakistan, OUP. 1964 Appendix II

important factor is that northern districts do receive 75 mm. to 100mm. of rain during this period. Central and south-western districts may, on occasions, get 25 mm. or so of rain during this season, which germinates life in the fields after winter sowings of wheat and barley.

During this season the incidence of precipitation, in the form of snow, over Kashmir mountains is important as its melting during the summer adds to river flow. In the rear of depressions there is often a wave of cold weather, and hailstorms are sometimes met during February and March. These bring considerable damage to standing crops.

2) During the Hot Weather Season (April-June), due to increased insolation and dissipation of atmospheric moisture, hot and dry conditions prevail over the Plains. Day temperatures steadily rise to over 35°C, over the whole of the area. Shade thermometer readings over western and southern districts range between 40°C and 45°C, and even 50°C is not uncommon here for a day or two, during the month of June.

In the first two months convectional currents lift off great quantities of dust particles and towards the evenings duststorms are raised quite frequently. The strong convectional currents rise to the upper layers of the troposphere; it may at occasions result in a sudden brief shower and a short-lived relief is found from excessive heat. During most of the season however, extreme high direct insolation gives rise to the '<u>loo</u>' (hot winds), which blow with varying intensity over whole of the region.

3) The Monsoon Rain Season over the Upper Indus Plains is experienced much later as compared to southern and eastern parts of the Subcontinent, where it starts by middle of May. This rainy season is pronounced only over the northern submontane districts where 250 mm. to 450 mm. of rain falls during July and August. The amount of rain decreases markedly towards the south and west. It is less than 200 mm. over the central parts and less than 100 mm. over the south-western districts. With the advent of rains, humidity rises and as the temperatures are still high, dampness of the air makes the weather sticky and unagreeable.

The Monsoon current starts withdrawing from the Subcontinent in August, but occasionally it continues active even in September when some of the highest floods of the Indus Basin are recorded.[7] As for the whole of the Subcontinent and much more for a marginal area such as the Indus Plains, the incidence of monsoons is much critical; because, 'the onset of monsoon may be late, or it may withdraw for considerable period - or may withdraw early.'[8]

As the failure of monsoons makes conditions precarious, so the excessive downpour, when fields and streets are flooded alike, loss to the crops and property is enormous. Many floods (1950, 1952 and 1954) have carried away road bridges and submerged railway tracks. The devastating floods of 1954 seriously affected large areas in the Punjab. As one report says "The recorded rainfall of 399 mm. in less than thirty-seven hours in Lahore, brought havoc. Several hundred

houses collapsed, causing death to 18 persons, injuries to 136, complete dislocation of traffic, and much damage to property."[9]

4) The Post-Monsoon Season (October-November) is a transitory period in which conditions gradually change to those of the winter. Clouds disappear completely and a dry season sets in. In October, over most of the area, day temperatures drop to 25°C while night temperatures may even fall below 10°C. In November the change is much more rapid and by the middle of that month wintery conditions set in over the region. This season is characterised by 'lack of any active atmospheric system,' as high pressure becomes established over the Plains.

The foregoing account of prevailing weather conditions over the Upper Indus Plains provides a twofold divisions of the region, viz. semi-arid north-east and arid south and south-west. In fact it is the acute aridity, total absence of winter rains, prolonged summer and more days experiencing dust-laden winds that distinguish the later and greater part of the Plains from a smaller north-eastern section. In the south-western districts, heat during summer months is so great that temperatures on some nights may not even fall below 25°C and the '<u>loo</u>' blows until the small hours of the morning.

In the north-east, over the semi-arid districts, summers are as hot, but relatively shorter in duration and winters are somewhat cold. However, the main characteristic

is some cyclonic rain in addition to a larger share (250 to 300 mm.) of summer rains.

In arid and semi-arid climates where availability of water for agriculture is crucial, an understanding of the exchange of heat and moisture in the lower layers of the atmosphere is important. Naqvi and Rahmatullah (1962) have computed evapo-transpiration losses for various stations of West Pakistan. It is found that monthly and annual rainfall is always less than the potential evaporation all over UIP except Sialkot and Gujrat districts.[10] Only here, monthly rainfall is slightly more than the evapo-transpiration in two to three months. (Figure 1.1).

Nasrullah Khan (1968), following Thornthwaite's system of classification, has calculated potential evapo-transpiration, actual evapo-transpiration, water surplus and water deficiencies for West Pakistan.[11] Comparative moisture data for seven meteorological stations from north to south within the UIP is detailed in Table 1.4. Negative value of moisture index (column 7) for all stations is conspicuous and makes irrigation an obvious necessity in the region.

SOILS, LANDFORMS AND VEGETATION COVER

The soils of the Upper Indus Plains are characterised by their source material which is alluvium, and general absence of vegetational cover over large areas. The alluvium may be coarse or fine and particles may vary in diameter from less than 0.002 mm. in case of clay to 2 mm. in case of sand, depending on its location and mode of deposition. In

TABLE 1.4

COMPARATIVE MOISTURE DATA FOR METEOROLOGICAL STATIONS WITHIN UIP

(in centimetres)

Station	Water need	Precipi-tation	Water surplus	Water Deficiency	Deficiency % of need	Moisture Index
1	2	3	4	5	6	7
Sialkot	131.36	78.13	6.28	47.45	36.12	-16.89
Lahore	137.28	49.02	0.00	88.26	64.29	-38.57
Khushab	138.98	38.79	0.00	100.23	72.11	-43.27
Montgomery	140.20	26.11	0.00	114.09	81.37	-48.43
Multan	145.52	16.31	0.00	129.21	88.79	-53.27
Bahawalpur	142.66	14.19	0.00	128.47	90.05	-54.03
Fortabbas	148.11	19.60	0.00	128.51	86.76	-52.06

Source: NASRULLAH KHAN (1968), 'Climates of West Pakistan According to Thornthwaite's System of Classification,' PGR Vol.23/1, January 1968, pp.12-37.

vernacular terms the soils are either Khadir (new alluvium), which is confined to flood-plains and mostly consists of sand, silt, mud and clay, or Bhanger (older alluvium), found over wider areas of interfluves and is made up of clays mixed with loam and sand. Some of the soils, locally known as Kallar and mostly found in central and western areas, are rich in inorganic salts which remain unleached due to insufficient rainfall.

Detailed scientific studies of the landforms, soils and vegetation cover are as yet non-existent for the region. However, particular studies and some sample surveys carried by official or semi-official agencies provide general outlines. Among these, an important study, 'Land Use and Land Forms of West Pakistan (1954)', was carried out in cooperation with the Canadian Government under the Colombo Plan. This study is based on a Photographic Survey and as such it is under restrictive use. However, some academic use has been allowed and comments and references have appeared in print.[12] The Report of this Survey divides the surveyed area of West Pakistan into 20 Landform Units and 10 Land Use Types. The classification of landforms has a special relevance to agricultural land use and five of the categories which relate to UIP are briefly noted below.

1. Scalloped Interfluve: The three well defined interfluves between rivers Sutlej, Ravi, Chenab and Jhelum come under this category. The soils of this landform are extremely uniform and generally vary from moderately coarse to medium texture.

2. Level Sand Plains: Two wide sandy areas which have been levelled for cultivation. These comprise most of the Thal area (Sind-Sagar Doab) and Eastern Bahawalpur and Bahawalnagar districts. Surface soils are coarse sand but sufficient evidence shows finer texture of the lower crust.

3. Meander and Cover Flood Plains: Adjacent to active flood plains this land belongs to recently abandoned river courses. This unit is quite extensive in Montgomery and Multan districts. Most of the surface materials are the result of sheet flooding. Soils are finely stratified though have a complex pattern and are liable to undergo frequent changes.

4. Active Flood Plains: All along the river channels vast areas that remain dry in winter but are inundated by floods during summer. The soils of these tracts are generally coarse in texture and finely stratified.

5. Desert Fringe: Southern and south-western parts of Bahawalpur and Rahimyar Khan districts belong to the Desert Fringe. Here medium and coarse sand form the bulk of surface land. Sand dunes are met along the southern margins of this unit which merges with the Thar Desert.

Excepting a ribbon-like growth of trees along the river banks, the Plains have a very scanty and low vegetation

growth. An unevenly distributed shrubby and less arboraceous vegetation cover is found over distant areas. Such scattered dry scrub forests are locally known as Rakhs and provide some fuel for local consumption. Prickly bushes and xerophytic plants are found over drier areas of south and west.

However, irrigation facilities developed over the years have been utilized for some planned tree plantations. Rows of trees have been provided on the canal banks and all along the roadsides. Besides these some smaller plantation forests known as Reserved Forests have also been established over some of the irrigated lands. The most important and well established among them is the Changa Manga Forest in Lahore district. Another two larger Reserved Forests are near Chichawatni (Multan district) and Wan Bachran (Mianwali district).

High temperatures and low amount of precipitation experienced over almost the whole of the Plains have effectively restricted any widespread human occupance of the region. Historical evidence shows low population density, precarious nature of agriculture and prevalence of subsistence economy till the recent past. However, it now ranks economically as one of the most prosperous regions not only in Pakistan but in the Subcontinent as a whole. It is in this context that canalization and development of irrigation potentials, which transformed the economy of the region are studied in the next chapter.

REFERENCES

1. The Potwar Uplands covering some 2330 sq. Kms. (900 Sq. miles) of rock and ravine are a much different entity than the lowland plains. It is not only the geologic and physiographic stature but typical economic characteristics which led to the exclusion of these Uplands from this study.

2. AHMAD, K.S. 'Physiography of the Punjab Plains', Punjab Geographical Review, Vol. 2/1 (1947), pp.2-7.

3. The Indus Water Agreement was signed on 19.9.1960 between the Governments of Pakistan and India, after a prolonged dispute over the control and use of river waters. The dispute, and now the Agreement has important bearing on the development of water resources in the Indus Basin. A reference to this is made in relevant chapters.

4. The Indus River System is a term now in vogue for the combined tributaries of the Punjab rivers and the Indus itself.

5. AHMAD, K.S. 'Climatic Regions of West Pakistan', Pakistan Geographical Review, Vol. 6/1 (1951), pp.1-35.

6. APATE, O.H.K. & LEARMONTH, A.T.A., India and Pakistan, 3rd Ed. Methuen (1967), pp. 51.

7. NAQVI, S.N. & RAHMATULLAH, M. 'Weather and Climate of Pakistan,' PGR, Vol. 17/1 (1962), pp. 1-18.

8. SPATE & LEARMONTH, op cit. pp.54.

9. UNITED NATIONS, Multipurpose River Basin Development, Flood Control Series No. 11, Bankok (1956), pp.89.

10. NAQVI & RAHMATULLAH, op cit.

11. NASRULLAH KHAN, 'Climates of West Pakistan According to Thornthwaites' System of Classification', PGR, Vol. 23/1, (1968) pp.12-37.

12. The author had the opportunity to look into this Report in 1967 while conducting Landuse survey with the students near Rawalpindi. For reference see:

    GILL, M.S. (1970) 'Soil, Climate & Crops of West Pakistan' World Crops, Jan./Feb. 1970, pp. 18-23.

    'Land Use of Indus Plain' Statistical Supplement, PGR Vol. 16/2 (1961) pp.59-63.

CHAPTER: II

IRRIGATION ECONOMY, COLONIZATION AND SETTLEMENT PLANS OF THE UPPER INDUS PLAIN

The major factor in the process of urbanization is the change in economic characteristics of an area, which contributes towards an increase in the standard of living as well as sets in particular traits in the occupation structure of the inhabitants. High dependence on river water as a basic resource in arid and semi-arid climes for sustained economy is too obvious. Apart from irrigation, its potentials for generation of hydro-electric power and its management as a factor in flood control are noteworthy. In the Indus Basin until very recently even agricultural pursuits have been basic on account of difficult physical environment. Before discussing the socio-economic changes that have occured in the region, some consideration of the factors behind the change is important.

A. IRRIGATION AS BASIS OF THE ECONOMY OF THE UIP.

As noted in the first chapter, the broad plains consist of alluvial deposits, mainly silt and sand of low permeability with some clay, with no known substantial gravel layer.[1] The potential fertility of soils for certain crops like wheat, cotton, sugarcane and barley is high. However, a restraining

factor in the development of agriculture was aridity linked with high cyclical seasonality and unrealiability of precipitation.

Use of irrigation water in the UIP is so well spread today, that conditions prevailing prior to modern canalization have greatly obliterated earlier elementary usage. In the earlier times application of irrigation was restricted to riverine tracts where river inundations could be channeled over the fields. Thus a single summer crop, which sufficed local needs was raised. Such inundation canals are still in vogue, to some extent, in remote areas. Their capability has been undependable like scanty rains as, if the river is 'slow to rise' due to late melting of snow or it 'sinks before it has done its task', due to failure of monsoon, no summer crop could be grown at all. Furthermore, inundation waters bring great quantities of silt in the channels which must be cleared annually in order to keep the water flowing.

The need to maintain a through supply of water in the channels led to the evolution of perennial canals. In such a system, canals are not only cut to a sufficient depth in order to take the water, where the river is at its lowest, but they are also served by a 'headworks' or weir, across the river. This method provides regulatory and controlling devices to check the volume of water passing through sluices.

Although irrigation has been in practice for centuries, in this region as elsewhere, its modern development, which is the basis of present day economy, took place in the UIP

from late 19th century onward. It was after their early commercial exploits, when the British took fancy to governing a vast subcontinent and established an administration which gradually became interested in promoting Western ideas and the establishment of lasting links with the land which came under their political control.

The art of irrigation agriculture was new to the British who found it in operation, as they took charge of administration, not only in India but in Egypt and Mesopotamia as well. Though not directly engaged in local agriculture, they felt it obligatory to help enlarge the scope and developed new techniques in order to get more production out of the areas which were potentially conducive to such increases. From humble beginning to the development of the most sophisticated methods of river control, the technique is backed by scores of investigations, modelling and experimental exercises which were carried out in the Subcontinent.

Whereas the role of inundation canals was limited in extent and scope, the system of perennial canals proved a considerable step in extending culturable areas over barren lands and enhancing crop production. Availability of water at required times led to the cultivation of two or more crops which suited different seasons of the year.

Irrigation development was first initiated in other parts of India,[2] especially in the West Gangetic Plain and the Deccan. Most of these works were for arranging

supplemental waters to the fields during the few dry months there. It was in the Punjab however, that the whole concept of large scale irrigation, colonization and settlement planning took shape.

The Upper Bari Doab Canal was the first irrigation work taken in hand soon after the annexation of the Punjab in the year 1849. The objectives behind the UBDC were to gain confidence of the peasant class of newly acquired areas; and partly as a measure to give employment to a large number of Sikh soldiers who had lost their means of livelihood by the annexation of the Province.[3] Extensive surveys and development of civil engineering was to precede the idea of settlement and colonization which was started in the last quarter of the 19th century.

B. THE NEED FOR IRRIGATION EXTENSION AND COLONIZATION

The basic factors which led to the development of irrigation and colonization of hitherto unsettled tracts in the Punjab were realization of such inherent potentials and the pressing demands for increased agricultural production. The advisability of making complete new records of all rights and liabilities connected with the land led to many extensive surveys by British administrators and engineers. As the revenue assessment work progressed, it became evident that there were many areas of culturable land which remain uncultivated and vast tracts of inhospitable country were unclaimed by the inhabitants. All such areas were appropriated to the State and later became known as the Crownlands.

In the meantime, the first census of the Punjab (1868)

showed that central and south-western areas of the Province were sparsely populated whereas eastern districts were becoming congested. It was realized that pressure of population on agricultural land in these districts was approaching a critical stage. The following quotation from the 1868 Census Report is a revealing assessment of the peculiar situation:

> "Although there may be four acres of cultivable land available for each agriculturist in the Punjab, much would require to be done before this land could all be actually cultivated. A great portion of it is situated away from the centres of trade and from the lines of communication. Very little of the uncultivated area is at present within the reach of canals, or of wells - or even of rains. The extension of population in such tracts can only be looked for when they come within the reach of these ameliorating influences".[4]

The Punjab till 1901 was divided into 27 districts, reckoned as British territory which covered 72.5% of the total area, and 34 native (princely) states. Based on general geography, the census authorities categorised the Province into four broad sub-divisions, which had the following overall population density in three successive censuses. (Table 2.1)

TABLE 2.1

POPULATION DENSITY IN THE FOUR REGIONS OF THE PUNJAB 1881-1901

	Region	1881	1891	1901 (persons per sq. mile)
I.	Himalayan Districts.	70	74	77
II.	Sub-Himalyan Districts.	273	302	300
III.	Indo-Gangetic Plain West.	270	297	315
IV.	Northwest Dry Area.	-	80	96

Source: Census of India, 1901, Vol. XVII Part I Report, Table I-A.

Leaving aside the mountainous Himalayan Districts for obvious reasons, the contrast between sub-divisons II & III which comprised the northern and eastern districts of the Punjab as against subdivision IV (central and western districts), is apparent from the above figures.

Table 2.2 below shows population density for eight congested districts from sub-divisions II and III and eight sparsely populated districts from centre and southwest for the year 1881.

TABLE 2.2

POPULATION DENSITY IN SELECTED DISTRICTS OF THE PUNJAB, 1881.

(persons per sq. mile)

A. Congested Districts (Eastern)			B. Sparsely Populated Districts (Western)		
1.	Amritsar	558	1.	Muzaffargarh	93
2.	Jullundar	552	2.	Multan	91
3.	Sialkot	508	3.	Montgomery	89
4.	Delhi	499	4.	Shapur	87
5.	Ambala	448	5.	D.G. Khan	80
6.	Gurdaspur	436	6.	Jhang	59
7.	Ludhiana	425	7.	Mianwali	47
8.	Hoshiarpur	402	8.	Bahawalpur (including BNG & RYK)	34

Source: Census of India, 1881, Vol. II Table II.

Apart from the need to look for new lands which would take immigrants from the congested districts, scarcity of food in other parts of the Subcontinent was ever pressing. Recurring famines of 1860-61, 1868-69 and 1877-78 had brought great misery to the populace and were a burden to the government. On such occasions not only substantial income from land revenue was lost but large amounts were spent on famine relief measures.

Determination to undertake such protective measures as would bring confidence in the new administration as well as provide a surety against famine, had led to earlier

attempts on enlarging irrigation provisions for double cropping in the already settled areas.[5] During this period two other important demands on irrigation facilities were put; one by the Railways, --forest plantations were to be introduced to meet increased fuel and timber requirements, and the other by the Army, for the improvement of its horse-breeding, after the South African War.

While the Punjab Administration was looking for newer opportunities, the experience and confidence earned by its engineers brought in alternative proposals for venturing into the arid wastelands of central and western districts, most of which now belonged to the Crown. The potentialities in the interfluvial tracts did not escape all notice, and more than one reference is to be found in official records to the feasibility of using the Punjab rivers for irrigation.[6] In the days when Col. E.G. Wace was asking for extension of cultivation by digging new canals, Mr. Lyall (later Sir James B. Lyall) at that time as Financial Commissioner, realising the economic significance and social benefits that would ensue, proposed (1883) the founding of planned colonies.

Colonization projects were still in an early stage when India experienced further famines during the years 1896-97 and 1899-1900. However, this experience brought to light another valuable aspect of irrigation extension and colonization. The 1901 Famine Report says:

> "In many ways the Chenab Colony has been of incalculable benefit during the present famine. The actural construction work afforded employment to large numbers, but the employment offered by the Canal works must have been small as compared with the employment by the settlers themselves -- by the capitalist and yeomen class to the tenants and by all classes including the peasant grantees to agricultural labourers."[7]

The Royal Indian Irrigation Commission (1901-1902) looked into the whole question of agricultural demand and production of food and other crops in India, including prospects of extended cultivation. Keeping in view the recurring famines and possibilities of enhanced state revenue from the export of agricultural commodities, the Commission, in its report to the British Parliament, strongly favoured opening up of the Crownlands in the Punjab. Commenting on the proposals from the Punjab Provincial Administration, the Commission wrote:

> "Such works are almost certain to prove highly renumerative as financial investments, so that indirect protection against famine which they afford can be obtained not only without throwing away additional burden on the State, but also with a certainty of ultimately increasing its resources."[8]

Thus the objects and motives which prompted the whole concept of extending agricultural potentials, enhancing economic prospects and establishing new colonies in the Upper Indus Plains may be summarized as follows:

1. To relieve the pressure of population in the congested eastern districts of the Province.
2. To create, establish and promote settlements of a type superior in comforts and civilization to anything which had previously existed in the Punjab.
3. To enhance production of food crops to meet the conditions of famine and scarcity in the country.
4. To provide jobs to the disbanded native Sikh Army, or the unemployed labour class during the time of emergencies.
5. To encourage the undertaking and maintenance of stables for horse and camel breeding.
6. To establish irrigated forest plantations to meet the fuel requirements of the Railways.

As various schemes matured and other needs arose, conditional grants out of the Crownlands in the Colonies were made for the furtherance of other objectives such as:

7. The establishment of fruit farms.
8. The breeding of special strains of cattle and for increasing the supply of dairy products.

9. To establish Seed and Experimental Agricultural Farms.

C. THE PROCESS OF COLONIZATION

As noted before, during the last two decades of the 19th century, development of irrigation potentials became synchronous with the process of colonization in the UIP. Almost all irrigation extensions, thenceforth, included opening up of uninhabited and unclaimed lands belonging to the State. Study of the history and circumstances of such agricultural colonies which were planted by the British in persuance of a deliberate and systematic policy, forms an illuminating chapter in the agricultural economy of the region. It starts from earlier restricted colonization to later enlarged areas and scope of various schemes, sometimes extending to remote corners and at others, absorbing previous schemes.

Out of the two closely interlinked pursuits of Canalization and Colonization the later process may be treated in detail; involving the setting up of a colony as an entity, though not necessarily separated from irrigation extension in its entirety. All such colonies, on maturity were gradually merged with the regular settled areas of the districts to which they belonged.

The history of colonization in the Upper Indus Plains may be said to open with the proposals which Sir Charles Aitchison, Lt. Governor of the Punjab laid before the Government of India in early 1882. The four schemes submitted at the time, envisaged the opening up of Crownlands

for settlement in the following areas:

1. Montgomery district, along a canal from River Sutlej.
2. Multan district, along a canal from River Ravi.
3. Gujranwala district, along a canal from River Chenab.
4. Jhang district, along another canal from River Chenab.

These schemes were submitted in response to an earlier communication from the Government at the Centre, asking the Provinces to put forward proposals for new irrigation works to be constructed out of the Loan Funds.[9] Preliminary works for these schemes were started in anticipation of central government's approval and necessary alterations, modifications and extensions were made as the work progressed. Such irrigation developments and colonization projects were followed in much wider areas of the region and the activity has continued till present times, embracing remote areas.

In order to appreciate the socio-economic change in general and the trends in town growth in particular that ensued as a result of colonization in the region, a brief survey of the projects is made here. The chronological sequence in which various projects were brought to maturity, with reference to the period of main activity, is as detailed in Table 2.3. The extent and location of individual canal projects is illustrated in Fig. 2.1(a).

TABLE: 2.3

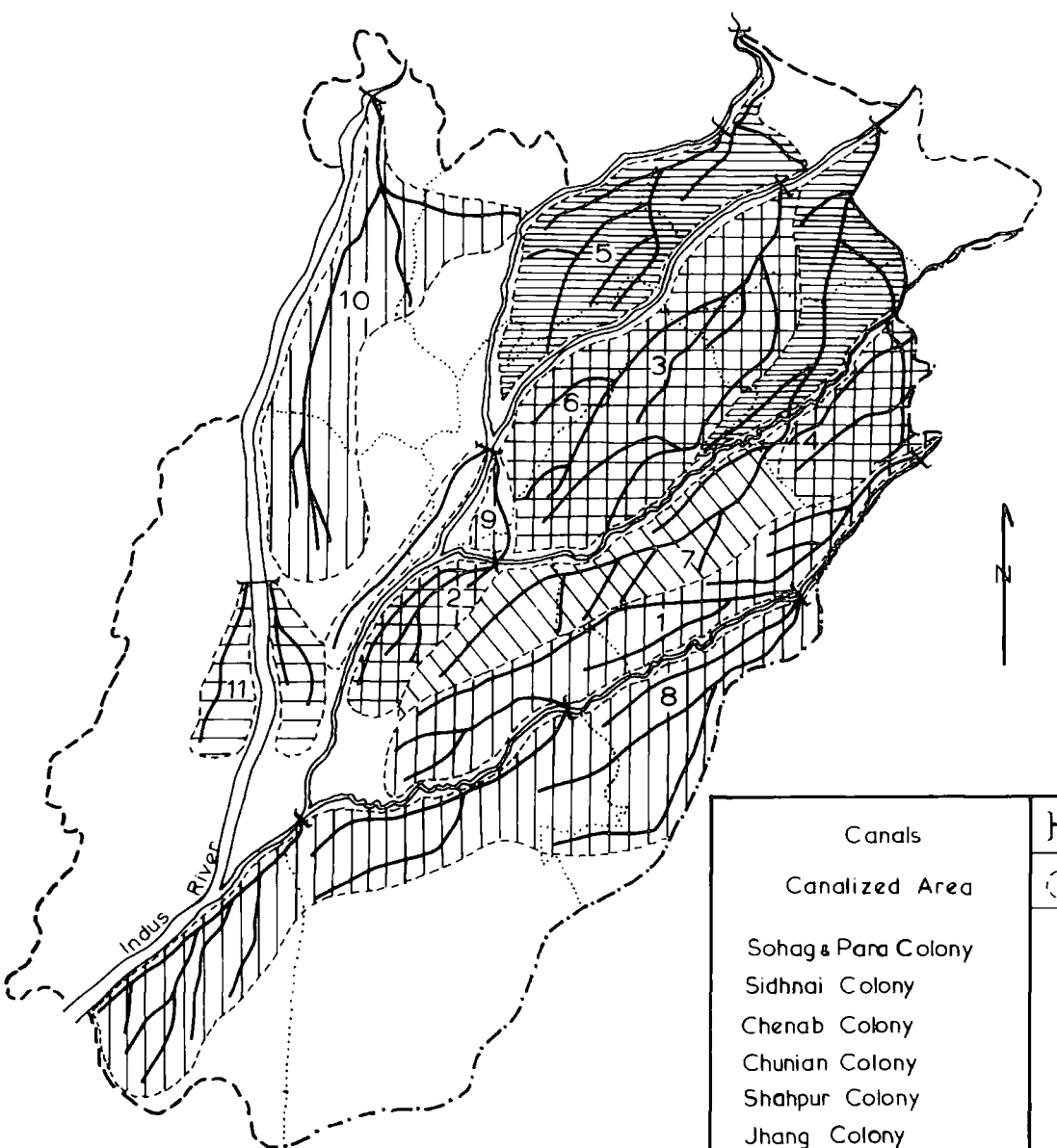
CANAL COLONY PROJECTS IN THE UPPER INDUS PLAIN.

1880's - 1960's.

	Name of the Project	Years of Development
I.	The Lower Sohag & Para Colony.	1882-86
II.	The Sidhnai Colony.	1886-88
III.	The Chenab Colony.	1892-96
IV.	The Chunian Colony.	1897-98 and 1904-06
V.	The Shahpur Colony.	1902-06
VI.	The Jhang Colony.	1904-06
VII.	The Triple Canal Project. 1. The Upper Jhelum Canal 2. The Upper Chenab Canal 3. The Lower Bari Doab Canal	1910-15
VIII.	The Sutlej Valley Project 1. Ferozepur Headworks. (a) The Eastern Canal (b) The Bikaner Canal (c) The Dipalpur Canal 2. Sulemanki Headworks. (a) The Pakpattan Canal (b) The Eastern Sadiqia Canal (c) The Fordwah Canal 3. Islam Headworks. (a) The Mailsi Canal (b) The Bahawal Canal (c) The Qaimpur Canal 4. Panjnad Headworks. (a) The Panjnad Canal (b) The Abbasia Canal	1921-33
IX.	The Haveli Project	1937-39
X.	The Thal Project	1947-58
XI.	The Taunsa Project	1954-

Figure 2.1(a)

UPPER INDUS PLAIN
CANAL COLONIES
1881 – 1960



Canals	
Canalized Area	
Sohag & Para Colony	1
Sidhnai Colony	2
Chenab Colony	3
Chunian Colony	4
Shahpur Colony	5
Jhang Colony	6
Lower Bari Doab Colony	7
Sutlej Valley Project	8
Haveli Project	9
Thal Project	10
Taunsa Project	11

Azhar 9:70

1. The Lower Sohag & Para Colonization Scheme. 1882-1886.

The first experiment in colonization of an empty wasteland was carried out in a restricted tract to the north of Pakpattan town in the year 1882. A total area of 75,275 ha. (186,000 acres) was brought under irrigation from the Lower Sohag & Para canals which were completed in the same year. As much as half of this area was classified as Government Wastelands and was available for pioneer settlement.[10] To minimize the problems of readjustment in the new area, the settlers were chosen from among the farmers of the surrounding countryside. No new town was envisaged then, and the produce was taken to Pakpattan for sale or export.[11] This colony was finally absorbed in a larger Sutlej Valley Project (1921-33) and is now served by a much larger Pakpattan Canal.

2. The Sidhnai Colonization Scheme. (1886-88).

The Sidhnai Colonization Project was the next colonization scheme, again undertaken nearer to a settled area, this time in the Multan District. The Sidhnai system comprises the main Sidhnai Canal and three small subsidiary channels which take off from the left bank of the river Ravi and are designated as the Koranga, the Fazal Shah and Abdul Hakim canals.

Initially a total of 71,630 ha. (177,000 acres) of wastelands were brought under irrigation and colonized with immigrants from the surrounding country.[12] A distributary channel added in 1897 brought an additional area of 9,700 ha.

(24,000 acres) of government wastelands and another 800 ha. (2,000 acres) of protected forest land under irrigation.

As flow from river Ravi was largely utilized by the earlier UBDC, insufficiency of water was felt in winter months, hence the Sidhnai system was subsequently linked with the Haveli Project in 1939. Ultimately a total area of 168,880 ha. (417,300 acres) was included in the Sidhnai system which included 93,900 ha. (232,000 acres) of government wasteland.[13]

3. The Chenab Colony

The Chenab Colony was the first major attempt to develop a vast area entirely comprising arid wasteland with an extremely small population, which was mostly of nomadic character. The original proposals (1882) for this scheme were to construct a smaller canal to irrigate some 58,275 ha. (144,000 acres), but as the work progressed its scope was greatly extended (in 1889) to cover an area of over 445,200 ha. (1,100,000 acres). Practically the whole area coming under this scheme was Crownland, not claimed by local inhabitants as private property.[14]

The Headworks for the Lower Chenab Canal serving this colony are situated near Khanki and the Main canal carries a flow of 11,000 cusecs at full capacity. Firstly smaller distributaries irrigate lands in Wazirabad and Hafizabad tehsils of Gujranwala district. After a distance of 28 miles from the Headworks a major offshoot on the left, the Lower Gugera Branch, carries the waters to southern parts

of the bar. The main canal after covering another 12 miles trifurcates into the Jhang, the Rakh and Mianali branches. The Jhang Branch and its subsidiaries irrigate the whole of north-western side, and the Rakh and Mianali branches cover the central parts of the Colony.

The headquarters of this large colony were established at the new town of Lyallpur. Upto 1904 the colony tracts were constituents of Gujranwala, Jhang and Montgomery districts when a district of Lyallpur was carved out embracing a major area of the colony.

Major colonization work was over by the year 1906, but subsequent extensions were made in 1908-09 and later. By the year 1920 an average of more than 1,000,000 ha. (2,500,000 acres) were actually irrigated by the Lower Chenab Canal, out of which over 607,000 h. (1,500,000 acres) comprised government wastelands.

4. The Chunian Colony. (1897-98 & 1904-05).

Another smaller colony was established on government wastelands nearer to Pattoki town in Chunian Tehsil of Lahore district. Initially it covered some 14,570 ha. (36,000 acres). This area was brought under irrigation by taking a distributary channel out of the UBDC in the year 1897. Being a fringe of a well settled district, not much land was available. However, an extension of this colony was made in 1904-05 when some plots of wastelands lying towards the northern side were added and the total area was raised to 34,000 ha. (84,500 acres). A market for the produce of this colony was established on the northern side of Pattoki station in 1906.[15] The settlers

for this colony were drawn almost entirely from the more congested parts of Lahore district.

5. The Shahpur Colony. (1902-06).

The Shahpur Colonization Scheme was drawn to serve a vast area lying in between the Chenab and Jhelum rivers. The Main Line of the canal (the Lower Jhelum Canal) issues from the Jhelum river at Rasul in Gujrat district. It carries a supply of over 4,200 cusecs and firstly runs for some 40 miles through Phalia tehsil of Gujrat and Bhera tehsil of Sargoda districts. From there it bifurcates into northern and southern branches, spreading water over to vast arid lands.

This area was originally surveyed in 1887 and a scheme was drawn for irrigating over 323,760 ha. (800,000 acres) The execution of this work was postponed till the completion of the Chenab Colony. However, construction work was started earlier in 1897, and its scope enlarged in order to provide employment for the famine stricken people.[16] On the completion of the canal and its distributaries in 1902 it commanded 607,000 ha. (1,500,000 acres) in Sargodha and Jhang districts.

This area was thinly populated when in its natural condition, and much of this was government wasteland available for allotment. In the Shahpur colony as much as 97,000 ha. (240,000 acres) were allotted as 'Service Grants' for the special purpose of breeding horses for the army, while some grants were made direct to the Army Remount

Department for the same purpose.[17]

6. The Jhang Colony. (1904-06).

This was again a rather small colony established on an extension of the Lower Jhelum and the Lower Chenab canals, but situated outside the limits of the two large colonies. It was developed mainly on certain scattered plots of government wastelands lying to the north and south of the Chenab river in the Jhang and Chiniot tehsils of the Jhang district.

The whole land, except what was sold by auction was allotted to the persons from within the Jhang district.[18]

7. The Triple Canal Project. (1910-15).

By now the area of wastelands to draw attention was of a more arid nature, lying along the lower middle course of Ravi river in the Montgomery and Multan districts. There was not enough water available in the Ravi, as it had already been tapped by the UBDC to serve the settled districts of Central Punjab and by the Sidhnai System downstream. However, extra supplies were available in the Jhelum river further north, and the great canal engineer Sir John Benton drew up a novel plan, better known as the Triple Canal Project for this purpose. Backed by earlier predictions by engineers such as Col. S.L. Jacob[19] the authorities took the Triple Canal Project with much the same enthusiasm as accompanied the construction of the Panama Canal at the same period. (1907-14).

Water from the Jhelum river was carried by the first canal (the Upper Jhelum Canal) which took off at Mangla and brought extra flow to the Chenab river above Khanki, irrigating 142,000 ha. (350,000 acres) of Gujrat district on its way. Rivers Chenab and Ravi were then linked together by a second canal (the Upper Chenab Canal) which was taken out at Marala and irrigated another 263,000 ha. (650,000 acres) on its way in Sialkot, Gujranwala and Sheikhupura districts. Finally, the water that remained was carried across the Ravi at Balloki, and completed the project. Thus the Lower Bari Doab Colony a third canal (the Lower Bari Doab Canal) / or the Montgomery Colony , the third of the great colonies, was established over an area of 526,100 ha. (1,300,000 acres) of government wastelands.[20]

The main channel of the Lower Bari Doab Canal runs some 220 km. and was completed in 1913. The area served by this canal consists of what are now Okara and Montgomery tehsils of Montgomery district and Khanewal tehsil of Multan district. Both Upper Jhelum and Upper Chenab are primarily feeder canals, though they do irrigate considerable areas en route.

8. The Sutlej Valley Project. (1921-33)

After World War I, another great colonization project namely the Sutlej Valley Project was undertaken which entailed the siting of as many as four different Headworks across the river Sutlej. This vast project covered arid lands on the two sides of the Sutlej and included large areas of

native states of Bikaner and Bahawalpur besides some parts of Lahore, Montgomery and Multan districts. Out of a total of over 2,023,500 ha. (5,000,000 acres) brought under irrigation by this scheme as much as 1,517,625 ha. (3,750,000 acres) comprised government wastelands.

From the first Headworks at Ferozepur (now on the Indian side of the International boundary) two canals (the Eastern Canal and the Bikaneer Canal) take off from the left bank and serve Indian territory. From the right bank the Dipalpur Canal and its distributaries irrigate southern parts of Lahore and southeastern parts of Montgomery districts.

From the second Headworks at Sulemanki, two canals (the Fordwah and the Eastern Sadiqia) proceed to irrigate Bahawalnagar and Bahawalpur districts. While on the right bank the Pakpattan Canal irrigates the southern part of Montgomery and southeastern part of Multan district. The Pakpattan canal has absorbed the earlier Sohag Para Colony of 1882.

The third Headworks is situated at Islam, from the left side of which a smaller Qaim Canal and a larger Bahawal Canal have been drawn to irrigate lands in Bahawalpur district From the right bank the Mailsi Canal and its distributaries serve the southern and more arid lands of Multan district.

The fourth, namely the Panjnad Headworks, is actually erected at the confluence of the Sutlej and Chenab rivers. From here the Panjnad Canal and the Abbasia Canal carry the waters to Rahimyar Khan district - the southwestern corner of the Punjab Plains.

9. The Haveli Project. (1937-39)

The Haveli Canal Project with its Headworks at Trimmu, below the confluence of the Chenab and Jhelum rivers was constructed during the period 1937-39. Two canals take off from here; the Rangpur Canal on the right bank and the Haveli Canal on the left bank. The Haveli Canal in addition to providing irrigation also acts as a feeder canal and tails into the Ravi river above Sidhnai. With the additional supplies thus made available to the Ravi, the Sidhnai weir and canals were remodelled in 1939. As an adjunct to the Haveli Project a further adjustment of water distribution was carried out with the construction of Montgomery Pakpattan Link which transferred some 700 cusecs of water from the LBDC to the Pakpattan Canal.

10. The Thal Project. (1947-1958)

With the development of the lands lying in between the tributaries of the Indus, there remained the largest and more formidable tract of land, known as Sind-Sagar Doab or the Thal, between the Indus and the Jhelum. The vastness and empty nature of this area had in fact drawn attention of the authorities even before any other colonization scheme was undertaken. The first scheme for its systematic exploitation namely 'Andrews Plan' dates back to 1873. Actual construction work was taken in hand in 1939 but was held in abeyance for the duration of World War II (1939-45) and was later completed in 1947.[21]

The Jinnah Barrage of the Thal project is situated near Kalabagh. The project covers portions of districts Sargodha (Khushab Tehsil) Mianwali (Mianwali & Bhakkar Tehsils) and Muzafargarh (Muzaffagarh & Kot Adu Tehsils). The Main canal trifurcates into the Thal Main, the Mohajir and the Dullewala branches 19 miles from the Barrage. They altogether irrigate over 607,500 ha. (1,500,000 acres). Most of the lands in this area have been allotted to the refugees coming from India after Independence.

11. The Taunsa Project. (1954-

The Taunsa Project was prepared in 1947 for the purpose of irrigating the lower parts of the great Thal area. Construction work started in 1954 and the Barrage was completed in 1959. This barrage is designed to carry a road and a railway line too. The first railway for the Dera Ghazi Khan District across the Indus was started only in 1970.

The Muzafargarh Canal taking off on the left covers 283,290 ha. (700,000 acres) in the Muzafargarh district. From the right bank another canal, namely the D.G. Khan canal, commands 364,230 ha. (900,000 acres). There is provision for further extension of this canal to bring in another 283,290 ha. (700,000 acres) under irrigation. Colonization work for this project is still in progress and new settlements are being established in the area.

THE LINK CANALS AND STORAGE DAMS 1960-1973

Roughly between 1881 and 1960, eleven major irrigation extension and colonization projects were established in the UIP. This phase of development has incidentally covered most of the culturable land which needed irrigation water in the region. However, use of the Indus waters has not been exclusive to the Upper Indus Plains. A major sharer in this river supply has been the Lower Indus Plain (Sind Province) where the environment being more arid, dependence of agriculture on irrigation is almost 100 per cent. Furthermore, as the upper courses of the rivers Ravi and Sutlej and the entire course of the Beas lie in Eastern Punjab (India) that territory also has a share in the total supplies of water in the Indus River System.

A reference to Figure 1.2 (River Regime) & Table 1.2 would show that not only the eastern rivers have much less flow but also the seasonal variations could cause paucity of water in the canals during the winter months. There had been virtually no development of surface storage to regulate the river flow. At the time of Independence out of a total supply of 168 million-acre-foot of water, in the Indus River System only 42 MAF was being utilized by the canals and the rest was discharged into the Arabian Sea or lost through seepage. By this time a judicious use of water within the region and in other lands of the Indus Basin was thus becoming a necessity, especially in view of any further extension of irrigation. In the same year (1947) the Partition line in the Punjab by cutting across the UBDC and the Ferozepur Headworks (first of the Sutlej Valley Project) gave rise to a bitter dispute between India and Pakistan which was later settled in 1960 under the aegis of the World Bank.

The Indus Water Treaty, signed on 19th September, 1960 by the two heads of the Governments of India and Pakistan, besides other commitments for development, inter alia provided for the 'Indus Water Replacement Works' designed to meet the shortfall of the supplies of the three eastern rivers which India would be taking off completely from October 1973 onward.* It would be recalled that the earlier Triple Canal Project (1910-15) was constructed on a similar premise. It had been designed to transfer the unused flow of the Jhelum, and to the extent available, of the Chenab for irrigation of areas lying mainly south of the Ravi and the Sutlej.

Figure 3.1(b) depicts major construction works which have been in progress during the past decade in consequence of this Treaty. The principal elements of this programme are two high dams and a series of seven link canals with an aggregate length of about 600 kilometers. Other works include two hydroelectric stations and a 2,500 tubewell project to combat water-logging and salinity in an area of over a million hectares. First of the high storage dams, Mangla across the Jhelum, with its hydro-electric station has been completed and is in operation since 1969.

Mangla Dam is located just above the earlier headworks of the Upper Jhelum Canal, one of the famous Triple Canal Projects completed in 1921. The new canal from this dam has

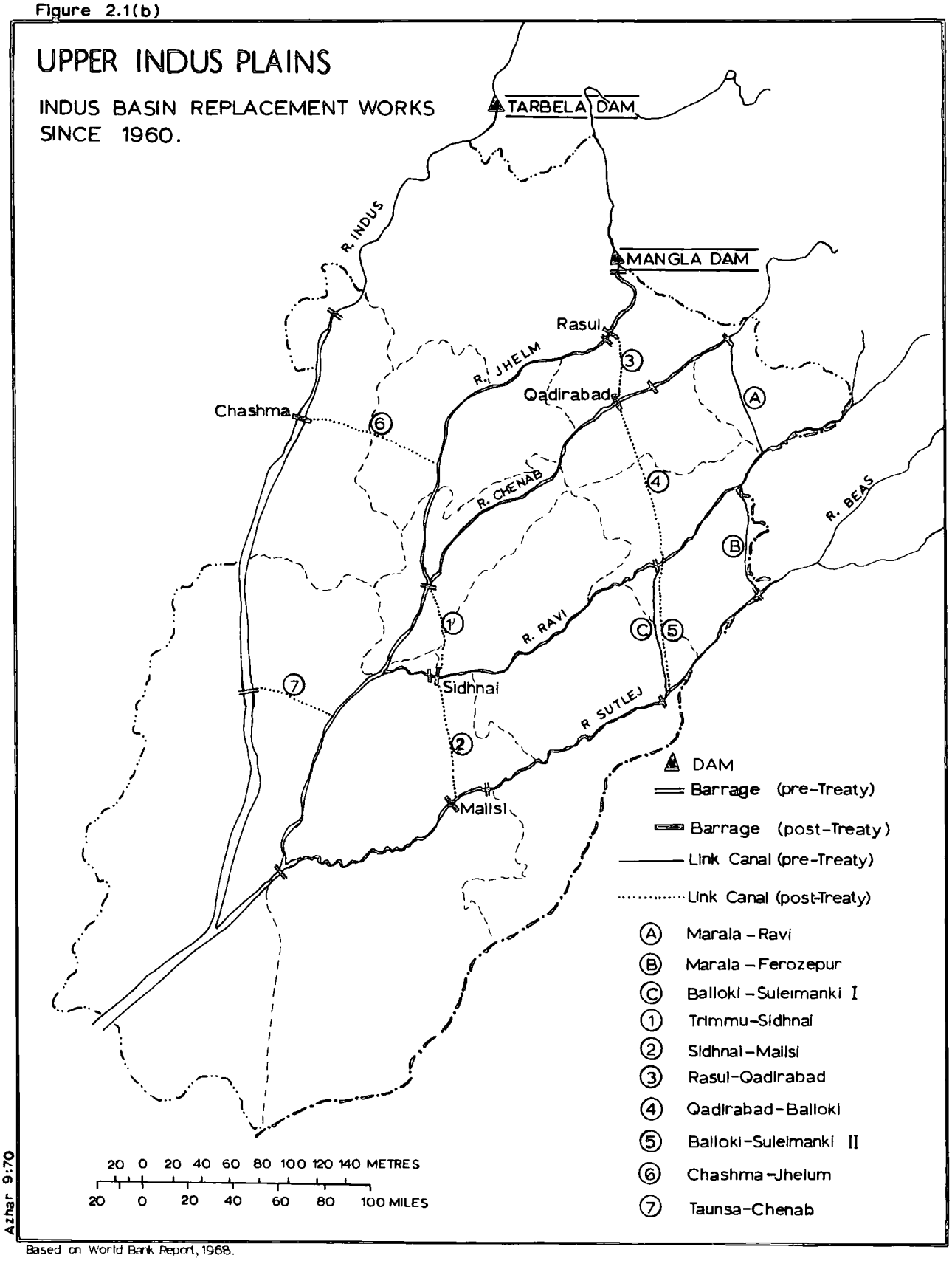
---

* Two important studies of the resource development in the Indus Basin take into account much of the economic and technical details of this programme. These are

MICHEL, A.A. The Indus Rivers: A study in the effects of Partition, Yale University Press, (1967), especially pages 99-133 and 195-265.

WORLD BANK REPORT, Water & Power Resources of Pakistan, Volume I and II published in 1968.

Figure 2.1(b)



Azhar 9:70

Based on World Bank Report, 1968.

a capacity of 40,000 cusecs. The combined water carrying capacity of the other seven link canals at their respective headworks is nearly 100,000 cusecs. Table 2.4 below gives the location, length and capacity of these link canals. Six of the link canals have already been completed by 1971, whereas work on the last link Taunsa-Chenab is in progress.

TABLE 2.4:
LINK CANALS UNDER INDUS BASIN REPLACEMENT WORKS 1960-73

Name of the Link Canal	Source/ Location Headworks	Capacity at the Headworks in cusecs	Length in Kilometres
1. Trimmu-Sidhnai	Chenab, at Trimmu HW	11,000	66
2. Sidhnai-Mailsi	Chenab, across Ravi above Sidhnai HW	10,100	104
3. Rasul-Qadirabad	Jhelum, at Rasul HW	19,000	45
4. Qadirabad-Balloki	Jhelum, across Chenab above Qadirabad HW	18,600	156
5. Balloki-Suleimanki-II	Jhelum, across Chenab and Ravi	6,500	60
6. Chasma-Jhelum	Indus, at Chasma Barrage	21,700	95
7. Taunsa-Chenab	Indus at Taunsa Barrage	12,000	57

The Tarbela Dam is now under construction on the north-western side of the Potwar Uplands at a site some 200 kilometres upstream from the Jinnah Barrage. This dam will rise to 148 metres above ground level with a crest length of 2,750 metres. It will have a capacity of over 11 million acre-foot of water.

D. SETTLEMENT PLANS IN THE UPPER INDUS PLAINS

To bring out the nature and characteristics of urban growth in the Upper Indus Plain it seems appropriate here, to first consider and discern among the forces of development and change that have shaped the urban landscape. The phase of change in the physical plans of settlements that came about at the turn of the last century as a result of a deliberate exercise undertaken by the administration, stands out in contrast to the amorphous growth of earlier settlements.

As far as settlement schemes based on preconceived plans is concerned within the Subcontinent, the Upper Indus Plain stands out as a unique region where systematic layouts were materialized on a large scale for various categories of settlements. In its central and western districts, the advantage of availability of open land, unexploited resources and almost a blank sheet to begin with, provided vast opportunities to the developers of these resources for habitation.

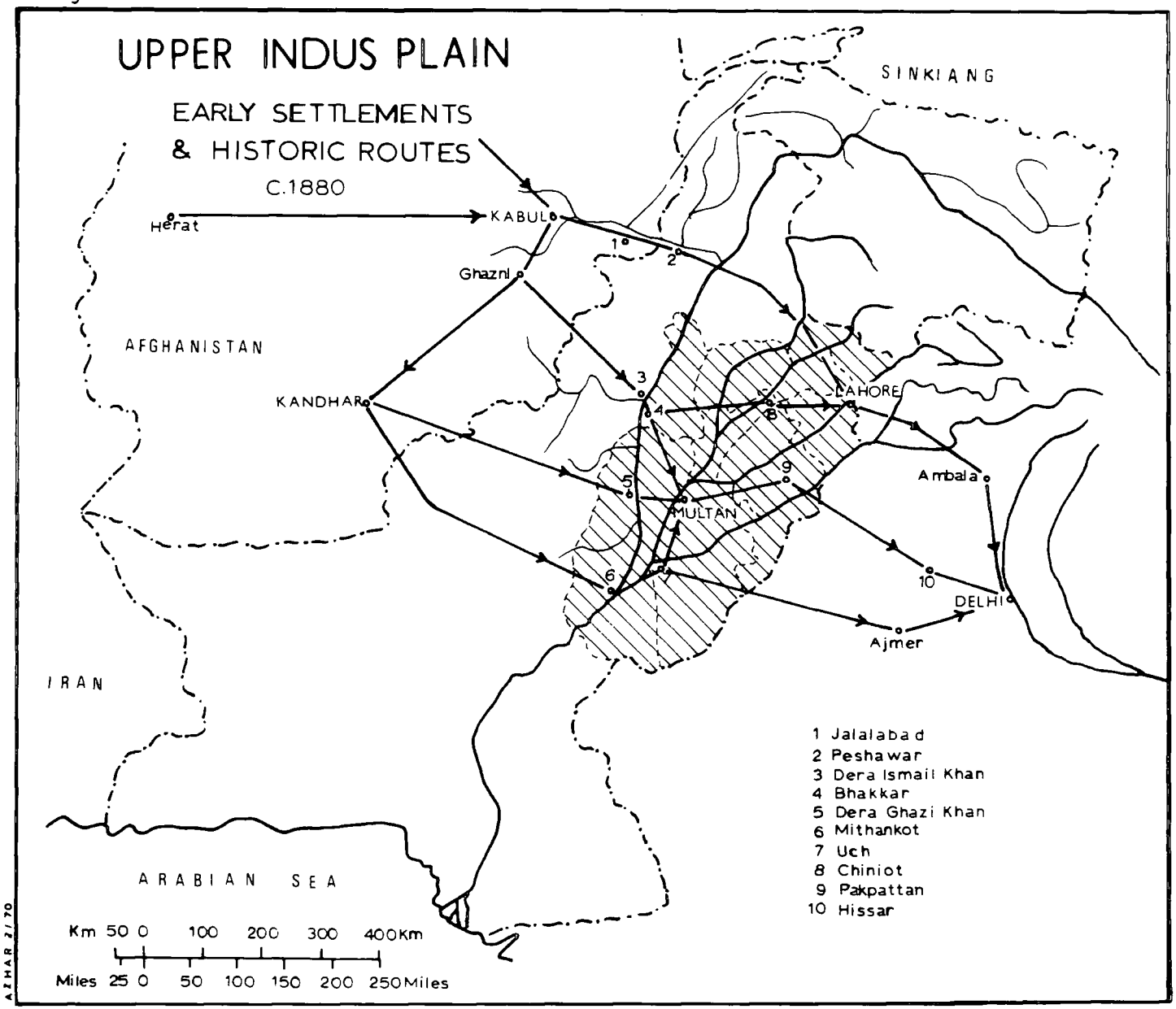
The earlier settlements in the UIP with their origins in antiquity, bore a medieval outlook and possessed an amorphous townscape. The establishment of Canal Colonies brought in new settlements, large or small; whereas the ensuing economic and social change has set in definite 'planned' trends in the built of well placed old towns as well. For a fuller appreciation of the two concurrent phases of change pertaining to new townscapes, the state of urban traits in the region prior to colonization are examined.

TOWNS OF THE PRE-BRITISH ERA (The indigenous towns).

Urban centres of the Upper Indus Plains till the closing decades of the 19th century were not much different than what is typical of semi-arid interior lands. The first characteristic is that there were very few and scattered settlements; all near to riverine tracts and the larger ones were just on the bank of one or the other river. Figure 2.2 illustrates the trade routes and location of the towns in the area prior to irrigation colonization. Local trade or encamping of caravans from Central Asia, which entered the Basin down the valley of the Kabul river, was the sole function of most of these towns. Apart from the well known submontane route (from Kabul, via Khyber Pass to Lahore and Delhi), trade from the west had two other important entries into the Plains from Ghazni and Kandahar, which crossed the Indus lower down at points now marked by Dera Ismail Khan and Dera Ghazi Khan.[22]

With the exception of Lahore and Multan which were two historical cities, the rest of the towns were essentially primeval in their morphology and socio-economic structure. High density of dwellings, aggregation of retailers and wholesale merchants in tortuous bazars and numerous by-lanes were typical features of all urban centres. Extensive growth outside the town walls had taken place in some towns during the Mughal period.[23] But this too was haphazard and did not produce any well defined pattern in the morphology of the towns. A singular exception to the town features added by the Mughals was the introduction and maintenance of parks and gardens. Such features had deteriorated during the

Figure 2.2


UPPER INDUS PLAIN
EARLY SETTLEMENTS
& HISTORIC ROUTES
C.1880
SINKIANG
Herat
KABUL
Ghazni
AFGHANISTAN
KANDHAR
LAHORE
MULTAN
Ambala
DELHI
Ajmer
IRAN
ARABIAN SEA
1 Jalalabad
2 Peshawar
3 Dera Ismail Khan
4 Bhakkar
5 Dera Ghazi Khan
6 Mithankot
7 Uch
8 Chiniot
9 Pakpattan
10 Hissar
Km 50 0 100 200 300 400Km
Miles 25 0 50 100 150 200 250Miles
AZHAR 2/70

period of decandence in between.

Among the towns of that period, Bhera and Mithankot soon lost their prominence as both were functioning as river ports and the advent of modern communications in the wake of irrigation development took away their role. Chiniot and Bhakkar, both situated on river crossings of historical caravan routes have changed their functions and are now important grain market centres as a result of agricultural prosperity of their countryside. Gujrat, Wazirabad and Sialkot, situated in submontane districts have not only retained their importance and grown in size, but have included factory productions into their activities. However, it is in the two historic cities of Lahore and Multan that one finds a greater blending of old and new traditions. The City of Lahore has retained its prime importance as first city of the Punjab (including the Indian part) since pre-British days to present times. Multan, the other city of historic repute, enjoying a steady growth, has in the last census, given second place to the planned city of Lyallpur.

THE COLONY SETTLEMENTS (Settlements of British Origin)

The Colony towns and rural settlements which came later, are a direct product of the development and extension of irrigation. They exhibit a new style, associated with new towns built where none had stood before; thus representing a massive change unparalleled in concept and boldness. Ever since 1880's when the first colonization schemes were inaugurated till present day development projects, planning of settlements has been an important

assignment for the developers of wastelands. These planned settlements are of two categories - CHAKS (rural settlements) and MANDI TOWNS (Market towns). A Chak is inhabited mostly by tillers and peasants whose sole occupation is raising crops in the nearby fields, whereas a Mandi Town primarily functions as a trade centre for agricultural produce of a large area. Whereas administrative functions were usually assigned to some earlier existing towns in various districts, three Headquarter towns namely, Lyallpur, Sargodha and Montgomery were specifically planned for Lower Chenab, Lower Jhelum and Lower Bari Doab canal colonies respectively. One aspect common to all new settlements has been initial governmental planning and apportionment of land use for various purposes within each settlement.

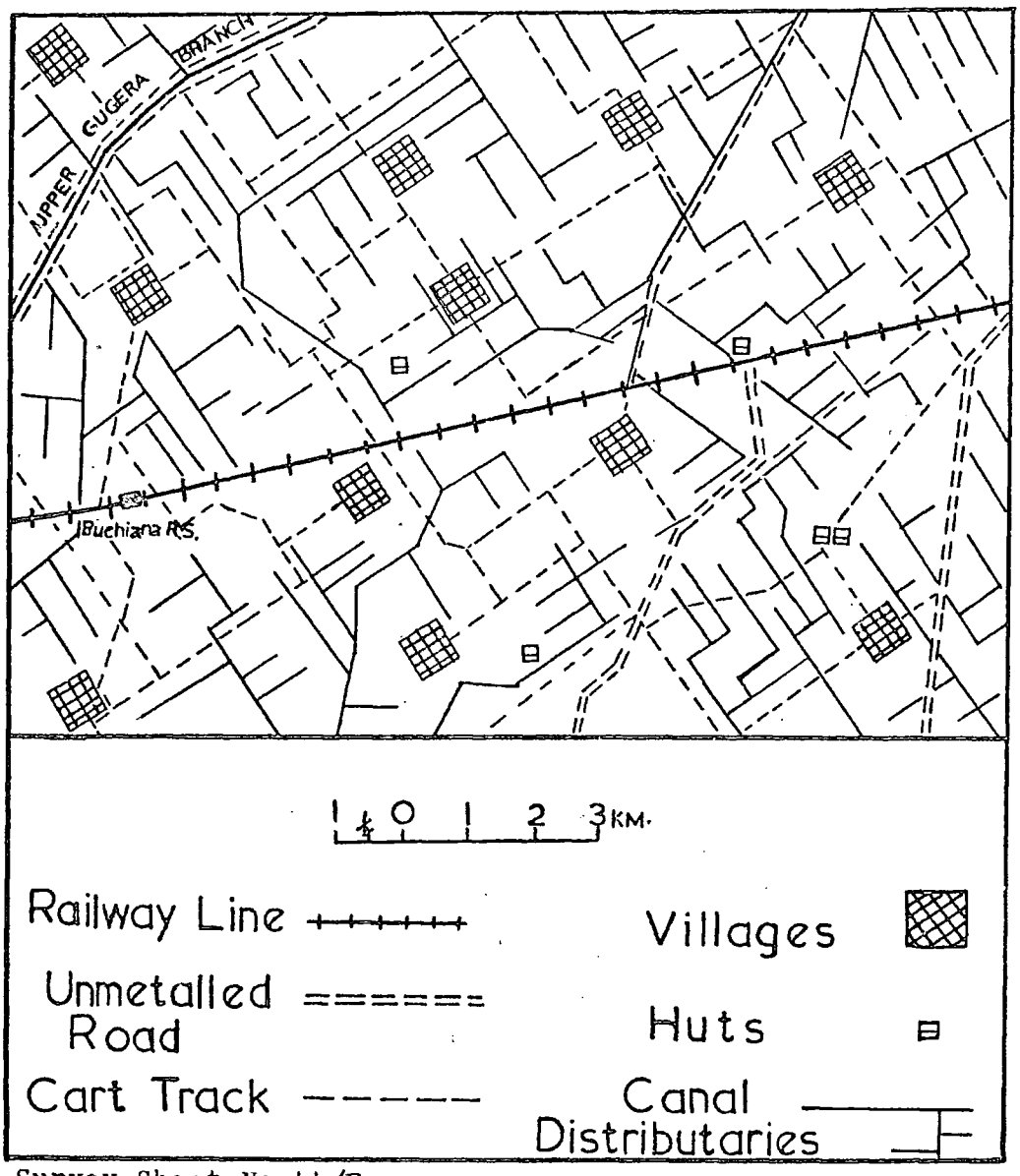
The Layout of Colony Settlements

It is in its physical layout that a colony settlement stands out in sharp contrast to the earlier settlement pattern of the Indus Plains. Another feature of note is the scale of the developmental area. Nowhere in the Subcontinent, or for that matter in Asia, has similar change in the cultural landscape over such a vast area taken place. Naturally enough, each colonization scheme had its own strategy and priorities of development based on local conditions and opportunities. Although governmental control over development and financing was involved to the maximum extent, no hard and fast rules and procedures were prescribed by the central or provincial administration. Professor

Paustian of Columbia University, who visited the area in 1920's, records in his economic study of Canal Irrigation in the Punjab that he 'is unable to discern the criteria which determined the putting up of one or other type of settlement over the ground'.[24] This is because most of such decisions were spontaneous and were arrived at by the colonization officers and surveyors literally on the ground.

Fig. 2.3 illustrates the systematic pattern of rural settlements and canal distributaries. The authorities had realized that it would be more expedient for the survey and demarcation of the project area to precede rather than follow the construction of canals and arrangement of their distributaries.[25] As nearly all the land was crown waste and virgin soil, the canalised area was subdivided with much precision. Every village was assigned its own water course; fields and grazing lands were clearly demarcated and made ready for occupation by a selected community of peasants. Having prepared a contoured plan which showed the water courses and villages made available within the project area, the Colonization Officer numbered each of these settlements for purpose of identification. The initial letters of a main distributary canal served to distinguish between separate series. For example three main branches of the Lower Chenab Canal, namely (a) Rakh (b) Jhang and (c) Gugera branches have given their initials to the Chaks as (a) 1 RB, 2 RB, 3 RB etc., (b) 1 JB, 2 JB, 3 JB etc., and (c) 1 GB, 2 GB, 3 GB etc., respectively.[26] Such numbers

Figure : 2.3



Survey Sheet No.44/E

RURAL SETTLEMENTS PATTERN AND CANAL DISTRIBUTARIES

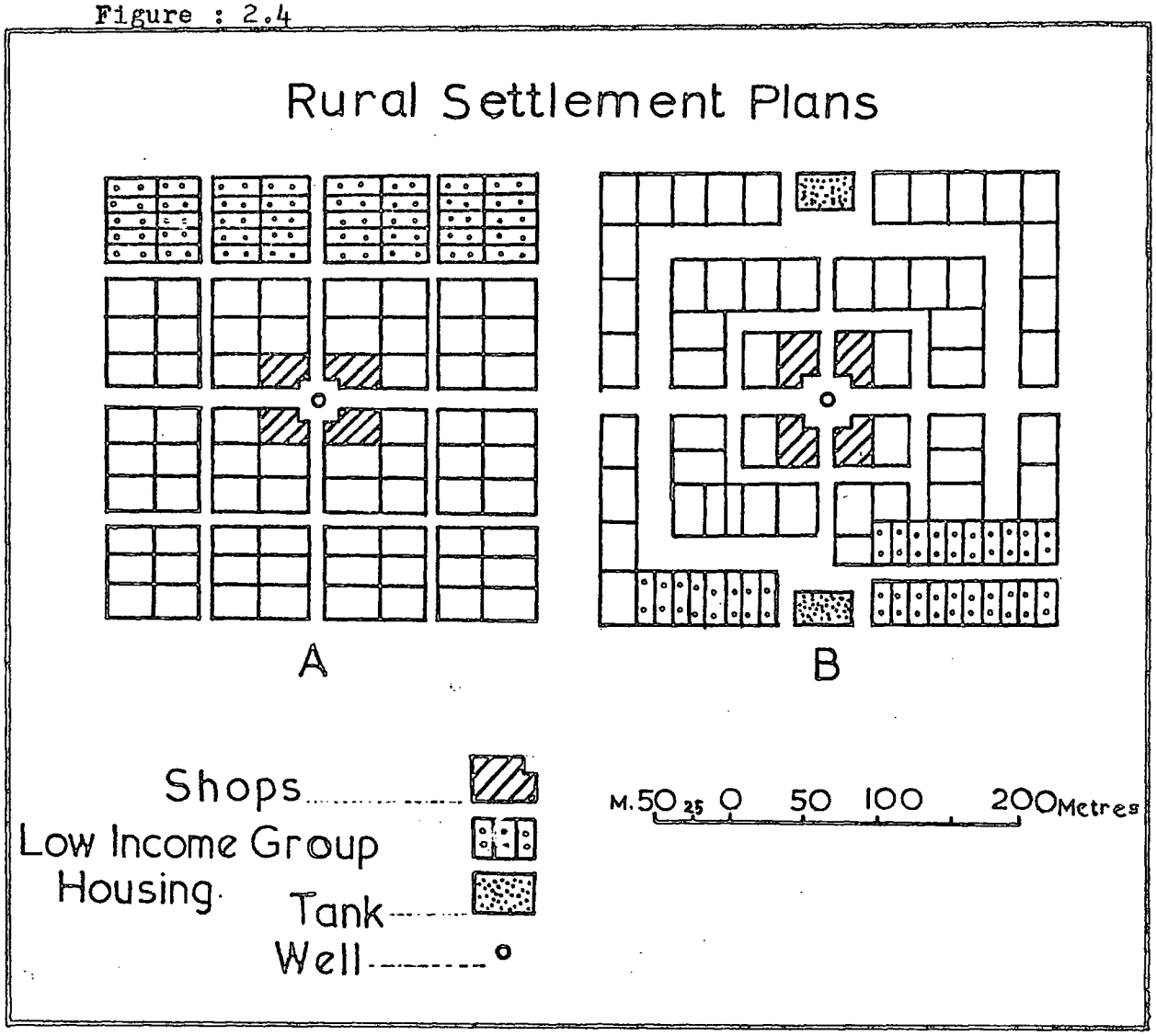
Rural settlement pattern along Gugera Branch of the Lower Chenab Canal in Lyallpur District. Rectilinear pattern was adopted for all settlements as well as for irrigation distributaries and ditches in the Colony areas of the region.

are prevalent in all the colony districts and connote new settlements, although some of them have been given place names by the residents in due course of time.

The intra village planning and development was undertaken on a more precise scale. In common with the social background of the colonists, the settlements were kept nucleated in form, rather than dispersed. Among the general principles as enunciated in early official communications, one by Sir Denzil Ibbetson, served as a prototype for the layout of all the settlements. He wrote, "It would, perhaps, be a good plan to insist upon all new abadis (settlements) being intersected by two great open streets at right angles to each other and some 30 or 40 feet wide."[27] Ecologically, several models have been developed in different project areas, each having the central crossroads as a dominant feature, but the square type became the most common. Figure 2.4 depicts two earlier village plans adopted in the Lower Chenab Colony. Both the plans have a central square with shops around it, and a community well in the centre. Quarters for low income group families are at one side of the settlement; whereas open water tanks appear in the second plan only. Plan 'B' has also reduced street openings compared to the first, which were objected to by the settlers, for security reasons.

An essential improvement brought about after successive experiments was a larger central square and enhanced provisions for shops and community buildings. A specific place for a mosque and a school appears in the plans adopted

Figure : 2.4



Two of the earlier Rural Settlement Plans of the LOWER CHENAB COLONY. The planned rectangular layout of the streets and residential blocks is evident. The central square serves as a shopping area, whereas quarters for the low income group families are kept on one side of the settlement.

for settlements in the Lower Jhelum Colony (Fig. 2.5). Here housing also becomes more compact, whereas provisions for a Satellite block in case of expansion also appears for the first time.

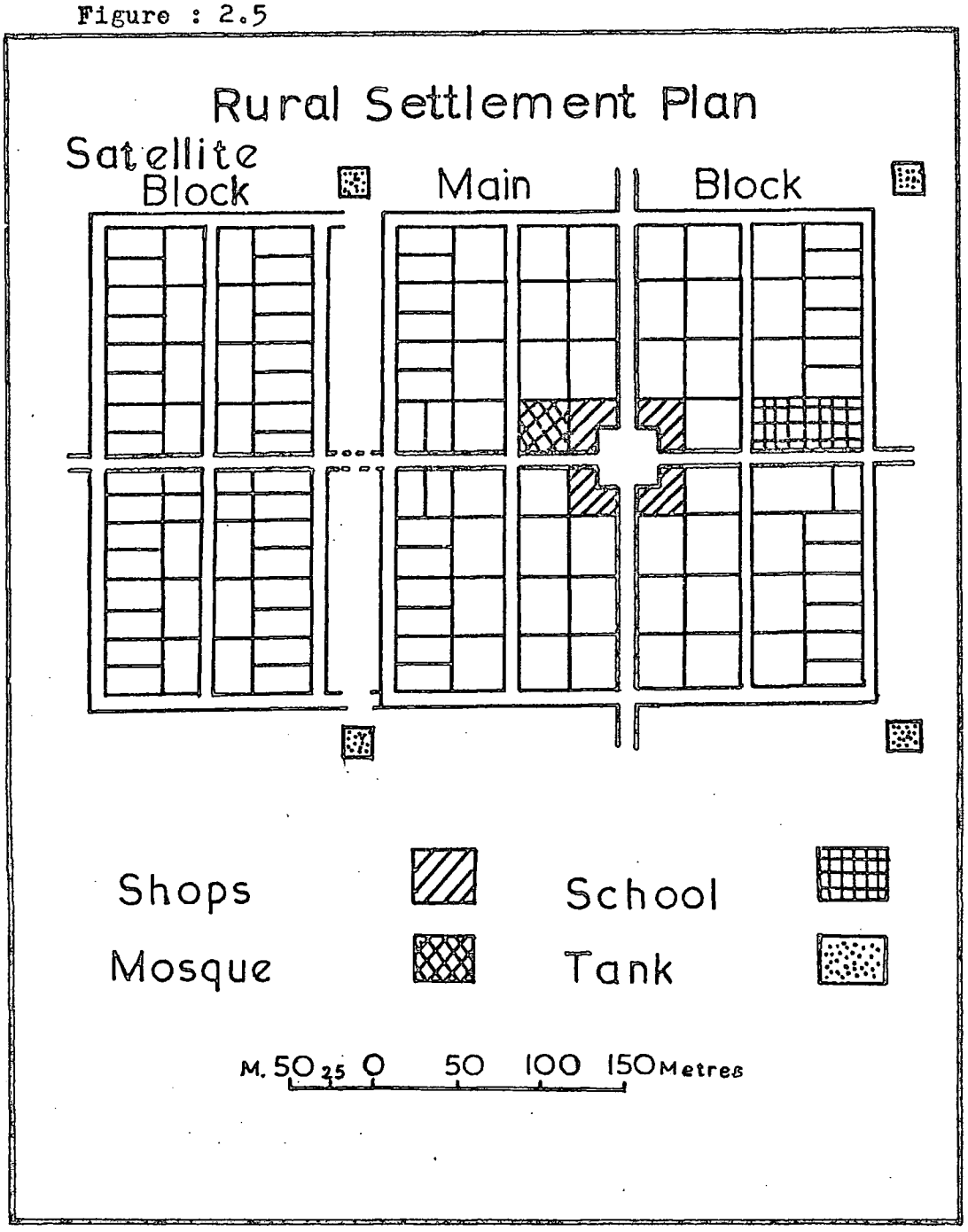
As for the obligations of the settlers in respect of erection of a house over the allotted plot, no particular type was prescribed by the authorities. As long as the grantee surrounded his compound with a wall and constructed something which could fairly be called a house and not a mere shanty, details of architectural design were left for individual taste to decide.[28] Many a settlers built pucca (burnt brick) houses from the start as the agricultural returns brought handsome rewards from the earliest harvestings.

Thus looking into different village plans adopted for various colonization schemes one finds progressive planning of residential as well as shops and community buildings. Among the non-residential buildings a Patwarkhana, i.e. a place for revenue or canal official of the lower grade and a Serai or guest house became an adjunct to larger villages in later years.

Town Plans

Following the extension of perennial irrigation to arid wastelands and their planned occupance by prospering agricultural communities, revolutionary changes in the cultural landscape of the region ensued. This expansion of habitat and economic prospects, forestalled organised development of towns and cities. It was apparent from the

Figure : 2.5



Another Rural Settlement Plan adopted in the LOWER JHELUM COLONY (1901-12) and in other later development areas. Provision for a school within the locality, compact housing and provisions for a Satellite block for later extensions are some of the new characteristics in this case.

outset that effective administration of the emerging rural communities and proper utilization and trade of their farm produce would require provisions for market centres and an efficient communication system. In fact many railway track extensions preceded a colonization scheme, whereas road construction and bridges over canals were for the most part concurrent with it.

The siting of urban settlements within a project area was decided by the Colonization Officer in consultation with civil officials and irrigation engineers. His choice was essentially governed by (a) a situation on the railway line, (b) avoiding local depressions if any to allow efficient drainage and water supply and (c) a desirability to allow 20 miles or more to intervene between two markets to discourage undue competition.[29]

One distinguishing feature of the Colony Towns is that, as contrasted to earlier urban settlements, none are located on a river. Being away from active flood plains, these towns are spared of the flood menace. Since they were to function primarily as market centres, road and railway communications played a vital rôle. The close relationship that exists between the railway and colony towns can be estimated from the fact that all the new towns are located on a railway line.

A Colony town is distinct from an indigenous urban centre in that it was designed and planned ahead of actual settlement. The colonization officers were responsible for the ultimate proposals regarding physical planning of

individual towns in a particular colony. The size and extent of a town depended on the success of the Mandi (market) which in turn was related to the produce of the irrigated land and its quick disposal to the buyers. A rectilinear plan of roads and residential blocks was adopted in each case except the Headquarter town of Lyallpur, which was constructed on a radial pattern. In matters of location of main bazaar (shopping centre), the Mandi (market place for agricultural produce) and necessary factory units such as a flour mill or a cotton ginning factory, the Colonization Officer used to obtain prior advice of the Executive Engineer, Public Works Department, Sanitary Engineer and railway authorities. Thus a definite plan for each town site was prepared and executed after undergoing many official formalities.

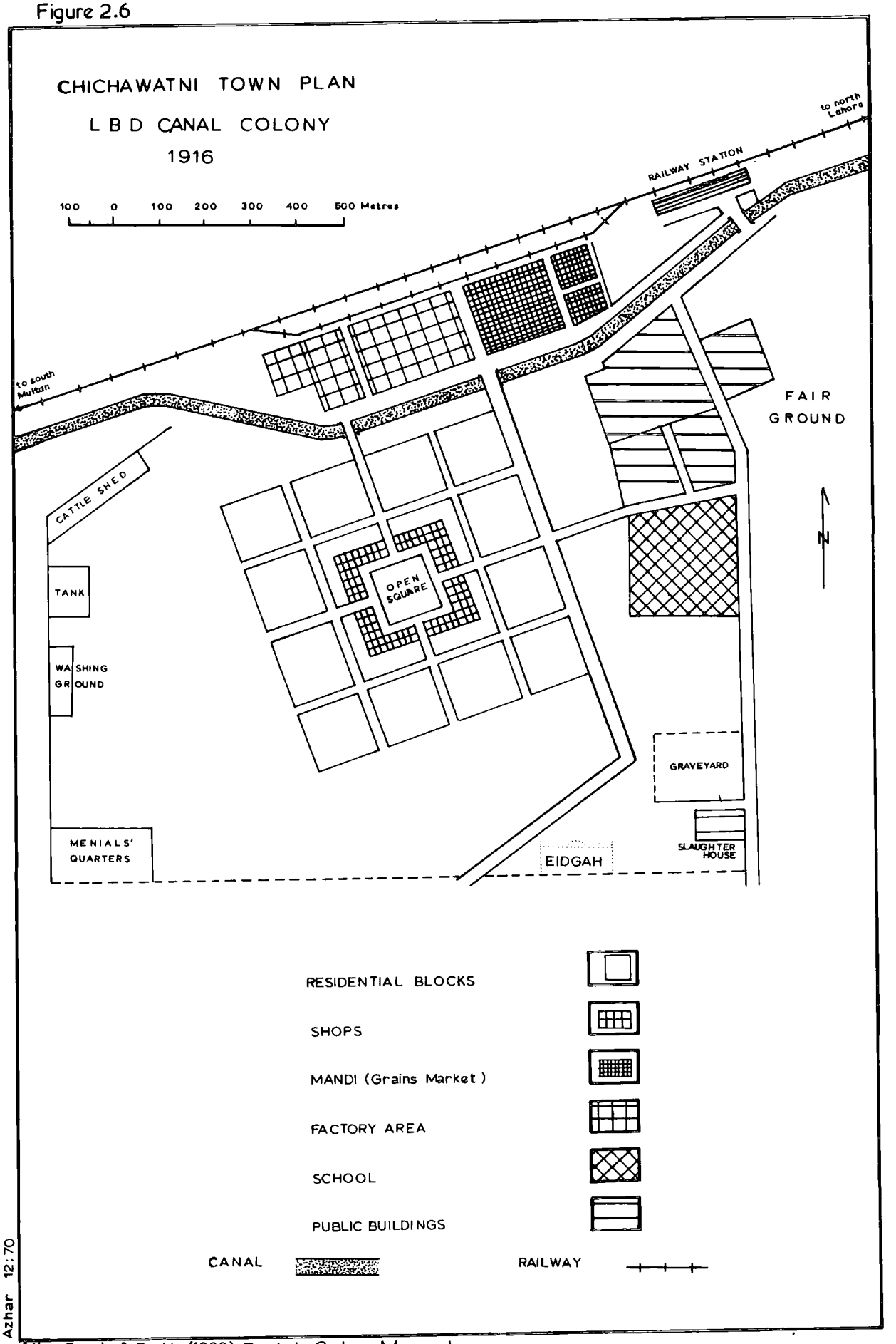
All pioneering colony towns were given a simple but well apportioned morphology. Although no instructions to adopt a particular type of layout were issued by the Local Government, yet the recommendations put forward by the Town Planning Committee which met at Simla in 1914, did provide general guide lines for later plans. While passing orders on the Report of the Committee, the Local Government had laid down that, 'while the recommendations of the Committee were not to be considered to possess more authority than that which it attaches to the advice of a body of administrative, sanitary and colony experts, all specific proposals for new towns should be framed with due attention to the resolutions and recommendations of the Committee and

any departures from these should be explained and justified'.[30]

Figure 2.6 shows the plan of Chichawatni town (1916) which is highly representative of the broad features of other new towns in the Lower Bari Doab Colony. Here functional approach in the general layout is very much in evidence. The main residential blocks are spread in almost equal sized squares with wide intervening streets. The central square provides an open space around which are located area shops for the locality. Other essential services like a livestock shed, Dhobighat (washermen's platform) and a slaughter house etc., are detached and provided at a distance from the main residential blocks. Administrative buildings, hospital and school buildings are placed on one side of the town and there is open space in between the two. Provisions for a veterinary hospital in the new town speaks of its links with the surrounding countryside. Apart from these general services, the main function of the town, i.e., requirements of a grain market and its siting are most appropriate. The grain market, flour mill and cotton ginning factory and an elevator (for loading and unloading) are all located with regard to railway facilities. The railway authorities have provided an additional goods platform on one side of the market and factory area facing the railway track. Nearer to the grains market and railway station provisions were made for carts bringing the agricultural produce from the distant rural areas. It now serves as parking ground for trucks and lorries.

The role of road communications in linking the new towns and its railway station with the countryside is manifest

Figure 2.6



Azhar 12:70

After Beazle & Puckle (1922), Punjab Colony Manual.

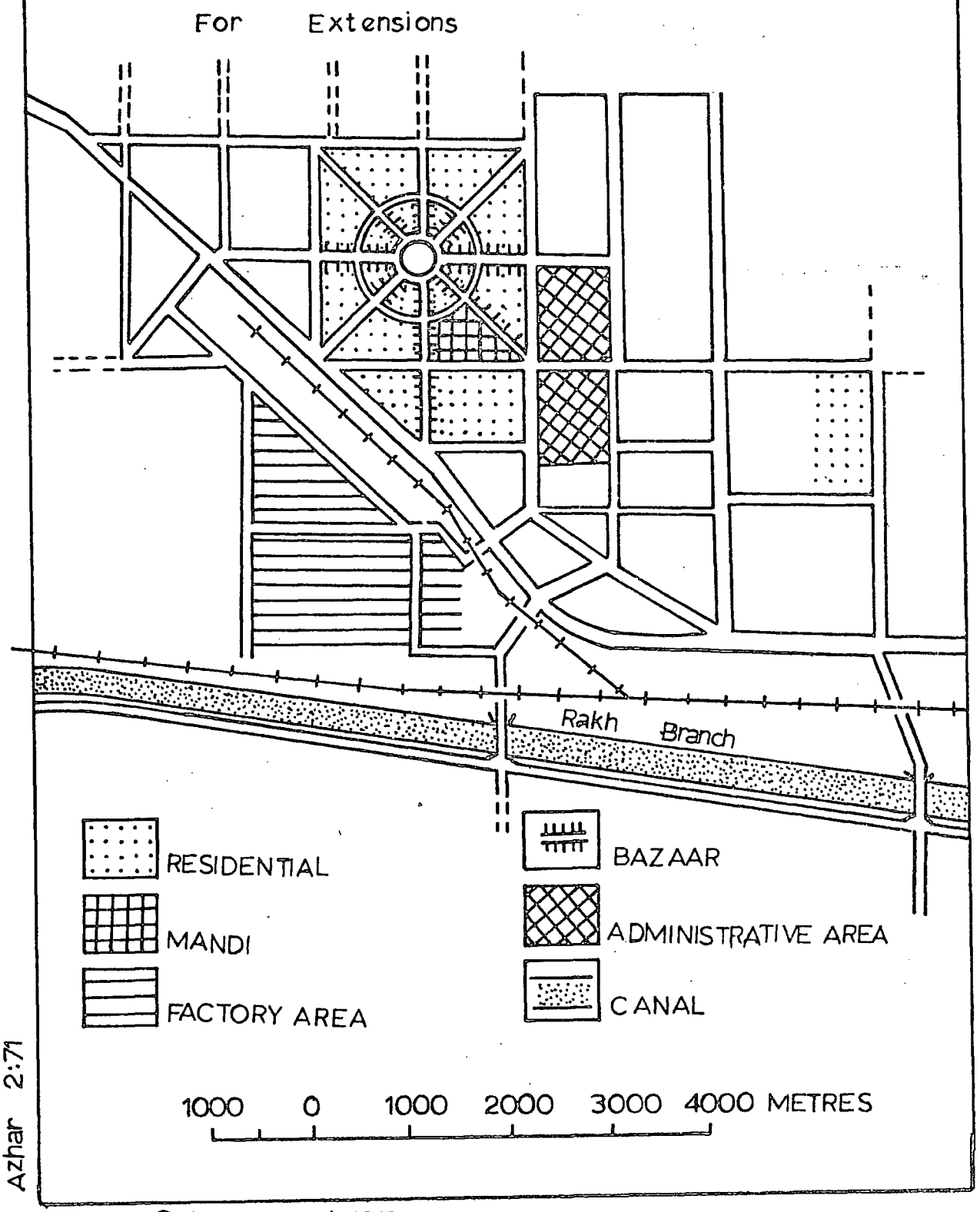
in the plan. The main road of the town starts from the railway station and passes by the side of the market. By virtue of its importance such a road is widest in the locality and is invariably known as the Railway or Station Road in all colony towns. It continues beyond the town limits and serves as the main artery for the link roads of the countryside.

Figure 2.7 shows the initial pattern of the head-quarter town of Lyallpur. It was designed on the pattern of Madrid; to stand as a prestige town of a prosperous canal colony.[31] All roads radiate from the inner traffic roundabout in the midst of which stands the Victoria Clock Tower, erected with contributions from the first settlers. Each of the radiating roads were assigned shops specializing in particular merchandise. The residential blocks, which were first filled within the centre, soon spread in all directions. Ample provisions for future growth of the town were provided from the beginning. The growth of Lyallpur (from 10,000 in 1901 to nearly a million now) has been phenomenal during the past seven decades. Establishment of industries, especially textiles and chemicals have given it a new role. Lyallpur now stands as the second largest city of Upper Indus Plain after Lahore. A detailed study of the morphology and other urban characteristics of Lyallpur city follows in chapter VII.

Figure: 2·7

LYALLPUR

INITIAL PLAN 1907.



Azhar 2:71

Source Colony Manual, 1913.

REFERENCES

1. UNITED NATIONS, Multipurpose River Basin Development, Flood Control Series No. 11 Bankok, (1956), pp.108.

2. The Ganges Canal was the first major work constructed by the British under the supervision of Col. Proby Cautley, F.R.S. of the Bengal Artillery. It takes off from the right bank of the Ganges at Hardwar and serves the Ganges-Jamna Doab.

3. BUCKLEY, R.B. The Irrigation Works of India, 2nd Edition, London (1905), pp.17.

4. PUNJAB GOVERNMENT, Census of the Punjab 1868, Lahore (1870), pp.16.

5. The Western Jamna, the Sirhind and the Upper Bari Doab canals serving the eastern congested districts, were undertaken for the purpose of ensuring water supplies during winter months.

6. FRENCH, L. Punjab Colony Manual, Vol. I, Lahore (1913) pp.2.

7. PUNJAB GOVERNMENT, Famine Reports, Lahore, (1901), pp.75.

8. H.M.S.O., Report of the Royal Indian Irrigation Commission, London, 1903, p.2.

9. By 1880 all irrigation extensions were broadly categorised as (1) The Productive Works - those likely to show a financial return, have essentially renumerative and regarded as commercial enterprise. For such projects Loans and Funds were raised from the public. (2) The Protective Works were essentially to serve as protection against famines. Theoretically such works were constructed out of 'Famine Relief and Insurance Fund' as a part of the annual expenditure. (BUCKLEY, p.308).

10. Paul W. Paustian, Canal Irrigation in the Punjab 1930, p.51.

11. Punjab Government, Colony Manual, Vol. I (Lahore) 1922 p.

12. M.L. DARLING, Punjab Peasant in Prosperity and Debt., Oxford University Press, 4th ed. 1947, p.112.

13. Colony Manual (1913) p.7.

14. Paustian, p.56.

15. Punjab Government, Colony Reports 1906, (Lahore) p.33.

16. Colony Manual (1913) p.59.

17. Paustian, p.60.

18. Colony Manual (1922) p.22.

19. MICHEL, A. A. The Indus Rivers, Yale University Press, 1967 p.87.

20. Darling, p.112.

21. HAMEED, A. Thal Development Project: An Appraisal of its Progress, Geographia, Vol. III No. 1, Summer 1964 pp.43-50.

22. TREVASKIS, H.K., The Land of Five Rivers, Oxford University Press, 1928 pp.83.

23. AHMAD, K.S., & KUREISHY, K.U., 'Growth of Settlements in West Pakistan' Pakistan Geographical Review, Vol. 16/2 July, 1961. pp.6.

24. PAUSTIAN, P.W., Canal Irrigation in the Punjab, New York Columbia University Press, 1930. pp.64.

25. BEAZLE, J.G. & PUCKLE, F.H., The Punjab Colony Manual. Rev. ed. Lahore: Superintendent of Government Printing, Punjab, 1922. pp.158.

26. HONIGMAN, J.J. 'A Case of Community Development in Pakistan' Economic Development and Cultural Change, Vol. 8 pp.294.

27. BEAZLE, J.G. & PUCKLE, F.H., Op cit, pp.182.

28. BEAZLE, J.G. & PUCKLE, F.H., Op cit, pp.184.

29. FRENCH, L., The Punjab Colony Manual, 1st ed., Lahore: Superintendent of Government Printing, Punjab, 1913 pp.161. (para 484, 485 and 486).

30. BEAZLE, J.G. & PUCKLE, F.H., op cit. pp.219.

31. GOVERNMENT OF THE PUNJAB, Gazette of the Chenab Colony, Superintendent of Government Printing, Lahore, 1905, pp.149.

CHAPTER: III

THE PROCESS OF URBANIZATION IN THE UPPER INDUS PLAINS

A. URBANIZATION, SOME THEORETICAL IMPLICATIONS

Urbanization is defined variously as a particular phase-stage in human society and has drawn students and workers from almost every field of social sciences. Historians, sociologists and economists are more concerned with the impact of the process related to social and political behaviour of individuals or groups of people. While Town Planners and Architects have been confronted with finding a solution to the ever increasing physical demands of housing and recreation, it is for the geographers to deal with the phenomenon as a cohesive phase-stage in human society. Urbanization is studied in geography as related to environmental control of habitat and differential patterns of human occupance of the earth's surface. It is not an exclusive realm of study, for geography has shared with other social sciences many common concepts and methods, but has contributed a distinctive set of view points and a unique focus; that which is primarily concerned with the organization of man's use of space and resources in the development and functioning of urban settlements.[1]

Considering urbanization as a process of change and a characteristic having high correlation with economic development of a region, studies have been undertaken with

regard to spatial differences, and prevalance of widely differing patterns have been noted by authorities.[2] Study of urbanization as a process of change in the form and structure of the habitat must take into account the differences in the level of economic base and technological infra-structure of the communities concerned. Hitherto more efforts have been devoted to the study of individual cities or urban agglomerations on the basis of which comparisons between different culture areas have been derived. This trend though measuring a highly representative form of urban growth, is deficient as far as degree of comparability among different areas is concerned. This weakness in current studies has been noted by many authorities.[3] Holzner (1967) has emphasized the role of the urban geographer firstly for his contributions to the regional studies, secondly in interpreting the city as the expression of the surrounding cultural realm and thirdly, for comparative study on the regional variations of cities from one culture region to another.[4]

The points of population concentration have multiplied in number and sizes in the developed and the developing countries alike. Rising standards and expectations have brought a rapid change in type and structure of houses, establishment of marketing and services, provision for recreation and transport in large parts of the world. Recognizing differentials in the patterns of urban growth, the present study looks into aspects of urbanism in a region where a Western style of growth has been adopted and mixed

with indigenous traits to provide a pattern essentially based on an agricultural economy.[5]

Irrigation agriculture has been an age old tradition in the Indus Valley, but perennial irrigation developed by the British since the 1880's provided avenues for new settlements as well as influenced the growth of earlier urban centres on an unprecedented scale. Another point to note is that industrialization (which had a late start) has accelerated urban growth, but the basic framework of urban centres was laid during the period of agricultural expansion and the settlement plans indicate explicitly marketing and service functions as dominant features. This chapter takes into account economic development of the region as a whole and confines its investigations to the evolution of demographic size of urban centres. In addition, an attempt is made to identify a general urban system within the region. The study is growth oriented; identifies the forces of change and in the final analysis, emphasizes evolutionary trends of the current urban pattern.

Urban places and urbanization are widely considered, in a demographic sense, as agglomerations or attributes of a given size. However, in the consideration of a city or an urban place, either as a dependent or an independent variable, much more than the demographic definition is necessarily involved.[6] This is where geographical studies of the process take over from the general social studies of human agglomerations and bring in morphology, structure, extent, locational interaction and spatial differentials.

For convenience in quantification, a demographic criterion suits best for definition of an urban settlement. For this reason, number of persons in a particular size class, usually +5,000 is taken; although +20,000 and +100,000 figures have also been made a basis of study for various assumptions. Difficulties in international comparisons, however arise as an urban place is defined variously in different national censuses (Clarke 1972, Jones, 1966).[7] Recognizing differences in national attitudes to urban criteria and keeping in view various forms and needs in which such data could be utilized, the U.N. Demographic Year Book appreciates a multidimensional approach to the setting up of arbitrary cutting points for differentiating 'urban' from 'rural'. As such statistics of urban population despite their shortcomings are useful for comparing between countries or territories on a broad scale.[8] Whatever criterion is adopted, the term 'urban' connotes a qualitative attribute of the locality, which differentiates it from a rural or non-urban locality.

In Pakistan Census Reports, it is the administrative, social, economic or demographic characteristics that determine the status of a locality as urban or rural.[9] While a demographic concept for urban definition has been followed here, other factors, especially those affecting the composition of large agglomerations and growth outside fixed boundaries, wherever observed, will be taken into consideration. The system of marking boundaries of towns and cities has produced some rigid skeletal outlines, due to

historical causes or other arbitrary decisions. It does not take into consideration the economic and social changes that have taken place in later times. Rarely do the boundaries of the municipalities correspond to the actual built up areas; we find that in the case of growing urban centres, many people though belonging to the same city have taken their abode and established factories just outside the municipal limits to avoid certain taxes. Though urban in reality, this occupance is not reflected in urban population statistics.[10]

Before looking into actual figures of growth spread over the past decades, relation of economic development to urbanism may again be stressed. True, economic development in the Upper Indus Plains was in the field of agriculture alone, but even in Britain, large-scale industrialization and urbanization were preceded by the Agricultural Revolution of the 17th and 18th centuries. In the case of this region the resources and potentials do not offer any strong base for large scale industrialization in the foreseable future. Necessarily for such reasons, urbanization of a degree as witnessed in contemporary industrial regions of the world is very much out of question here.

In fact, it is development of an economic base, in whatever sector it may occur, that leads to surplus production and ensuing trade and commerce; creating markets for exchange and demand of goods and services. Through economic prosperity, a sizeable proportion of population is relieved from primary occupations and becomes engaged in secondary and tertiary

occupations. As the change, in such a case, is relatively slower, than that which accompanies industrial growth, the process of urban and social change remains less perceptible for a time.[11]

Considering the City, the State, and Economic Development, Keyfitz (1965) puts this very clearly. In the early phases agricultural products are needed not only to support people in the cities while they add to local capital in the form of factory buildings, but also, through their export abroad, to finance the purchase of machinery.[12] However, urbanism, itself a product of basic economic and technological development, tends in turn, once it comes into being, to affect every aspect of existence.[13]

Two points which have a bearing on the degree of urbanization in the UIP may be noted here. Firstly, economic gains both in public and private sectors brought by the opening up of the wastelands, were enormous and with each new scheme one notices a comparable shift in the degree of urbanism. Secondly, establishment of new towns in the Canal Colonies led to the planning of settlement morphology of a superior quality than anything which existed before. The mere fact that all new towns were on a railway track is of significance in the development of trade and commerce. We shall note such qualities of urbanism in the region in a subsequent chapter.

B. ANALYSIS OF ECONOMIC FACTORS LEADING TO RAPID URBANIZATION IN THE UIP

Irrigation expansion acted as an important agent in the areal distribution of population and intra-regional character of settlements. The nature and present arrangement of settlement occupance reflects the conceptual and organizational changes that have occurred since the start of planned colonization programmes in the region. In the previous chapter, under the heading PROCESS OF COLONIZATION, we have already noted how irrigation extensions were planned to open up government wastelands. Besides providing new lands for occupance, all canal projects strengthened the agricultural economy of the region. All through the period one finds a break occurring in the old traditional, closed economy of the region and a sudden turning to enterprising spirit in the community, producing export oriented agricultural commodities. The vast literature on agriculture and economic development demonstrates that an increase in agricultural productivity is of vital importance in the early stages of economic development. (Grigg, 1970)[14] From initial take off to gradual build up, economic development is an ever expanding phenomenon; what we are concerned with here is to correlate economic progress in the UIP with its concomitant growth of urban centres.

Fairly reliable census data are available from 1881 onwards, which show signs of growing urbanism in the region. The debt of any research worker to some classic studies on

socio-economic aspects of irrigation extension and colonization in the Punjab, written by people who witnessed the change, is quite obvious. Later studies have concentrated on the economic processes alone and an objective study of change of the later times, lacks much exploration in the region.

Four periods of economic growth are distinguished, during which over a predominently cultural nomadic area, (with a few exceptions of historical/administrative centres), monofunctional towns were planned, many of which grew rapidly into multifunctional towns and cities. Economic growth is a continuous process and certain changes are to be noticed appearing with each new project. Yet the impact of such 'projects' is experienced only when the population has settled in the new areas and taken up jobs permanently. Hence some overlapping of the periods becomes inevitable. However, an important factor in assigning economic history to different periods is the availability of census figures on which the demographic aspect of urbanization is largely based.

I. 1881-1901 THE PRELIMINARY PERIOD.

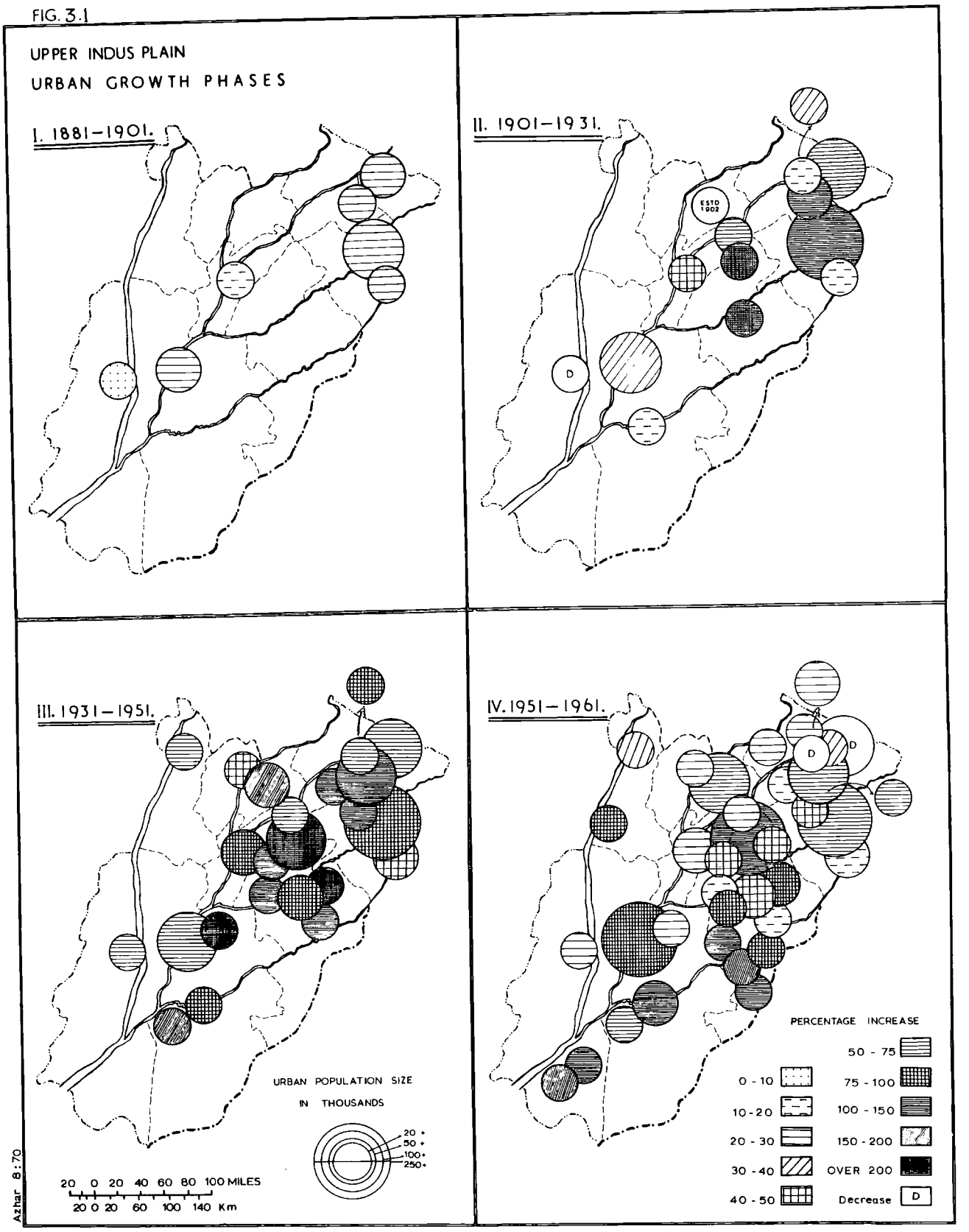
II. 1901-1931 THE PLANNING PERIOD.

III. 1931-1951 THE TAKEOFF PERIOD.

IV. 1951 to date THE GROWTH PERIOD.

The growth of urban centres during various phases, as discussed below, is depicted in Figure 3.1. The four maps in this figure show individual urban centres with a population of 20,000 or more at various censuses and percentage increase in their respective population in each

FIG. 3.1



Azhar 8:70

case.

I. 1881-1901 : THE PRELIMINARY PERIOD.

The last two decades of the 19th century saw the beginning of a change that brought the province from medieval times to modern. The policy of change was envisaged to meet an endemic food shortage in India caused by large scale crop failures and epidemics.[15] Three pioneering attempts of the Sidhnai, the Lower Sohag Para and the Chunian Colonies in Multan, Montgomery and Lahore districts were of smaller magnitude. It was with the establishment of the Chenab Colony, which brought over 250,000 hectares of virgin land under the plough that major shifts of population from congested eastern districts of the Punjab were undertaken by the administration.[16] The Chenab Canal proved to be most renumerative to the government. Its revenue accounts showed an accummulated profit of £16.5 million up to January 1924 only, after all interest charges and working expenses had been met.[17]

The Famine Commission Report (1880) forseeing the importance of an integrated economy, had stressed the need for the development of internal communications and trade facilities along with opening of new lands. While new roads and bridges over rivers and canals were being built by the Public Works Department, the Railways were made a State concern under the name North Western Railways in 1886.[18] Reference has already been made (Page 44, Chapter II) to the cost and philosophy of financing irrigation projects

of two types; one out of "Famine Relief & Insurance Fund" formed in 1881-82 and the other essentially undertaken on commercial basis, being renumerative.[19]

II. 1901-1931 THE PLANNING PERIOD :

The first quarter of the present century saw a real change in the economy of the region. Success of earlier ventures prompted the planners and engineers and they presented a score of new developmental schemes to the administration. The Royal Irrigation Commission (1901-03) commenting on the provincial proposals and plans wrote:[20]

> " ... such works are almost certain to prove highly renumerative as financial investments, so that indirect protection against famine which they afford can be obtained not only without throwing any additional burden on the State, but also with a certainty of ultimately increasing its resources."

Encouraged by the views of the Commission, the local administration pursued its forward policy in earnest.

By now a reflection of success and response in the land economy is found in the rise of land prices. About the year 1870, unirrigated land had practically no sale value, as no clearances of wastelands had been effected. With the colonization that ensued, investment in land became much more lucrative even for urban capitalists. In the Chenab Colony, the sale value of land rose from roughly £3 in 1892

to £7/10 per acre by 1900. In Sargodha district, in public auctions, held by the government in 1919-20, each of the residential sites was sold for nearly £6,000, while sites for shops fetched up to £34,000 for a plot of one acre.[21]

The intensity of agricultural land use which eventually developed in the region brought sufficiently large surplus of stable food and led the farmers to concentrate on commercial crops like cotton and sugar cane. In Darling's words: "the cultivator now began to look to the market."[22] Agricultural prosperity necessitated the emergence of specialist artisans and other non-agricultural workers, which form an essential element of urban communities. Much of the expansion of long distance trade in wheat and cotton depended on the intermediary efforts of traders and commission agents. The sophisticated methods of handling financial transactions encouraged further extension of business. Scheduled Banks and Credit Societies sprang up in many towns of the region. In Montgomery Colony alone, 113 new cooperative societies were established by 1920.[23]

It was in the last decade of this period that first signs of manufacturing and factory industry appear to have taken concrete shape in the region. The Provincial Department of Industries was established in 1919; previously affairs of industry and labour had also been a concern of the Agriculture Department. Foundary works, oil milling and weaving were established in selected towns; while cotton packing and ginning factories brought a first change in

the functions of many smaller towns.

Before 1920 the region had largely depended on animal power both for its soil-produce and crafts. Small thermal electric generation plants, providing supply for lighting had appeared in some towns but Jogindernagar Hydroelectric Station (11,000 KW capacity) was the first major source of power in the British Punjab. Thence onward the provincial government assigned a high degree of priority to the schemes related to Hydro-electricity, for domestic as well as industrial usage. But it took long to realise such goals.

III. 1931-1951 THE TAKEOFF PERIOD :

This period saw great increase not only in the size and frequency of urban localities, but a real change in the functions of many towns. The Sutlej Valley Project, comprising 4 barrages which irrigated lands on both sides of the river, brought first perrennial irrigation to the districts of Bahawalnagar, Bahawalpur and Rahimyar Khan. The Haveli Project, though smaller in extent, provided additional waters to the earlier established Sidhnai Colony.

As noted earlier, the agricultural economy had already acquired stability and now the region was looking to entreprenuerial leadership in trade and industry. Whereas export of agricultural raw material to other provinces in India and abroad flourished, lack of minerals and industrial fuel remained major handicaps for the growth of industry. With the increase in acreage of sugarcane in the irrigated areas, efforts were directed to capturing the

home market from imports. It was considered that if a great sugar industry sprang up both agriculture and industry would benefit.[24]

Growing income of the communities led to greater demand for sophisticated consumer goods for which selective manufacturing concerns multiplied in all medium and large towns. The establishment of manufacturing (mainly to substitute imports of goods of everyday use) brought some concentration in the towns which encouraged it doubly; as venues of a good market and also as sources of semi-skilled labour. A government sponsored Metal Works Shop at Sialkot, led to the initiation of Sports Goods and Surgical Instruments industry in that city. Iron foundaries, shoe factories and big flour mills sprang up in and around Lahore while some Textile factories began to appear in Multan and Lyallpur. Although it is hard to find any substantial industrial growth by the close of this period, agricultural prosperity of the province had, however, produced a high propensity in the levels of consumption. The rise in socio-economic status of the community in general had created a base for industrial activity to commence. Explanations of the entrepreneurial spirit, which led to a sudden outburst of industrial development in the region after independence, (i.e. the next period) are to be found in the stage of economy that by then had been achieved in the region.

The mass immigration of Muslims from across the

border was absorbed in the Colony areas of the Province.* A larger proportion of these new comers settled and took up urban jobs. The contribution of refugees to the city life in the country or the region demands a separate study. Admittedly there was out migration too. Economic conditions became unsettled for a time and wide ranging adjustments were to come in later years. However, immediate effects of the migrants' arrival on the economy, resources and urban extensions is obvious.

IV. 1951 to-date THE GROWTH PERIOD :

It is difficult to evaluate in summary form, economic growth of recent decades,[25] concerning the prominent region of a developing country like Pakistan. However, we can discern the economic forces which have a direct relation with urbanization by confining ourselves to what has been achieved in urban localities. Among many forces that have a bearing on current urban expansion three factors stand out conspicuously.

1. The potentials and inheritance of the region: Economic growth, entrepreneurship and manufacturing in the region had been set on a 'launching pad' in the decades immediately preceding independence. The potentials of a 'semi-industrial' system were just ripe and the region's inheritance was quite impressive by contemporary standards.

---

* A total number of 5,281,200 refugees settled in the Punjab by 1951 which formed 26% of the total population of the Province. Incidentally the bulk of these political immigrants came from the Eastern districts (now East Punjab) which had previously sent settlers to the colony areas.

2. The liability and assets of Muhajirs: Contribution to human resources and change in social aptitudes.

The vast number of Muhajirs (political immigrants) though initially without much resources, contributed to the economic and social change as well as physical growth of the urban localities. No separate mention of their contribution is available as they were absorbed within the population as natural citizens of Pakistan. Only the 1951 census recorded the Muhajirs separately, and for all practical purposes there has been no distinction between the old and the new citizens.

Table 3.1(a) gives the number and percentage of Muhajirs settling in different class-sizes of urban centres within the Province and Table 3.1(b) details similar figures for some towns and cities as enumerated in 1951 census. In the former case proportion of Muhajirs in larger urban class-sizes is between 45 to 50 per cent whereas in case of individual cities (second table) their percentage amounted to over 60 in case of Lyallpur, Sargodha and Jhang. The impact of movement and mobility within the population, skill of many a craftsman, and sudden addition to labour and capital in the region are thus obvious.

3. The role of Specialized Agencies and Events:

Governmental policies and programmes of economic growth and physical expansion of the towns during the period have been many and varied. The role of specialized agencies like PIDC, WAPDA, IDBP, ADBP, ADC etc., is a subject of many studies on the economy of Pakistan. The Thal Development Authority has been concerned with the colonization of the most difficult tract (Sind Sagar Doab) in the region. While the Taunsa Barrage has provided irrigation to the trans-Indus district of Dera Ghazi Khan: construction of

TABLE 3.1(a)

NUMBER OF MUHAJIRS IN THE URBAN CENTRES OF THE PUNJAB AS ENUMERATED IN THE CENSUS 1951.

Class-Size of the Urban Centres	Total Population	Muhajirs	Percentage of Muhajirs in the Total Population
100,000 +	1,743,817	787,316	45%
25,000 to 100,000	661,977	327,692	49.5%
10,000 to 25,000	612,561	298,551	48.7%
5,000 to 10,000	408,551	158,272	38.7%

*Source: Census of Pakistan 1951, Vol. I Report and Tables, Table2

TABLE 3.1(b)

PROPORTION OF MUHAJIRS IN SELECTED URBAN CENTRES OF THE UPPER INDUS PLAINS, CENSUS 1951, (in Thousands).

Urban Centre	Total Population	Number of Muhajirs	Percentage of Muhajirs
LAHORE	849,000	366,000	43%
MULTAN	190,000	94,000	49%
LYALLPUR	179,000	124,000	69%
SIALKOT	168,000	54,000	32%
GUJRANWALA	121,000	61,000	52%
SARGODHA	78,000	54,000	69%
JHANG	73,000	47,000	64%
BAHAWALPUR	42,000	17,000	40%

* Source: Census of Pakistan, 1951, Vol. 5, Punjab and Bahawalpur State, Statement 5-B p.73.

high storage dams and link canals is going apace and have their own bearing on the regions future growth.

With the readjustment of population which followed the Partition of the Sub-continent, emphasis was laid on the consolidation of resources. The new nation found itself cut off from many manufacturing and industrial centres of India. While maintaining the disrupted concerns many fresh ventures were started. Colonization of the Thal tract was undertaken in earnest, where a large number of muhajirs were settled. Each of its new towns was given an industrial unit, while Daudkhel evolved as a purely industrial town developed by PIDC. Incidently the Thermal Power Station (20,000 KW) for industrial use at Daudkehl was the first source of power within the region. Though Multan Thermal Station (270,000 KW) and Lyallpur Power Station (140,000 KW) completed in 1960 and 1968 respectively are of much importance, Hydro-electric Power Stations at Rasul, Shadiwal, Nandipur have all been completed within this period. The role of natural gas being supplied from Sui (Baluchistan) both as industrial fuel and raw material for fertilizers is obvious.

In short a tremendous change in the agricultural and industrial sectors of the economy is taking place in the region. Lower parts of the Thal are being developed through the Taunsa Project, which has also provided a new rail link across the Indus.

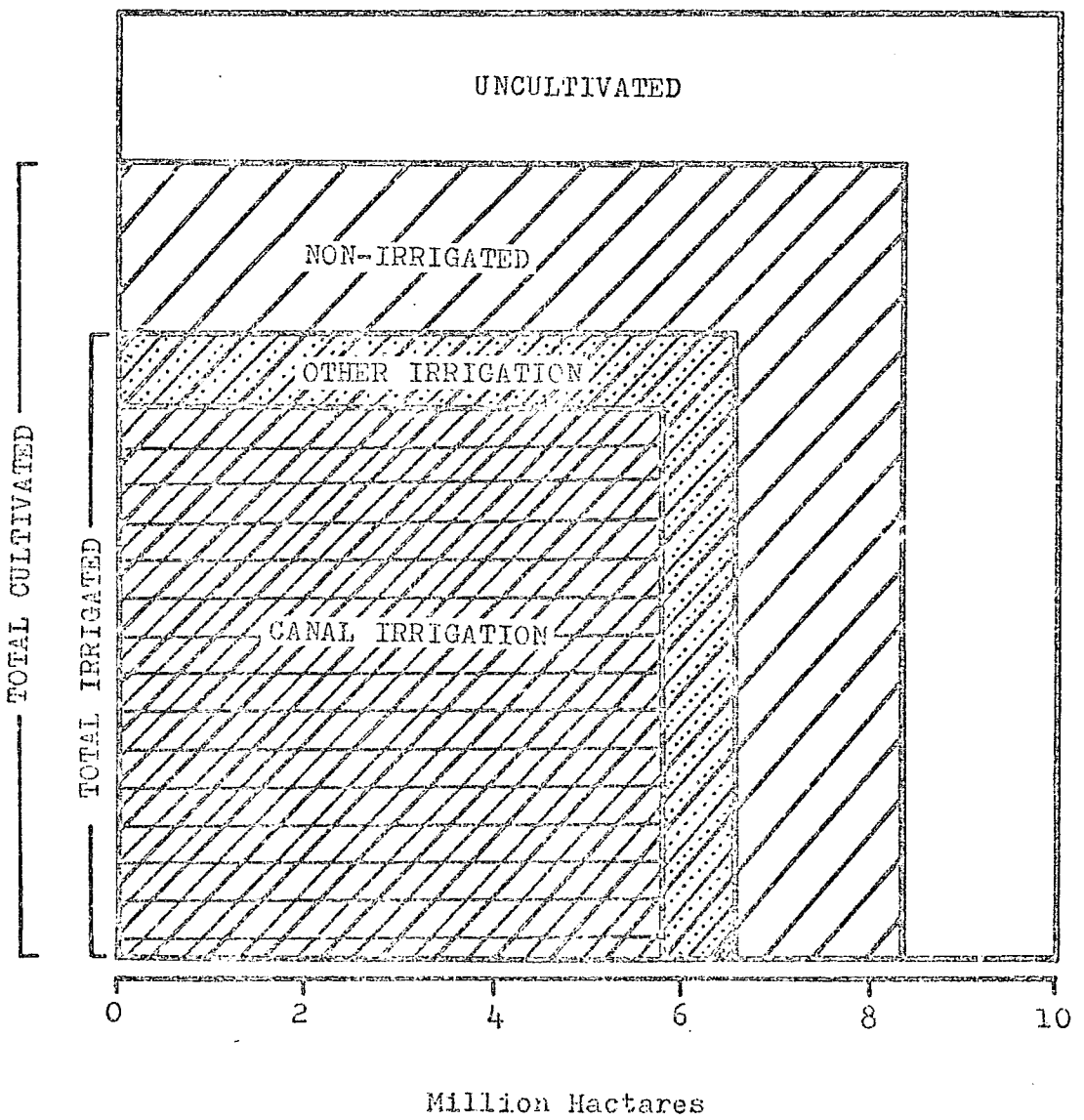
A brief reference to Agricultural Land Use, showing dependence of economy on irrigation expansion, may be made here (Figure 3.2). Out of the total cultivated area of 51.9 million hectares (21 million acres) in the Upper Indus Plain, as much as 40.7 million hectares (16.5 million acres) was under irrigation by 1960.[26] According to the Agricultural Census Report out of this 35.8 million hectares (14.5 million acres) were under canal irrigation, which constitute 70% of total cropped area of the region. In 1880's i.e. prior to colonization, the total irrigated area for the whole of British Punjab was 5.7 million hectares (2.3 million acres) only.

Since the beginning of colonization in the late 19th century to the present day, if one takes 1931 as a halfway mark; the groundwork preparation by surveyors, engineers and administrators seems complete in the first half. It was in the second half (i.e., since the 1930's) that many changes in the economy began to be reflected in the pattern of urbanization. Prominent among these were the expansion of trade and commerce, establishment of manufacturing, improvement of transport and communications. Fairly accelerated rate of capital investment in non-agricultural sectors has occurred recently. All these processes have involved radical shifts in the use of manpower and natural resources; alterations in occupational structure and composition of population. New industrial suburbs and satellite towns, internal communications and transport, establishment of local commercial areas and recreation facilities have all contributed to the growth of towns and cities.

FIGURE 3.2

UPPER INDUS PLAINS

AGRICULTURAL LANDUSE 1960



C. THE PATTERNS OF URBAN GROWTH IN THE UIP

Urbanization taken in its various contexts and as witnessed in different parts of the world shows some characteristic patterns of human occupance of the land surface. Study of such urban patterns has produced some of the most revealing treatises on human agglomerations, more especially those concerning non-western or developing areas. In the western countries where urbanization has come as a corollary to industrial and technological advance, specialists now examine such features of townscape as CBD, neighbourhood units, transport and commuting. Here, as Harris (1966) puts it, with increased man-space ratio, the upswing in urban-industrial demands is now in full competition with other uses of land.[27] In the conurbations of a post-industrial community, emphasis is being laid on an ecological adjustment and environmental control.

In the developing world, where urbanization is seen mostly as a symbol of modernization and change, notwithstanding the size of population and areas involved, many emerging concepts are subject to conjectural interpretations. For, in this part of the world, rather large urban areas have developed which were not industrial in character, but were colonial, administrative, or marketing centres developed through the initiative of foreigners; in other words these areas were characterized by a kind of urbanization that was externally imposed.[28]

It is of value here to take cognizance of some recent literature on the nature of cities in the non-industrial world in general and countries with export oriented economies in particular.* In the developing countries the study of urban patterns has led to such evaluation of urban occupance as the 'million city', the 'colonial city', the 'pre-industrial city' and 'overurbanization'.

With a few exceptions, Latin American countries are characterized by the dominance of the largest city. Indeed several of them have only one real city; yet they reveal a typically high percentage of urban within their total population.[29] Chile, Uraguay and Argentina all show a higher degree of urbanization than any country in Europe, except the United Kingdom, the Netherlands and Western Germany. Many Middle Eastern and African countries have relatively higher urban proportion within their total population. The polarisation of urban growth in a few large cities like Cairo, Alexandria, Casablanca, Lagos, Kinhasa (formerly Leopoldville) and Johannesburg, has produced very high rate of primacy, nowhere more than in Tunisia, where the agglomeration of Tunis is nearly ten times the size of the next large city. (Clarke, 1971)[30] In the case of Kuwait, Hill (1969) has shown the concentration

---

* A detailed treatment of urban growth characteristics and comparison between the developing countries is made in Chapter VIII.

of population in the City as of recent origin, and a result of industrial-commercial attraction for skilled and unskilled workers and availability of social services like health and education.[31]

The 'Colonial' & the 'Million' City:

Functional dominance was recognized as a major characteristic of urbanization in countries of South-east Asia, first by Fryer (1953)[32] and later by Ginsburg (1955).[33] Other noteworthy characteristics of the 'great cities' as well as individual countries are exceptionally large-sized cities in relation to total population and a marked absence of medium or small-sized towns. Founded in the era of Mercantalism, such 'million cities' dominate the urban scene at the cost of inner areas of the countries concerned. They have attained their present size and pre-eminence through their role as intermediaries (entrepots) of interchange of foodstuffs and raw materials with the manufactured goods of the West, and this activity has been carried on mostly by aliens. Hence the other attribute 'colonial cities'.

Towns were founded in the UIP at a similar juncture of world history and the developers behind most of this activity were also aliens. Although they are all inland towns (i.e. not ports), marketing has been a dominating function and as we shall see in a later chapter none presents 'problematic' features similar to million/colonial group.

The 'Pre-Industrial' City:

Sjoberg (1960) in his presentation of the nature of the medieval or pre-industrial city, delineated cities of non-industrial character in a wider societal perspective.[34] His observation that the pre-industrial city was, and is characterized by the dominance of a single function or very few functions may not be held universally true. However, his theoretical characterization reflects visual aspects of city life in 'underdeveloped' parts of the world. Speaking of the cities and the impact of technology in a cross-cultural analysis, Sjoberg (1965) remarked, "the cities have lately been compartmentalized into three categories - viz, the pre-industrial city, city in transition and the industrial city."[35] Thus recognizing societal differences one can look to universally applicable view-points of the past and present, or medieval and modern cities.

With this background of urbanism in the developing parts of the world, we now make a specific study of urban patterns in the region.

D. QUANTITIVE ANALYSIS OF URBAN PATTERNS IN UIP

Besides empirical studies of urban growth, increasing attention has been paid to the relationship noticed in the number and size of urban centres, in different unit areas. Jefforson's concept of Urban Primacy (1939), Zipf's Rank-Size Rule (1949) and Christaller's (1933) earlier observations on location and spacing of towns, have provided tests and criteria for finding regularity or diversity, in the patterns

of urban growth both in the developed and the developing countries. Availability of varied data, for the greater part of the world, from national and international agencies, has made drawing of comparisons and testing of hypotheses possible. Primate cities are generally, though not exclusively, equated with under-development and over-urbanization. Rank-size regularities have been associated with the existence of integrated system of cities in economically advanced countries. Berry's (1961) hypothesized relationship between urbanization and basic patterns of economic development showed a high positive correlation.[36] It is intended here to discern a pattern of growth using census data, for the economic periods already discussed (pp.78-88) and correlate the results with the observed patterns in other parts of the world.

Comparable variation percentages within urban and total population, for the four economic periods, are detailed in Table 3.2. A consideration of these statistics reveals a rapid increase in urban population both relatively and absolutely within the region. Over the periods, percentage of urban within the total population was 8.5 at the end of first period, i.e., 1901, whereas it rose to 21 by 1961. Urban population has increased from 750,000 to nearly 5 million i.e. almost seven times between the period 1901-61. During this period total population has grown from under 8.8 million to 23 million i.e. an increase of $2\frac{1}{2}$ times only.

Table 3.3 showing growth of urban centres by size

TABLE 3.1 GROWTH OF URBAN AND TOTAL POPULATION IN UIP (1881 - 1961)

PERIOD	URBAN POPULATION (+ 5,600)			URBAN PERCENTAGE	TOTAL POPULATION		
	POPULATION	PERCENTAGE VARIATION	AVERAGE ANNUAL GROWTH		POPULATION	PERCENTAGE VARIATION	AVERAGE ANNUAL GROWTH
1	2	3	4	5	6	7	8
1881-1901	747,859	24.0	1.2	8.5	8,789,537	-	-
1901-1931	1,389,981	85.9	2.9	11.5	12,065,444	37.3	1.2
1931-1951	3,063,065	120.4	6.0	16.7	18,370,451	52.3	2.6
1951-1961	4,810,228	57.0	5.7	21.0	22,928,516	24.8	2.5

Source: Calculated from Census of Indian Reports 1881-1931 and Census of Pakistan 1951-1961 (Reports.

TABLE 3.2 GROWTH OF URBAN CENTRES IN UIP BY SIZE AND PERCENTAGE OF URBAN POPULATION IN EACH SIZE-CLASS. 1881-1961

Class Size	1881			1901			1931			1951			1961		
	No.	Population	Percent-age	No.	Population	Percent-age	No.	Population	Percent-age	No.	Population	Percent-age	No.	Population	Per
+1,000,000	-	-	-	-	-	-	-	-	-	-	-	-	1	1,296,477	26.9
+ 100,000	1	157,287	26.0	1	202,964	27.1	3	650,177	46.8	5	1,506,977	49.2	5	1,273,240	26.5
+ 50,000	1	68,674	11.4	2	145,350	19.4	1	58,716	4.2	4	265,136	8.7	6	456,981	9.5
+ 20,000	4	113,077	18.7	4	99,359	13.3	10	296,167	21.3	15	473,449	15.4	25	785,162	16.3
+ 10,000	7	104,911	17.4	7	112,433	15.0	11	145,195	10.5	34	464,241	15.2	37	513,455	10.7
+ 5,000	23	159,474	26.4	27	187,753	25.1	34	239,726	17.2	47	353,262	11.5	64	484,913	10.1
---	--	---	---	--	---	--	--	---	---	--	---	--	--	---	--
(-) 5,000+	31	106,433	15.0	14	50,310	6.3	18	67,224	4.6	26	97,074	3.0	21	75,360	1.5

Source: Calculated from Census of India Reports 1881-1931 and Census of Pakistan Reports 1951-1961.

classes and percentage of increase in each class reveals that medium size urban centres have grown in larger proportions as compared to very small towns or a single large city. A summary statement, Table 3.2(a) showing number of urban centres in size-classes of +20,000 and above/is as follows:

TABLE 3.2(a)

SUMMARY STATEMENT, INCREASE IN NUMBER OF URBAN CENTRES 1881 - 1961

CLASS SIZE	1881	1961
1,000,000 +	-	1
100,000 +	1	5
50,000 +	1	6
20,000 +	4	25

Furthermore, whereas in 1881 there were 31 towns in (-) 5,000 category with a combined population of over 106,000 in 1961 the census recognized only 21 such small centres as urban, with a population of 75,360 which was 1.5% of the total population.

From historic records one learns that, at the time of British annexation of the Punjab, only Lahore and Multan were above 50,000, Sialkot and Dera Ghazi Khan above 20,000 in the region, and no town approached 100,000 in the whole of the Punjab.[37] Apart from Lahore, 5 other cities had more than 100,000 population by 1961 and two of these, Lyallpur (2nd in rank) and Sargodha are new

planned towns. According to the U.N. Demographic Year Book 1970, three more colony towns namely, Okara, Rahimyar Khan and Montgomery have attained this status.[38]

As for the rate of growth within the successive economic periods, the decades after 1931 show much accelerated growth. By this time, 50 years of agricultural expansion had provided a viable economic base, and the expanding economy led to the establishment of manufacturing and services in many towns and cities of the region. As the colony towns matured they surpassed the old centres both in number and size, and in respect of their new and better physical outlook. We have already noted the impact of 'refugee' migrants, a sizeable majority of whom settled in colony towns permanently.

(a) RANK SIZE DISTRIBUTION OF URBAN CENTRES IN UIP

Zipf's Rank-Size Rule (1949)[39] states that, when all towns of a region are arranged in descending order by population, the size of the rth town is 1/r the size of the largest town, according to series 1, 1/2, 1/3 .... 1/r. Thus a regularity of hierarchy in towns is established, for a given self contained region. However, departures from this empirical deduction are many and varied, as a linear logrithmic distribution of towns by size is rarely found.[40] In broader terms, approximation to this rule is indicative of a contrast to the related concept of urban primacy.

Berry (1961) recognizes three categories of city size distribution: log-normal, intermediate and primate.[41]

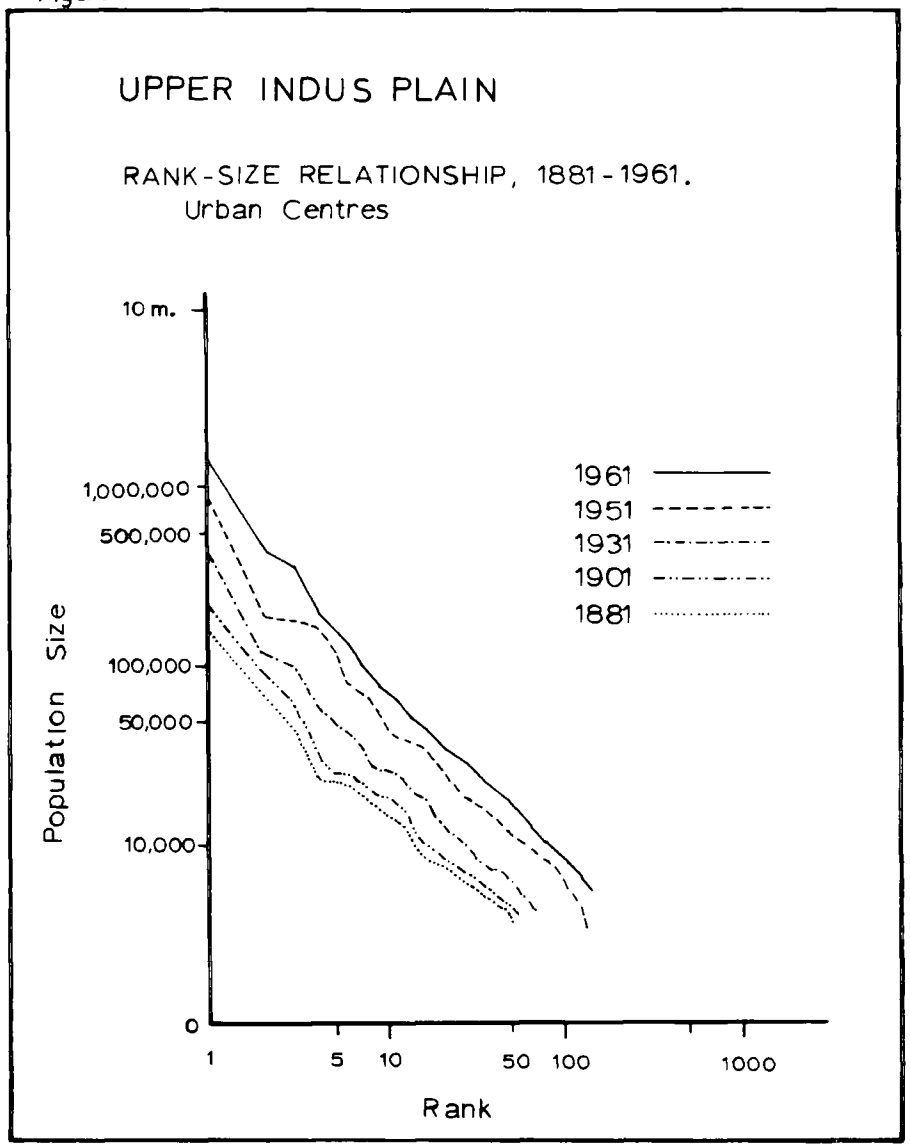
Further, he draws three sub-categories for the intermediate type; those with more small cities than the primate, those with more medium-sized cities and those with more large cities. The graph (Fig. 3.3) drawn on a logrithmic scale, shows curves for urban centres for different periods of the study. It is found that city size distribution in UIP has been of sub-category one and two, of the intermediate type, with fluctuations of the curves within medium size range. The top graph line shows that this distribution has progressed towards log normal type in the decade 1951-61.

Positive relationship between city-size distributions and urbanization or economic development is not a universal measure; however, its evolutive appearance in UIP demonstrates the importance of a large number of urban centres as against a single town becoming 'supereminent'. In the hierarchy of towns, number one city is followed by 5 medium sized cities, each one of which is maintaining steady growth, followed by 25 medium sized towns.

(b) APPROXIMATION TO BERRY'S MODEL OF CITY-SIZE DISTRIBUTIONS IN UIP

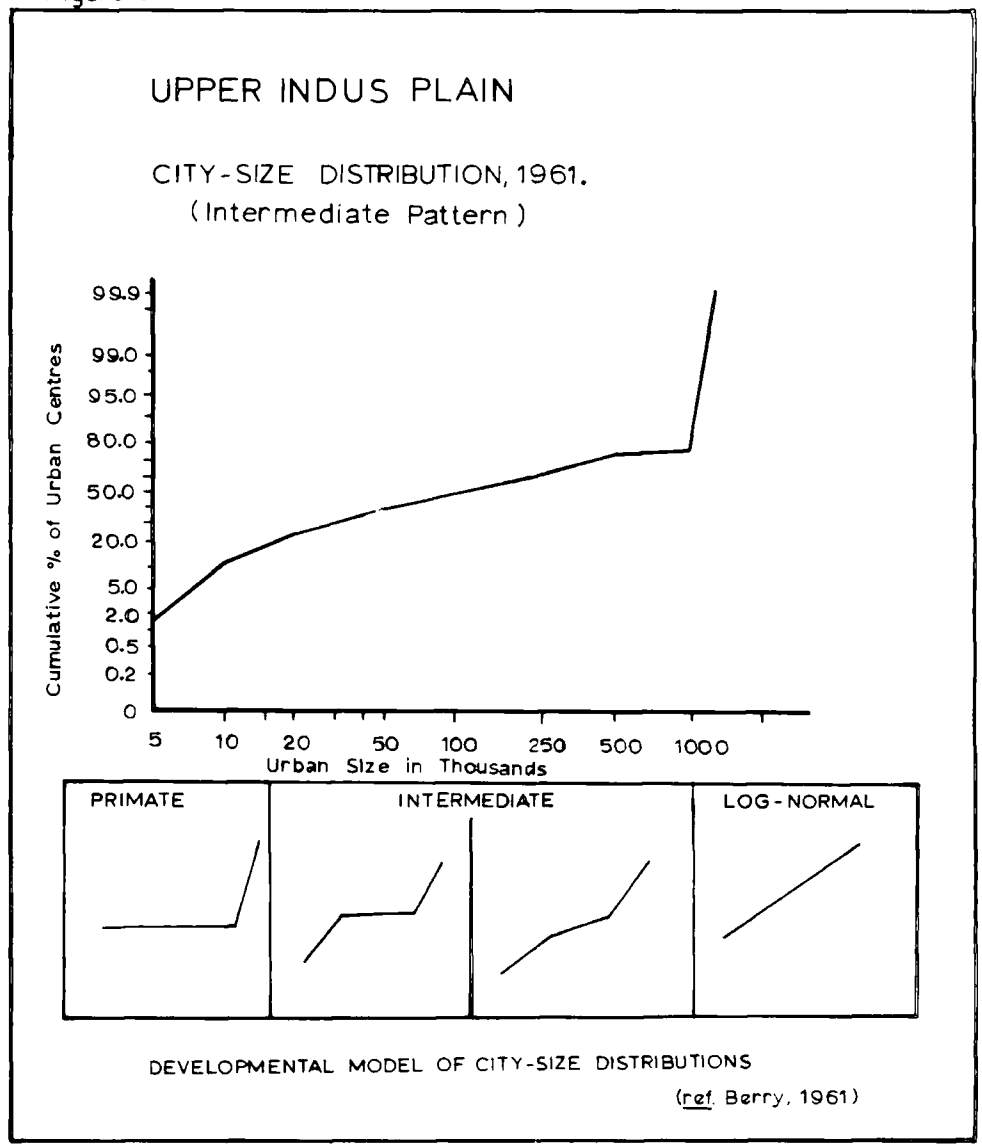
Berry (1961) from his study of 'City-size Distribution and Economic Development' concludes 'primacy' as the simplest city-size distribution, affected by fewer forces, whereas on the other hand 'rank-size' distributions are found, when many forces (economic and political as also historical) affect the system of cities for a long time. In the case of UIP, the distribution of urban centres, for

Figure 3.3



Azhar 1:71

Figure 3.4



DEVELOPMENTAL MODEL OF CITY-SIZE DISTRIBUTIONS

(ref. Berry, 1961)

the last census (1961) approximating to near normalcy has already been noted above. This is now tested on Berry's Model of City-size Distribution. Table 3.4 below shows the cumulative frequences of the percentage of each size class to 100 percent of the population at the largest city, for different size classes: viz, 5000-10,000, 10,000-20,000, 20,000-50,000, 50,000-100,000, 100,000-250,000, 250,000-500,000 and 500,000-1,000,000. In Figure 3.4 these frequencies have been plotted on a log normal probability paper, so that if a city size distribution is log normal it would assume the form of a straight line.[42]

TABLE 3.4

CITY SIZES IN UIP : FREQUENCY NUMBER & CUMULATIVE POPULATION

CLASS	FREQUENCY NUMBER	CUMULATIVE NUMBER	CUMULATIVE POPULATION	CUMULATIVE PERCENT
<5,000	21	21	75,360	1.5
5,000-10,000	64	85	560,273	11.47
10,000-20,000	37	122	1,073,728	21.98
20,000-50,000	25	147	1,858,890	38.0
50,000-100,000	6	153	2,315,871	47.4
100,000-250,000	3	156	2,805,662	57.43
250,000-500,000	2	158	3,589,111	73.46
500,000-1,000,000	-	158	3,589,111	73.46
1,000,000 +	1	159	4,885,588	100

The resultant graph for the above cumulative percentages assumed a shape which closely resembles Intermediate - II group of Berry's Model. Considering the pattern of

urbanization for the whole period of growth the different curves illustrate clearly the sharp reduction of percentages in the lowest size-class from 1881 to 1961 and inclusion of high-class over the same period. Thus while smoothening of the curve is indicative of tendency towards lognormalacy, its spread denotes greater urbanization.

Though no definite correlation between log-normalcy of the city size distribution and either degree of economic development or degree of urbanization is suggested by Berry (1961), the phenomenon is regarded as depicting a distinct pattern. Vapnarsky (1969) has shown that a "well defined pattern" of rank size distribution of cities is conditioned by a relatively high degree of closure of the area under analysis.[43] He further postulates that rank-size rule is related to the degree of interdependence, that is, a high level of interaction among the different units in the system is a requisite for differentiation of the system in a complete hierarchy of city sizes. Trends towards log-normalcy in the UIP are thus indicative of greater interaction among the constituting urban units.

Looking into different aspects of the process of urbanization in the UIP one finds initiation of a phase of rapid growth since the turn of the century. This phase resulted from the founding of new settlements as market and service centres. It is because of this role as centres of trade and commerce in prosperous agricultural colonies that all sizes of urban centres have shown comparable increase in their population.

This pace of development has largely depended on the opening up of new areas for settlement as well as introduction of manufacturing and industries in the region. Thus the urban centres have kept their links with the countryside as markets for agricultural produce and suppliers of consumer goods and services in return. Because of this economic growth from within, most of the urban centres have gained attraction and significant increase in population. Smoothening of the curve, or lognormalacy in rank-size relationship may here be regarded as a sign of overall growth rather than prominence of a few urban centres.

REFERENCES

1. HAUSER, P.M. Urbanization : An Overview, in HAUSER, P.M. & SCHNORE, L.F. (Ed), The Study of Urbanization (1965), p.6.
CLARKE, J.I. Population Geography, Pergamon Press 2nd Edition (1972) p.46

2. HAUSER, P.M. Chairman, Committee on Urbanization, Social Science Research Council; in Preface to the Study of Urbanization op cit. p.vi.

3. MAYOR, H.M., Cities and Urban Geography, Journal of Geography, January, 1969, pp.6-19.

4. HOLZNER, L., World Regions in Urban Geography, Annals of Association of American Geographers, Vol. 57/4, December, 1967, pp.704-712.

5. A recent, broad but comprehensive analysis of the subject matter of Urban Geography is presented by Davies, W.K.D. Approaches to Urban Geography, in DAVIES, W.K.D. & CARTER, H. (Ed) Urban Essays: Studies in the Geography of Wales, Longman, London, (1970), pp.1-21.

6. UNITED NATIONS, Demographic Year Book 1955, New York, (1956), pp. 15-16ff

7. CLARKE, J.I. 1972, op cit. & JONES, E. Towns & Cities O.U.P. 1966 pp.3-5.

8. UNITED NATIONS, Demographic Year Book 1967, New York(1968) p.2 and also in the earlier (1955) Demographic Year Book p.15ff

9. GOVERNMENT OF PAKISTAN, Census of Pakistan 1961, Vol. I, Pakistan, pp. PII/15,16.

10. AHMAD, K.S., Urban Population in Pakistan, Pakistan Geographical Review, Vol. 10/1 (1955) p.2

11. Here we may take note of the tremendous efforts put in the field of Civil Engineering and Land Surveys in the wake of agricultural expansion in the region.

12. KEYFITZ, Nathan, Political-Economic Aspects of Urbanization in South & Southeast Asia, in The Study of Urbanization, op cit, p.278.

13. DAVIS, Kingsley, The Origin and Growth of Urbanization in the World, American Journal of Sociology, Vol. 60/5 (1955) p.429.

14. GRIGG, D., The Harsh Lands, Macmillan, London, (1970), p.23

15. The need and importance of agricultural extension already discussed, p. 36 ff.

16. Especially districts of Gurdaspur, Amritsar and Jullunder, also see Table 2.2 for density in the eastern districts.

17. BENNERJEE, D.N., Punjab Canal Colonies, International Review, Agricultural Economics, Vol. 3, 1925 p.214.

18. CALVERT, H.B., The Wealth and Welfare of the Punjab, 2nd Edition, Lahore, (1936) p.108.

19. BUCKLEY, (1905), p.308.

20. ROYAL INDIAN IRRIGATION COMMISSION REPORT (1903) Part I, p.2

21. BENNERJEE, (1925), p.219.

22. DARLING, M. (1967) The Punjab Peasant in Prosperity and Debt, (4th Ed.) O.U.P. p.149.

23. BENNERJEE, op cit p.225.

24. CALVERT, (1936), p.143.

25. PAPENEK, G.F., (1967) Pakistan's Development, Harvard University Press.

26. GOVERNMENT OF PAKISTAN, Pakistan Census of Agriculture, (1960), Vol. II, p.103 and 153.

27. HARRIS, C.D., The Pressure of Residential-Industrial Land Use, in: Thomas, W.L. Jr., (Ed), Man's Role in Changing the Face of the Earth, Chicago, The Chicago University Press, 6th Edition (1966), pp.881-895.

28. BREESE, G., Urbanization in Newly Developing Countries, Princeton, Princeton University Press, (1966), pp. 3 & 39ff

29. BEYER, G.H. (Ed) The Urban Explosion in Latin America, Cornell University Press, Ithaca, New York, (1967) p.141.

30. CLARKE, J.I. Population Geography and the Developing Countries, Pergammon Press Ltd. Oxford 1971 p.121.

31. HILL, A.G. Aspects of Urban Development of Kuwait, unpublished Ph.D., Thesis, University of Durham, Durham, (1969).

32. FRYER, D.W., The 'Million City' in Southeast Asia, Geographical Review, Vol. 43/4, October (1953), pp. 474-494.

33. GINSBURG, N.S., The Great City in Southeast Asia, American Journal of Sociology, Vol. 60, (1955), pp. 455-462.

34. SJOBERG, D., The Pre-Industrial City - Past & Present, The Free Press, Glencoe, Illinois, 1960.

35. SJOBERG, G., (1965) Cities in Developing and Industrial Societies: in Hauser & Schnore (ed) The Study of Urbanization, op cit, pp.213-263.

36. BERRY, B.J.L., City Size Distributions & Economic Development, EDCC Vol. 9/4, (July, 1961), pp.573-588.

37. GOVERNMENT OF PUNJAB 1st Census of the Punjab 1868, Lahore, (1870).

38. UNITED NATIONS (1971) Demographic Year Book 1970, New York pp.456-457.

39. ZIPF, G.K. (1949) Human Behaviour and the Principle of Least Effort, Cambridge, Massachusetts.

40. BERRY, 1961.

41. ibid.,

42. ibid.,

43. VAPNARSKY, C.A. (1969) 'On Rank-Size Distribution of Cities: An Ecological Approach', EDCC Vol. 17/4, July, 1969 pp.584-595.

CHAPTER: IV

SPATIAL VARIATIONS OF URBANISM IN THE UIP: A FACTOR ANALYTIC STUDY OF DEMOGRAPHIC AND AGRO-ECONOMIC VARIABLES

The process of urbanization and growth of urban centres have been evaluated in the preceding chapter. It was found that the city-size distribution has assumed a near rank-size normality and that the number of medium and small sized towns have been on the increase, all through the period of study in the region. Present stage of urbanism is of prime importance and its spatial analysis will lead to an understanding of socio-economic facets of the region. It is also intended to serve as a basis to the study of individual town characteristics which follows in the next chapter. Thus the present chapter is a quantitative study undertaken to determine the basic dimensions of variance which have defined the pattern of the society in the UIP as a whole.

The factors which determine response to socio-economic evolution within the society are many and varied. Interaction between, and interdependence of demographic characteristics and economic potentialities, is an accepted rule. Any implied dependence between such phenomena may be regarded as arbitrary, in certain cases, but in a socio-economic

context it is hard to find explicit explanations for all interactions.

Accepting that the impetus to rapid change has been provided by irrigation expansion in the semi-arid clime, inclusion of agro-economic indices becomes imperative for a study of multivariate nature, that follows. By highlighting significant demographic characteristics of the population and relating them to the agro-economic base of the various districts, it is possible to

(a) identify the response to economic development and the dependence of the economy on irrigation agriculture as a whole, and

(b) hypothesize about the influence of certain 'extracted' factors.

In addition to this, it becomes possible to identify subregions based on such 'extracted' characteristics of the region. Economic-demographic linkage brought about by this statistical study forms a broad examination of spatial pattern of urbanism. Significant elements of the individual urban centres are studied in the next chapter.

THE NEED & IMPORTANCE OF SPATIAL/QUANTITATIVE STUDY

Recent methodological developments in some social sciences, as also in human geography, are turning to synthetic presentation of regional variations. Among these methods is

FACTOR ANALYSIS, wherein a set of samples (observation units) is divided into a small number of subsets or clusters so that each subset represents a grouping of samples, which have a basic common similarity with respect to certain variables (Pocock & Wishart, 1969).[1] It is assumed that in the matrix of intercorrelated variables there are some common factors running through data. It is these common factors that are extracted and expressed by factor analysis (Cole and King 1969).[2]

The statistical details of multivariate analytic techniques are complex and lie outside the scope of this study. However, a select resume of important works, points to the basis of the present study and also illustrates the usefulness of applying such techniques to socio-economic data. The technique evolved to delineate areas of uniform scoring on a set of Principal Components owes its origin to Education Psychology among behaviourial sciences. In geography, Kendall's 'Geographical Distribution of Crop Productivity in England' was one of the first attempts on regionalization, using Principal Components Analysis as a fundamental technique.[3] Berry (1961),[4] reviving interest in mathematical and statistical methods, has adopted this analytical procedure for deriving Multifactor Uniform Regions. Horton, McConnell & Tirtha (1970),[5] have applied such a technique to work out a 'Spatial Pattern of Socio-Economic Structure in India': wherein relationships between selected socio-economic indices have been used to identify underlying patterns of areal association. Similarly

Hautamaki (1970),[6] reporting on the use of multivariate methods in regional geography, has shown that it is possible to group the various factors on a basis of interdependence, and to expose the features especially typical of the area studied. While such studies relate to regions, Moser and Scott (1961)[7] in their classic study of British Towns, and later many others have applied such techniques successfully in evaluating principal factors which govern the variation between samples.

Briefly stated, taking n observations and value of m variables for each observation, the computation groups the large number of samples in a way that internal uniformity of the resulting groups is maximized.[8] Thus regional groups having similiarity, rather than contiguous regions are derived. Such regionalization implies gains in generality and manageability, wherein explanation of variation could be looked for. As for the losses of detail, in the grouping, Berry (1961) has shown that very little (only 3.5 per cent) detail was lost in the first five steps of the grouping analysis in his study[9]. This means that almost as much can be learnt about the differentiation from amongst the regional grouping as from the whole data.

Dawson (1970), by drawing two examples and taking different sets of data for SW England and Eire, has shown that a multifactor region is not an absolute grouping, but is related to the type of data input, and using partial correlation methods, while keeping a variable fixed, a series of regions may be defined.[10] Thus choice of variables

is of utmost importance as any classification obtained from the data remains a function of the available variables. Another limitation inherent in the process is that non-comparibility of areal units may arise due to differing size of samples.

THE MODEL & ANALYTICAL PROCEDURE FOLLOWED

The relationship between selected indices are employed to identify underlying patterns of areal association among all the 16 districts of UIP. This is followed by quantification of patterns such that a district is given a standard score on each pattern. The 32 variables selected and computed for this study are considered to reflect significant aspects of urbanism. They relate to the following attributes of the area.

I.	Demographic Characteristics.	9 variables
II.	Agro-Economic Structure.	6 variables
III.	Urban Facets.	11 variables
IV.	Population Change & Movement.	6 variables

A detailed list of variables together with abbreviated names used in the analysis appears in Table 4.1.

Among demographic variables such indices are employed which are concerned more with economic and social characteristics such as literacy, adult percentage, male index and total dependency ratio. Moreover, similar indices

TABLE 4.1

SPATIAL VARIATIONS OF URBANISM IN THE UIP

List of 32 Variables with abbreviated names used in the analysis.

I. DEMOGRAPHIC CHARACTERISTICS — 9 Variables.

1. 'TPOP' Total Population (in '00,000)
2. 'DENS' Density of Population.
3. 'SEXR' Sex Ratio (males /000 females)
4. 'LTPC' Percentage of Literacy.
5. 'LTML' Percentage of Male Literacy.
6. 'ADPC' Adults Percentage of Total Population.
7. 'CHPC' Children Percentage of Total Population.
8. 'MLIN' Male Index.
9. 'TDR' Total Dependency Ratio.

II. AGRO-ECONOMIC STRUCTURE — 6 Variables.

10. 'CULB' Culturable Area (Percentage of Total Area).
11. 'CTVD' Cultivated Area (Percentage of Culturable Area).
12. 'IRRD' Irrigated Area (Percentage of Cultivated Area).
13. 'CLIR' Canal Irrigated Area (Percent. of Irrigated Area).
14. 'CLF' Civilian Labour Force.
15. 'ALF' Agricultural Labour Force. (Percentage of CLF).

III. URBAN FACETS — 11 Variables.

16. 'UPOP' Urban Population (Percentage of Total Population).
17. 'USEX' Urban Sex Ratio (males/000 females).
18. 'ULIT' Urban Literacy.
19. 'UMLT' Urban Male Literacy.
20. 'UFLT' Urban Female Literacy.
21. 'UAPC' Urban Adults (Percentage of 'UPOP').
22. 'UCPC' Urban Children (Percentage of 'UPOP').
23. 'UMIN' Urban Male Index.
24. 'UTDR' Urban Total Dependency Ratio.
25. 'UCLF' Urban Civilian Labour Force.
26. 'NALF' Urban Non-Agricultural Labour Force.

IV. POPULATION CHANGE & MOVEMENT — 6 Variables.

27. 'POCH' Population Change (Percentage change 1951-61).
28. 'UPCH' Urban Population Change (1951-61).
29. 'INDP' Indigenous Population (Born in the District).
30. 'CODT' Migrants from Contiguous Districts.
31. 'NCDT' Migrants from Non-contiguous Districts.
32. 'OSWP' Migrants from Outside West Pakistan (mostly from the Subcontinent)

from among the urban population, as also female literacy, child percentage, etc., characterise significant elements of study. Total civilian labour force, agricultural labour force and non-agricultural labour force are included as measures of human/economic resource. Indices of cultivated area, and irrigated area reflect the agricultural base of the economy in the region. Inter-censal population change and intra-regional movement of population reflect the changing socio-economic response in different districts.

The number and range of variables used for this analysis seems quite appropriate as they cover most of the significant indices related to the urban population of the districts. However, data relating to inter-urban movement (which are not compiled by the census authorities), would have brought out an important dimension of urban migration within different districts. So is the case with per capita income or indices related to income from agriculture, manufacturing or service sectors of economy. Nevertheless, the main object of differentiating regions on the basis of development and change is fulfilled by the variety of available data in this case. Any detailed analysis of the economy could be carried out if and when such data became available.

COMPUTATION OF DATA AND CLASSIFICATORY PROCEDURE:

Various sets of demographic and economic data in their

raw form were available in the Census Bulletins, Provincial and District Census Reports of the Census of Pakistan. Agricultural indices were selected from the Pakistan Census of Agriculture, Vol. II, West Pakistan. Relevant data for the areas under study were worked out by the author on high speed electronic calculators available in the Department of Geography, University of Durham.

For the analysis of the selected variables, which follows in this chapter, a Q-Mode Factor Analysis Programme, developed by J.E. Klovan of the University of Calgary, Canada was employed. The computer programme was written by the author according to the set procedure and run on an IBM System/360/67 machine with the assistance of Durham University Computer Unit. The programme starts with the computation of means and vector lengths, followed by matrix of correlation. As a second step, eigenvalues and eigen vectors of the correlation matrix are extracted sequentially, using modified Hotelling iterative procedure.[11] Extraction of eigenvalues is terminated when 10 eigenvalues have been extracted, or when 99% of the variation is explained. Then the component factor matrix, based on the principal axis solution, along with the communalities is listed.[12] Each factor loading in the matrix represents the correlation of a particular variable with the corresponding factor, while a communality shows the amount of variance explained by all factors. As the component solution produces very general factors, not easily identifiable, this principal component factor matrix is rotated according to the standard varimax

procedure for all the factors extracted.[13] This is followed by a factor score matrix for individual samples.

THE RESULTS

Tables 4.2 to 4.4 and Appendix I list the results of the factor analysis. A maximum of variance (99.24 per cent) is found to be explained by six component factors. This small number of principal factors is evidence of homogeneity and extreme linkage within the characteristics of the region. The eigenvalue of each principal factor together with the percentage of variance it explains, is detailed in Table 4.2. A correlation matrix of 32 x 32 variables is shown in Appendix I.

A component factors solution is put up in Table 4.3(a) The varimax rotation was employed to simplify such factors. The varimax rotation has the property of rendering the principal factor loadings either high or low while maintaining each variable's communality. This enhances identification of factors which account for the pattern of association in the correlation matrix. The rotated factor matrix is shown in Table 4.3(b). The scoring of 16 individual districts on the factors is listed in Table 4.4.

INTERPRETATION OF FACTORS & ANALYSIS OF DISTRICT SCORES:

The six component factors identified here are independent of each other, but each tells a part of the total variance. Their independence means that a classification in terms of,

TABLE 4.2

URBAN CHARACTERISTICS, UPPER INDUS PLAINS

PERCENTAGE OF VARIANCE EXPLAINED BY EACH FACTOR

	Eigenvalues	Percentage of Total Variance	Cumulative Percentage of Total Variance
FACTOR I	29.65	92.66	92.66
FACTOR II	0.92	2.86	95.52
FACTOR III	0.54	1.68	97.52
FACTOR IV	0.31	0.97	98.17
FACTOR V	0.18	0.57	98.74
FACTOR VI	0.16	0.50	99.24

TABLE 4.3

UPPER INDUS PLAIN

URBAN CHARACTERISTICS

(a) Principal Component Factor Matrix

VARIABLES		FACTORS						
		COMM.	1	2	3	4	5	6
1	'TPOP'	0.9757	0.9259	0.2414	0.1456	0.0801	-0.1802	0.0034
2	'DENS'	0.9887	0.8735	0.4325	0.1901	-0.0370	-0.0299	0.0162
3	'SEXR'	0.9996	0.9970	-0.0344	-0.0597	-0.0145	-0.0186	-0.0177
4	'LTPC'	0.9975	0.9714	0.1848	0.0458	-0.0757	0.0913	0.0599
5	'LTML'	0.9968	0.9807	0.1393	0.0650	-0.0649	0.0761	0.0752
6	'ADPC'	0.9993	0.9975	-0.0070	-0.0702	-0.0032	-0.0146	-0.0076
7	'CHPC'	0.9993	0.9948	-0.0562	-0.0727	-0.0189	-0.0277	-0.0022
8	'MLIN'	0.9993	0.9979	-0.0115	-0.0561	-0.0056	-0.0139	-0.0149
9	'TDR'	0.9997	0.9935	-0.0701	-0.0797	-0.0219	-0.0293	0.0014
10	'CUCB'	0.9856	0.9597	0.1944	-0.0354	0.1211	-0.0146	0.1031
11	'CIVD'	0.9952	0.9972	0.0052	-0.0151	0.0118	-0.0193	-0.0053
12	'IRRD'	0.9923	0.9667	-0.0497	0.0307	0.0809	-0.0936	-0.1967
13	'CLIR'	0.9782	0.9715	-0.1342	0.0293	0.1107	0.0452	-0.0337
14	'CLE'	0.9994	0.9931	-0.0592	-0.0903	-0.0121	-0.0326	-0.0159
15	'ALE'	0.9965	0.9741	-0.1647	-0.1337	-0.0091	-0.0495	-0.0029
16	'UPOP'	0.9556	0.8861	0.2288	0.2562	-0.1708	0.1315	-0.0139
17	'USEX'	0.9998	0.9978	-0.0397	-0.0460	-0.0142	-0.0194	-0.0013
18	'ULIT'	0.9935	0.9872	0.0647	-0.0694	-0.0929	0.0350	0.0098
19	'UMLT'	0.9960	0.9903	0.0596	-0.0859	-0.0799	0.0261	0.0223
20	'UELT'	0.9821	0.9609	0.1949	-0.0392	-0.1228	0.0582	-0.0262
21	'UAPC'	0.9998	0.9969	-0.0217	-0.0720	-0.0118	-0.0179	-0.0076
22	'UCPC'	0.9984	0.9955	-0.0295	-0.0760	-0.0137	-0.0213	0.0025
23	'UMIN'	0.9996	0.9981	-0.0336	-0.0434	-0.0139	-0.0203	-0.0019
24	'UTDP'	0.9963	0.9939	-0.0398	-0.0790	-0.0097	-0.0209	0.0018
25	'UCLE'	0.9984	0.9967	-0.0536	-0.0381	0.0156	-0.0191	0.0093
26	'NALE'	0.9986	0.9960	0.0308	-0.0641	-0.0040	-0.0386	-0.0096
27	'POCH'	0.9875	0.9357	-0.3071	0.1011	-0.0777	0.0352	-0.0087
28	'UPCH'	0.9967	0.8867	-0.3358	0.1909	0.1328	-0.0096	0.2803
29	'INDP'	0.9991	0.9802	-0.0493	-0.1716	-0.0759	-0.0206	0.0153
30	'CDDT'	0.9965	0.9021	-0.0054	-0.0834	0.2886	0.2930	-0.0810
31	'NCDT'	0.9769	0.7822	-0.4236	0.3966	-0.1338	0.0206	-0.0492
32	'DSWP'	0.9810	0.9056	0.1593	0.2472	0.2574	-0.0736	-0.0521
	VARIANCE		92.660	2.862	1.675	0.968	0.577	0.502
	CUM. VAR		92.660	95.522	97.197	98.165	98.742	99.244

(b) Varimax Factor Matrix

VARIABLES		FACTORS						
		COMM.	1	2	3	4	5	6
1	'TPOP'	0.9757	0.7273	-0.2981	-0.5018	0.1222	-0.2699	0.1373
2	'DENS'	0.9887	0.8722	-0.2066	-0.3971	0.1247	-0.0911	0.0612
3	'SEXR'	0.9996	0.4974	-0.4032	-0.7339	0.1929	-0.0893	0.0767
4	'LTPC'	0.9975	0.6961	-0.3267	-0.5977	0.1973	0.0434	0.0901
5	'LTML'	0.9968	0.6517	-0.3311	-0.6405	0.1953	0.0361	0.1130
6	'ADPC'	0.9993	0.5128	-0.3769	-0.7339	0.2015	-0.0878	0.0863
7	'CHPC'	0.9993	0.4765	-0.4076	-0.7468	0.1809	-0.0857	0.0912
8	'MLIN'	0.9993	0.5151	-0.3897	-0.7259	0.2014	-0.0903	0.0801
9	'TDR'	0.9997	0.4635	-0.4118	-0.7538	0.1771	-0.0836	0.0943
10	'CUCB'	0.9856	0.6433	-0.2250	-0.6299	0.2546	-0.1175	0.2138
11	'CIVD'	0.9952	0.5406	-0.4001	-0.6928	0.2060	-0.1050	0.0971
12	'IRRD'	0.9923	0.4828	-0.4495	-0.6530	0.2350	-0.2724	-0.0324
13	'CLIR'	0.9782	0.4263	-0.4952	-0.6499	0.3163	-0.1272	0.1123
14	'CLE'	0.9994	0.4654	-0.3975	-0.7580	0.1853	-0.0962	0.0813
15	'ALE'	0.9965	0.3611	-0.4284	-0.7956	0.1720	-0.0983	0.1018
16	'UPOP'	0.9556	0.7771	-0.4315	-0.3717	0.1444	0.0797	-0.0172
17	'USEX'	0.9998	0.4997	-0.4141	-0.7259	0.1889	-0.0853	0.0930
18	'ULIT'	0.9935	0.5730	-0.3431	-0.7190	0.1666	-0.0054	0.0526
19	'UMLT'	0.9960	0.5342	-0.3598	-0.7398	0.1687	-0.0018	0.0736
20	'UELT'	0.9821	0.6683	-0.2758	-0.6579	0.1611	0.0237	-0.0073
21	'UAPC'	0.9998	0.5022	-0.3863	-0.7393	0.1935	-0.0851	0.0847
22	'UCPC'	0.9984	0.4956	-0.3877	-0.7431	0.1878	-0.0821	0.0940
23	'UMIN'	0.9996	0.5057	-0.4115	-0.7232	0.1885	-0.0868	0.0923
24	'UTDP'	0.9963	0.4849	-0.3913	-0.7453	0.1909	-0.0839	0.0954
25	'UCLE'	0.9984	0.4884	-0.4218	-0.7183	0.2070	-0.0986	0.1155
26	'NALE'	0.9986	0.5423	-0.3550	-0.7251	0.1848	-0.1062	0.0849
27	'POCH'	0.9875	0.3309	-0.6643	-0.6342	0.1656	-0.0230	0.0806
28	'UPCH'	0.9967	0.2918	-0.6519	-0.6356	0.2052	-0.0683	0.4294
29	'INDP'	0.9991	0.4459	-0.3446	-0.8094	0.1435	-0.0297	0.0761
30	'CDDT'	0.9965	0.4173	-0.3002	-0.6017	0.6018	-0.0491	0.0747
31	'NCDT'	0.9769	0.2740	-0.8723	-0.3593	0.0925	-0.0557	-0.0065
32	'DSWP'	0.9810	0.6684	-0.3848	-0.3977	0.3184	-0.3223	0.1505
	VARIANCE		29.398	17.908	44.323	4.810	1.360	1.445
	CUM. VAR		29.398	47.306	91.629	96.439	97.799	99.244

TABLE 4.4

UPPER INDUS PLAIN

Urban Characteristics

VARIMAX FACTOR SCORE MATRIX

FACTOR	1	2	3	4	5	6
DISTRICTS						
1	0.8710	0.6891	-1.3657	-0.3116	1.0136	0.2400
2	0.3271	0.0103	-0.9157	1.2657	0.4629	-0.4141
3	-0.1826	-0.6906	-0.9361	0.0862	1.9416	2.8460
4	1.4054	-0.3917	0.0794	-0.1235	-1.4012	1.5500
5	0.3158	0.3240	-1.3869	0.0792	0.1710	-0.5201
6	1.4841	0.7805	-1.0355	-1.0599	0.1989	0.0213
7	2.9018	-1.3231	0.9437	-0.5967	0.8829	-0.9096
8	0.3081	0.4269	-0.7693	1.9355	-0.4135	0.3589
9	0.8746	0.2023	-0.4069	2.3280	0.6492	-0.6370
10	0.5370	0.2455	-0.6458	0.8155	-1.8892	0.3683
11	0.7709	-0.3647	-0.4835	-0.3658	-1.6384	0.5835
12	-0.2364	-0.3274	-1.4939	-0.4034	-0.2939	-0.7539
13	-0.4015	0.0978	-2.0121	-1.4292	-0.4708	-0.5353
14	-0.1545	-1.6563	-0.1878	0.5866	-0.9895	0.5302
15	-0.3962	-1.7414	-0.7734	0.4564	0.2564	-1.4314
16	-0.5184	-2.4535	-0.5250	-0.1779	0.1395	0.1214

say, the second factor is strictly independent of a classification in terms of the first or third or fourth factor.[13] In the case of the first factor, the weights are greater, therefore, the associations stronger for those primary variables which are directly or indirectly associated with it. Thus, Factor I becomes an aspect of overwhelming dominance and importance in explaining the widest dimension of variance. The other 5 factors that follow, naturally account for decreasing proportions of the total variance.

Six maps have been drawn to show the spatial variation as explained by each factor individually. However, the first four factors which explain 98.2 % of the total variance are interpreted here for their significance and high or low scoring of different districts on each of these factors is analysed. The inter-relationships of these four factors are illustrated in Figure 4.1. As the complete factor loadings are listed in the Tables, only the highest loadings, representing variables that characterize the component factors are discussed below. Further, group headings for each of the 'clustered attributes' of the factors are suggested for identification.

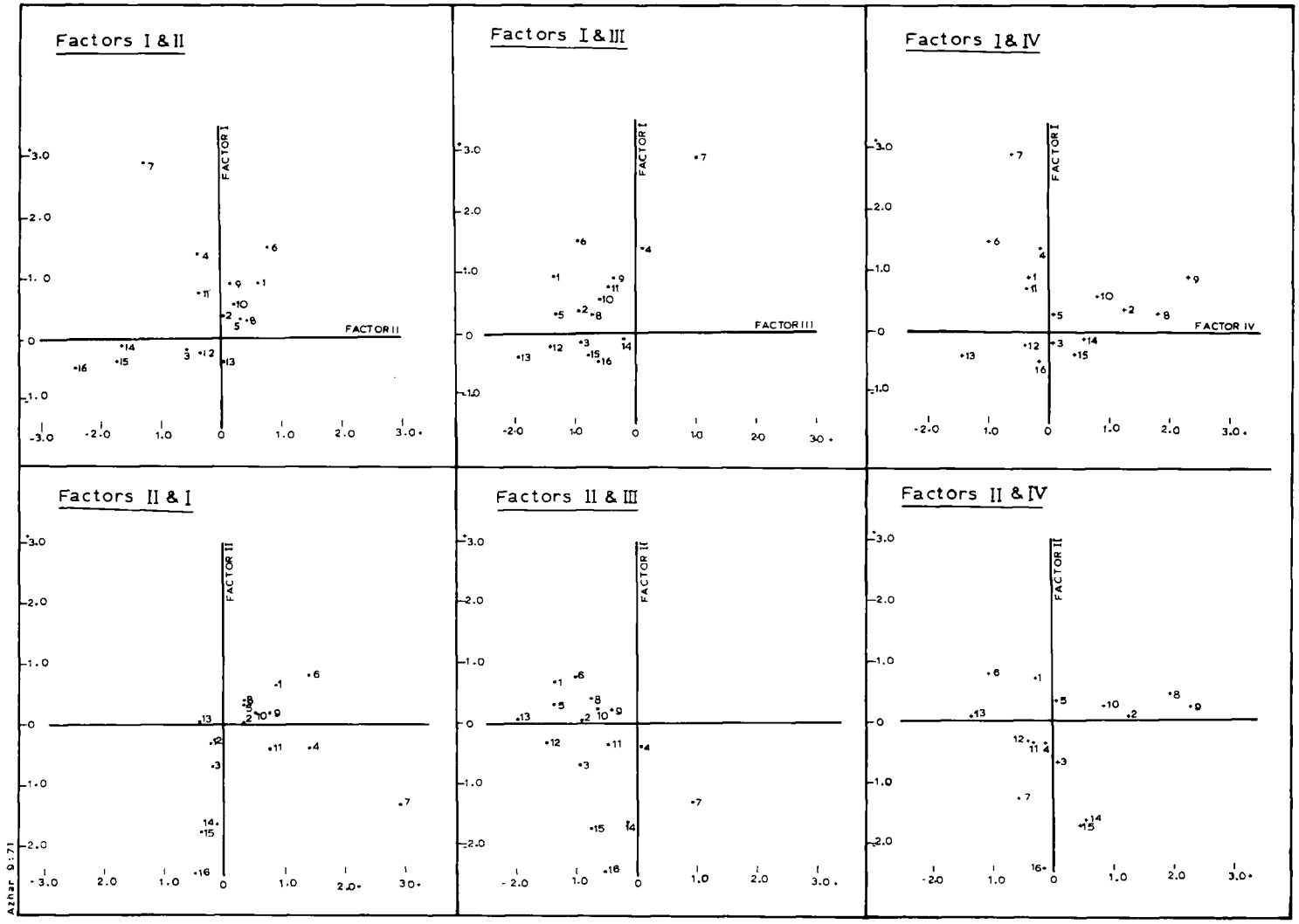
FACTOR I MODERNIZATION, URBANIZATION

The highest weighted loadings for the first factor in the rotated matrix include Density, Urban Population, Total Population and people coming from outside West Pakistan. Thus the districts having positive scores on this factor are reckoned with higher densities, higher percentage of urban population and also a very high proportion of people moving in from other parts of the Subcontinent, than from within

Figure 4.1

UPPER INDUS PLAIN

DISTRIBUTION OF DISTRICTS
BY INTER-FACTORIAL RELATIONSHIPS
(Main Factors)



Numbers are identical to Districts in Appendix I (i)

Azhar 9:71

West Pakistan itself. These factors reflect a high attraction of the districts and trends towards modernization.

Other high loadings for the first factor include ADPC, MLIN among the total population and UFLT, ULIT, UMLIT, UADPC, UMIN and NALF all of which reflect the urban character of the districts which score high positive values in this case.

Districts showing high scoring on this first factor are Lahore, Lyallpur, Sialkot, Gujrat, Montgomery and Multan. All these districts are almost contiguous in between the rivers Ravi and Jhelum with the exclusion of Sheikhupura, Sargodha and Jhang. This later group of districts comes second in rank and together with the first group completes the area of earliest developments in the region.

The districts of negative scoring (upto - 0.5) are Dera Ghazi Khan, Bahawalpur, Muzaffargarh, Mianwali and Bahawalnager, in order of increasing scores. These districts skirt the positively scoring districts like a fork on the northwestern and southeastern sides. Rahimyar Khan, which is at the extreme southwestern corner of the region has the least score of - 0.52. The spatial pattern of this factor is illustrated in Figure 4.2(a).

In all, modernization and urbanization is found as a high characteristic of 10 out of 16 districts.

FACTOR II POPULATION MOVEMENT

Factor II reveals negatively weighted loadings, the highest three of which relate to Population Change, Urban Population Change and movement of people from Non-contiguous

Figure 4.2

UPPER INDUS PLAIN

SPATIAL VARIATIONS OF URBANISM

DISTRIBUTION OF FACTORS

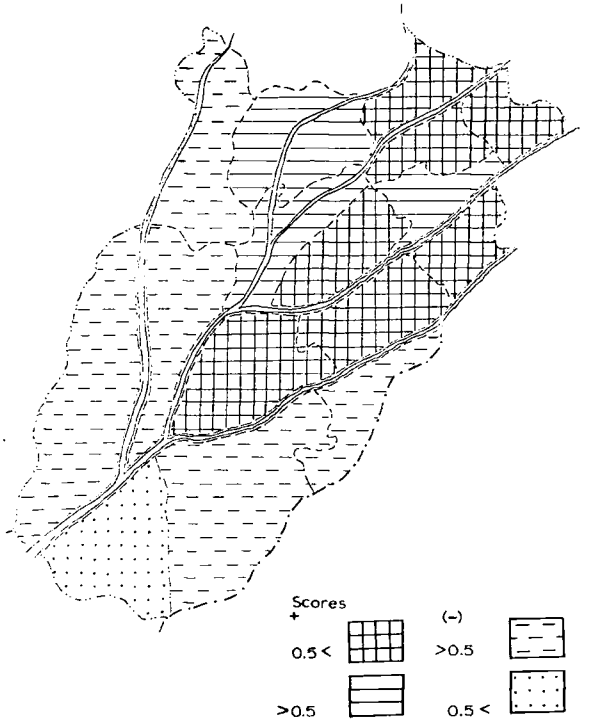
PERCENTAGE OF TOTAL VARIANCE EXPLAINED BY EACH FACTOR

Factors	Eigenvalues	Variance Explained	
		%	cum. %
1	29.65	92.66	92.66
2	0.92	2.86	95.52
3	0.52	1.67	97.19
4	0.31	0.96	98.16
5	0.18	0.57	98.74
6	0.16	0.50	99.24

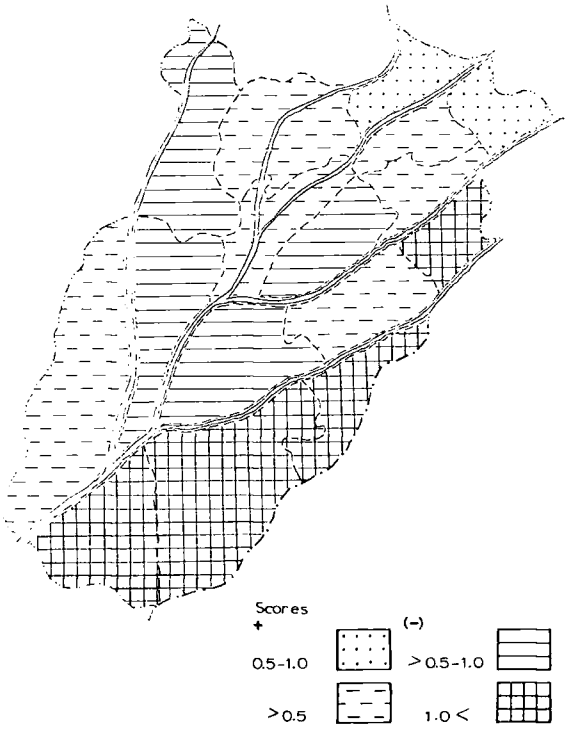
KM 20 0 20 40 60 80 100 120 140 160 KM

MILES 20 0 20 40 60 80 100 MILES

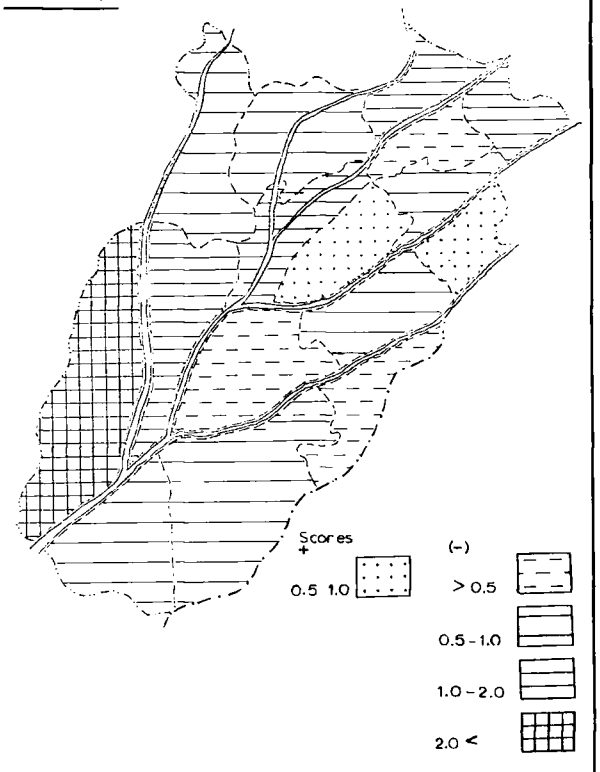
(a) FACTOR I



(b) FACTOR II



(c) FACTOR III



Azhar 9:71

CONTINUED....

Districts. Thus the districts having negative scores on this component factor show most attraction for population change and movement as compared to districts having positive scores. Looking for population change and movement Rahimyar Khan, Lahore, Bahawalpur and Bahawalnagar stand out as the districts exhibiting highest attraction, followed by Lyallpur, Multan, Muzaffargarh and Mianwali. These districts have not only attracted more people in aggregate, in the past decade, but have shown more percentage change in their urban population as well.

Districts showing least change in their population or less proportion of people moving in from non-contiguous areas are Sialkot and Gujrat. Immigration of people from non-contiguous areas is an indicator of urban change, as such people from far off places are attracted mostly to the towns. Districts of Sargodha, Sheikhupura, Gujranwala, Montgomery and Dera Ghazi Khan show scores of upto 0.5.

Thus more people are moving into new areas of development --Rahimyar Khan, Mianwali, Muzaffargarh-- or districts of high industrial attraction, i.e. Lyallpur, Multan and Lahore. Figure 4.2(b).

FACTOR III RURALLY BIASED ECONOMY

Rurally biased economy, dependent on traditional agriculture is revealed by Factor III. It highlights the indices of Indigenous Population, Agricultural Labour Force, Civilian Labour Force and high Dependency Ratio. This is also a negatively weighted factor. The highest score (+2) is obtained by Dera Ghazi Khan, where conditions of rurality

are most apparent for difficult communications and aloofness from rest of the region.

Muzaffargarh, Jhang, Gujrat and Sialkot are other districts scoring high on this factor. Lahore and Lyallpur stand out as the districts with least scores. Figure 4.2(c) illustrates the scoring of each district on factor III.

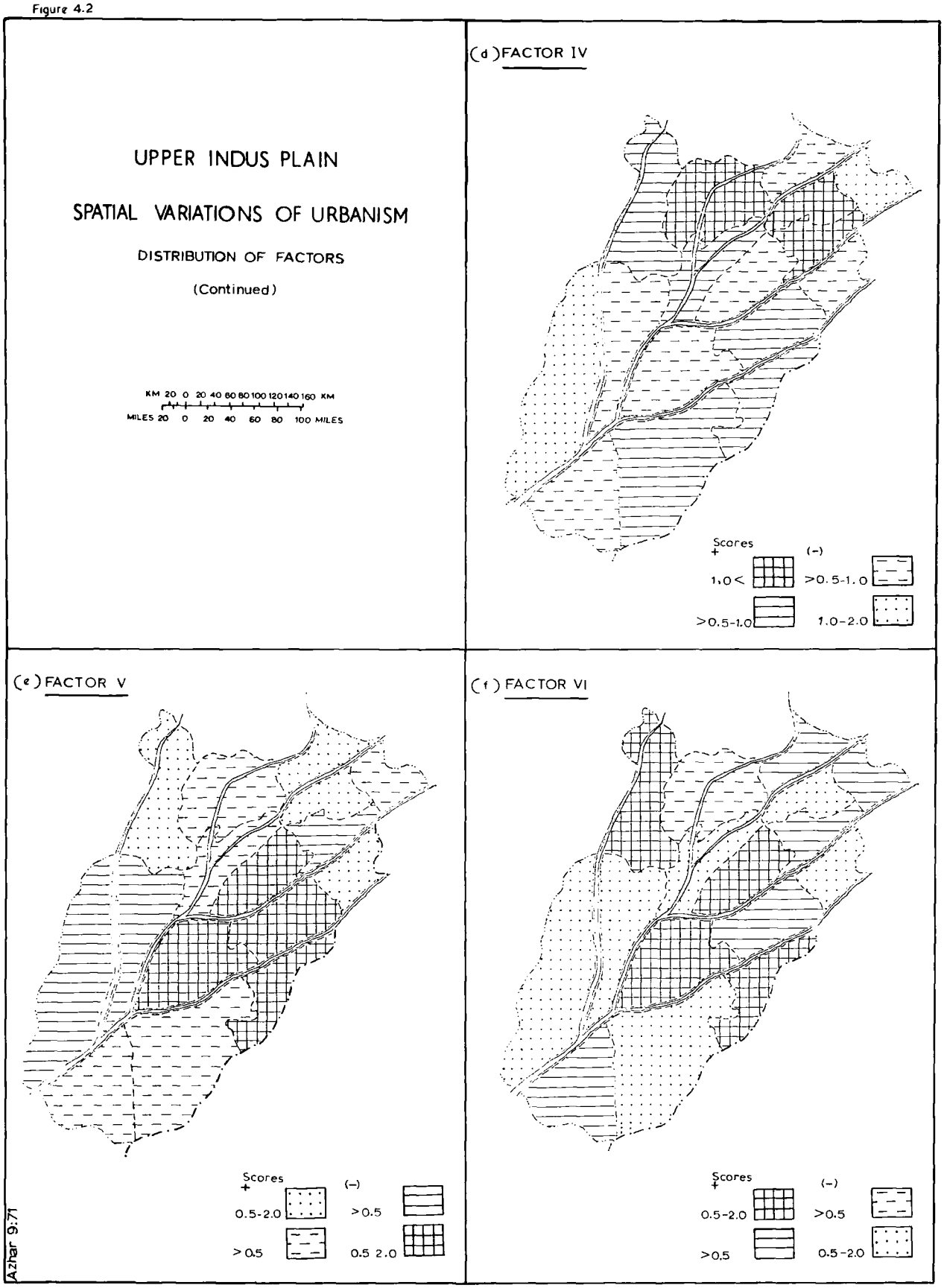
FACTOR IV DEVELOPED AGRICULTURAL ECONOMY

A positively weighted loadings for Factor IV related to people coming from contiguous districts as well as from outside West Pakistan and higher percentage of Canal Irrigated Lands. Total Culturable Area comes next in importance for this component factor. Thus it reveals attractive agricultural economy of the districts scoring high points on this factor. Highest score is obtained by Gujranwala followed by Sargodha and Sheikhupura districts. Montgomery, Bahawalnagar, and Bahawalpur form the next important group of districts having a developed agricultural economy. The least scoring district on this factor is again Dera Ghazi Khan (-1.4). The other district having a high negative score on Factor IV is Sialkot (-1.0), which district is least affected by canal irrigation. Figure 4.2(d)

FACTOR V & VI

Factors V & VI together explain only 1.07 per cent of the total variation and thus are too weak for attempting any explanation. This proportion of 'weak' relationship may be covering some other aspects of agro-economy or population growth within the primary variables. However,

Figure 4.2


UPPER INDUS PLAIN
SPATIAL VARIATIONS OF URBANISM
DISTRIBUTION OF FACTORS
(Continued)
KM 20 0 20 40 60 80 100 120 140 160 KM
MILES 20 0 20 40 60 80 100 MILES
(d) FACTOR IV
Scores
+
(-)
1.0 <
>0.5-1.0
>0.5-1.0
1.0-2.0
(e) FACTOR V
Scores
+
(-)
0.5-2.0
>0.5
>0.5
0.5 2.0
(f) FACTOR VI
Scores
+
(-)
0.5-2.0
>0.5
>0.5
0.5-2.0
Azhar 9:71

Figures 4.2 (e) and (f) illustrate the ranking of respective districts on these two factors respectively.

CONCLUSION

The study of urban facets required application of multivariate technique, as the relationship among the sets of data are both complex and multidimentional. The application of the Factor Analysis produced six factors accounting for basic variations which have been interpreted above. The impact of developments is strongly evident in all the factors which have emerged in the analysis. Modernization and urbanization is the outcome of sustained efforts and implementation of colonization programmes in the greater part of the region. The hypothesis is further supplemented as areas of incipient developments are highlighted with population change and movement.

The regional distribution of factor scores confirms the above interpretation. The highest scores are obtained by the districts with long established irrigation developments and colonization. The least scores are for the areas of recent openings.

REFERENCES

1. POCOCK, D.C.D., & WISHART, (1969) 'Methods of Deriving Multi-Factor Uniform Regions', Institute of British Geographers, Transactions No. 47, September, (1969) pp. 73-98.

2. COLE, J.P. & KING, C.A.M., (1969) Quantitative Geography, John Wiley & Sons Ltd., London, p.153.

3. KENDALL, M.G., 'The Geographical Distributions of Crop Productivity in England', Journal of Royal Statistical Society, No. 102 (1939), pp.21-62.

4. BERRY, B.J.L., 'A Method for Deriving Multifactor Uniform Regions', Przeglad Geograficzny, Vol. 33/2 (1961), pp. 263-279.

5. HORTON, F.E., McCONNELL, H., TIRTHA, R., (1970) 'Spatial Patterns of Socio-economic Structure in India', Tijdschrift voor Econ. en Soc. Geografie, Vol. 61, (March-April, 1970), pp. 101-113.

6. HAUTAMAKI, L., (1970) 'The Use of Multivariate Methods in Regional Geographical Analysis', Fennia, Vol. 99/6 (1970), pp.5-25.

7. MOSER, C.A., & SCOTT, W., British Towns, Centre for Urban Studies: Report No. 2, Oliver & Boyd, Edinburgh, 1961.

8. BERRY (1961), op cit.

9. BERRY (1961), op cit.

10. DAWSON, J.A., (1970) 'A Scale Problem in the Definition of Multifactor Regions', Tijdschrift voor Econ. en Soc. Geografie, Vol. 61 (July-Aug. 1970), pp. 207-214.

11. KLOVAN, J.E., Q-Mode Factor Analysis Programme in Fortran IV for small Computers, University of Calgary. 1968.

12. KING, Leslie, J., Statistical Analysis in Geography, Prentice-Hall Inc., Englewood Cliffs, New Jersey (1969), p. 185.

13. MOSER & SCOTT, op cit., p.75.

CHAPTER: V

AN ANALYSIS OF TOWN CHARACTERISTICS IN THE UIP

In the preceding chapter a study of urbanism in the UIP, as manifested in four broad dimensions, was made on the basis of which differing patterns and subregions were recognised. The following chapter analyses town characteristics for all the towns and cities of over 20,000 population in the region.(*) The procedure followed and the model adopted for this study is akin to that which was followed in the previous chapter. However, the variables selected for this study are totally different and relate to the characteristics of individual urban centres of the stated size under study. The groups of towns arrayed on the basis of this analysis reveal the trends in town life as also their spatial distribution.

In all, a total of 28 variables have been used. Of these, 13 variables were taken from the Census of Housing, and their selection was guided by an attempt to provide a comprehensive coverage to a variety of housing and household conditions. Other demographic characteristics of the individual towns were available in the District Reports of the Census of Pakistan. Variables relating to accessibility among towns were calculated empirically. However, important

---

(*) The names and location of the 38 towns studied here, appear at Appendix II(A). Muzaffargarh, though less than 20,000 in population, has been included in the analysis, being district headquarter town in an area where current development is in progress.

economic data pertaining to employment structure could not be included as this has been reported by the Census authorities for cities of over 100,000 population only. As for individual variables, each has a certain degree of theoretical support in their selection, in that, these are parameters of prevailing social attitudes; and provide a significant basis for areal differentiation within towns. Robson (1969) has utilized 30 variables, in his study of Urban Analysis of Sunderland; some of his sets of variables are similar, such as household tenure, household accommodation and composition and nature of housing types.[1]

Thus the 28 variables fall into six sub-groups and relate to the following attributes of towns under study:

I.	Demography	6 variables
II.	Household accommodation & Composition	7 variables
III.	Household Tenure	3 variables
IV.	Housing Structure	3 variables
V.	Civic Facilities	5 variables
VI.	Accessibility	4 variables

A detailed list of the variables together with their abbreviated names, is given in Table 5.1.

MULTIPLE CORRELATIONS AND FACTOR ANALYSIS

For the aforementioned data, the writing, checking and running of the Computer Programme was performed as in the case of the earlier programme detailed in Chapter IV. Here, like Moser and Scott's study of British Towns, the objective was to extract basic patterns according to which

TABLE 5.1

ANALYSIS OF TOWN CHARACTERISTICS IN THE UIP

List of Variables and their abbreviated names used in the Factor Analysis

I.	DEMOGRAPHIC CHARACTERISTICS		6 Variables.
1.	'TOTPOP'	Total Population.	
2.	'POPDNY'	Population Density.	
3.	'LITRAT'	Percentage of Literacy.	
4.	'FLITRA'	Percentage of Female Literacy.	
5.	'POPCHG'	Population Change.	
6.	'SECRTO'	Sex Ratio (Males/000 females).	
II.	HOUSEHOLD ACCOMMODATION AND COMPOSITION		7 Variables.
7.	'AVPPRM'	Average number of Persons per Room.	
8.	'AVRMHH'	Average Rooms per Household.	
9.	'PUOPRM'	Percentage of One Person per Room.	
10.	'HHTFRM'	Household of Three to Five Rooms.	
11.	'HHSMRM'	Household of Six or More Rooms.	
12.	'DNHOUG'	Density of Housing.	
13.	'DNHHLD'	Density of Household.	
III.	HOUSEHOLD TENURE		3 Variables.
14.	'OWNOCU'	Percentage of Household Owner occupied.	
15.	'RENTED'	Percentage of Household Rented.	
16.	'FREE'	Percentage of Household Free (Tied Accommodation).	
IV.	HOUSING STRUCTURE		3 Variables.
17.	'PPUCHS'	Percentage of Pucca Houses. (Superior quality).	
18.	'PSPUHS'	Percentage of Semi-pucca Houses.	
19.	'PKACHS'	Percentage of Kacha Houses. (Low quality).	
V.	ACCESSIBILITY		4 Variables.
20.	'DSCYRL'	Distance from City by Rail.	
21.	'DSCYRD'	Distance from City by Road.	
22.	'NRLRDG'	Number of Rails Radiating.	
23.	'NRDRDG'	Number of Roads Radiating.	
VI.	CIVIC FACILITIES		5 Variables
24.	'PRYSCH'	Number of Primary Schools.	
25.	'HEDUIN'	Number of Higher Educational Institutions.	
26.	'MNPOST'	Number of Main Post Offices.	
27.	'TBANKS'	Number of Banks.	
28.	'THOSPL'	Number of Hospitals.	

towns of the Upper Indus Plain vary. A list of towns with their enumerated population and a location map for reference is included in Appendix II (A) and II (B).

THE RESULTS

The results of the Factor Analysis are shown in Tables 5.2 to 5.4 and the correlation matrix in Appendix II. The accompanying maps and graphs illustrate the multi-dimensional patterns graphically.

Almost all the variance (99.06 per cent), is explained by 10 factors. The eigenvalue of each factor and the variance it explains is detailed in Table 5.2. Table 5.3(a) depicts the component factors matrix and the loadings for individual variables on different factors. The varimax rotated results are shown in Table 5.3(b) and the individual town scores on this matrix appear in Table 5.4.

INTERPRETATION OF THE FACTORS AND ANALYSIS OF TOWN SCORES:

As noted earlier, each factor is independent of the others and relates to a part of overall variance which it shares with other factors within the matrix. Its share of prominence is according to its eigenvalue or percentage of variance it explains. Factor I naturally, assumes an overwhelming prominence as it gathers as large a share as 72.3 per cent of the total variance, among the variables. There being a significant gap after the fourth factor and the total variance explained by the last six factors being very small, the interpretation is restricted to the first four factors only.

TABLE 5.2

UPPER INDUS PLAINS, TOWN CHARACTERISTICS

PERCENTAGE OF VARIANCE EXPLAINED BY EACH FACTOR

	Eigenvalues	Percentage of Total Variance	Cululative Percentage of Total Variance
FACTOR I	20.25	72.33	72.33
FACTOR II	4.06	14.51	86.85
FACTOR III	1.06	3.80	90.65
FACTOR IV	1.07	3.83	94.48
FACTOR V	0.39	1.40	95.88
FACTOR VI	0.31	1.11	96.99
FACTOR VII	0.22	0.79	97.78
FACTOR VIII	0.14	0.51	98.29
FACTOR IX	0.13	0.46	98.75
FACTOR X	0.09	0.31	99.06

TABLE 5.3

UPPER INDUS PLAIN

TOWN CHARACTERISTICS

(a) Principal Component Factor Matrix

VARIABLES		FACTORS										
		COMM.	1	2	3	4	5	6	7	8	9	10
1	'TOTPOP'	0.9946	0.5815	0.8057	-0.0648	0.0283	0.0324	0.0051	0.0029	-0.0017	-0.0131	0.0335
2	'POPDNY'	0.9979	0.8247	-0.1373	-0.2592	0.4716	-0.0342	0.0052	0.0321	-0.0447	-0.0226	-0.0180
3	'LITRAT'	0.9937	0.9767	-0.1065	0.1507	-0.0352	-0.0449	0.0079	-0.0199	0.0205	0.0157	-0.0354
4	'FLITRA'	0.9860	0.9533	-0.0280	0.2456	0.0024	-0.1008	0.0307	0.0189	0.0382	0.0064	-0.0554
5	'POPCHG'	0.9845	0.9499	-0.1649	-0.1694	-0.1208	-0.0692	0.0214	-0.0255	-0.0091	0.0042	0.0403
6	'SEXRTO'	0.9978	0.9825	-0.1619	-0.0032	-0.0521	-0.0289	-0.0309	-0.0316	0.0212	0.0115	0.0151
7	'AVPPRM'	0.9879	0.9508	-0.1573	-0.0047	-0.0281	-0.1081	-0.0455	-0.1349	0.0303	0.0720	0.1420
8	'AVRMHH'	0.9970	0.9662	-0.1930	0.1516	-0.0071	0.0367	-0.0365	0.0075	-0.0143	-0.0040	0.0156
9	'POOPRM'	0.9938	0.9227	-0.2078	0.2827	-0.0066	0.1090	-0.0139	0.0382	-0.0733	-0.0035	-0.0169
10	'NNTERM'	0.9918	0.9142	-0.2131	0.2922	0.0173	0.1189	-0.0059	0.0360	-0.0935	0.0120	0.0263
11	'NNSMRM'	0.9910	0.8839	-0.1708	0.3824	0.0145	0.0583	0.0593	0.1200	-0.0691	-0.0244	-0.0916
12	'DNHOUG'	0.9956	0.8341	-0.1631	-0.2879	0.4328	-0.0042	0.0278	0.0010	-0.0304	0.0258	-0.0267
13	'DNHHLD'	0.9993	0.8251	-0.1582	-0.2718	0.4622	-0.0228	0.0413	0.0074	-0.0519	-0.0242	-0.0163
14	'PPUCHS'	0.9972	0.9111	-0.0419	0.2986	0.0950	-0.1929	0.0857	-0.1199	-0.0208	-0.0578	0.0665
15	'PSPUHS'	0.9972	0.8375	-0.2486	-0.0858	0.0924	0.3401	-0.2373	-0.0177	0.1687	-0.1308	0.0123
16	'PKACHS'	0.9967	0.7889	-0.2771	-0.3467	-0.3216	0.0224	-0.1454	0.1168	-0.0487	0.1885	-0.0282
17	'DSCYRL'	0.9754	0.8409	-0.1966	-0.2364	-0.2949	0.1486	0.2964	-0.0447	-0.0333	-0.0750	0.0688
18	'DSCYRD'	0.9819	0.8142	-0.1933	-0.2402	-0.3753	0.1075	0.2497	-0.0110	-0.0116	-0.0749	-0.0571
19	'NRLRDG'	0.9683	0.9509	0.0306	0.0103	-0.0611	-0.1014	-0.0869	-0.0702	0.2180	-0.0185	-0.0712
20	'NRDRDG'	0.9624	0.9686	0.0388	0.0270	0.0057	0.0156	-0.0486	0.0023	0.0139	0.0871	-0.0356
21	'OWNOCU'	0.9968	0.9415	-0.2328	0.1428	0.0642	0.1272	-0.0323	-0.0341	-0.0114	0.0697	0.0913
22	'RENTED'	0.9868	0.9514	-0.0114	-0.0490	-0.0766	-0.1194	0.0590	-0.1643	0.1228	0.0352	-0.1108
23	'FREE'	0.9996	0.8286	-0.1667	-0.1764	-0.2408	-0.2093	-0.2132	0.1822	-0.0761	-0.1854	0.0274
24	'PRYSCH'	0.9953	0.5017	0.8507	-0.0491	-0.0232	0.0652	-0.0589	-0.0650	-0.0679	-0.0051	0.0186
25	'NEDUTR'	0.9877	0.6632	0.7362	-0.0147	-0.0152	0.0451	-0.0384	-0.0245	-0.0298	-0.0041	-0.0167
26	'NNPOST'	0.9981	0.7302	0.5450	0.0454	0.0584	-0.0565	0.1732	0.2055	0.1869	0.0240	0.0794
27	'TBANKS'	0.9902	0.6011	0.7889	-0.0104	-0.0407	0.0093	-0.0354	-0.0376	-0.0276	-0.0238	-0.0244
28	'THOSPL'	0.9932	0.6116	0.7788	-0.0193	-0.0433	0.0470	-0.0258	-0.0339	-0.0747	0.0128	-0.0231
	VARIANCE		72.333	14.514	3.802	3.030	1.402	1.109	0.798	0.509	0.462	0.312
	CUM. VAR		72.333	86.847	90.649	94.479	95.881	96.989	97.788	98.288	98.750	99.063

(b) Varimax Factor Matrix

VARIABLES		FACTORS										
		COMM.	1	2	3	4	5	6	7	8	9	10
1	'TOTPOP'	0.9946	0.1329	0.9687	-0.0973	0.1530	-0.0152	-0.0269	0.0564	0.0024	-0.0209	0.0330
2	'POPDNY'	0.9979	0.4495	0.1897	-0.2360	0.8353	-0.0545	-0.0326	0.0433	-0.0065	-0.0163	-0.0135
3	'LITRAT'	0.9937	0.8128	0.2819	-0.3780	0.3001	-0.0922	-0.0356	0.0359	0.0955	0.0170	0.0157
4	'FLITRA'	0.9860	0.8336	0.3374	-0.2729	0.2646	-0.1055	0.0155	0.0006	0.1143	-0.0010	-0.0128
5	'POPCHG'	0.9845	0.6044	0.2265	-0.6127	0.3941	-0.1319	-0.0153	0.0219	0.0641	0.0662	0.1029
6	'SEXRTO'	0.9978	0.7331	0.2388	-0.4812	0.3693	-0.1272	-0.0871	0.0141	0.0747	0.0351	0.0684
7	'AVPPRM'	0.9879	0.7111	0.2277	-0.4430	0.3760	-0.1349	-0.0363	-0.0174	0.1009	0.0366	0.2478
8	'AVRMHH'	0.9970	0.8322	0.2030	-0.3717	0.3225	-0.0854	-0.1190	0.0155	0.0030	0.0295	0.0259
9	'POOPRM'	0.9938	0.8932	0.1738	-0.2967	0.2443	-0.0201	-0.1023	-0.0029	-0.0641	0.0303	-0.0461
10	'NNTERM'	0.9918	0.8959	0.1655	-0.2770	0.2550	-0.0025	-0.0931	-0.0057	-0.1005	0.0327	-0.0126
11	'NNSMRM'	0.9910	0.9173	0.1848	-0.2113	0.1994	-0.0219	-0.0272	0.0726	-0.0526	0.0063	-0.1485
12	'DNHOUG'	0.9956	0.4466	0.1735	-0.2824	0.8238	-0.0365	-0.0662	0.0113	0.0302	0.0369	0.0071
13	'DNHHLD'	0.9993	0.4487	0.1720	-0.2501	0.8361	-0.0500	-0.0518	0.0112	-0.0040	-0.0110	-0.0029
14	'PPUCHS'	0.9972	0.6443	0.3032	-0.1733	0.3023	-0.1156	0.1078	0.0158	0.0971	-0.1444	0.1245
15	'PSPUHS'	0.9972	0.5974	0.1150	-0.3752	0.6322	-0.0571	-0.5450	-0.0236	0.0069	0.0236	0.0027
16	'PKACHS'	0.9967	0.4136	0.0774	-0.7698	0.2737	-0.1361	-0.1078	-0.0037	-0.0006	0.3250	0.0175
17	'DSCYRL'	0.9754	0.4886	0.1653	-0.7836	0.2561	0.0422	-0.0713	0.0210	-0.0597	-0.1328	0.0353
18	'DSCYRD'	0.9819	0.4648	0.1570	-0.8257	0.1926	0.0223	-0.0302	0.0416	0.0160	-0.1158	-0.0739
19	'NRLRDG'	0.9683	0.6674	0.4020	-0.4072	0.3157	-0.1830	-0.1029	0.0222	0.2217	0.0223	0.0390
20	'NRDRDG'	0.9624	0.6722	0.4622	-0.3695	0.3523	-0.0775	-0.0803	0.0687	0.0465	0.1308	-0.0023
21	'OWNOCU'	0.9968	0.8231	0.1587	-0.3404	0.3706	0.0202	-0.1523	-0.0051	-0.0403	0.0647	0.1072
22	'RENTED'	0.9868	0.6356	0.3536	-0.4876	0.3478	-0.0727	-0.0024	0.0418	0.2955	-0.0213	0.0501
23	'FREE'	0.9996	0.5116	0.1778	-0.5625	0.2608	-0.5052	-0.0258	0.0235	-0.0108	0.0288	0.0088
24	'PRYSCH'	0.9953	0.0793	0.9866	-0.0701	0.0664	-0.0104	-0.0363	-0.0595	-0.0114	0.0025	0.0363
25	'NEDUTR'	0.9877	0.2454	0.9409	-0.1409	0.1376	-0.0304	-0.0434	-0.0043	0.0228	0.0102	0.0027
26	'NNPOST'	0.9981	0.3692	0.7646	-0.1556	0.2243	-0.0304	0.0234	0.4484	-0.0014	-0.0080	-0.0044
27	'TBANKS'	0.9902	0.1890	0.9639	-0.1137	0.0862	-0.0507	-0.0167	-0.0096	0.0431	-0.0131	0.0011
28	'THOSPL'	0.9932	0.1962	0.9621	-0.1349	0.0952	-0.0143	-0.0056	-0.0345	0.0922	0.0190	-0.0053
	VARIANCE		38.328	23.366	16.739	14.486	1.917	1.510	0.843	0.770	0.693	0.510
	CUM. VAR		38.328	61.694	78.433	92.919	94.836	96.345	97.188	97.959	98.652	99.062

TABLE 5.4

UPPER INDUS PLAIN

TOWN CHARACTERISTICS

Varimax Factor Score Matrix

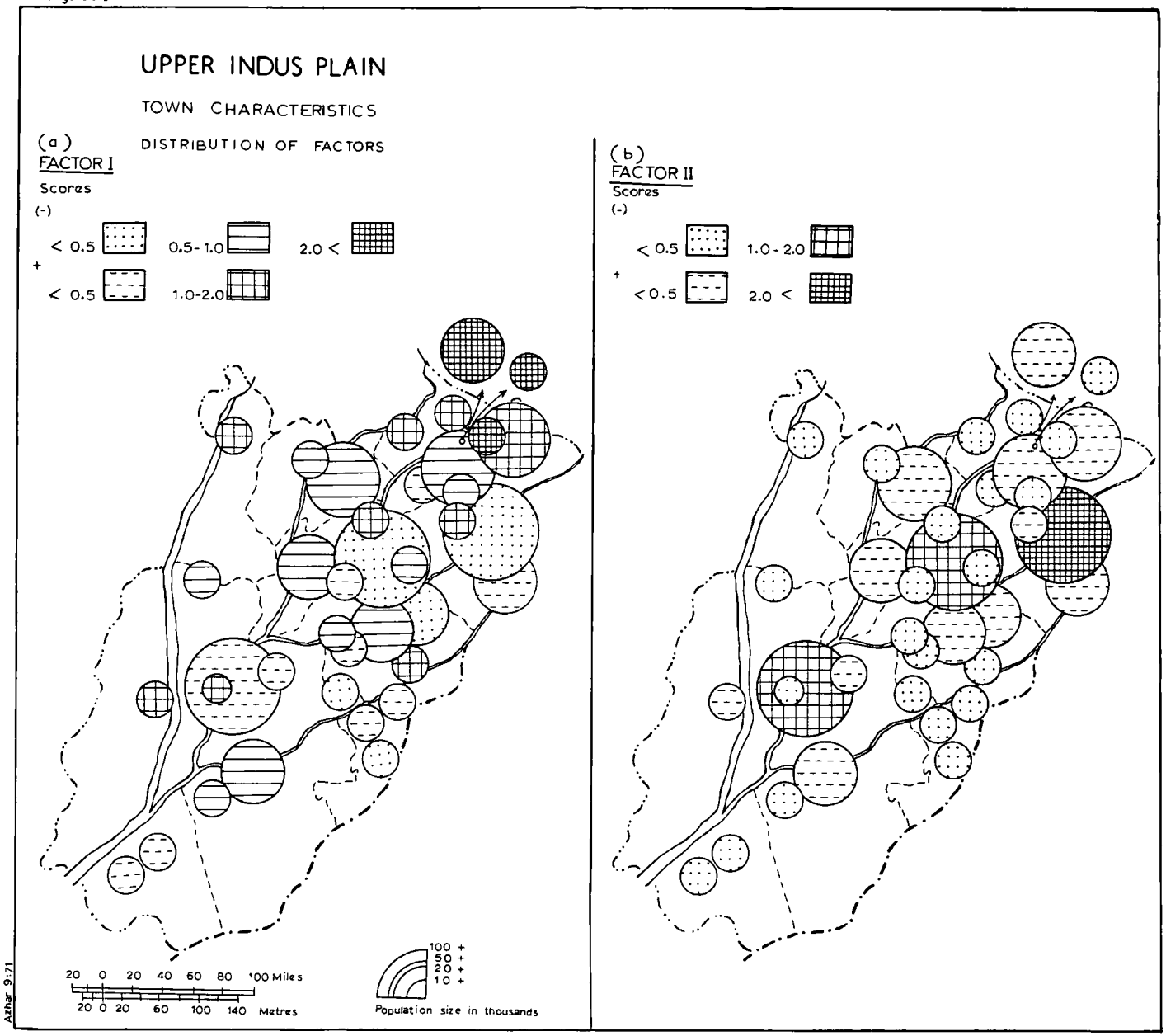
FACTOR	1	2	3	4	5	6	7	8	9	10
TOWNS										
1	-0.1188	5.8787	0.1166	-0.5778	-0.1481	-0.1369	-1.5050	-0.0583	-0.1303	-0.0448
2	-0.2641	1.0663	-0.5667	2.0884	0.2773	-0.0430	1.1770	-0.0024	-0.3453	0.8697
3	0.0114	1.1100	-0.7150	0.0374	0.5024	-0.3979	3.0208	-0.5505	0.7957	0.7841
4	0.3623	0.4565	0.0272	2.1116	-0.0707	1.4521	0.6804	-0.4574	-0.5455	-0.8475
5	1.6116	0.4707	0.4962	-0.2355	-0.5650	0.0012	3.1081	-0.2600	-0.0076	-0.2237
6	0.6422	0.3319	-0.5989	0.3308	-0.4349	-0.1607	0.5314	1.9471	-1.0670	-0.4548
7	0.9434	0.2546	-0.5713	-0.2162	0.4653	-1.0224	0.3007	-0.4117	0.3795	0.1465
8	0.7254	0.2255	-1.0635	-0.2424	0.4297	-0.3451	0.0006	0.5128	1.5690	-0.2242
9	0.9785	0.2853	-0.1371	-0.0169	-0.0309	0.3036	0.2533	0.3106	1.5364	-0.6563
10	0.3362	0.0244	-0.0791	1.1626	0.1228	-2.1340	0.1355	0.0298	-0.8815	-0.0687
11	-0.0687	0.0489	-0.1782	2.0184	0.4442	1.4086	-0.7301	1.0934	1.6657	0.3896
12	2.2558	0.1608	0.0146	-0.8075	0.4426	0.3957	1.1364	0.1184	0.0232	-0.5208
13	0.4132	0.0546	-0.6208	-0.1603	-2.2912	-0.0608	-0.1733	1.0745	0.1576	-0.9196
14	1.0751	0.0538	-0.9462	-0.0895	1.0522	-0.2728	-0.4495	-1.0730	-0.3284	0.3159
15	1.0817	-0.0175	0.5592	1.5327	0.3179	-0.5401	-0.5092	-0.0296	0.5692	-1.3282
16	0.1344	-0.0587	-2.0594	0.8152	0.8529	0.8484	-0.1215	0.7339	-0.7230	-1.2821
17	1.1220	0.1023	0.1507	0.0209	0.1345	-0.6803	-0.1867	2.0933	0.3907	0.3295
18	0.0613	-0.0581	-1.9969	-0.1529	-0.0564	-0.3354	0.1370	0.5837	-1.3995	0.3026
19	0.9281	-0.1205	-0.1438	-0.0895	0.1655	-3.4658	0.0010	-0.6632	-1.0825	0.7158
20	0.3494	-0.2064	0.4462	2.7991	-1.3758	-0.2453	-1.0565	-1.3862	-2.3160	-0.6989
21	-0.0524	-0.0686	-1.2469	0.9975	-0.0404	0.7284	-0.3744	-0.4792	0.9777	1.3679
22	0.0029	-0.0966	-0.4052	0.5872	0.2164	-0.7574	-0.3497	-0.3292	1.8897	0.5995
23	0.2192	-0.1425	-1.4282	0.4631	0.2630	-1.9394	-0.2777	1.1058	-1.2448	-0.2995
24	1.3666	-0.0277	-1.2211	-0.5813	0.0254	0.0167	-0.3990	-1.1253	-0.5425	-2.0168
25	0.4293	-0.1223	-0.0810	1.6125	0.0236	0.4769	-0.6776	0.0332	0.7246	0.1740
26	2.1128	-0.0401	0.5998	-0.7517	-0.6436	0.6334	-0.4964	1.6580	-0.5851	-1.5192
27	1.0568	-0.0836	-0.0162	-0.4454	-0.0816	-0.2609	-0.3029	-0.4173	0.1809	0.6698
28	0.0416	-0.0962	-0.4271	0.3321	-0.5403	0.1387	-0.2781	0.6591	-0.5811	1.4912
29	0.1116	-0.0331	-2.0101	-0.5378	-2.1604	0.0416	-0.2648	-1.5048	1.0190	0.3676
30	0.7581	-0.1087	0.1858	0.7296	-0.1103	-0.2858	-0.3212	0.8686	0.1711	2.5109
31	0.9148	-0.1606	0.1025	1.1130	0.3833	-1.5893	-0.5443	-0.5579	1.7469	-1.2953
32	1.8511	-0.1026	0.0411	-0.2221	0.2685	1.0838	-0.2201	0.0153	-0.1194	2.8306
33	-0.0137	-0.1352	-2.0755	-0.4293	0.0745	1.1791	-0.3259	0.1895	-0.2352	0.0870
34	1.5388	-0.0958	0.0140	-0.5070	-0.3544	0.4824	-0.4198	-0.5512	-1.3366	1.2308
35	0.5141	-0.0722	-1.9798	-0.0518	1.0389	0.0014	-0.1996	-0.3771	0.3759	0.0496
36	0.2981	-0.0378	-0.5537	0.0947	-3.0561	-0.5154	0.2199	-1.1614	0.0911	0.0090
37	2.0252	-0.0617	0.7982	0.1215	0.0144	1.1834	-1.1194	-1.6020	0.0205	0.4267
38	1.2416	-0.0302	0.0093	-0.2922	-0.2862	-1.1609	-0.2345	0.4538	1.7359	-0.4715

FACTOR I

Factor I combines a large number of variables with high weights. The variables weighting highest on this factor in the varimax matrix relate to household size and composition. Other variables of greater weights include percentage of Pucca houses, Female literacy, Average room per household, Owner occupied houses and Percentage of literacy; all getting $>.80$ loadings. The overall impression becomes that of a characteristic reflecting accommodation, quality of housing and social class. Thus large spacious houses, constructed with superior quality material and mostly owner occupied, become a distinguishing feature of towns showing high positive scores on this factor. Variables pertaining to literacy also speak of differentiation on a social basis, especially as female literacy shows a higher correlation with other such variables in the matrix.

Gujrat, Wazirabad and Daska, the three northern towns show the highest scores ($+>2.0$) on this factor. The second group of towns, namely Sialkot, Lalamusa, Mandi Bahauddin, Sheikhupura, Chiniot, Pakpattan, Mianwali, Muzaffargarh and Dera Ghazi Khan is scattered widely over the whole region. The first six of these towns are in the north-eastern sector and are within the region of higher urbanization. The last three towns of this group, namely Mianwali, Muzaffargarh and Dera Ghazi Khan, situated in the north and south of the western sector, perhaps, attain this high score because of lack of pressure on their resources; being old towns with small populations. Another feature of these later towns is retention of old traditional (feudal) housing accommodation

Figure 5.1


UPPER INDUS PLAIN
TOWN CHARACTERISTICS
DISTRIBUTION OF FACTORS
(a)
FACTOR I
Scores
(-)
< 0.5
0.5 - 1.0
2.0 <
+
< 0.5
1.0-2.0
(b)
FACTOR II
Scores
(-)
< 0.5
1.0 - 2.0
+
< 0.5
2.0 <
20 0 20 40 60 80 100 Miles
20 0 20 60 100 140 Metres
100 +
50 +
20 +
10 +
Population size in thousands
Azhar 9:71

and buildings rather than higher literate population. The distribution of scores on Factor I is depicted in Figure 5.1 (a).

Incidentally, all large cities (except Sialkot), with a population of more than 100,000 have scored low on this factor. Haroonabad, Burewala, Okara, Lahore and Lyallpur have shown the negative scores ranging from (-) 0.01 to (-) 0.2 in descending order. This reflects the large size of their population and pressure on accommodation facilities and other physical resources in case of Lyallpur, Lahore and Okara and possibly a combination of such factors, together with low literacy figures, in the cases of Burewala and Haroonabad.

FACTOR II

Factor II has picked up the set of variables depicting civic facilities and size of town population. For this factor five of the variables pertaining to civic amenities have loadings which weighted + .90, while the sixth variable, i.e., post offices weighted +.76. Incidentally there is a sharp gap among the loadings of the six variables and the rest as the next loadings is only +.46. Figure 5.2 illustrates individual town scores on Factor II.

The fact that civic facilities become associated with the size of population strengthens the notion that it is larger towns alone which hold significant social services and amenities available to their population. Lahore obviously gets highest score (+ 5), followed by Multan and Lyallpur scoring + 1.11 and 1.06 respectively. The next group of towns having positive scores include all the towns having

50,000 or more population and three towns of lesser population, namely Sheikhupura (41,635), Khanewal (49,093) and Dera Ghazi Khan (47,105).

All the rest, that is, 23 towns get a minus score on Factor II. This group of low scoring towns include four district headquarters namely, Rahimyar Khan, Bahawalnager, Mianwali and Muzaffargarh. In other words, these districts (having aforesaid headquarter towns) are devoid of much of modern facilities as a whole.(*)

This 'availability' of civic facilities is rather a qualified assumption and serves the limited purpose of mutual comparability among urban centres. As even in the case of large cities the situation is far from satisfactory. These variables were kept as actual numbers in the analysis, as up till very recently the provisions of civic amenities have been governed by administrative status of the town rather than any socio-economic considerations. A district headquarter town, whatever its size or location, enjoys patronizing civic amenities. It is not only lack in number, but the quality of service available in mofussil (other than headquarter) towns that guided the choice of actual numbers in place of per unit number of population. Further more it is not only actual existence but the size, specialized operational units or number of staff and supervisors for such institutions which become more important in the case of a larger town.(**)

(*) All these districts scored low on Factor I, identified with modernization urbanization, in the previous chapter.

(**) The weakness of town size was a differentiating factor was noted by Moser and Scott in their study. (pp.63).

FACTOR III

Factor III shows negative loadings for all the variables which means positive scores on this factor are of lesser importance as compared to minus scores. High loadings on this factor related to distance by road and railways and the percentage of inferior quality house construction material. Other loadings closely followed correlate this factor to Population change and Tied accommodation.

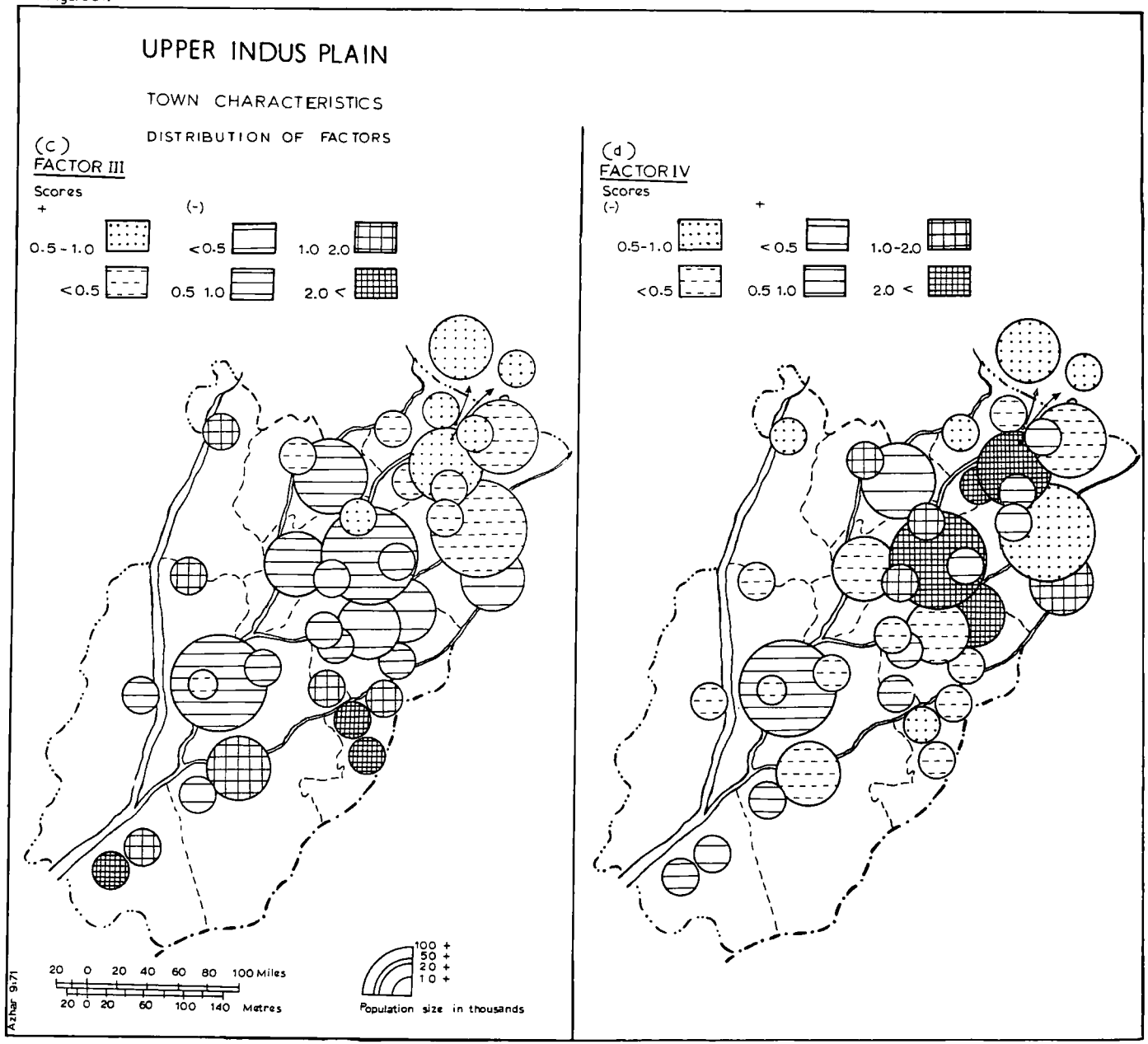
These five variables, emerging as significant on Factor III, might appear a sort of loose combination of town characteristics as a whole. However, viewed empirically they represent important segregating criteria for ascertaining town groups in the region. The fuller implication of this factor is evidenced in Figure 5.1(c), where a gradation is apparent from north, northeast to south, southwest.

As for accessibility, the respective distances are increased markedly as there is only one railway bridge across the river Sutlej and that, too, towards its lower end. Thus towns like Chistian, Bahawalnager and Haroonabad could be approached from the northeast only by circumventing a long course.

The percentage of Kacha built houses reflects local way of adjustment with dry hot climate. Mud walls and scanty roofing is regarded a poorman's device against heat accummulation in the buildings.

But the most important characteristic related to all

Figure 5.1


UPPER INDUS PLAIN
TOWN CHARACTERISTICS
DISTRIBUTION OF FACTORS
(c)
FACTOR III
Scores
+
0.5 - 1.0
<0.5
(-)
<0.5
0.5 1.0
1.0 2.0
2.0 <
(d)
FACTOR IV
Scores
(-)
0.5-1.0
<0.5
+
<0.5
0.5 1.0
1.0-2.0
2.0 <
20 0 20 40 60 80 100 Miles
20 0 20 60 100 140 Metres
100 +
50 +
20 +
10 +
Population size in thousands
Azhar 9-71

these other variables is higher percentage of population change. This reflects that towns in this category are not yet mature and more people are moving into these towns. Looking into individual cases, Rahimyar Khan, Chistian and Haroonabad, the three towns attaining a score ≥ 3.0, infact ranked 1st, 2nd and 4th in West Pakistan as a whole, with regard to percentage increase in decennial population.[4] Other towns scoring high on this factor are Mianwali, Bhakkar, Burewala and Khanpur. The former two towns are in the Thal project area, where Bhakkar is one of the designated new towns and was the headquarter town of the Thal Development Authority. Burewala and Khanpur have important cotton textile mills.

Out of the six towns showing least scores on Factor III, five, namely Gujranwala, Gujrat, Wazirabad, Daska and Lalamusa, are clustered in the north, while the sixth (Chiniot) is a little apart from them towards the southwest.

FACTOR IV

Factor IV, reflects high density of population and congestion of housing as distinguishing characteristics of the towns scoring high on this factor. The scores on this factor are illustrated in Figure 5.1(d).

Lyallpur, Gujranwala, Okara and Hafizabad show the highest score ($+ > 2.0$). Recent industrial growth and other socio-economic changes have brought more buildings and housing structures to the first three towns thus depicting higher number of structures per unit area. Other towns

scoring high (>+ 1.0), on this factor are Gojra, Chiniot, Qasur and Khushab. Each one of these towns is located in prosperous agricultural colonies and is thus an important trade centre . Congestion and shortage of space is imposed by municipal boundaries which have restricted outward growth.

Conversely, Lahore, Gujrat, Mianwali and Mandi Bahauddin show least scores (- 0.5 to - 0.7) on Factor IV. Lahore incidentally, is largest of all towns in area, i.e., 331.5 sq. Km. (or 128 sq. miles). Thus although being second largest city (by population) of Pakistan and the first in this region, Lahore enjoys many open and less congested neighbourhood areas.[5]

Though using different sets of variables, compactness and overcrowding, emerged as an important differential (at No. IV) both in Moser & Scott's study of British Towns and Qazi Ahmad's analysis of Indian Cities.[6] Though any worthwhile comparison of results for such different studies becomes conjectural, social attitudes, reflecting incomes or education have also been highlighted as factors of differentiation among town characteristics. Berry (1972)[7] in a recent city classification study based on Factor Analysis notes that "similar studies in other parts of the world show similar latent dimensions, although the nature of dimensionality may change with the level of economic and cultural development." The most distinguishing feature in the case of the present study is population change for the towns which still lack in communications and other intra-urban facilities, but are growing rapidly; hence these could be labelled as immature towns.

The 4 Dimensional Graphs:

An attempt has been made to depict the four dimensions of covariance identified in the study diagrametically on a single plane surface. It involves the scoring of 38 individual towns on each of the emergent factors and provides their complete identification. A generalized picture of all the towns emerges and deviant behaviour of individual samples can be picked for any combination of factors.

Figure 5.2(a) depicts that while not many towns differ on Factor I, and largest towns are at the lower end, there are wide differences in the accessibility of some towns (Y-axis). As the size of the circles refers to civic facilities, and intensity of shade relates to density and congestion, in this figure the graph reflects that the two sets of towns, getting highest or least scores on accessibility, both suffer from lack of facilities; though not from congestion and over-crowding.

Figure 5.2(b) shows that while a great number of towns have good accessibility (size of circles in this case), they lack in facilities (being situated to the left of Y-axis) and are also conspicuous for their density of dwellings.

Summary and Conclusion:

It is obviously of interest to note in what ways towns in various parts of UIP most differ from one another. Four major dimensions of differentiation have emerged from the above analysis, accounting for 94.5 per cent of variation

Figure 5.2 (a)

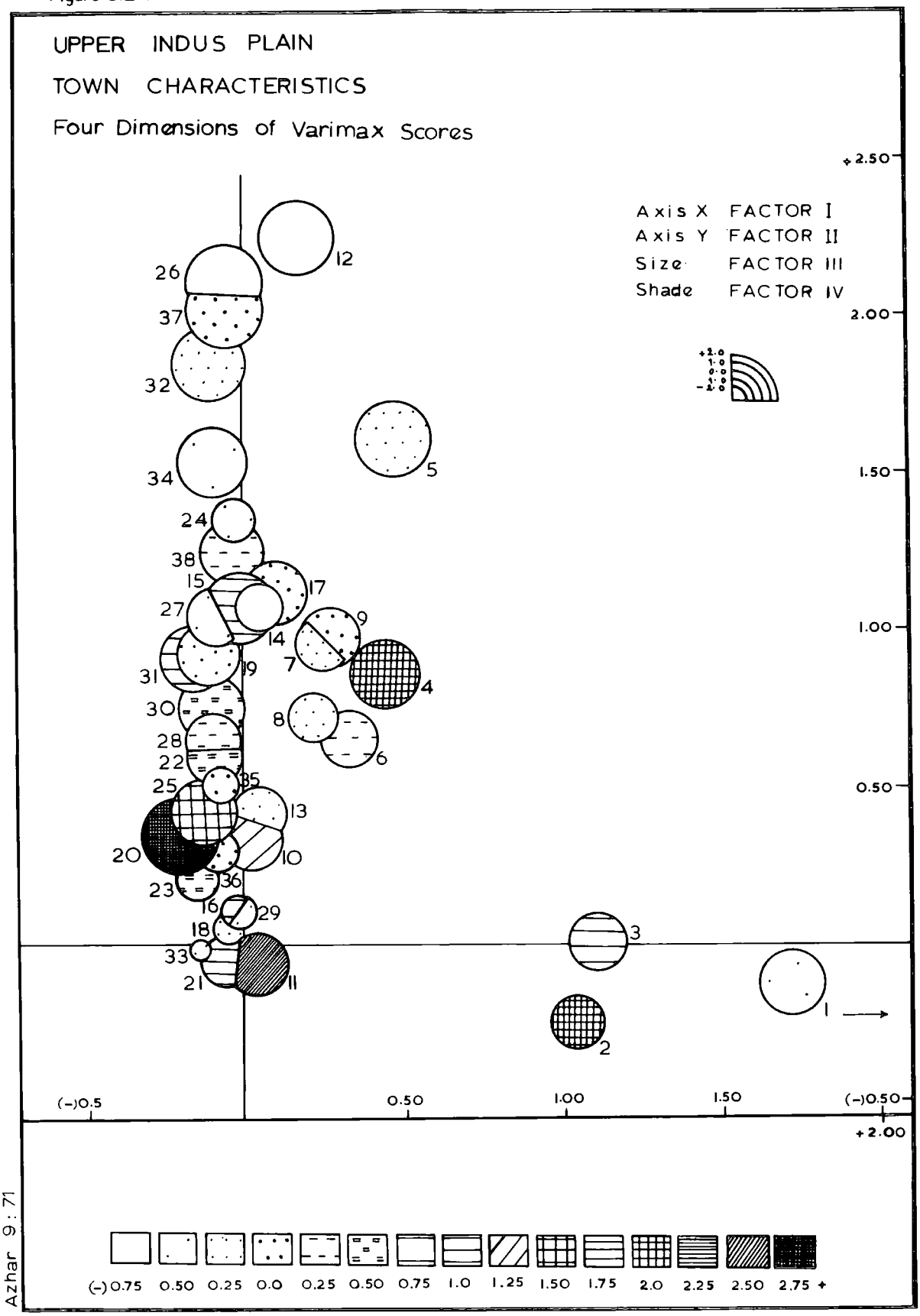
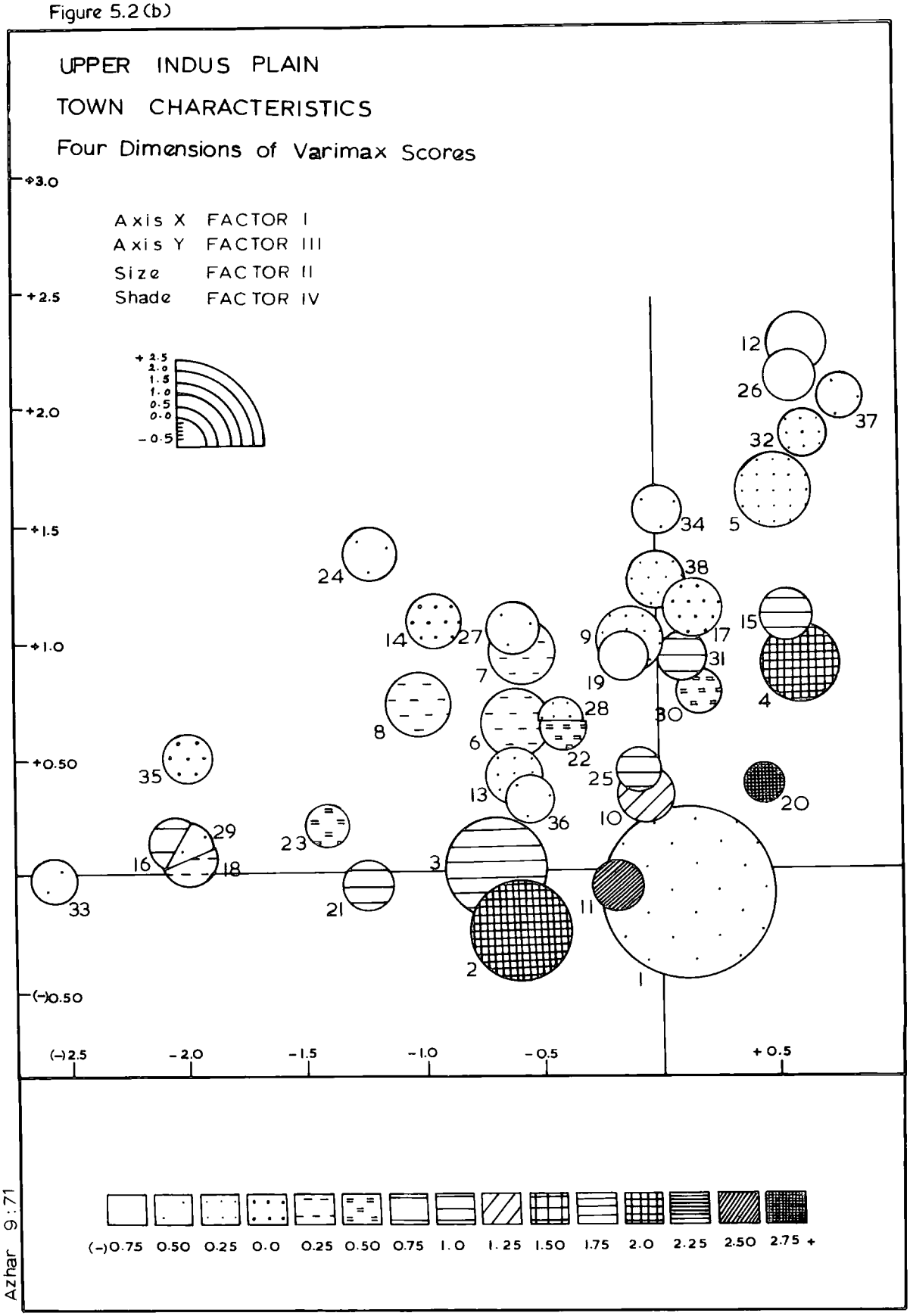

UPPER INDUS PLAIN
TOWN CHARACTERISTICS
Four Dimensions of Varimax Scores
Axis X FACTOR I
Axis Y FACTOR II
Size FACTOR III
Shade FACTOR IV
+2.50
2.00
1.50
1.00
0.50
(-)0.50
+2.00
(-)0.5
0.50
1.00
1.50
(-)0.75 0.50 0.25 0.0 0.25 0.50 0.75 1.0 1.25 1.50 1.75 2.0 2.25 2.50 2.75 +
Azhar 9:71

Figure 5.2 (b)


UPPER INDUS PLAIN
TOWN CHARACTERISTICS
Four Dimensions of Varimax Scores
Axis X FACTOR I
Axis Y FACTOR III
Size FACTOR II
Shade FACTOR IV
+3.0
+2.5
+2.0
+1.5
+1.0
+0.50
(-)0.50
(-)2.5
-2.0
-1.5
-1.0
-0.5
+0.5
+2.5 2.0 1.5 1.0 0.5 0.0 -0.5
(-)0.75 0.50 0.25 0.0 0.25 0.50 0.75 1.0 1.25 1.50 1.75 2.0 2.25 2.50 2.75 +
Azhar 9:71

between the towns. These four factors have been broadly identified with i) quality of housing, accommodation and social class ii) sharp differences in the availability of civic facilities, iii) accessibility and iv) high density and congestion of housing.

The four maps in Figure 5.1 illustrate such differences vividly. A clear impression one gets is that, how markedly the towns in the north, northeast differ from those in the south, southwest. The size and physical structure of dwellings (construction quality) show significant differences. The north is particularly marked by a higher proportion of larger dwellings, whereas congestion and overcrowding is a feature more of the towns in the middle parts of the region. The two parts together form the area of greater economic well-being where the part played by commerce and industry in town life is manifest.

South and southwestern towns have a substantially larger proportion of inferior types in construction-quality houses. As for social class, there are relatively more people occupying tied accommodation in most of the southern towns. However, low accessibility is the most significant characteristic of south and southwestern towns. This lack of means of communication has not hindered the growth of population and attraction in these towns, although it reflects their immaturity.

The analysis in this chapter could have been pursued further to produce a grouping of towns into classes or categories. But in view of smaller number of variables

for which reliable data are available a differentiation in major characters for all the towns involved has been adopted here. This study has, however, shown differences between the towns of earlier colonized areas and later or current development areas very clearly.

Moser & Scott's plea for a periodic analysis of towns characteristics is pertinent in the case of rapidly growing towns, in areas of extensive current developments, as differentials between towns are subject to change.[8] This is particularly important in the case of this region, where both urban expansion and reconstruction is taking place, with consequent shifts in the demographic and economic characteristics or vice-versa of almost all the towns.

REFERENCES

1. ROBSON, B.T., (1969) Urban Analysis: A study of city structure with special reference to Sunderland, Cambridge, p.136.

2. A very high intercorrelation among any two variables may be considered as duplication of the same factor in a multivariate analysis. But in many cases the inclusion or exclusion of certain variables becomes difficult as one should also take into consideration the correlation of each of the two associated variables with all the remaining variables.

3. The weakness of town size as a differentiating factor was noted by Moser and Scott in their study. (p.63)

4. Rahimyar Khan, Chistian and Haroonabad have shown 192%, 154% and 125% decennial increase in their populations respectively.

5. Detailed study of Lahore's morphology and other urban characteristics is undertaken in Chapter VII.

6. MOSER & SCOTT, (1961) British Towns, Oliver & Boyd, Edinburgh, pp 14-15.
AHMAD, Q., (1965) Indian Cities; Characteristics and Correlates, University of Chicago, Chicago pp.36-37.

7. BERRY, B.J.L. (1972), The Goals of City Classification, in BERRY, B.J.L. & KATHERINE B. SMITH (Eds), City Classification Handbook : Methods and Applications, John Wiley & Sons, New York. pp.3-4.

8. Moser & Scott op cit.

CHAPTER: VI

URBAN PHYSICAL PLANNING IN PERSPECTIVE

In urban studies it is usual to emphasise as primary the difference between planned and unplanned towns.[1] Since British times, the morphology of urban centres in the Upper Indus Plains exhibits two strains: integrated or sporadic planned development in the earlier urban localities and that emerging from the founding of new towns. As mentioned in an earlier chapter it was the establishment of canal colonies that led to the setting up of new settlements in areas where none existed before, as also the old towns and cities began to show conspicuous changes in their form and structure.

Such changes in the structure of urban areas were slow at first, but as the momentum of growth was steered towards an urban based manufacturing economy, the physical extension of towns assumed prominence. This is particularly the case with the appearance of 'model towns', 'satellite towns' and numerous 'colonies' (residential quarters), brought about by Town Improvement Trusts and other agencies. This chapter, puts into perspective the role of various agencies of change and points out the broad outlines of emerging townscape patterns prior to undertaking a more detailed analysis of individual towns and cities.

Almost in all the cases, origins of morphological changes could be traced to the guidance and motivation of the administration as well as receptive inclination of private enterprise. As for the digging of big canals and the clearance of wastelands, so with the building of roads and other community services, the role of the civil administration, authoritative or otherwise, is paramount. It could be criticized for any lapses in the process but the basic need for channelling community's efforts could not be denied.

A. TOWN PLANNING IN UIP - CONCEPTS AND PRACTICES.

Since the early days of British Raj the establishment of residences for administrative and revenue officials at district head-quarters brought in 'civil lines' to many a remote settlement, whereas cantonments were established adjacent to towns and cities of strategic importance. The twin units of townscape are thus common to many urban centres in the Subcontinent; where the civil lines contain official residences of the local bureaucracy and the cantonments are the barrack quarters.[2] Establishment of perennial irrigation brought another such unit, 'the canal colony', (office buildings, residences and rest houses) for the canal engineers and officials. These were built on a similar style, but with more spacious surroundings, attached gardens and water ditches to cool the atmosphere.(*)

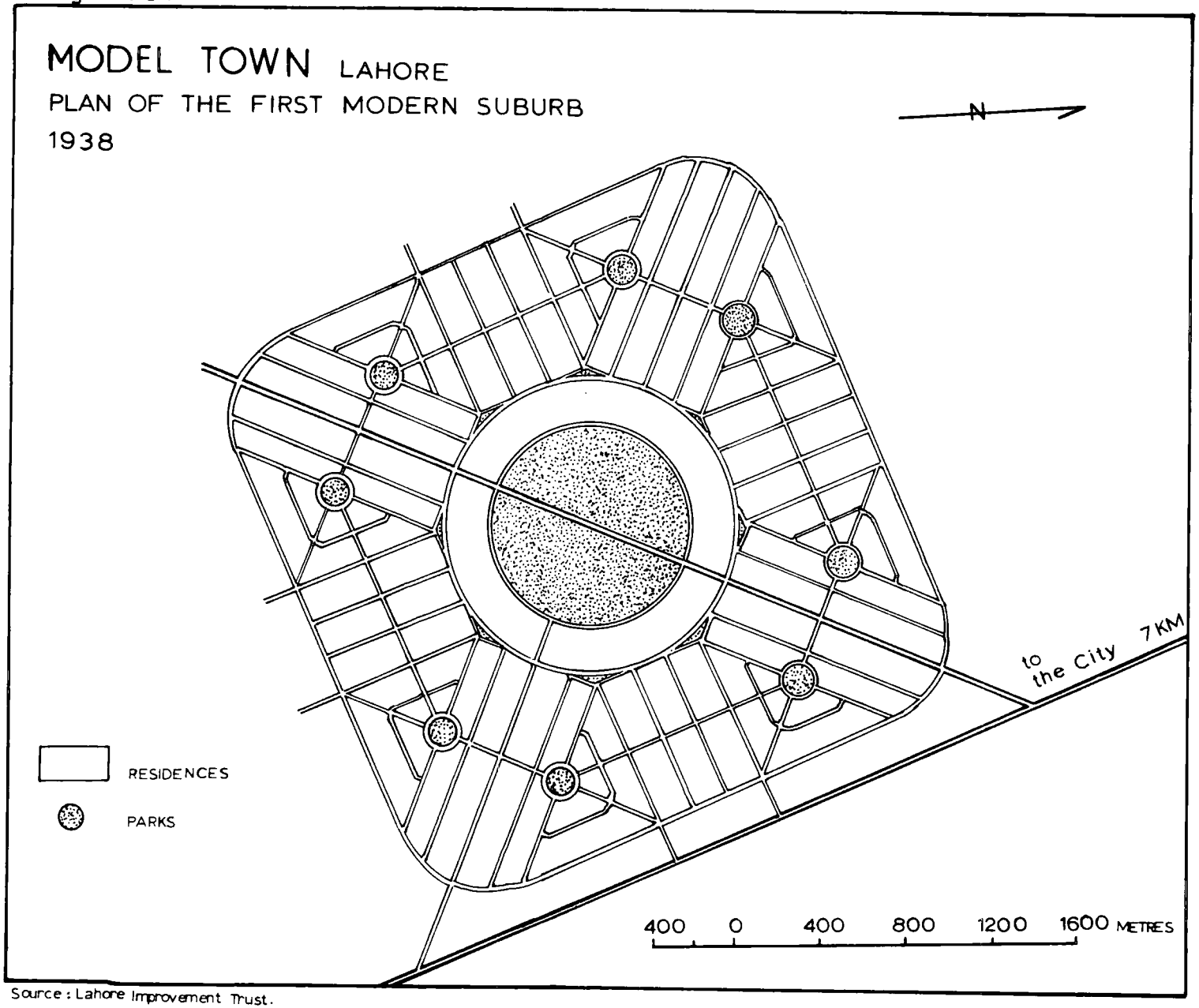
(*) The three units, cantonment, civil lines and canal colony forming a distinct sector in the urban land use of Multan are illustrated in Figure 7.3 facing page 187

As new towns were being set up in canal colonies, the economic rewards of agricultural expansion and prosperous trade were manifested in the steady uplift of the urban community as a whole. Soon private housing started adapting itself to governmental construction standards. With the fixing of municipal limits, a gradual accretion to town size ensued, as civic amenities now extended farther than the city walls. Patterns of housing changed as more and more people, many of whom had long sojourn abroad, came in contact with the western and, more precisely, anglicized standards of living.

Lahore being the provincial metropolis, witnessed many important changes in physical form and structure and many additions to its suburbs. Its model town excelled in concept as a replica of a garden city: a square plan with a vast circular open space in the centre, encircled by a ring road. Here each individual house is located among trees and grassy lawns, which provide idylic surroundings. (Figure 6.1).

Towards the closing years of the mid-century, Sutlej Valley Project areas prospered as changes emanating from irrigation extension were affecting the then princely State of Bahawalpur. On return from active service on the North African and Middle East fronts, during World War II, the Ameer of Bahawalpur renamed its capital as Baghdad-ul-Jadid (new Baghdad). A number of schemes for new administrative, educational and community buildings and other premises were taken up in the town. The state government also established a Model Town Housing Scheme in the private

Figure : 6-1



Source : Lahore Improvement Trust.

sector.(*)

While sporadic transformations of the townscape were proceeding in various parts of the Province, the end of British political rule in the Subcontinent set in waves of migrants across the newly emerged border line. Almost all colonization areas remained on the Pakistan side and here towns, old and new, were suddenly swarmed by new inhabitants from across the border. The problem of resettlement was initially tackled on a makeshift basis, on local, district or provincial levels. As a result of this upheaval, conditions of dwelling units, social or educational buildings, all became deplorable in the towns. But, as an outcome of the past 50 years of growth, the region could and did absorb this sudden influx of immigrant population in a manner, and with a speed, not easily contriveable in many developing parts of the world.

The Thal Colonization Project, at that time in its final phase, provided considerable opportunities for settlement but the bulk of the refugees went to the already existing towns. Decisions were arrived at hastily to set up satellite towns, residential colonies, facilities for community work and industrial units to absorb a large number of immigrants and to create employment opportunities

---

(*) Sadiq-Egerton College, Technical High School, Jamia Millia (College for Religious Education), Public Library and a new hospital were some of the urban accretions under this policy. The author was posted to the College during 1963-65, whence One Unit Colony and a Satellite Town Scheme were in progress.

Most of these developments took place on the southern side of the old city, which, with its own railway station, is now referred to as Baghdad-ul-Jadid, whereas the name Bahawalpur is extent for the rest of the city itself.

wherever possible. Before dealing with the general urban planning in the region, prospects of the new Mandi towns may however be considered here as these relate to particular urban expansion schemes.

PLANNING FOR NEW MANDI TOWNS

With the passage of time, planning of new Mandi towns has assumed a new character in the region. Mention has already been made of the opportunity to establish new settlements under the Thal Colonization Scheme which was in progress at the time of independence. It covered the upper parts of the Sind Sagar Doab, whereas a subsequent scheme, namely Taunsa Barrage Project extends over to the lower parts of this doab including the trans-Indus district of Dera Ghazi Khan. It is considered worthwhile here to mention in brief the establishment of Mandi towns under these two schemes as these are latest manifestations of the process of colonization and also represent some current urban planning trends in the region.

For the purpose of integrated development under the new scheme the Punjab Provincial Government had set up the Thal Development Authority in August 1949, which formulated an ambitious Development Plan for the area as a multi-purpose project. The plan envisaged development of agriculture and dairy farming, establishment of rural settlements and marketing centres with industries to provide additional avenues of employment, planting of forests and creating national parks. Inspired by its motto, 'Build for

the People of Pakistan' and backed by a zeal to create amiable living conditions for the refugees in the Project area, the Authority joined hands with the PIDC for the establishment of industries in the proposed new towns. It also floated its own Joint Stock Company and established a Thal Industries Corporation for the same purpose.[3] Thus almost from the outset of the Colonization Project, manufacturing was visualized as an important function of the new towns, which process was to utilize the agricultural produce of the area. As a result of this policy not only all the new towns in the Thal started off with at least one industrial concern but a whole new town Daudkhel came up as a Company town with many modern industrial concerns wholly developed by the PIDC.(*)

During the course of time, there have occurred many conceptual and procedural changes, especially with regard to the functioning of industrial concerns and the working of the agricultural farms. It suffices to say here that the Thal Project represented a new phase in regional settlement planning as a continuation of the process of colonization in the region. In the wake of this process over 1100 new rural settlements have been established all of which have a general standard physical layout, where many of the homesteads were built by the TDA itself.[4]

(*) An account of this Company town is included in Chapter VIII pages 202-205.

Out of the six towns envisaged in the original plan, three, namely Jauharabad, Quaidabad and Liaqutabad are totally new towns, planned and developed in the open country. Two others, namely Bhakkar and Leiah, are earlier towns which were designated, and substantial new development schemes have been executed in their residential, functional and service sectors. The sixth, Rakh Ghulaman, comprises units of a vast agricultural farm which include the Commonwealth Livestock Farm and a Dairy Farm apart from agricultural machinery, seed development and forestry units.

Four other towns have now been designated as Mandi Towns in the area and their extension and development is under progress. Table 6.1 gives some basic details of the Thal towns.

The Layout Plan of a New Mandi Town

The physical plan of a new Mandi town covers many essential aspects of modern town planning such as the determination of population size, both grid and radial street pattern, functional zoning and provisions for an essential industry on which a substantial section of its population depends.[5] The industrial zone is suitably segregated from the residential area by means of green belts. The residential area of the town is divided into separate neighbourhoods, each with its own local shopping area, civic amenities like a school, playgrounds and a mosque etc. The main commercial or general shopping area has double-storeyed arcaded shops. The industrial area is subdivided

TABLE 6.1

MANDI TOWNS IN THE TAHAL PROJECT AREA

Name of the Town	Year of Ettd. or Desigted	Projected population	1961 Population	Sponsored Industrial Units	Other Institutions and Remarks
			PHASE I		
JAUHARABAD	1952	25,000	8,189	1 Sugar Mill 3 Textile Mills	It included one of the earliest Technical Schools in the country established under the Colombo Plan
QUAIABAD	1952	25,000	2,659	1 Woollen Mill	Includes Agricultural Machinery Workshop
LIAQUATABAD	1953	25,000	3,879	1 Textile Mill	
RAKH GHULAMAN	1953	30,000	..	1 Dairy Factory	Commonwealth Livestock Farm Commonwealth Agricultural Farm Reserved Forests
LEIAH	1954 (d)	50,000	19,608	1 Sugar Mill	TDA's Agricultural Machinery Organization
BHAKKAR	1953 (d)	50,000	21,749	1 Textile Mill	Headquarters for TDA
			.....		
			PHASE II		
PATTAL MUNDA	1970	30,000	newly proposed	....	Land for development has been acquired in these towns and urban construction schemes are in planning stages for these towns.
KAROOR	1970 (d)	30,000	5,567	....	
KALUR KOT	1970 (d)	30,000	6,723	....	
DARYA KHAN	1970 (d)	30,000	10,533	1 Sugar Mill	

(d) Designated towns.

into a heavy industries area and an area for light industries.

An essential feature of the Thal towns is that houses of various sizes were constructed by the Development Authority and offered to the settlers on hire-purchase or on an easy instalment basis. Among these, a typical small size house, Type 'N', consists of three rooms and a verandah, a kitchen and a small porch, a small court and a bath and lavatory at its other end. Its initial cost on completion was about £800.[6]

Establishment of new Mandi towns in the Taunsa Project area is still in the initial stages of planning and not many new towns are expected in this part of the region. A number of earlier towns are however, undergoing adequate uplift and extension in built-up areas. Figure 6.1 depicts the proposed town plan (1971) for a new town, Akhtarwala, in district Dera Ghazi Khan.

CENTRAL GOVERNMENTAL INTEREST IN URBAN PLANNING:

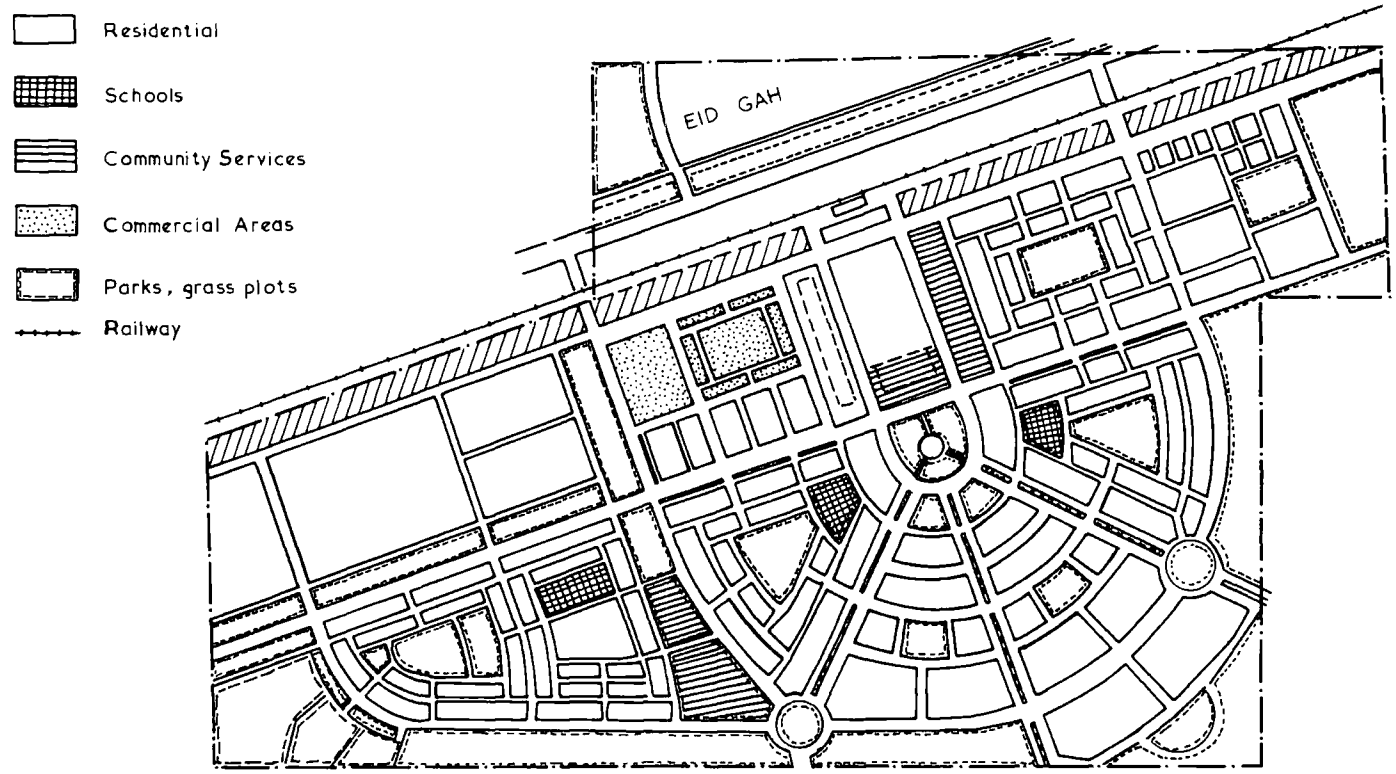
Central governmental interest in housing and urban growth dates back to the need for accomodating its employees in Karachi, the first capital of the new country, as also its desire to ameliorate living conditions of shelterless displaced persons. Resettlement and rehabilitation of refugees whether on old evacuee property or in areas of new development remained a priority with the central government for many years. Central government's town building efforts in Karachi and later for the two administrative and

Figure : 6·2

PLAN OF A NEW MANDI TOWN

at GAGGOO, AKHARWALA (PROPOSED 1971)

TAUNSA COLONIZATION PROJECT



Azhar 3:72 SK

Source: Director of Town Planning, Punjab, Lahore.

legislative capitals at Islamabad and Dacca respectively, are of relevance to the present study only as indicators of central administrations involvement with the subject. Certain techniques of physical planning and propagation of skills have come through its Capital Development Authority. Apart from the building of a capital city, central government's concern for refugee rehabilitation in particular has lately shifted to housing provisions for industrial labour and other low income groups in general.

Setting up of a House Building Finance Corporation in 1949, made a definite though limited contribution to the house building activity in the country. This Corporation is virtually the only credit giving institution in the field of housing. There are no other specialized mortgage institutions, nor do commercial banks provide any service in this regard. Now the Central Planning Commission has proposed the setting up of a Housing Corporation for the production and marketing of cheap houses.

The Central government's overall line of approach to the problems of housing has remained tied firstly to its concern for creating financial viability and providing adequate expertise to the provincial administration and secondly to enhansing physical layouts. Keeping these two factors in view the Central Planning Commission has eulogized the need to erect more and better housing units as well as to avoid unplanned growth of other urban infra-structure. Its Five Year Plans have envisaged setting up educational facilities for architectural and city planning

in the country.[7] The Planning Commission's advice on increased housing and other related urban construction and expansion activities relate to the preliminary plans prepared and submitted by provincial and local authorities. Recommendations and allocation of development funds during the 2nd and 3rd Plan periods i.e. 1960-65 and 1965-70 have set the current pace of activity on a higher level, both at central and provincial levels.

The 3rd Plan (under its Basic Development Programme), while emphasizing the need for regional development plans, proposed the picking up of small centres in the underdeveloped areas and developing them into appropriate urban centres in order to achieve balanced growth. For development of larger cities it said, "Special efforts will be made to initiate comprehensive planning for growing metropolitan regions in the country which at the moment are centred around Karachi, Hyderabad, Multan, Lyallpur, Lahore, Rawalpindi, Peshawar, Dacca, Khulna etc."[8] Under such directives and in order to relieve over crowding in inner parts of the cities new housing projects have been drawn up for Lahore, Lyallpur Multan and Rahimyar Khan in the region.

B. SPECIALIZED TOWN BUILDING AGENCIES

The municipalities or local bodies in Pakistan still have a restricted role in the sphere of town building. Their main function remains catering for essential services like primary education, hospitals and dispensaries together

with making provisions for civic amenities like electricity, water, sewerage and maintainance of internal roads, streets and public parks. However, municipal laws regulate and impose certain minimum requirements for the construction and maintenance of all buildings and structures in the town. The ground plan for each individual building must be approved by the municipal engineer before any construction is carried out. Number of storeys and the extent of covered space on a plot of land is also regulated for different localities and type of structures. However, the execution of a building plan is left to private enterprise or specialized agencies wherever they exist or are created for a specific job.

TOWN IMPROVEMENT TRUSTS:

To cater for the ever growing need for urban renewal and expansion, the provincial legislature created separate statutory bodies called Town Improvement Trusts for an individual town or city. The first, and for many years the only, Town Improvement Trust was that of Lahore. (Established 1936).

In the case of urban extensions the Improvement Trust acquires government or private land, develops it and secures its after sale profits for financing long term plans of constructing public utility services in the area. The trust proceeds with the clearance of open spaces, construction of roads and streets and demarcation of individual zones of land use within a particular scheme of development. In

certain cases some quarters are built for low-income group families to be allotted on hire purchase terms by the government. A prototype house plan is also drawn for middle class families which they have to maintain while constructing individual houses. The only requirement in the case of upper class residential areas is a limit on the extent of built up proportion on an individual site.

As for urban renewal and reconstruction in the old dilapidated and congested parts of the cities, problems of assessment and execution of desired plans become formidable. Residential and shopping premises, street alignments and provisions for other services provide little or no choice in the inner areas of the city. However, redevelopment of inner areas or extension of existing facilities such as shopping premises or road and street linkages are undertaken by the Improvement Trust.

A big hurdle in the working of any town improvement scheme is scarcity of finances. Urban reconstruction and expansion cannot be a paying proposition in terms of direct financial returns. Nor can the capital cost of any such scheme formulated by the Trust, be wholly met by a municipal body. As such many of the Trust's schemes remain of an advisory nature and the ultimate authority for the size, scope and timing of development rests with the local body or municipality concerned. Many schemes are postponed, altered or abandoned in the process.[9]

MASTER PLAN ORGANIZATIONS:

Preparation of comprehensive Master Plans for urban areas by anticipating the kind of problems which may arise in the near and distant future, has been adopted as a state policy in many developing countries.[10] In Pakistan with increased central planning in many of the urban development programmes such as Public Health Engineering(*) the need to provide comprehensive plans for large cities has been realized by the authorities. Master Plan Organizations have been set up for Lahore, Multan and Lyallpur in the region and central government has provided funds and necessary office machinery for the functioning of such planning organizations. These new organizations are working in collaboration with the municipalities, improvement trusts and other civic bodies to draw urban development plans keeping in view requirements for the next 20 years. As their origin is recent, only preliminary surveys have been carried out and no reports or plans have been published so far.

Outline Development Plans:

Some current schemes for physical urban planning have been undertaken for selected medium sized cities on a priority basis in the region.[11] The aim is to prepare Outline Development Plans for Gujrat, Gujranwala, Sialkot Okara and

---

(*) Public Health Engineering Programmes include new extensive water supply schemes and provisions for the disposal of city waste and night soil.

Sheikhupura over a period of three years beginning from June, 1970. These plans will provide a framework of policy for the siting of new residential, commercial and industrial areas and improvement of the existing road pattern and traffic flow. Such plans will eventually cover many other towns in the region.

Regional Plan for Lahore Metropolitan Region:

A regional development plan covering northeastern and central districts of the region was sanctioned by the provincial government in 1970 and is expected to be completed by June, 1974. The Plan envisages the introduction of systematic physical planning in the area through the coordination of proposed and needed investment and other policies for greater economic and social benefits. The strategies of the Regional Plan include:[12]

"a) To develop a viable land use system for creating communities of scale and developing the highest and best use of land at regional level in terms of urban, agricultural, recreational uses as well as improvement of areas subject to flooding, water-logging, salinity and other problems,

b) To create intermediary market and service centres to intercept current trends of concentration of population and development in big urban centres,

c) To develop an integrated regional land use and transportation system (rail, road and air) consistent with the best future regional form."

It is reported that studies relating to such aspects as Hierarchy of settlements, commercial activities in the region, Communication & Transport, Water supply, sewerage etc., have been started by the Directorate of Physical Planning in the Communication and Works Department. It is anticipated

that much of the study work will be completed by the end of 1972.

Urban Renewal

In recent years there has been a startling increase in the proportion of new dwellings going up in multiple storeys in place of old single or double storey mansions. A renewed form of urban land use, both residential and commercial is emerging in the central and peripheral parts of older cities. This large scale building activity has arisen because of three main factors: (a) general prevailing conditions of the old buildings in the core areas which require extensive repairs, (b) settlement of evacuee property claims and transfer of deeds for such buildings to the allottees and (c) formulation of urban renewal plans by town improvement trusts. Consequently, new types of housing as well as new commercial areas and communication lines have emerged in many large and medium sized urban centres. In spite of the conviction held by the planning profession that comprehensive planning is necessary, urban renewal has hitherto been on an ad hoc basis with little regard to other needs. However, in the case of town extensions, especially in the colony towns initial grid plans have been retained.

EXECUTION OF TOWN BUILDING SCHEMES AND ROLE OF PRIVATE HOUSE BUILDING AGENCIES.

Whereas a Development Authority, Town Improvement

Trust or Master Plan Organization conceive and control the overall land use pattern in the urban localities, execution of such plans and construction responsibilities are shared by the Public Works Department, Municipal Engineering Department and functionaries of other departments who have a concern in a particular activity or area. Such public authorities undertake major projects of land improvement and provide a skeleton for a city's expanding environs. Construction of individual structures is more or less a concern of private endeavour for which, until the past decade, there was no organized effort. However, during the past few years government has encouraged growth of private construction companies in major towns and cities. These companies seek out suitable land, bargain over the price and resell it in lots of developed plots or built houses for outright sale to the individuals. Such modality is similar to many other developing countries particularly where public authorities have assumed the role of active participation in urban development.[13] How far such private enterprise can solve the acute shortage of housing is yet to be seen. Council Housing schemes like Britain would be more plausible, for enlarging on present housing stock and the introduction of standard units to maintain uniformity of growth, especially when a large number of new city dwellers is to be accommodated.

C.(i) SATELLITE TOWNS AND INDUSTRIAL ESTATES

The term 'satellite town' in Pakistani context is more akin to Soviet 'sputnik towns'[14] (though, smaller in size and extent), than a British New Town. The British concept of new town could be said to apply only to Canal Project Towns specifically, since the reasons and background of new towns in Project areas have been much different than overspilling and growth of a particular city.

As an outcome of government's concern to channelize town expansion on proper lines, residential and industrial localities have been planned since the early 1950's in most towns of the Upper Indus Plain. Such localities are usually planned on the outskirts of the existing built-up areas, mostly along a major communication route. In general, larger towns and cities exhibit stronger suburban development like this, but the relationship is rather irregular. Some of the relatively smaller towns have shown greater suburban growth in comparison to their initial size. One thing common to all suburban growth is that it represents a distinct segment of the town both in morphology and clearly defined functions.

Moser and Scott (1961) have distinguished English suburbs as either residential suburbs (upper or middle class), or suburbs with light industry or with modern industry.[15] As regards the present study, there are no separate population or economic data, nor any growth strategy has been defined by the authorities beyond fixing and laying out a physical skeleton. The size and rate of growth has remained fluid

in some cases. It therefore suffices here to distinguish them as residential or industrial suburbs.

Satellite towns developed by the planning authorities assume the lineaments of the main city as day to day functions are gradually absorbed within the local municipal sphere. In many respects soon they become akin to privately developed new localities. However, uniformity of construction style and shape imposed by town improvement trust and better civic provisions, especially low density and more open spaces remains a distinct feature for them.

As Harris (1943) pointed out, Industrial Estates could be distinguished as a) Industrial Fringe Suburbs or b) Industrial Suburbs. In industrial fringe suburbs commuting is largely from the city to the suburbs, to work in the factories located outside the political limits of the city.[16] Industrial suburbs are such outlying localities which contain not only the factories but also a large proportion of the people who work in them. Near Multan, Muzaffarabad and Pirangaib are two such industrial localities situated to the west and east of the city.

Development of outskirts and urban fringes have put great strains on the already inadequate means of communications and intra urban transport. In large cities, peripheral railway halts served by special shuttle trains, form a vital link between the place of work and residence. But for areas away from the railways, acute shortage of transport is apparent.

C. (ii) TOWNSHIP SCHEMES

Being somewhat smaller in scope and extent, the Satellite town schemes are now considered quite inadequate for the requirements of the large and growing cities. Hence in order to cope with the pressing needs for city extensions, a new concept of massive urban development and location has been adopted in Pakistan, known as Township Schemes. The concept is based on the demands for urban extensions within the framework of existing civil entities i.e. the existing municipal and local government institutions. Thus a township may be regarded as an offshoot largely provided to cater for 'overspill' population of a big city. Two of such schemes, one for Lahore and the other for Multan, have been undertaken in the region during the Third Five Year Plan.

The Lahore Township or 'New Lahore' covers an area of about 1125 hectares, which includes an Industrial Estate of about 300 hectares. It is situated to the south of the city on the western side of the Lahore-Karachi railway line. The area has been planned into 7 sectors: 4 residential sectors, further divided into two subsectors each, two industrial, and one civic and commercial sector. Each of the residential sub-sectors is being developed into a self-contained neighbourhood unit having its own schools, dispensaries and local shopping centres, places of recreation and mosques etc. The estimated cost of the development scheme amounts to over 91 million rupees out

of which over 14.2 million rupees have been provided by the Canadian Government against their assistance programme to cover the cost of foreign equipment and material.[17]

The Township includes provisions for the development of residential sites of various sizes and categories: 600 sites for the higher income group, over 4,500 sites for upper middle income group and over 7,000 sites for lower middle income group families who have to construct their own houses. The scheme also provides for 10,000 one-roomed quarters to be constructed by the Lahore Improvement Trust for the low income group families. In the industrial sector, 161 industrial sites have been provided for the instalation of small manufacturing units to ensure employment opportunities for the skilled and unskilled workers among the allottees of this scheme. It is reported that over 6,000 quarters have already been completed and occupants have been shifted there by December 1971, while work on the private housing is also in progress.

Changes in the form and structure of the towns, introduced since early British times, have been far reaching in scope and extent. Administration has played a definite though restricted part in the growth and expansion of urban physical structures. Not only local authorities but provincial and central governments have been keen to help establish well planned urban communities. But as the municipalities were not designed to cater for city extensions brought about by a rapid economic growth, all such activity has remained piecemeal. Controls and functions of

specialized bodies are limited to the extent of acquisition, clearance and improvement of land. Town improvement trusts or other agencies are handicapped because they do not have any executive powers in their own right. One of the objectives of the third Five Year Plan included appropriate legislation to enforce the discipline of development plans, as well as clarification of and fixing responsibilities for physical planning in the country.

Since the early 1950's the programme of town extensions has led to the emergence of distinct morphological outgrowth. Later with urban renewal schemes for the inner decaying parts of old cities such developments have reshaped some core areas. Lately, governmental emphasis has shifted to middle class and low income group housing. New housing has appeared in the form of Satellite Towns more specifically at Lahore, Lyallpur, Multan, Gujranwala, Montgomery, Bahawalpur, Okara, Sargodha and Rahimyar Khan.

As town growth picks up momentum, Master Plans are in preparation for large cities. Latest among the town extension schemes are New Townships such as for Lahore and Multan, now under development.

It seems important to end this chapter with some illustrations of current physical activity undertaken by various agencies in the region. Instead of illustrating some specific towns, the 14 plates included here present topical views of general nature of the urban structures. These plates are put in a sequence depicting earlier amorphous nature, modern planned quarters, commercial and business centres and presuures on physical expansion.

P L A T E S

URBAN PHYSICAL STRUCTURES

THE EARLIER SCENE.

PLATE I The Old City - 1. A view of the inner and peripheral reisdential area of Multan from the citadel. The single storey structures in the foreground belong to the early period of this century which replaced the wall in this part of the city. The TOWN HALL towards the right side represents the typical administrative structure of the Raj days.

PLATE II The Old City - 2. A closer view of the inner residential area of Multan. The closely nestled house structures rise higher towards the middle part as they stand on the debris of the earlier buildings. A newly constructed house appears towards the right corner of the photograph.

THE MODERN SCENE

PLATE III New Residential Areas - 1. A view of the middle income group housing structures. These single storey houses represent urban extentions of the first decade after independence.

PLATE IV New Residential Areas - 2. Another view of middle income group houses, built by the Lahore Improvement Trust at Shadbagh Colony, Lahore and offered for outright sale.

PLATE V New Residential Areas - 3. Front view of the government built quarters under the Satellite Town Schemes of the middle 1950's period. Also these remain single storeyed and the streets are usually wide enough, thus these represent low housing density in modern urban extensions.

PLATE VI Accommodation for State officials - 1. A general view of the government servants' quarters built during the second and third Plan periods. These single room quarters with a small courtyard belong to the lowest category of housing.

PLATE VII Accommodation for State officials - 2. A close view of the multi-storey flats built to accommodate government officials or employees of the semi-autonomous bodies. Comparatively cheaper to rent and with many amenities provided, such flats are a blessing for white collar office workers. Many commercial concerns especially the banks are now providing similar accommodation to their employees.

PLATE VIII Accommodation for State officials - 3. Two of the double storey houses represent prestigeous accommodation of the high officials. It has two , an inner and an outer open lawn, and an annexe for the servants, which appears to the left of the photograph.

PLATE IX A modern Office Block. The Head Office of the Water and Power Development Authority at Lahore stands on the Mall nearer to the Provincial Assembly Chambers. The canopy of Queen Victoria's statue (on the left) is a relic of the period when Colonization was in full swing in the region, whereas WAPDA HOUSE is a present day expression of water-resource development in the region.

PLATE X A modern Business & Commercial Block. The ALFLAH building on the Mall represents not only a section of the modern business and commercial centre, but having being built out of the Benevolent Fund, represents a blending of various interests in the sphere of new developments in the country. Its six storeys above ground and a basement indicate that the skyline is still of low height and there is not as much pressure on the use of land as is found in many large cities.

PLATE XI A local Shopping Area. This block of shops-cum-flats is representative of local shopping centres which have been provided in Satellite towns and other residential colonies in the growing urban centres. All shop premises are arcaded whereas 'sun-cutters' all along the windows help reduce intensity of insolation.


SALE
SALE

PLATE XII The setting of a commercial bank in a housing unit at Rahimyar Khan is typical of rapidly growing urban centres where office and service concerns are accommodated in residential premises, pending the availability of suitable site and construction of an office or business block.

PLATE XIII A bazaar of recent growth in Rahimyar Khan. It has not only open but straight shop and street alingment, though shop-fronts are still small and these deal in petty goods.

PLATE XIV A view of the residential sector of the Pirangaib Industrial Suburbs, near Multan. Developed in late 1950's it represents modern planning trends and contrasts with earlier scene. (Plate I and II).


Woodbine

REFERENCES

1. SMAILES, A.E., The Geography of Towns, London (1966) p.99

2. SPATE & LEARMONTH, India & Pakistan, London, (1967), pp. 208-210 and SMAILES (1966), p.77.

3. Handbook of Thal Development Authority, Jauharabad, 1954, pp.44-45 ff

4. Ibid, pp. 133-134.

5. For a summary of physical plan see AHMAD, K.S. & KUREISHY, K.U., 'Growth of Settlements in West Pakistan, PGR, Vol. 16/2, July 1961, pp.1-13.

6. Handbook of Thal Development Authority, op cit, p.133.

7. GOVERNMENT OF PAKISTAN, Planning Commission, Third Five Year Plan, Karachi, (1965), pp.370-371.

'_____' Twenty Years of Pakistan (1967, pp.524-537.

8. '_____' Planning Commission, op cit, p.380.

9. '_____' Twenty Years of Pakistan, op cit, pp.129-130.

10. BREESE, G., Urbanization in Newly Developing Countries, Princeton University Press (1966), pp.128-129.

11. JAFRI, T.A. Activities of the Town Planning Wing, Communications & Works Department, Pamphlet, Lahore (1970) p.1-6.

12. Personal Communication.

13. A general survey of town expansion under state or public authority in some European and Central African Countries appears in J. Beaujeau-Garnier & G. Chabot, Urban Geography, Longmans, London, (1967) pp.233-237.

14. Ibid,, pp.252-253.

15. MOSER & SCOTT (1961), British Towns, Oliver & Boyd, Edinburgh.

16. HARRIS, C.D., (1943), 'Suburbs', American Journal of Sociology, Vol. 49/1, July, 1943, pp.1-13.

17. Brief note on the Salient Features of Lahore Township Scheme, Physical Planning Cell, Communication & Works Department, Lahore, 1970.

CHAPTER: VII

EMERGING PATTERN OF MODERN TOWNSCAPE

Looking back to the previous chapter one notes the fact of a host of urban building activity, organised or unorganised, being pushed through and reconstruction of urban areas going apace all over the region. This changing land use pattern is a manifestation of administrative organisation, economic growth and social attitudes. It also brings in adjustment and realignment in intra-urban relationships and movements.

Each urban centre has a peculiar townscape, moulded on a particular geographic site and patterned by demographic, economic, social and political forces from both inside and outside. Once a major trend is initiated, it continues to affect the growth and a new pattern emerges which foreshadows earlier precincts. But more than that, in Upper Indus Plains it is the founding of new settlements that has made up most of the present townscape features.

The new pattern that has emerged in Upper Indus Plains may be discerned by looking into both earlier and present day townscapes that typify its urban scene. The present chapter is a specific study of the growth of three representative types of towns and cities in the region. Morphological and functional changes and pattern of urban

land use are reviewed in each case. The three types of urban centres categorised for this purpose are earlier established urban centres (or historic towns), Colony Towns and New Project Towns.

LAHORE and MULTAN are two historic cities. Both originated on commanding routes and defensible sites on river banks. Fortified and compact during the Middle Ages, their present townscape is an admixture of old and modern town structure. Later developments are not only extensive but have been carried into their internal areas as well.

LYALLPUR is one of the foremost Colony towns, established by the British, but developed for and by the natives. Its physical planning and economic growth both represent new trends in the region. RAHIMYAR KHAN, though established beside an existing nucleus of a small settlement in the cotton region has shown a greater rate of expansion. It has grown from about 6,000 to over 104,000 in the past three decades.

DAUDKHEL represents a new type of town development in the country. It is a factory town developed by the Pakistan Industrial Development Corporation. Though no other town has yet been set up under similar circumstances or policy, many of its features are reflected in industrial suburbs of other urban centres where PIDC has established its factories.

LAHORE

The site of Lahore, by the left bank of the Ravi in the northern plains, is an indication of its importance for commerce and strategy. The three maps in Figure 7.1 depict phases of its physical growth since 1849. Not much account of Lahore's land use pattern prior to the British period is in evidence except in the accounts of the travellers. However, the following abridged description taken from the Imperial Gazetteer of India,[1] illustrates the earlier rise and decay of its precincts.

Lahore came into prominence in early 11th century when it was made capital of the Ghaznivid dominions, east of the Indus, and Malik Ayaz taking charge of the provincial headquarters in 1042 A.D. made it a garrison town. However, it was Mughal rule that brought true glory, when Lahore became a place of royal residence, and grew to be, in the language of Abul Fazal, 'the grand resort of people of all nations.' The Mughals erected many spectacular edifices in marble and red stone which was brought from the Aravelli Hills of central India. The Mughals were great builders, great enthusiasts of coolness and fragrance, of gardens and parks. Shalamar Gardens, laid in 1660's, are a monument to the skills of Ali Mardan Khan, engineer of Shahjahan, who had dug a perennial canal from the Ravi to water the gardens and other neighbouring lands.

But since Mughal decline, the city had dwindled

except for its strategic importance which brought prolonged instability and chaos. Before the British took over Lahore in 1849, the city had "sunk into a mere heap of ruins, containing a few scattered houses and a couple of Sikh forts within its shrunken walls; while outside, a wide expanse of broken remains marked the decaying suburbs which once surrounded the capital".[2]

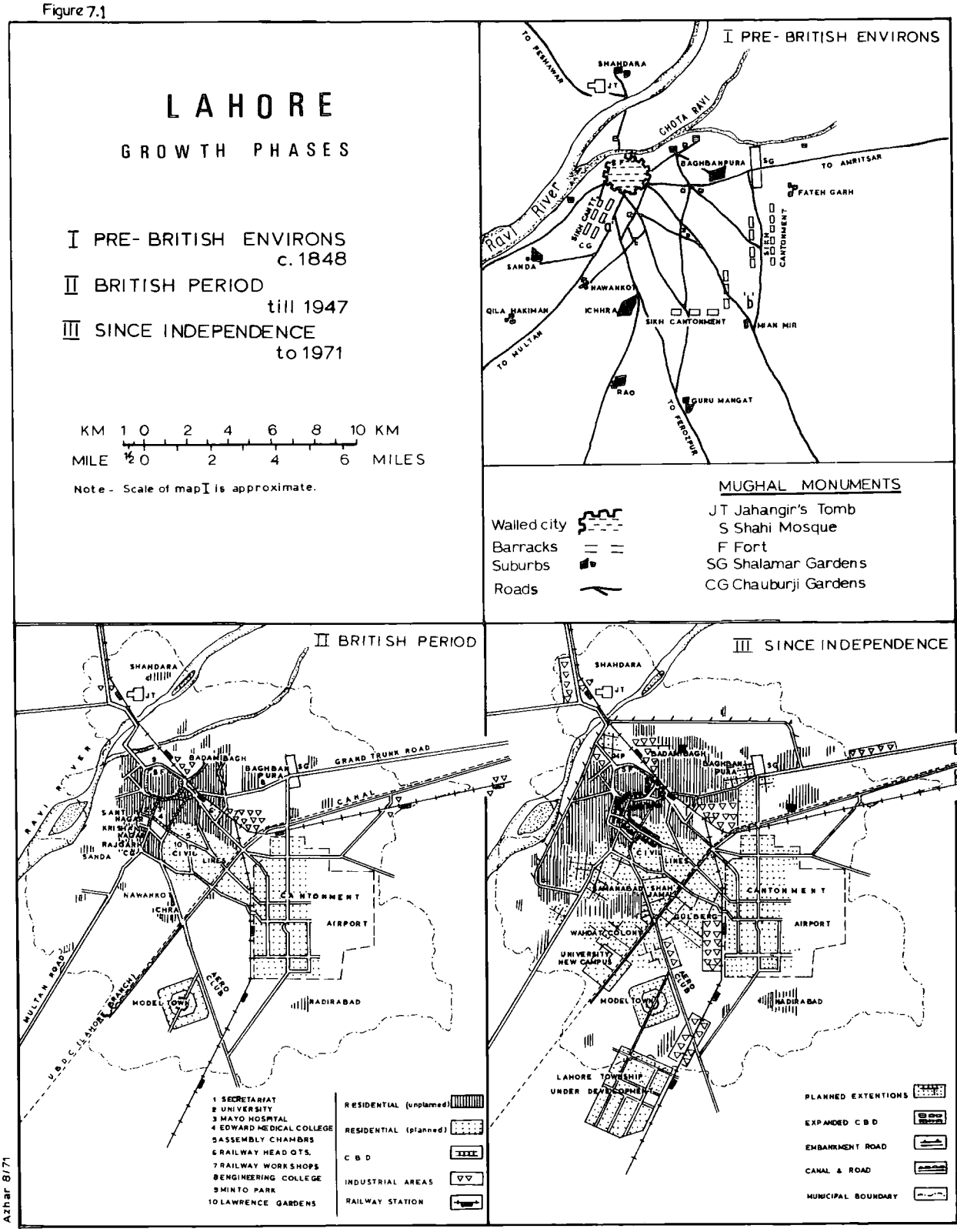
DEVELOPMENTS OF THE BRITISH PERIOD

Administrative Consolidation and Institutional Foundations

Map I in Figure 7.1 illustrates the walled city and environs as the British took over Lahore after the Second Sikh War. The native city covered an area of about 260 hectares. It was surrounded by a brick wall, rising to a height of 9-10 meters, from the outer ground, strengthened by a moat and other defenses. The moat was filled soon and the surrounding wall was razed to give place to a garden and open space on all sides. Outside the walled city, the important suburban localities were those of Sanda, Nawankot, Ichchra, Mianmir, and Baghbanpura etc.

The area of first British settlement was the old Anarkali, (Marked 'a' on Map I) where, in a Sikh cantonment, the first offices and residences were established. As new civil administration was to be set up soon, the Anarkali Barracks were vacated and the new Cantonment was established at Mian Mir suburb in 1853 (Marked 'b' on the same map).

Figure 7.1



Azhar 8/71

In the meantime all area of the city suburbs was surveyed and a plan for a civil station and connecting roads was drawn up in 1859.[3]

In 1862 the railway line was extended upto Lahore, from Delhi, and by 1865 it was joined with the port of Karachi in the south. The municipality of Lahore, encompassing a large number of surrounding localities was created in 1867 and local urban affairs were entrusted to the civic body. Thus from the middle or the 19th century rapid changes both in morphological and functional structure of the city ensued as the new government pursued its policies of administrative consolidation along with the establishment of British styled social institutions. But more than that, Lahore was capital of a province where many British civil servants, administrators, engineers and gentlemen were to make their imprint on town and country with an unprecedented fervour. Map II in Figure 7.1 depicts urban expansion of the British period. Civilian administrative offices were constructed along that stretch of Multan Road which is known as the old Mall, and lie to the south of the city. The main Secretariat, District Courts and Government College buildings were established in a north/south alignment, while more important developments took shape in a west to east-southeast alignment along the Mall proper. The Town Hall and Punjab Museum became conspicuous on the southern side whereas most of the northern side of the Mall, upto its junction with the Anarkali, was given to the Punjab University Campus.

About 4 kilometres further eastward, along the Mall, were erected the Assembly Chambers on the northern side, and Lawrence Gardens, which also contain the Zoo, were developed on the southern side. The long stretch of the Mall from Anarkali Chowk (crossing) to the crossing opposite the Assembly Chambers, then called the Charing Cross, was given to banking and commercial institutions with high class shops in between. The General Post Office and Central Telegraph Office and the impressive buildings of the Chief Court are also within this stretch of the Mall. Its further southeastward extension upto the branch of the UBD Canal is referred to as the Upper Mall, and contains the Governor's House and Aitchison Chief's College, a special institution for princely families of the Province.

A vast piece of land (over 500 hectares) initially dotted with ruins, kilns and other decaying structures was available to the south of this thoroughfare on which grew the Civil Lines, i.e. residences of the high officials and offices of the district administration. Apart from spaciousness of the dwellings and contrast in structural design, Lahore's Civil Lines hardly give impression of a planned locality. The roads and streets present a confused pattern as they have multiple junctions and several intersections.[4]

A Meteorological Observatory, District Prison and Mental Hospital were important developments to the south of the Civil Lines. Further southeastward across the Canal and railway line stands the Cantonment, another British

planned area, wholly devoted to the special needs of the military.

Railway Workshops and Other Industrial Areas

A great change brought to the urban life during British period was the introduction of railways and modern manufacturing. Establishment of North Western Railway's headquarters at Lahore not only added to the administrative and commercial functions, but more than that introduced a premier industry to the city. The railway's residential colony, offices, workshops and a training institute became important users of land. The Railway Bridge across the Ravi was completed in 1875 and soon there were through trains from Peshawar to Calcutta. This railway line passed through the northern side of the city, whereas the Karachi line turned off towards the south, thus creating nodality of great importance. The main city area came within the arc formed by the Peshawar to Karachi line whereas the Cantonment has the first line to the north and the second line to the west of it. It was in the eastern part of the third sector that the Railway Workshops and Marshalling Yards were developed and a substantial area came under industrial usage.

First Major Factory Locations:

While railway workshops grew under government patronage, manufacturing industries began to coalasce into definite areas of easy communications and cheap land. This was available on the outskirts along the northern railway

line and the Grand Trunk Road, which had the same alignment. Thus availability of cheap land and facilities of haulage caused the first linear development of the industrial sector in the city. Five pockets of industrial land use, which grew in each case adjacent to a suburban station are worthy of note, as these were the earliest industrial ventures and contributed to the importance of the capital city. By the mid 1940's they constituted a major part of the first industrial region (in the making) of the Punjab, in conjunction with similar developments around Amritsar.[5]

TABLE 7.1

MAJOR INDUSTRIAL ZONES IN LAHORE BY 1940

Industrial Locality	Manufacturing Concerns
1. SHAHDARA	Dyeing & Chemical Works, Electric Goods, Pharmaceutical Works, Match Factory and Flour Mills.
2. BADAMIBAGH	Iron & Steel Rerolling Mills, Flour Mills.
3. MOGHALPURA	Railway Carriage Workshops, Railway Locomotive Workshop.
4. HARBANSPURA	The Mint. Stationery Works.
5. JALLO (Batapur)	Bata Shoe Factory.

Educational & Other Public Institutions:

With the establishment of British administrative machinery came new education, health and other social service

departments and agencies. Institutions like Government College, Punjab University, and King Edward Medical College are a few to be mentioned on the government side. Community efforts saw emergence of many other schools and colleges on similar patterns. In the sphere of health and hygiene, Mayo Hospital on government account and Gulab Devi and Ganga Ram Hospitals on private account stand out as premier institutions. In a case study of Lahore's medical services, Chaudhry (1965)[6] found that the Mayo Hospital serves a vicinity of upto 100 miles (but a more densely populated area), whereas services of Gulab Devi Hospital extend to a much wider area. What importance such institutions carried in the period when these were the only services available in whole of the northwest of India can easily be gauged.

Consequent to the consolidation of the agricultural economy in the Punjab, was commercial and business fervour of the capital city, where both middle class traders and capitalists thrived in great numbers. The new localities of Santnagar and Krishannagar grew as a continuation of built up areas to the southwest of the city and are middle class residential areas. Quite distinct from these localities, a high class residential area Model Town was developed some 10 kilometres to the south of the city, off Ferozepur Road.

POST INDEPENDENCE CHANGES IN URBAN CHARACTER AND LAND USE.

The population of Lahore city has more than doubled during the past two decades and is now approaching 2 million. Map III in Figure 7.1 illustrates city extensions during this period. Its cultural importance as the farthest outpost of the Islamic world and its vulnerable border situation in a zone of conflict brings forth more emotional pride among the inhabitants than its size or urban form would warrant. From geographical point of view, Lahore has not only withstood its vulnerable location on the border and the loss of centrality by way of partition of the Punjab Province, but has shown rapid growth both in size of population and physical extent. New residential localities, administrative, social and educational institutions, commercial establishments and industrial concerns have sprung up within and on the outskirts of the city.

In its skeletal expansion and remodelling of inner morphology a duality of planned and unplanned growth has created sharp contrasts. Lahore Improvement Trust's town development schemes have contributed to the physical modelling as well as functional categorization to some extent but exigencies of rapid increase have perpetuated squalid dwellings in many parts of the city.

Role of Developmental Agencies and Impact on Morphology of Lahore.

The task accomplished by urban development agencies could be viewed in segments or for different categories of land uses.

1. Remodelling of parts of the Old City.
2. Central Business District & Administrative Hub.
3. Urban renewal and expansion.
4. Industrial Sectors.

1. Remodelling of parts of the old city: A dual carriage way encircling the inner core was constructed in the early 1950's, which provided easy access at least to peripheral parts of the congested quarters. Later the Lahore Improvement Trust cleared many blighted areas, especially on the eastern side of the inner zone. New marketing premises namely, Shahalam, Azam and Pakistan Cloth Markets etc., were constructed on cleared land. The new structures are mostly two storeyed with wide connecting roads and passageways in between. Thus the traditional tortuous bazar has been reshaped and enlarged to take in vehicular traffic and motor carriages in this district of the city.

In the northwestern sector of this core area stand the Fort, Badshahi Masjid (Royal Mosque), Hazuri Bagh (park) and other historical structures. The rest of the area contains a dilapidated but compact mass of dwellings, usually 3 or 4 storeys high with dark alleys in between. Despite clearance of many obstructions and introduction of

other urban amenities, this part of the city retains the highest density of buildings and population, and a very high concentration of trade and traffic.[7]

2. Central Business District & Administrative Hub: It is to the south of the old city where administrative and commercial services were established during the British period that one finds a great concentration and intensity of urban functions. It is within the localities of Lake-Lytton roads and Bank Square, with extensions on to the old Mall and new Anarkali, that the Civil Secretariat, District Courts, Provincial High Court, University Campus (old), numerous colleges, halls of residence and the main shopping areas are intermingled. Here the origins of all physical structures, buildings, roads etc., along with their assigned functions, relate to the developments of the British period. There is no study of land values but the tendency to open up backyards of many a business premises and then provide access to deep built shops indicate a sharp rise in the value of land in this part of the city. Such deep built enclosures, which may contain rows of 50 or more shops have assumed the character of covered bazars in places where none existed before 1950. In fact they are named as such, lik Bano Bazar, Chori Bazar etc. Such small bazars specialize in ready-made garments, women's attire, cosmetics, toys etc., and could be reckoned as clusters of stalls trading in a variety of goods. With the passage of time this area has gained in intensity of use by officials, the student

community, business class and hordes of customers. Road traffic as well as pedestrians flow becomes most confusing and congested in this part of the city especially in the evenings.

To the east along the Mall, the fashionable shopping area has turned more to commercial and banking enterprises than retailing. It is here that multi-storeyed buildings are replacing earlier double storey mansions. Though the skyline is reaching higher here than in any other part of the city, yet it is not more than six to seven storeys high, which is in contrast to similarly fast growing cities elsewhere. (See Plate No. X)

3. Urban Renewal and Peripheral Expansion: Outside the two areas of high functional intensity, the morphological pattern of Lahore consists of broad zones where land use can be identified more clearly. The northern and western parts' proximity to a river liable to flooding, has restricted the extension of builtup area for a long time. However, construction of two embankment roads (5-6 metres high) has provided protection since 1955. But the low lying land to the north and northeast of the old city has only given rise to congested and unplanned residential localities. Similarly the north-western segment has become a favourite area for lower middle class families, where much of the agricultural land has come under residential-cum-shopping use. However, on this side, on a spacious piece of low lying land, regained after the drying up of the meandering channel, a new Fruit and Vegetable Wholesale Market has been established. A

second bridge across the Ravi, completed in 1968, has provided new links with the towns and villages in the northwest.

The open, spacious and planned localities have spread in the eastern and southern directions from the city. In between the Civil Lines and Model Town of British period have sprung up a score of newly built residential localities like Gulberg, Samanabad, Shahbagh, Shah Jamal, Shadman Colony and Whadat Colony etc. Multan Road, Ferozepur Road and Gulberg Road leading outward from the central city have provided major radial extensions. Apart from these large localities, there are numerous smaller development areas and pockets of urban renewal undertaken by the Lahore Improvement Trust. Some of these schemes have lately taken up redevelopment of the expansive old structures of the British period, such as that of the old District Prison and Riwaz Gardens residential area. Here new compact structures are being erected in place of earlier buildings.

The new campus of the Punjab University, developed since the early 1960's lies astride the Lahore branch of UBDC to the south of Whadat Colony. A curious feature of Lahore (as well as including other district headquarter towns) is the scattered growth of new administrative offices and public buildings. Many government institutions and autonomous bodies have acquired private residences for their offices in new localities. The grouping of these

offices, as also that of the provincial secretariat, is an urgent need. The present situation entails unnecessary internal journeys from one office to another, scattered among residential areas all over the city.

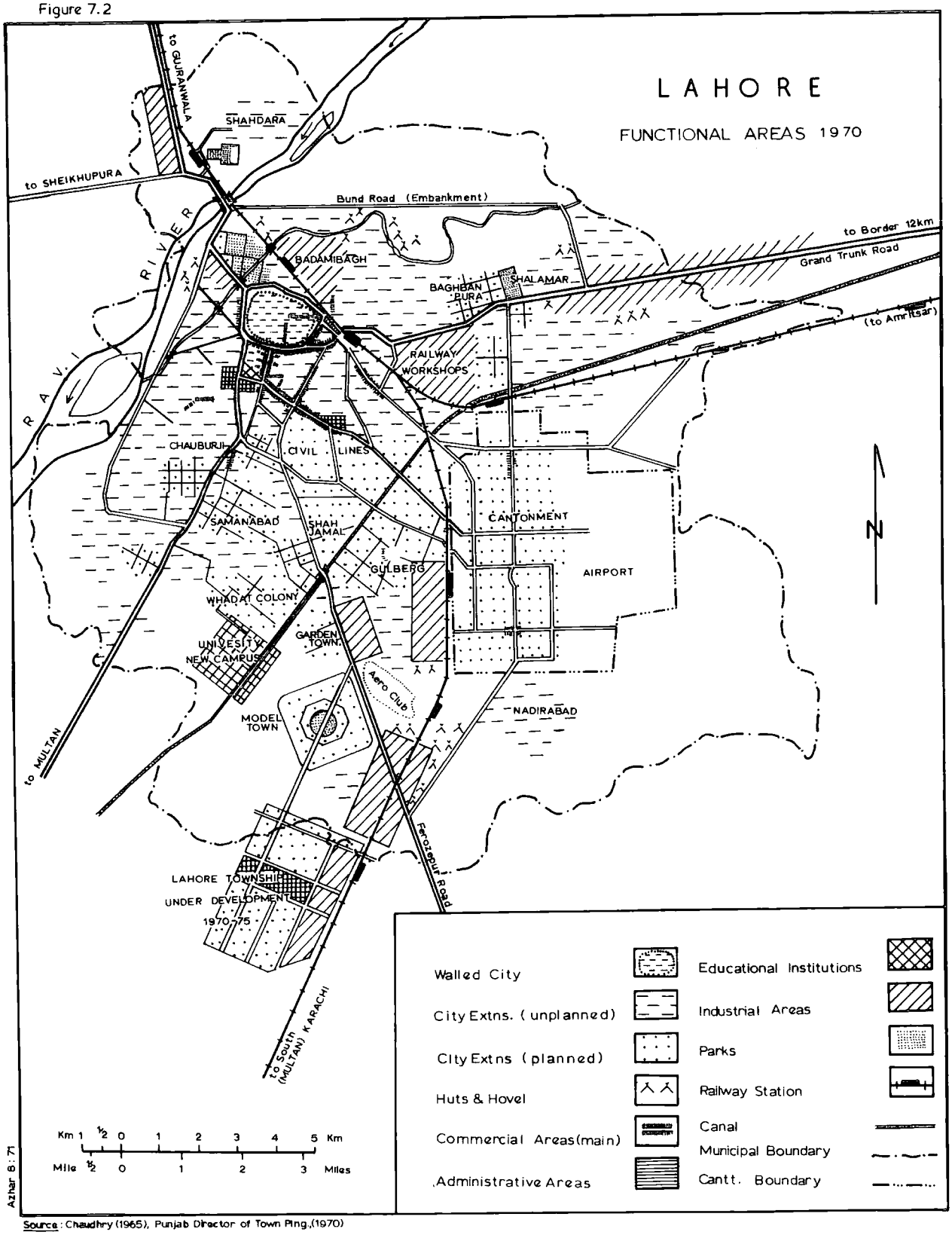
4. Changes in Industrial Land Use Pattern: A distinct change in the city's land use pattern has occurred in the industrial sector. The linear pattern along the railway line is still very much in evidence but a greater number of new industrial concerns have sprung up along the Lahore-Karachi line which radiates towards the south. This is an indication of limited growth space in the east, as well as the severing of former links because of the border. Though earlier industrial pockets have also grown in size, the new Gulberg Industrial Estate, Ferozepur Road Industrial Area and a larger industrial zone near Kot Lakpat are additions of the past two decades.

Fehmeeda Mirza (1968)[8] notes that the large scale factory concerns are forming their own zones of concentration in the city. Metal products and machinery are concentrated in Badamibagh, Transport machinery in Mughalpura and Printing and allied publishing and stationery works are near the old Walled City on Ravi Road. Most of other concerns which cater for items of everyday use such as food, beverages, footwear, leather and rubber goods and garments etc., are scattered. However, durable items such as bicycles, small motor engines, well pumps, electric goods and textiles are becoming prominent especially in Gulberg Industrial Estate and Kot Lakhpat Industrial area.

These later areas also provide greater employment opportunity as well as contrast in the structure of the city.

The present day functional areas of Lahore are depicted in Figure 7.2. A progressive change both in the morphology and functional characteristics of the city introduced since the early British period has moulded a larger part of the townscape outside the walled city. There is high concentration of functions in a relatively small area around Anarkali and the Mall. Later development works in all these parts have remained detrited and many urban renewal schemes are confined to small pockets only. However, new residential localities in the south and east occupy low density areas and provide better civic amenities. But these areas are spread out too far from the central city or the CBD. Increased industrial activity and consequent in-migration has led to the planning of a New Township which has already been discussed in Chapter VI. The new township of Lahore will emerge as a predominantly industrial workers' locality. Segregation of functional zones within the township has been planned. But within the city there is a greater intermixing and intermingling of functions. There is a more obvious need for relocating provincial administrative offices as has already been done in case of a new campus for the Punjab University.

Figure 7.2



Azhar 8:71

Source: Chaudhry (1965), Punjab Director of Town Ptng.,(1970)

MULTAN

Located within a narrow mesopotamian region, formed by the converging tributaries of the Indus, Multan's origins and traditional functioning as a trading post belong to antiquity. A well established trade route from Hindustan to Persia and Afghanistan passed through it and Multan has been a leading trade centre for centuries. The foundations of Multan appear to have been laid on two raised mounds of mud and earth, separated by the intervening bed of the river. Till the middle of the last century there were few habitations outside the walled area and the inner pattern was ardously congested.[9]

EVOLUTION OF MULTAN'S TOWNSCAPE DURING BRITISH PERIOD

A cantonment and a municipality were created for Multan in the same years as for Lahore, i.e., in 1853 and 1867 respectively. But here the municipal limits did not embrace large areas as the city itself was very compactly built and there were few suburban localities. Unattractive climate and semi-desert environs were prohibitive factors in the growth of the town till the extension of cultivation through canals was established. However, when the hinterland of Multan became a district of cotton, sugarcane and cereals, with emerging new Mandi towns like Khanewal, Mian Chunnu, Vihari, Jahania and Burewala in the vicinity, the city prospered in many spheres.

Construction of a circular road around the earlier

city was first to come, but all new morphological changes were introduced outside it. The Cantonment was the first planned locality established six kilometres to the west of the old city. Grid plan of the streets, roadside greens and parks, a Mission hospital and an Anglican church building became the standard land marks of the new locality. The Civil Station area which grew later, along the Abdali Road and Bahawalpur Road, was nearer to the cantonment than the city itself. A small Railway Colony, Divisional Offices of North Western Railway and marshalling yards were other planned additions of this period.

Till the early years of this century, the main economic function of Multan was overland regional trade mostly in hosiery goods and coarse cloth. This pattern was radically changed with the introduction of railways, while the prosperity of the surrounding new towns and rural settlements in the colonies effected a great change in the nature and type of trade goods. Though many residential localities grew outside the walled city as a consequence of rapid growth, all such extensions were unplanned and haphazard. Even Nawan Shahr (New City) a locality nearer to the Civil Station, grew in congestion and without any serious street plan, shopping premises or civic provisions. It was late in 1944 that the Multan Improvement Trust was established by the provincial administration.

MULTAN'S GROWTH SINCE INDEPENDENCE

Soon after its inception, the Multan Improvement Trust found its schemes to be much in demand. The influx of refugees in 1947 and subsequent expansion of trade, industry and commerce warranted development of a score of residential localities, educational buildings, shops and industrial concerns. One of the earliest schemes[10] drawn by the Trust was thus immediately taken over by the provincial administration and developed as one of the first satellite towns in the province, named as Mumtazabad.

Before considering the second satellite town and other residential extensions, mention must be made of the founding of Nishtar Medical College to the north of the Civil Station in 1951. This Medical College, with attached hospital, staff quarters and students' halls of residences form a compact modern sector in the morphology of Multan. In the early 1960's the construction of new buildings for the Government College, Teacher Training College with attached Secondary School and hostels for these institutions on an area of 37 hectares brought another compact addition of public institutions to the growing city.

A couple of years prior to the development of the later educational institutions another residential scheme, Gulgasht, (Sattelite town No. 2) was executed on the western side of Bosan Road. This area being nearer to the city (about 2 Km) not only became a quick success itself but many other smaller residential colonies sprang up

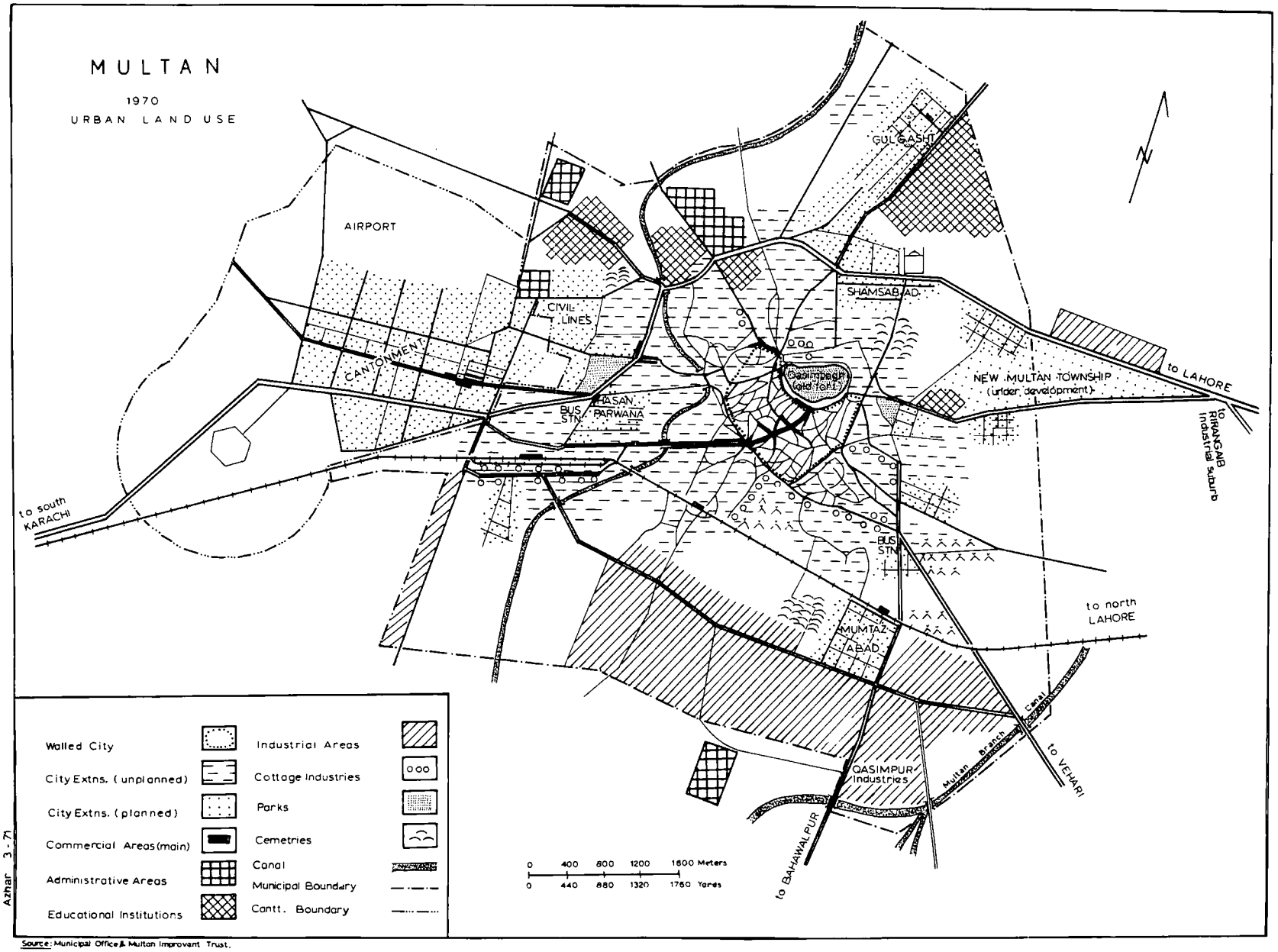
concurrently.

The Karachi-Lahore Highway forms a distinct divide, to the north of which are the major planned extensions as compared to unplanned growth immediately in the neighbourhood of the central city. (See Figure 7.3) The Cantonment itself, Civil Lines, Administrative Offices and District Courts, smaller new residential quarters like Lawyers Colony, Pir Khurshid Colony, Gulgasht and the newly developed educational campus, all are on or near to the northern side of the Highway. Other institutions located at different points along this highway are the main Bus Station, Central Telegraph Office, many cinemas and hotels. This sectoral differentiation is in sharp contrast to the southeastern sector where unplanned growth has continued unchecked. Multan's new expansion will assume a more linear pattern than the previous growth. Expansion towards the east along the Highway is already in progress and New Multan Township is planned along this road.

Small Industries Estate:

Multan has a large number of small industrial units which include handlooms, hosiery goods, wool knitting, tapestry and printing of cloth etc. An assessment of their role in the economy of the town would require detailed analysis as to their production and employment. However, it is sufficient here to note that their physical presence and spread especially in the southeastern sector not only defines a large use of the land but also provides opportunity

Figure 7.3



Azhar 3-71

Source: Municipal Office & Multan Improvant Trust.

of work to in-migrants. These small units of manufacturing industries usually employ 10 to 15 semi-skilled workers or unskilled labour.

An exclusive Estate for such small industries has now been planned in the public sector. These industries are being housed in an area of over 550 hectares outside the present municipal limits of the city but adjacent to an already existing industrial suburb, Ismailabad. The Estate would provide the necessary physical infrastructure for new industries as well as promote the transfer of many units from within the city.

Major Industrial Land Use:

Apart from handicrafts and small industries, which are traditional to Multan, modern large industrial units have been established in large numbers since the early 1950's. The main industrial sector has grown to the south of the railway line on both sides of Multan-Ferozepur-Delhi Road. It includes textile mills, vegetable oil mills, metal works, fruit preservation, pharmaceuticals and cold storage units.

The Suburban Industrial Townships:

Outside Multan City proper, there are two suburban industrial townships, namely Ismailabad to the west and Pirangaib to the east. Among these the township of Pirangaib has two exceptionally important concerns, namely Multan Thermal Power Station and PIDC's Natural Gas Fertilizer Factory. Apart from factories, residential

quarters have been established near to the sites. The PIDC Colony has over 550 residential units, a local shopping area, recreational clubs, play grounds, a middle school, post office, hospital and two rest houses. A similarly patterned but smaller housing colony is maintained by WAPDA for their Power Station.

Morphological changes outside the walled city and new residential localities, the break down of the traditional local economy and the emergence of industrial suburbs have introduced new patterns of urban land use. Multan thus is in the process of rapid transition from within.

Multan city is very central in position, particularly in relation to communication net-work of West Pakistan. For its central location, Multan was a contender as a possible site for national capital (Tayyeb, 1966).[11] But because of its comparatively more drier and hot physical enyirons, it has fallen to third rank in the region. Both in population increase and economic growth, it has been overtaken by new city of Lyallpur since 1961.

LYALLPUR

Lyallpur, literally the city of Lyall,(*) founded in 1896, in the heart of the wasteland, now stands as the heart of the most prosperous agricultural community in the country. Its precolonization environs were among the most desolate and dreary and have been adequately described in an earlier chapter. The profound influence on demography and socio-economic pattern of the area as a whole brought about by colonization efforts has set a distinct mark on the planned growth of the city from the start. The initial planning pattern of this town as the headquarter for Rechna Doab Colony has been briefly discussed in Chapter II (page 68). Lyallpur had a population of 9,171 in 1901 which rose to 425,248 in 1961 and according to estimates for the year 1969[12] it stood at more than 854,000.

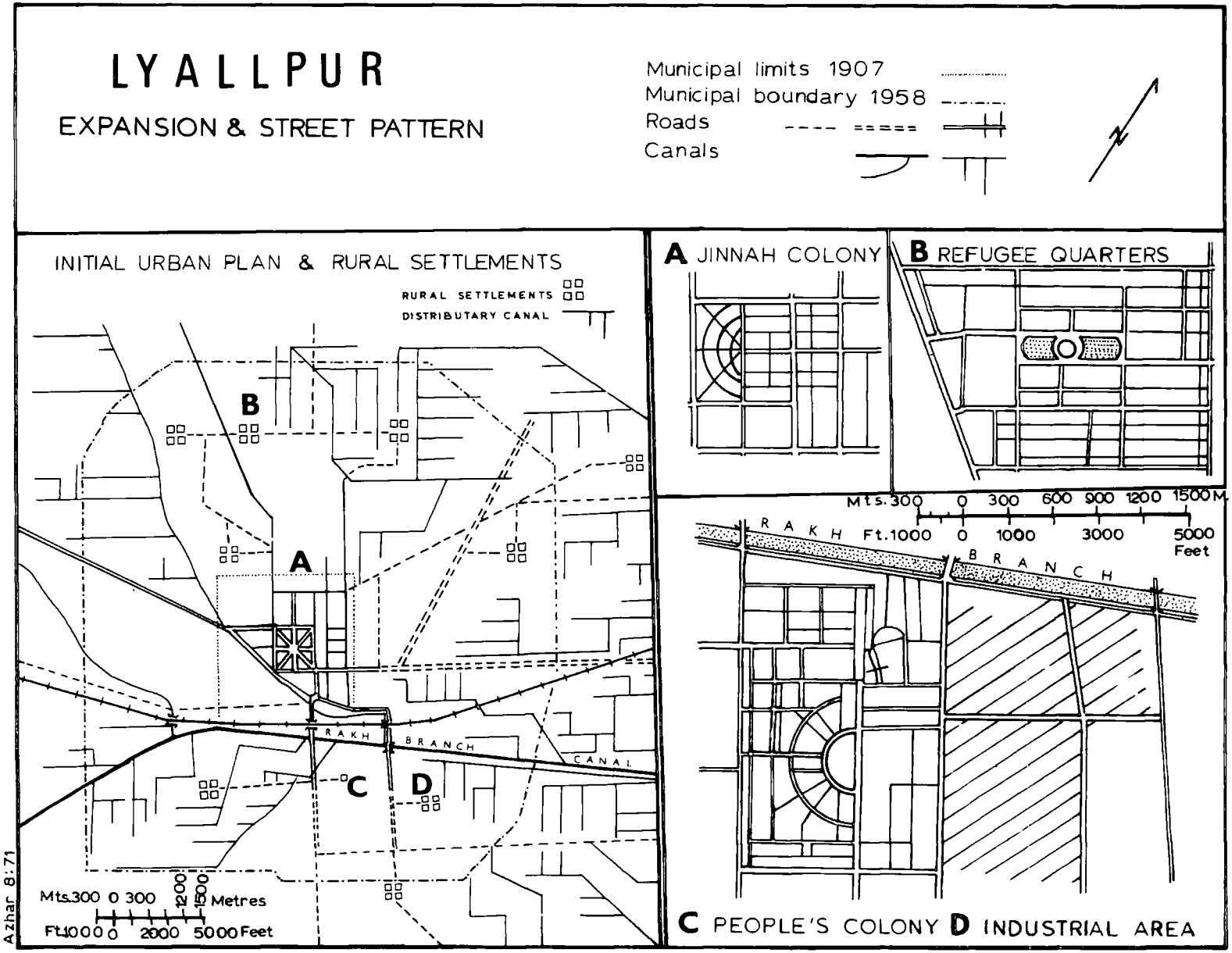
The characteristics of the city which led to such phenomenal growth can be traced from an account given within the first decade of its existence.

"The town is one of the greatest depots for the exportation of wheat in the Province, and collects all kinds of agricultural produce from the Chenab Colony. It contains five ginning factories, four cotton presses, two combined ginning and pressing factories, an iron foundry and a flour mill".[13]

This aspect of the town's economy has become well

(*) Sir James Lyall, Financial Commissioner and later Lt. Governor of the Punjab in 1880's, who greatly moulded early colonization policies.

Figure 7.4


LYALLPUR
EXPANSION & STREET PATTERN
Municipal limits 1907
Municipal boundary 1958
Roads
Canals
INITIAL URBAN PLAN & RURAL SETTLEMENTS
RURAL SETTLEMENTS
DISTRIBUTARY CANAL
A
B
C
D
RAKH BRANCH CANAL
Mts.300 0 300 600 900 1200 1500 Metres
Ft.1000 0 2000 5000 Feet
Azhar 8:71
A JINNAH COLONY
B REFUGEE QUARTERS
Mts.300 0 300 600 900 1200 1500M.
Ft.1000 0 1000 3000 5000 Feet
RAKH BRANCH
C PEOPLE'S COLONY D INDUSTRIAL AREA

established, as according to 1961 census, 96% of Lyallpur's Civilian Labour Force were engaged in non-agricultural pursuits, nearly half of it directly in manufacturing. Attraction of the town's economy, especially for the industrial class, brought an increase of 137% in its population during the decade 1951-1961. Thus it jumped to the rank of 5th city of Pakistan and 2nd of Upper Indus Plains, after Lahore.

LYALLPUR CITY DURING THE BRITISH PERIOD

Bokhari (1968)[14] recognized three phases of urban development of Lyallpur.

1. The Initial Stage 1896-1904.
2. Formative Period 1905-1946.
3. Modern Period 1947 - onward.

Continuous growth of the city from the days of its inception makes it a point of personal conjecture to divide the years into periods. However, the reasons for fast growth are easily discernable. As mentioned earlier a central position of the place in Rechna Doab was the primary consideration as a choice for the site. Its nodal position for converging country tracts and roads from Jhang, Kamalia and Chiniot towns was further augmented when Lyallpur was provided with railway connections to Lahore (via Wazirabad) and Karachi (via Khanewal).

The cob-web plan of the initial area (Kureishy, 1957)[15] had provision both for residences and shops. Eight

roads radiating from the central clock tower became the retail shopping area, each specializing in a particular type of merchandise. Along these roads double storey structures became most common, where ground floor frontage was developed for commercial use; inner parts and upper floor served as residences.

The outer ring road provided avenues for the setting up of wholesale business in grains, cloth, shoes, salt, timber and hides and skins etc. The southeastern triangular sector was devoted to the main Mandi (Market) where agricultural produce from the countryside was traded and stocked for export.

With rapid increase in the city's population and consequent demand for housing, new mohallahs (localities) sprang up during 1930's and 1940's. These new localities such as Tariqabad in the east, Santpura, Partabnagar, and Guru Nanakpura in the west, grew from individual nucleated dwellings on the periphery of the then municipal limits. In spite of a set road pattern, this growth proceeded in a very unsystematic way, giving rise to congestion and squalor in these parts. Such inapt growth could be ascribed to the fact that the dwellers in new mohallahs belonged to middle class workers groups who came to the city at a time when costs and rents for accommodation, within the city, had risen to a point beyond their capability or expectations.

The Civil Lines:

The administrative area was developed on a vast

triangular block, lying adjacent to the initial radial plan at the opening end of the Kutchery Bazar. Here a strict grid-iron pattern of roads and streets is interspersed between separate office premises. The District Courts compound contains single storey structures for magistrates and the Sessions Judge. To the north of it are the Police Barracks and finally the District Prison; the later having tall mud-plastered walls. On the other side, that is, to the southeast, were constructed the Canal Offices, PWD Offices and the Tehsil Headquarters.

On an extension of this grid-iron pattern, further to the northeast, were developed the bungalows for senior civil and revenues officials. The spaciousness of these later residences, open lawns and shady trees, indicate the status of their dwellers. These residences together with the administrative sector form the Civil Lines.

Lyallpur has no cantonment. It has been a purely administrative, regional marketing and manufacturing centre.[16]

Punjab Agricultural College:

Apart from its normal administrative functions as a District Headquarter town, an Agricultural College was established in Lyallpur. The northwestern side of the city was developed both for the teaching and experimentation in agricultural practices. Thus a large area belonging to the College with its administrative and teaching blocks, students' hostels and staff residences, became a distinct sector of the city.

Industrial Sector:

Provision for manufacturing industries was made to the south of the city on the other side of the Railways' Goods Platform, which is on the leeward side of the prevailing northeasterly winds.[24] For a very long time industries remained confined to this area which was bounded in a triangle, formed by the railways Goods Platforms, the main railway line and a road which connected with the main Samundri Road. (Figure 2.7 in Chapter II)

GROWTH IN THE POST BRITISH PERIOD AND PRESENT MAJOR URBAN REGIONS:

First the influx of refugees and later of industrial labour caused a phenomenal increase in the population of Lyallpur. During the two decades, 1941-51 and 1951-61, Lyallpur's population increased by 156 per cent and 137 per cent, respectively. This rate of growth has continued, bringing the estimated total to over 854,000 by 1969. The Municipal limits of the city were enlarged three fold in 1958 and now cover an area of 7,540 hectares. Figure 7.4 illustrates the expansion of the city's limits from its initial plan to the present day municipal limits as well as the street pattern which has been maintained in the later developments. An interesting feature in the physical growth noticed over this period is that whereas planning in the residential sector has been maintained by and large, the industrial land use pattern has emerged in a most unorganized form. The reasons for this anomaly are far

from clear except that the pattern of residential growth was retained as an extension of an already existing, infrastructure of road and street pattern. Whereas the manufacturing area was initially confined to a small offside location and later industries grew either along the main highways leading out from the city (where non-residential land was cheap), or within the newly developed residential colonies where small units of machinery were erected for the production of handy consumer products. (Figure 7.5).

Bokhari (1968) divided the present city regions on the basis of functional use in major sectors and morphological pattern of the subsectors where distinguishable, on the basis of size or structural materials.[17] His urban regions of Lyallpur are as follows:

I. The Commercial Core.

II. Administrative Quarters.

III. Agricultural University Campus.

IV. Old Factory Area.

V. Inner Residential Areas.

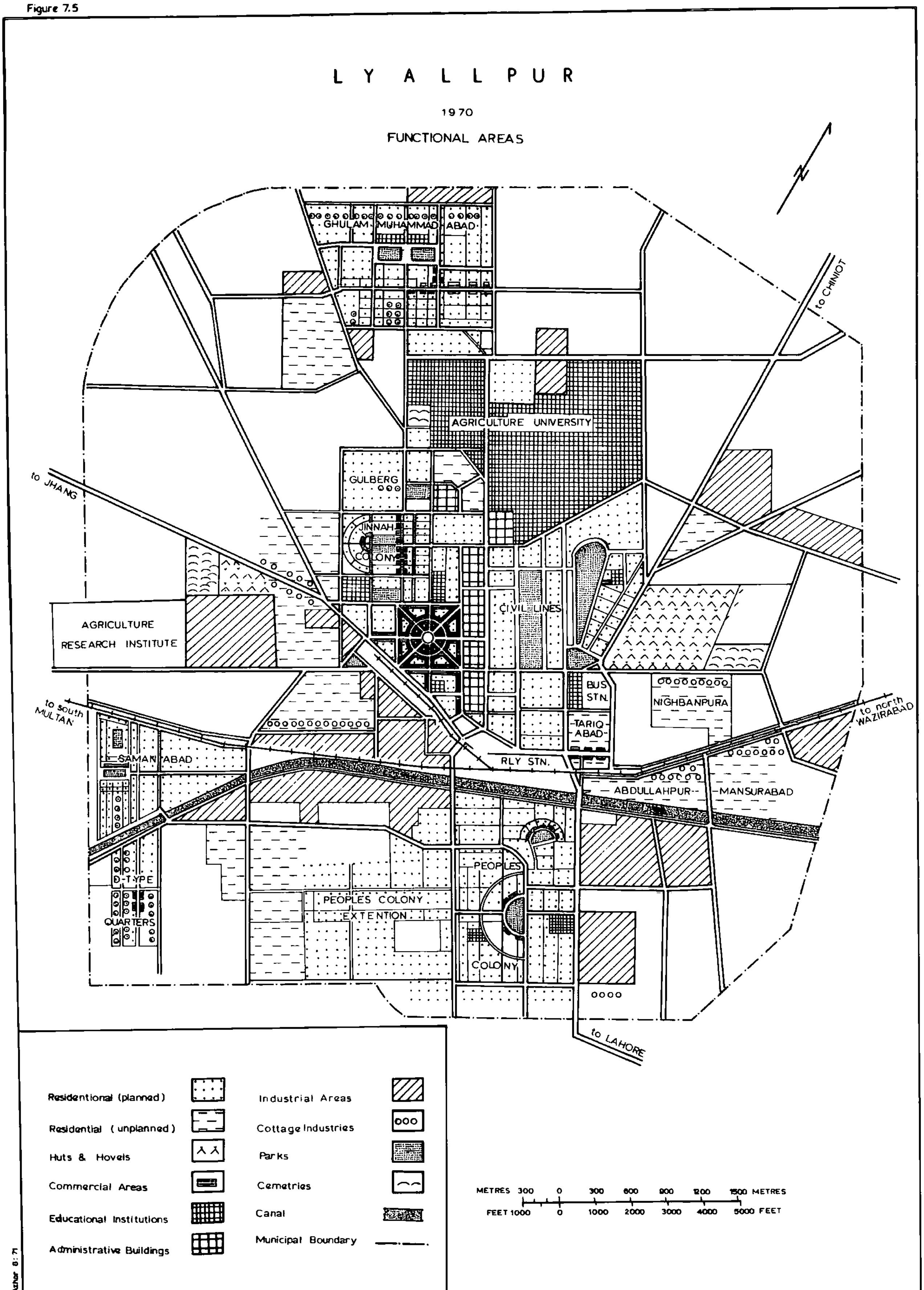
(a) The Detached Bungalow Areas.
(b) The Semi-Detached Bungalow Areas.
(c) Indigenous House Areas.
(d) Terraced Quarters Areas.
(e) Huts and Hovels Areas.

VI. The Suburban Areas with Industrial Satellites & Colonies.

(a) Semi-detached Bungalows.
(b) New Terraced Quarters.
(c) Private Localities with Indigenous Houses.
(d) Huts of Suburban Areas.

VII. The Outer Fringe of the Open Country.

Figure 7.5



after Boukhari(1968)

The first five of Bokhari's regions coincide with the earlier established pattern (i.e. pattern of the British period), with a phenomenal increase in intensity of use and areal extensions. For instance, the bazaars of the initial radial plan have now grown to be the Commercial Core or Central Business District with its extensions towards the southeast where wholesale trading is dominant. Structural changes have also occurred in this part of the city as new and many of the earlier buildings are now three or four storeyed. A number of hotels, commercial and business firms and banks have invested in the reshaping of this area. However, the triangular sectors still retain housing as their dominant function, though the structures have now become old-fashioned. Additional storeys have been added to many houses. Congestion and increased rents of the inner areas have shifted residential preferences to newly developed areas. This trend is in agreement with the well known generalization that land prices and residential densities increase towards central localities within the city.[18]

The intensity of usage and pressure of dwellings has also increased in outside mohallahs, thus making them more congested per unit area.(*) Overcrowding is naturally more severe in unskilled labourers' mud houses and huts which have also increased in number during recent years.

(*) Overall congestion and high density of dwellings was revealed as a characteristic feature for Lyallpur in the chapter Analysis of Town Characteristics, page 133 .

Conspicuous changes in the administrative sector have been the expansion of services and building of new premises for the Telephone & Telegraph Department, General Post Office and a Regional Branch of the State Bank of Pakistan. A Teachers' Training College, Polytechnic Institute and an Institute of Textile Technology are some of the other important public institutions established in the city in recent years. To this may also be added the raising of the Agricultural College into a full fledged Agricultural University and additional facilities of agricultural research on a new site in the south along Jhang Road, as Ayub Agricultural Research Institute.

New Residential and Industrial Areas:

Refering to the Functional Area Map (Figure 7.5) one finds that as compared to Lahore and Multan the new residential and industrial areas in Lyallpur have been established on a much more elaborate scale. Jinnah Colony and Gulberg Colony are immediately to the west of the initial planned area and comprise semi-detached double storey houses and bungalows. Their rectangular plan with provisions for parks, open spaces and local shopping areas, schools and other services, together with nearness to the CBD make these two localities attractive for the business community and the professionals.

A larger and similarly patterned area, the People's Colony and its extensions has grown since the late 1950's in the southeast, across the Rakh Branch Canal. This residential sector has two large industrial areas to the

north and southwest and a number of smaller manufacturing units interspersed within it. Modern architecture and design of many residences is prominent in this area. General housing quality, both in spaciousness and structural material is also evident.

Somewhat different to these suburban areas are the localities of Ghulam Muhammadabad in the north, Samanabad and D-Type Quarters in the south. These localities have been developed by the government specially for middle class workers and low income group families. Dwelling units in the first two of these localities comprise two room quarters while in the third locality a single room has been constructed with provisions for additions at a later stage. All basic services like electricity and water, and civic amenities such as schools, post offices, shopping areas and local bus connections have been provided for each locality.

As noted earlier, the new pattern of industrial land use is most complex and scattered within the municipal limits. A reference to Figure 7.5 would show that the main reason for the scattering of industrial units has been the availability of cheap agricultural land at the periphery of inner residential parts and the advantage of main through roads. As a result of the rapid increase in industrial units during the past two decades, with no effectual control on the siting of these or smaller manufacturing units, a more confused and dispersed pattern is in the offing. This confusion is evident not only in the industrial sector but also in the nucleated growth of unapproved mud houses and

huts in the neighbourhood of various industrial areas. The planned expansion of the city has been overtaken by an influx of semi-skilled or unskilled labour in the wake of a lucrative urban economy.

With the expansion of the built up areas some of the earlier village settlements have been absorbed but a few such as Sidhupur and Nurpur in the north, Chak Fuajian and Chuhar Majra in the west, stand apart with their surrounding agricultural farms and fields. Apart from provisions for market gardening, such areas provide cheap accommodation for unskilled labour.

RAHIMYAR KHAN

The most rapidly growing new town in the country is Rahimyar Khan whose 1969[19] estimated population was over 104,000. It is situated in the southwestern part of the UIP, half way between Lahore and Karachi. This part of the UIP came under the Sutlej Valley Canals and belonged to the princely state of Bahawalpur till its merger with the rest of the Province in 1956. It has already been noted in Chapter IV that the district of Rahimyar Khan has as a whole attained least urban characters in comparison with other districts. This is due to the fact that irrigation extension and development came very late to this part of the region. In 1931 there was only one town Khanpur, (then population 5,231), while the total population of the district was about 359,000. As a result of Sutlej Valley canalization the situation was greatly changed and the 1941

Census recorded as many as seven towns in the district, though four of these were still under 2,500. By this time however, Rahimyar Khan was firmly established as a new Mandi Town having a population of 6,239, which was slightly more than the old town of Khanpur.[20] From then onward the population of Rahimyar Khan has grown rapidly as is evident from Table 7.2 below.

TABLE 7.2

RAHIMYAR KHAN: GROWTH OF POPULATION, 1941-1969

1941 Population	1951 Pop.	Percent increase	1961 Pop.	Percent increase	1969	Percent increase
6,239 New Mandi status	14,919	139.0%	43,548	192%	104,000	239% in 8 yrs.

Source: Census of Pakistan 1961, District Census Report Pp. IV - 4&5 and U.N. Demographic Year Book 1969. Table 7.

With the growing agricultural produce in the canal areas the State government became interested in setting up manufacturing concerns, and two separate schemes for the establishment of Cotton Textile Mills and Vegetable Ghee Factory (Hydrogenated Oil from Cotton seed) were drawn by the time of independence. The first concern went into production as Abbasia Textile Mills in 1946 while the other concern, namely Lever Brothers Ltd, which later included soap manufacturing as well, started production in early 1950. Both of these establishments have been greatly enlarged since that time. As the town had less than 50,000 population in 1961, no breakup of its demographic characteristics

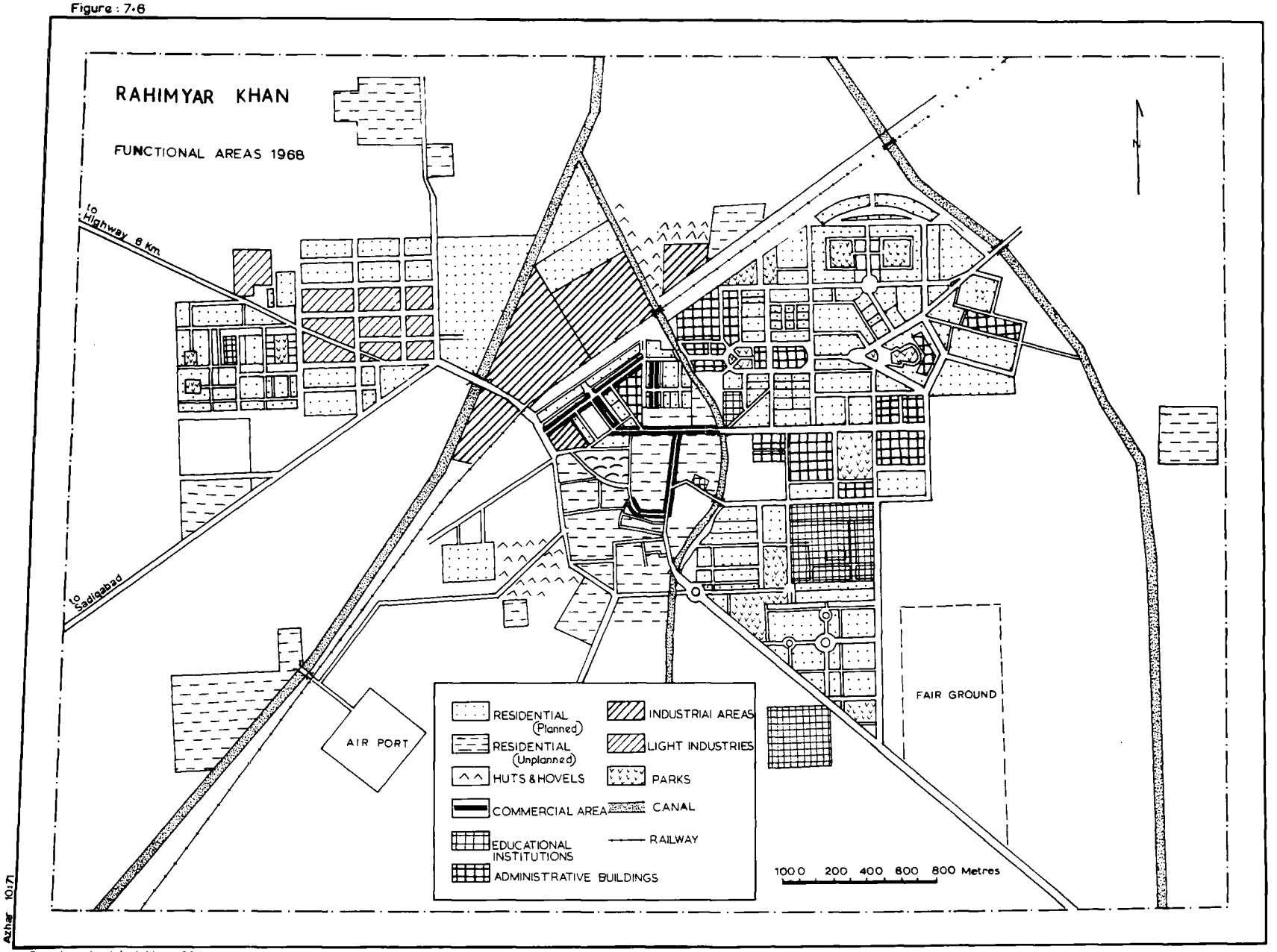
or economic activity is given in 1961 Census Reports.

Expansion of Rahimyar Khan town:

Rahimyar Khan has grown around a small nucleus of an earlier settlement originally known as Noshera.[21] Initially the new town had a modest plan covering a total area of about 162 hectares (400 acres). When the canals were introduced in this area, the Mandi and a small factory premises were established to the north of the said nucleus immediately to the south of the railway station. Now its municipal boundary extends over an area of about 27 sq. Kms. (2,720 hectares) which incorporates the built up area of the town, three small villages and some agricultural land on the periphery. Three canals cross this area in a general north to south direction. Sadiqabad canal, a branch of the main Panjnad canal, passes to the east of the present builtup area, whereas Noshera minor passing through the middle of the town skirts the old core on the eastern side, and Adam Sahaba distributary passes close to the northwest side of the railway line. (Figure 7.6)

As the Mandi and other shopping premises were established to the south of the railway station, earlier residences were also constructed nearer to this part of the town. However, soon after independence with the sudden increase in the population two residential localities, a Model town and a Mohajir colony were established to the east and south of the earlier part, during 1952-55. A spaciously planned administrative sector has emerged on

Figure : 7·6



Azhar 10-71

Based on Municipal Plan 1968.

the eastern extension of Shahi Road. Here the Town Hall and District Courts have been erected on a curious pattern of roads and passage ways among open spaces and greens. Government College, a sports stadium and District Headquarters Hospital have been built in between the two residential localities. Another large residential area, namely Satellite town, has been added to this side since 1962.

The main commercial area is immediately to the south of the railway station where shops and the Mandi were erected in the late 1930's at the time of colonization. Here Shahi bazar with its later extensions has become an important retail shopping area. Wholesale business has, however, concentrated in New Sadiq bazar and Sadar bazar area, where new premises have been added for trading in such material as cloth and tapestry, hardware goods and other bulk items.

The industrial sector has grown mostly to the north of the railway line. Among these the Lever Industrial Estate also includes a residential colony (over 200 residences) for its staff and workers. The Abbasia Textile Mills which employ over 5000 industrial labourers is also now providing some accommodation for its workers.[22] However to the west of these two larger concerns small engineering foundary and two vegetable oil mills have been established along the link road which joins the town with the Lahore-Karachi Highway. It is along this link road that an industrial workers' colony has been established

by the Town Improvement Trust in the past decade.

It becomes clear from the above short account that the town of Rahimyar Khan is undergoing rapid growth, though much of it is as yet undifferentiated and no clear pattern has taken shape.

DAUDKHEL

As mentioned earlier, Daudkel is unique in the sense that this town represents a new type of urban development in the country. The following is the first geographical account of the town and is limited to a brief description of the circumstances of siting and general plan of the town. There is virtually no account yet available, nor do the census reports provide any breakup of its demographic or economic characteristics. The scope of the present study inhibits any detailed treatment which would otherwise provide a useful dissertation within the context of modern urban development and economic trends in the country.

A number of factors have been responsible for the establishment and growth of this company town. It happened in the initial years after the creation of Pakistan, when the Central Government was looking for avenues of industrial development in the country and the TDA had come to the conclusion that establishment of some industries in the public sector would be favourable for the growth and viability of its new colony towns. With the induction of PIDC in 1952 to cater for the industrial needs of the country specifically in the areas and for such industries

where private capital was lacking, the TDA invited the Corporation first to establish a Sugar Mill at Jauharabad and a Woollen Mill at Quaidabad, two of its proposed new towns.[23]

Meanwhile increasing demand for Cement and Fertilizer was an obvious result of the construction of an infra-structure of roads, bridges and new settlements in the Thal Project area and agricultural extension over newly opened wastelands as well as other parts of the country. The extreme northern side of the Thal is too near to the Salt Range where the availability of limestone, gypsum and a fair amount of coal deposits was already known. As the availability of means and resources, as well as costs and benefits of the newly envisaged industries were being debated, the Canadian Government offered to meet foreign exchange expenditure for the cement factory in 1952. A more generous grant, financial as well as for training of personnel abroad, had already been assured by the US Government for the establishment of a Fertilizer Factory in the country.[24]

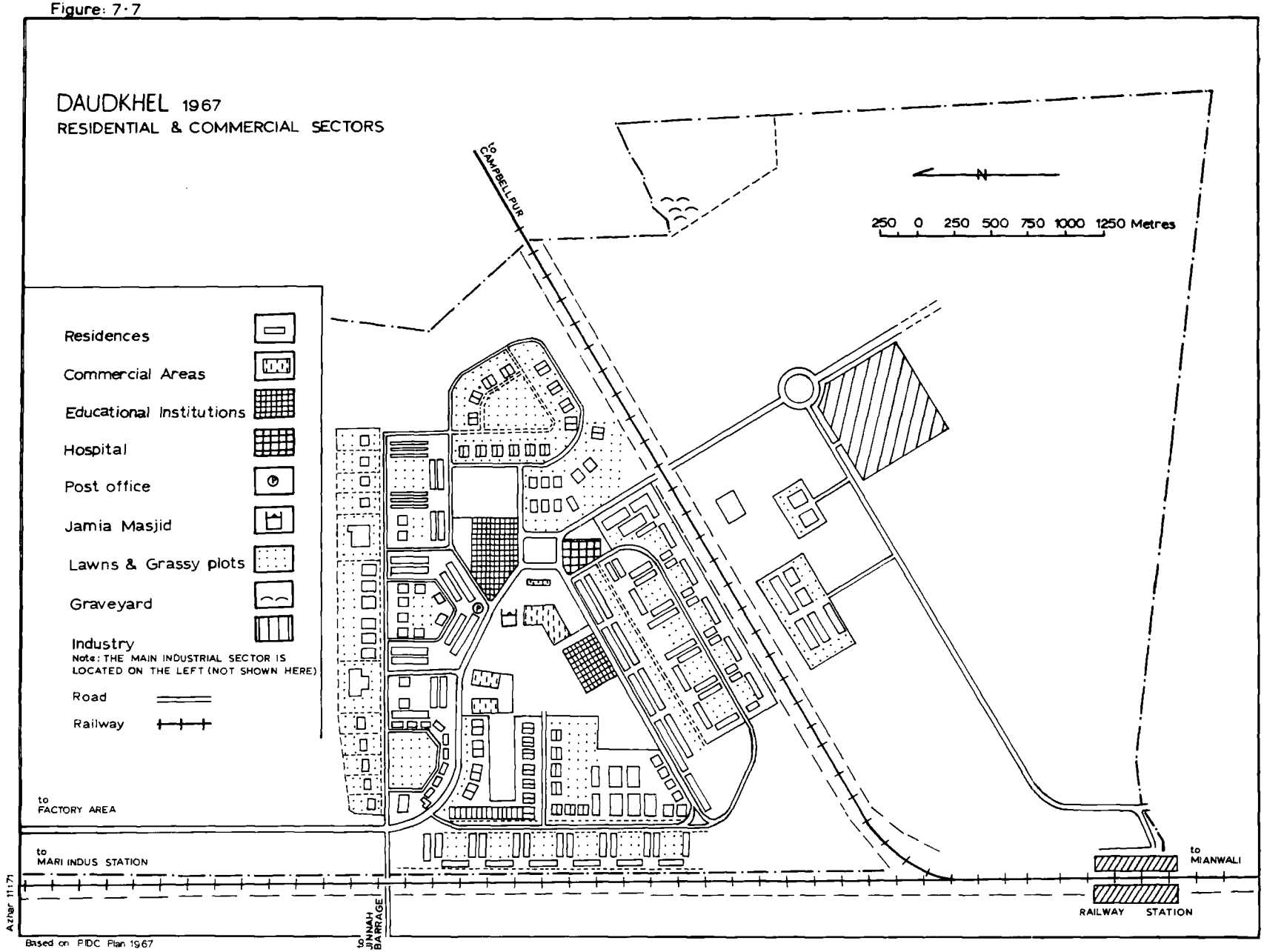
PIDC took a momentous decision within one year of its induction, and soon a company town came into being on its account. A site was selected in the vicinity of a bend towards the extreme western side of the Salt Range where the Indus river enters the Plains below the Kalabagh Gorge. This location has many advantages. The new town has been located 8 Kms southeast of Mari Indus which is a terminal station for the broad gauge railway

line coming from the south and the starting point for a metre gauge line which continues across the Indus over the area of the Suliman Ranges and valleys. The broad gauge line on the other side makes a loop and passing through Daudkhel enters the Potwar Uplands and then joins up with Campbellpur in the north.

The site of the industrial sector is towards the north where gypsum and limestone quarries are nearer, and water for industrial use is pumped from the Indus. The metre gauge line has been extended from Mari to the factory sites and provides a direct link with the Makerwal coal mines some 60 kilometres to the west. Three industrial concerns, namely Pak Dyes and Chemicals Factory, Pak American Fertilizer Factory and the Maple Leaf Cement Factory are located here. A fourth concern, which produces Antibiotics such as Penicillin etc., is situated some distance away on the southern side of the residential sector. There is scope for other industries and the town has links with the salt mining and iron-ore prospecting activity in the northern and western uplands.

Figure 7.7 shows the Residential and Commercial Sector of the new town. This part covers a total area of about 350 hectares. Here all constructions, housing structures, shopping premises and public buildings including roads, streets and lanes have been developed by and belong to the PIDC. Accommodation is made available to the factory workers and other employees of the Corporation according to their job and status. This

Figure: 7·7


DAUDKHEL 1967
RESIDENTIAL & COMMERCIAL SECTORS
to CAMPBELLPUR
N
250 0 250 500 750 1000 1250 Metres
Residences
Commercial Areas
Educational Institutions
Hospital
Post office
Jamia Masjid
Lawns & Grassy plots
Graveyard
Industry
Note: THE MAIN INDUSTRIAL SECTOR IS LOCATED ON THE LEFT (NOT SHOWN HERE)
Road
Railway
to FACTORY AREA
to MARI INDUS STATION
to JANNAH BARRAGE
to MIANWALI
RAILWAY STATION
Based on PIDC Plan 1967
Azhar 11-71

accommodation varies from one-room quarters to 5-7 room bungalows, hostels and rest houses. Traders and other non-employees of the Corporation are charged nominal rents for residential or shop accommodation. All these premises are made of good quality construction material as well as having all amenities like electricity, tap water and sanitary fittings.

Sports facilities and other provisions for recreation including staff and labour clubs are maintained by the PIDC. The civic amenities which have been established in the town include two high schools, a Model Nursery School, a hospital where all services are available free of fee or charge, as well as banks, a post office, police station and Jamia. There are provisions for open areas, lawns and kitchen gardens; some vegetable gardening is carried on to meet part of the town needs.

Daudkhel had a total population of 17,524 in 1961 out of which 9,580 were males and 7,944 females.[25] It gives a male ratio of 1206 per 1000 females which is indicative of its industrial function. Some 3000 men are employed in the four factories. Free transport is provided to take the workers from place of residence to their respective factory.[26]

Apart from providing job opportunities for the skilled and semi-skilled workers and labourers in particular, the new town has opened other avenues of employment, especially shops and petty services. Thus the economic significance of this development for the local people of such a remote area is considerable.

Two main points emerge from this study of present day townscapes in the UIP. Firstly the introduction of planned physical growth, as initiated in the early phases of colonization, has gradually been extended all over the area. All new as well as earlier urban settlements have planned residential, commercial and industrial areas and segregation of functions is now becoming a significant feature of town morphology. Secondly it is in the new towns, especially those which have relatively more industries, that a diversity of services and rapid spatial extension is significantly manifested in structural fabric. Addition of new trades and services especially banks, commercial and business enterprises educational and training institutions, hospitals and health services have added to the importance and attraction of urban centres in once remote areas.

REFERENCES

1. GOVERNMENT OF INDIA (1908), Imperial Gazetteer of India, Vol. XVII, Calcutta, pp.106-110.

2. Ibid., p.110.

3. CHAUDHRY, M.M., (1966), Lahore; A Geographical Study, unpublished Ph.D., thesis, Department of Geography, University of London, pp.60-61.

4. CHAUDHRY, M.M., (1967), Lahore; Major Urban Regions, Pakistan Geographical Review, Vol. 22/1, Jan., 1967, pp. 24-41.

5. NATH, V., (1947) Lahore-Amritsar Industrial Region, Punjab, Punjab Geographical Review, Vol. 2/1, Jan. 1947, pp.61-65.

6. CHAUDHRY, (1966), pp.117-127.

7. CHAUDHRY, (1967), op.cit.

8. FAHMEEDA MIRZA, (1968), Development of Factory Industry in Lahore, unpublished M.A. thesis, Department of Geography, University of the Punjab, Lahore.

9. GOVERNMENT OF INDIA, (1908), Imperial Gazetteer of India, Vol. XVIII, Calcutta, p.23 and pp.35-36.

10. KHAN, I.A. (1969) Multan Town Improvement Trust, in Multan Past and Present, op cit., pp.103-105.

11. TAYYEB, A. (1966), Pakistan: A Political Geography, Oxford University Press, London, pp.175-176.

12. UNITED NATIONS, Demographic Year Book 1969, Table 7, New York, 1970.

13. GOVERNMENT OF INDIA, Imperial Gazetteer of India, Vol. XVI, Calcutta, 1908, p.224.

14. BOKHARI, M.H., (1968) Lyallpur, A Study in Urban Geography, unpublished Ph.D., thesis, Queen Mary College, University of London, pp.47-71.

15. KUREISHY, K.U. (1957) Urban Development in West Pakistan, unpublished Ph.D., thesis, London School of Economics, p.217.

16. KUREISHY (1957) pp.460-462.

17. BOKHARI (1968) pp. 73-125.

18. TRUMAN, H.A. (1971), Inner City Residential Structure and Decline, Annals AAG, Vol. 61/1 March 1971, pp.72-96.

19. Demographic Year Book 1969.

20. Census of Pakistan 1961. Rahimyarkhan District Report pp. IV 4 & 5.

21. op cit. p. I-3

22. Personal Communication.

23. Handbook of Thal Development Authority. P.44-45

24. Trade & Industry Special Issue on PIDC Vol: 10/1 Jan 1966 Karachi p.37.

25. Census of Pakistan 1961, Mianwali District Census Report pp. IV - 22 & 23.

26. Personal Communication.

CHAPTER: VIII

URBAN GROWTH CHARACTERISTICS IN THE UPPER INDUS PLAINS: FINDINGS AND COMPARISONS

One of the aims of this study has been to examine the urban growth characteristics of Upper Indus Plain in its general context; especially with regard to urban growth in the developing world. The pattern of growth that materializes in a community is a product of historico-economic processes that operate over a given time.[1] It has long been realized that general theories of urban growth as evolved in the developed parts of the world do not necessarily show much relevance to the aspects of urbanization in the developing world. Dependence by a very high percentage of population on agriculture, a restricted economy and slow process of change are responsible for the prevalence of pre-industrial socio-economic systems. The past few decades, however, have seen a build up of population concentrations in a few large agglomerations. In 34 underdeveloped countries, Davis (1965)[2] estimated that during the decades 1940's and 1950's the average annual gain in their urban population was 4.5 per cent. By contrast, in the nine European countries during their period of fastest urban population growth (mostly in the later half of the 19th century) the average gain per year was 2.1 per cent.

In order to appreciate implications of world wide rapid urbanization and its characteristics, some recollection of the time when it all started is essential. With the advent of modern technology in the 18th century, the Western world superseded older civilizations and new global contacts advantageous to it were established. From this time onwards colonization of the Americas, Australia and New Zealand progressed under pioneer settlers and new urban trends appeared in the Old world under Western influence. Thus urban settlements across the continents showed many variations in structure and form which depended upon the form of the colonial impact.

McGee (1971)[3] suggests that "where there was no history of indigenous urban settlements and permanent settler populations of colonists were established (such as Australia or North America) new towns can be labelled 'replica towns' in that the colonists attempted to establish urban settlements which were close replicas of their homeland. Not denying their importance as a different category, he then puts forward the case of towns and cities which grew up in the period since 1800 in the tropical areas of Africa and Asia, popularly known as 'colonial' cities, to be reckoned as portraying a distinct model of their own. McGee argues that the 'colonial' city is intermediary between the 'pre-industrial' city and the 'industrialized' city. The basis of his proposition is the urban economic structure of many 'underdeveloped' countries and the impact of what he calls 'capitalist

penetration in the Third World'.[4] However, he admits that because of varying historical experiences of capitalism, indigenous socio-economic structure, and interaction of one on the other, there are different stages of development in each country.

The Indus Plains had prior urban traditions, but these were dominated at that time by two historico-administrative centres. Historical accounts and geographical surveys of the mid 19th century show vast tracts of inhospitable dry lands, sparsely peopled and almost totally lacking in communications. Irrigation agriculture was practised in the region but it was restricted to seasonal canals and floodings from the rivers. There were fewer commodities of trade within the region, though some overland caravans to and from other parts of Hindustan passed through the region.

Such an economy would not have provided means of subsistence to any large number of inhabitants or a life of comforts consistent with hope. The arts and crafts, reflecting ingenuity of an individual's skill had little scope for recognition as their market was restricted within the confines of the region. Then as Ginsburg (1970)[5] has put it - "the extension of British power into the Punjab about the middle of the nineteenth century ... brought the Indus Plains under the control of a modern state potentially capable of launching irrigation works on an unprecedented scale ... a comparatively enlightened Western imperialist power, totally without experience in these matters, which created and seized that opportunity

and provided the means for maximizing it".

Soon, proposals were drawn to augment and extend irrigation agriculture by means of a series of perennial canals which would also facilitate planting of new settlements in central and western districts of the Punjab. The growth of urban centres as influenced by the development of irrigation potentials has been analysed in the preceding chapters. It is intended here to put into perspective the growth differentials of the region under study and to make a comparison with other developing parts of the world.

A. GENERAL CONSIDERATIONS

Urban growth in the Upper Indus Plains has been characterized by the development of irrigation potentials in the region only since the 1880's. It has come about as a result of uniform administration over a long period, which adopted the policy of agricultural colonization and planting of settlements, both rural and urban, in the semi-arid districts where vast areas of sparsely populated or empty wastelands were available for exploitation. Specific impact of political power upon urban growth, is the central theme of Sjoberg's theoretical perspective on the Rise and Fall of Cities.[6] He writes: "It is the primacy of political power in providing the social stability necessary for the maturation of commerce and manufacturing that is responsible for our de-emphasis of the role of purely economic or commercial factors in the rise of cities. These forces are significant on their own account; yet they can operate only under the aegis of a broader societal power

structure".

Agricultural expansion led to economic prosperity, which is a pre-requisite for town growth. New towns were planned, for each successive colonization project, whereas older, well placed towns and cities got substansive functional uplift. An attractive pull was generated, within a large part of the region, which produced great mobility among all classes of population. Complete laissez-faire prevailed in the case of town settlers, as there were no restrictions on movement into the towns. On the spot auctions were made in the case of both residential and commercial sites. Merchants, traders, petty shopkeepers and new entrants in business from amongst the peasant class, were all at liberty to bid for a site and to follow the profession of their choice. Apart from skeletal layout of the settlements and a check on the outer form of buildings and structures, the new settlements grew purely in accordance with indigenous customs and outlook. Functional land use was adopted for different categories such as residences, Mandi and factory area, administrative and social institutions like schools and hospitals, but there were no special areas for the aliens.

The establishment of new colony settlements and steady increase in the number of medium size towns is basic evidence of economic viability of agricultural communities in the region. The economic and social change, that ensued, was evenly shared by rural and urban areas, in a way unlike that in many developing countries, where economic gains

remain restricted to a few large urban areas with the rural countryside staggering behind in poverty and ignorance.

During the period of colonization, definite functions such as trade and commerce, industry and manufacturing, administration and social services were institutionalized on a new pattern. Many of these socio-economic changes were commonly introduced all over British India. Political pros and cons of such changes are outside the scope of this work. However, the planning and planting of a colony was purely an act in resource development and unique to the Punjab only.

The grid-iron pattern of streets, functional zoning and better sanitary provisions, were some of the features introduced for the first time, on such a large scale. In this sub-type of urban settlement it is futile to look for any resemblances to modern vintages that come from city planners like Corbusier or Doxiades. However, a clear reflection of town building movements of 19th century Britain is found, which were either concerned with devising regulations to restrict slum building, (from which modern town planning movement is ultimately derived), or creation of new model towns.(*)

All towns and cities have shown an accelerated rate of growth in the past two decades. During this period new settlements have been established in the Thal area while

---

(*) The influence of Ebnezer Howard and Patrick Geddes is reflected in the first Model Town and Garden Town suburban localities of Lahore and Bahawalpur. (See Ch. VI pp 141.).

others are planned under Taunsa Project. Many suburban extensions have also been made on the same pattern. It is in this respect that towns and cities of Upper Indus Plains present a distinct sub-type of urban settlements.

This assertion here, that the British administration in the Subcontinent made an impress on the urban settlement growth characteristics of the Indus Plains, does not negate the significance of the long standing urban traditions of the region or of the Sub-continent as a whole. The precocious growth of Mohenjodaro and Harappa, also many medieval cities, and their ascendency under the Mughals, is neither denied nor questioned. Those were manifestations of their time, the symbols of a civilization that has now passed. The fact is that in the second half of the 19th century, when the British came to this part of the Subcontinent, they found scanty resources and sparse population in the greater part of the Indus Plains. The case presented throughout the thesis reflects the outcome of a concerted effort to colonize wastelands, to improve and expand irrigation agriculture and to implant towns and cities which portray urban morphological trends perfected in the West after the Industrial Revolution.

Furthermore, this planting of Mandi towns as defined earlier was not only a positive contribution to urban typology of the region, but it was restricted to this part of the Subcontinent because of its peculiar environment. As Ginsburg[7] puts it, it was here that irrigation was most

needed and the largest area of idle land awaited settlement. Equal credit goes to the pioneer settlers and early builders of town life, who were receptive to the idea of planned settlements and not only adopted new techniques but adapted themselves to the changing character of the economy.

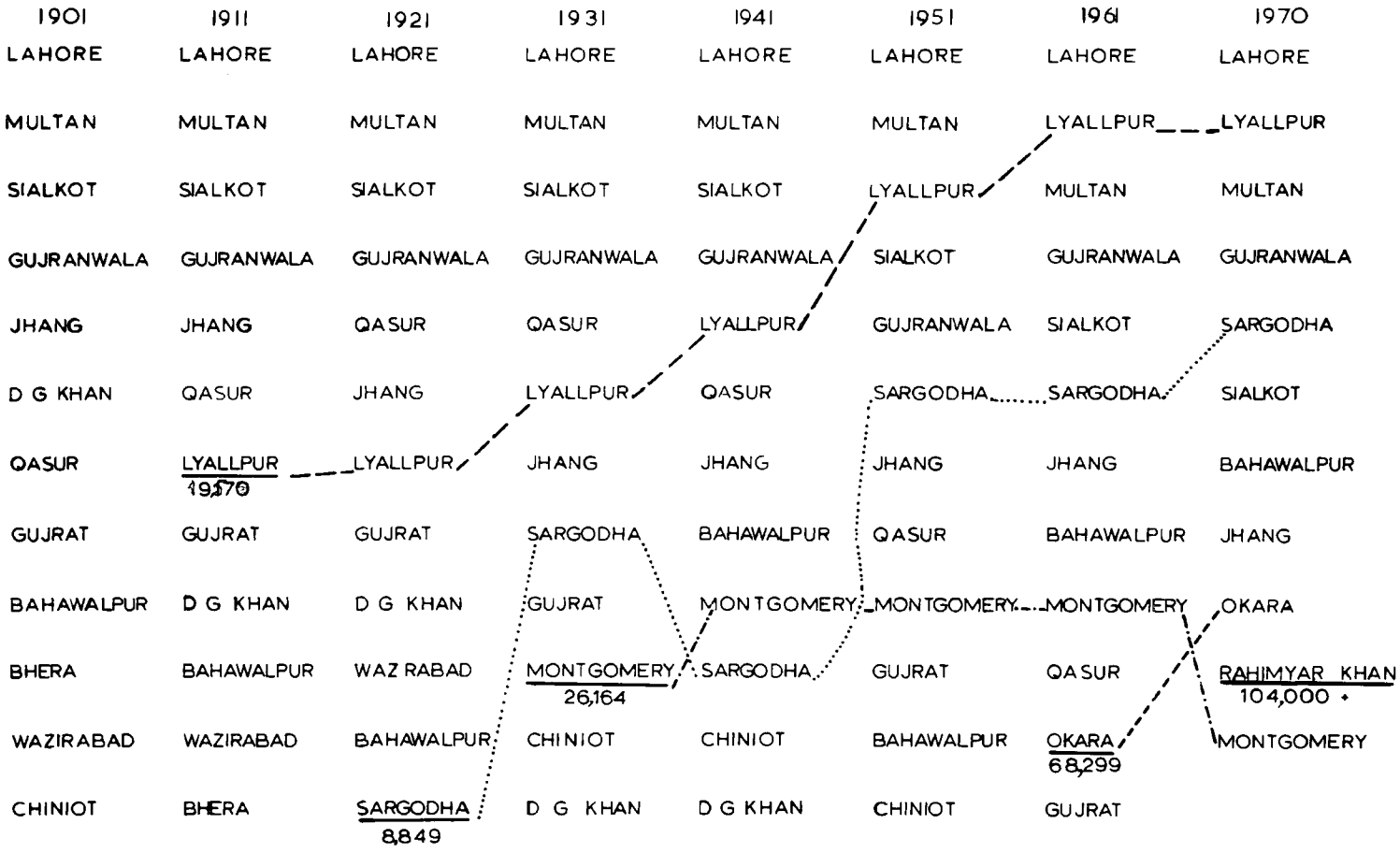
The economic success of colonization and parallel social change in the society have been adequately recorded by many authorities.[8] The towns that were established as service centres for the agricultural communities gradually took up the processing of agricultural raw material. Flour milling, cotton ginning and oil seed crushing of early periods, were to grow into the food processing, textiles and chemical industries of the recent decades. Banking and commerce, education and administration are necessary corollaries of urban growth. Thus it is not only demographic increase but economic diversification, growth of manufacturing industries and physical extention of builtup areas that have shown rapid increase throughout the region. When data eventually become available for economic occupations for all towns and cities, a functional differentiation and appreciation of secondary and tertiary occupations could be made.

The personality of urban centres, as these reach maturity needs recognition. This is now due, as most of the towns and cities have grown in size and stature. A consideration of town growth by number and size has been presented in Chapter III. Reference to Figure 8.1 reveals the growth of urban centres in general and the ascendency

FIGURE 8:1

UPPER INDUS PLAINS

HIERARCHY AMONG TOP URBAN CENTRES 1901—1970.



First Entry and Population LYALLPUR 19,570

N.B. 1901 Only one centre above 100,000
1970 All centres above 100,000

Azhar 4:72

of Colony towns in particular. In 1911, Lyallpur entered the rank of 12 top towns though it then had a population of less than 10,000. Now, in about 60 years, whereas Lyallpur is approaching a million mark, the 'lowest' town in the rank chart, Rahimyar Khan, has a population of over 104,000.

B. COMPARISON AND CONTRASTS WITH THE DEVELOPING WORLD:

Although literature on urbanization and urban growth in the developing countries is being disseminated on a wider scale now, little information is available in a systematic form on the structure and functioning of the urban centres in any region taken as a separate economic, social and physical entity. The present treatment of comparisons is therefore brief and of general nature, rather than a specific exercise. As the problem under scrutiny concerns the characteristics, rather than rate or degree of urbanization(*), no hard and fast rules could be devised or snapshot results achieved. Instead of comparing various statistics pertaining to urban growth, in widely differing parts of the world, we here confine our objective to common growth characteristics of the urban centers as a whole. This identification of distinct features for a major region is possible as such characteristics are evaluated in few studies.

Out of the five major regions of the developing world three most relevant and nearest to the region under study,

---

(*) This being already brought out in an earlier chapter, see pp.92-99 in Chapter III.

both geographically and culturally, are discussed below. They are The Middle East, South Asia and South-east Asia.(*)

1. COMPARISONS WITH THE MIDDLE EAST:

Physical continuity, general aridity, control of water resources and above all Muslim culture, are some of the obvious links of the Indus Plains with the Middle East. Because of inherent duality, i.e., widely harsh physical environment, and though few, but strong attractions, 'seclusion' and 'openness' are highly characteristics of the Middle East. Throughout the region, spatial distribution of population is much uneven as with the exception of few river valleys and the Mediterranean coast, most of the area is either desert or arid mountainous zone. Under such conditions, urban dominance became an important feature of social life, and explains comparatively high level of urbanization in at least half of the Middle Eastern nations.[9] Among these countries, highest level of urbanization is however, found in small sized states such as Kuwait, Bahrain, United Arab Emirates, Israel, Lebanon and Jordan. There are statistical difficulties of measuring an acceptable figure for urbanization in whole of the Middle East, which in 1970 would be about 35 per cent.

As for town growth and their dominant characteristics W.B. Fisher (1969, 1971), enumerates several factors, among

---

(*) Africa south of Sahara and Latin America are the two other major developing regions, for which general as well as specific reference has been made, in the earlier text of the study, wherever revelant.

which the following stand out and may be compared and contrasted with the towns of this study.[10]

i) Need for exchange and market centres in a diverse economy;

ii) defensible site attracting townships, because of frequent warfare and invasion;

iii) 'planting' of towns by conquerors, rulers and like;

iv) origin and expansion of great religions from towns: religious sanctity, importance and pilgrimage is attached to many of them;

v) external contacts of the town merchants since early times have produced economically dominant towns, which may have little or no relation with their hinterland;

vi) new towns emerging as a result of oil resource development in oil producing countries.

The first five characteristics, mentioned above, have little relevance with the town growth which has been totally dependent on the development and expansion of agricultural economy. The last type of towns, however, result from the changing economy of oil producing states. Uptil now they are in early growth phase, but how far this oil boom is going to mould the total life and economy in the region would be an interesting point to note. Possibly under same influence of new found economic wealth one has to consider the implications of recent urban growth away from the oil fields. Fisher (1971) notes that, recent

town growth has shown a tendency towards major pre-eminence, and the primacy of some chief cities (particularly in Iran and Egypt) which is already inhibiting development in rather smaller towns.[11]

Clarke (1971) points out the accelerated rate of growth in population among the 'millionaire' cities of the Middle East, as compared to the increase in urban population of their respective countries. He specifically mentions population of two cities; Baghdad, which grew from 785,000 in 1957 to 1,745,000 in 1965 (an extraordinary rate of growth even among 'millionaire' cities) and Tehran, which added 1,200,000 inhabitants between the last intercensal period, that is, 1956-1966.[12]

However, mention may be made of Israel's Negev settlements, where experiment is going on in agricultural colonization and 'collectivization' or manpower control particularly in the north.[13] Apart from the doubtful position of Beersheba, which had less than 2,500 population in 1948 there were no important towns in the region; today there are eight urban settlements, seven of them founded between 1948-1958.[14] The growth characteristics of these towns differ in the sense that these are being developed as urban settlements absorbing a very large proportion (70-80 per cent) of the total population in the region; as it was recognized from the beginning that the Negev could never support larger agricultural population, and most people should therefore depend on towns.[15]

2. COMPARISONS WITH SOUTHEAST ASIA:

Relationship with Southeast Asia is not that of physical contiguity culture or environment, but the fact of a developing economy. Development of agriculture and city life under colonial rule, makes Southeast Asia an important Asian case to be compared and contrasted with urban growth in the UIP.

Almost all the cities of Southeast Asia (except Bangkok) are of recent origin and their rapid growth has emanated from commercial activities of the colonial powers. As Ginsburg (1955)[16] pointed out, a major characteristic of urbanization in Southeast Asia is the functional dominance of one great metropolis in each of the countries of the region. Such dominating single cities are regarded as 'parasitic' rather than 'generative'.[17] Hauser (1957) remarked about them:

> "These cities tend to be 'parasitic' in the sense that they tended to obstruct economic growth in their country of location by retarding the development of other cities in the region, by contributing little to the development of their own hinterland, by being oriented primarily toward the contribution of services to the colonial power abroad or the colonial or indigenous elite in the great city itself."[18]

Apart from their economic role, physical structures in their also and development of morphology, the cities of Southeast Asia depict much foreign influence. As to such cities' internal structure, Murphy (1966) reveals:

> "Physically and in their morphology the new port cities clearly revealed their western and colonial origin. In most of them the Westerners and Asians were spatially segregated for housing, with accompanying differences not only in street development and architecture but in levels of living

> and their spatial manifestations. Urban skylines came to be dominated by larger buildings in almost purely European or American style, and although the populations of all of them rapidly became and remained predominantly Asian, the look of at least the cities' centres was and remains unmistakably Western. In most of the smaller Asian countries, the single dominant port became and remains not simply primate but the only genuine city in the national unit, in terms of both size and what Westerners at least would regard as major urban functions."[19]

The gap between growth of few cities and the hinterland is sharp and divisive which according to McGee (1967)[20] is 'pseudourbanization', as such rapid city growth in the area is not indicative of wider economic development. The divisive role of such great cities is again pointed out by McGee in a much sharper tone: "throughout Southeast Asia, despite the varying levels of urbanization, the dual urban structure divided between one great city -- a Singapore, Rangoon or Manila -- and a mess of smaller towns has persisted as one major feature of urban structure."[21] McGee's remarks about the city of the Third World are particularly true of the city in Southeast Asia when he says: "the city of the Third World (sic) retains its economic function as a 'link' between the industrialized powers and the sources of raw materials - a transplant, with closer economic ties to the urbanized world than to the Third World."[22]

As contrasted to these general characteristics of city growth in Southeast Asia, urban development in the UIP is held by the present writer to have originated solely as a result of economic change which was indigenous and not

externally generated. This development was widespread and encompassed rural as well as urban communities. It resulted in gradual build up of all, not a few categories of towns, which together gained in size and importance in all parts of the region. Another feature of distinction is that the Mandi towns show little or no functional segregation representing a 'Western' or alien character of the economy. For, as Dwyer (1968)[23] notes, there is a high concentration of economic functions in the western parts of 'colonial' cities. The western sector contains not only most of the CBD but also comprises high-class residential suburbs, port facilities and, more recently, perhaps an area reserved for modern factory development as an industrial estate. It is in non-western areas of the city, however, that the majority of the population lives and still, to a surprising extent circulates.

Many of the Southeast Asian countries in their bid to emulate urban structure of the developed countries, are following Western models in larger cities even after their transformation from colonial to national capitals. In Malaya, for example, Ginsburg (1965)[24] notes government housing estates transforming the fringe areas and introducing administratively derived occupance patterns which are not "natural"; or in case of Singapore where new flats have been developed on a large scale within the city or in the fringe areas which previously had been unattractive to people accustomed to think only of central areas as being desirable. Modifications of the urban

fringe landscape are more spectacular in case of Kuala Lumper, Singapore, Manila and Jakarta and these reflect some sort of political overtones concerning urban development in their respective countries.

Among the urban centres that have arisen in the past two dȩcades McGee (1967) notes the attempts of 'new' nations to develop some distinctively regional centres.[25] The geopolitical nature of the area (fragmented and politically weak) has caused the establishment of urban bastions, (sic) especially in Thailand, Malaya, Phillipines and South Vietnam. The opportunity of employment and needs of the military personnel attracts a substantial population to the vicinity of the bases, thus bringing about permanent settlement in some areas. How far such settlements are going to contribute to a sustained economic growth of these areas can be regarded as questionable. Because such settlements have no productive functions in economic sense.

3. URBAN GROWTH CHARACTERISTICS IN THE SUB-CONTINENT:

It is important to recall that a quarter of a century ago, the whole of the Subcontinent was administered as a single political entity. This consideration of the entire Subcontinent as one unit, and acceptance in the inheritance of a comparable societal change, emanating from British raj, little attention has been paid to the peculiar growth characteristics of the Indus Plains, especially in the field of urban geography. Thus major regions, totally different

topographically, climatically, economically and culturally have been treated singly, as presenting a mosaic of unvarying overall character.

It will be noted that the Indian Union is second most populous country in the world, which even by 1961 had over 100 cities with population of more than 100,000 including two enormously large conurbations of Bombay and Calcutta.(*) In comparison to this Pakistan is not only relatively small, but has been generally less urbanized with a much smaller number of cities. By 1961, that is, the last enumeration year, there were only 16 cities having more than 100,000 population in whole of Pakistan; 12 in West Pakistan and 4 in East Pakistan. However, as many as six of the West Pakistani cities belonged to the region under study.(**)

Yet despite the differences in size and magnitude of urbanization, similarities and contrasts in town characteristics could be looked for distinctly, as witnessed during the period of contact with the west and thereafter.

There have been an increasing number of studies of individual Indian cities and these emphasise the problems of overurbanization including implications on economic planning and investment, schemes for urban development and renewal.[26] All of these studies lay stress on

---

(*) Both Bombay and Calcutta owe their origin and growth to the Raj, as also the port of Karachi in Pakistan.

(**) According to the latest UN estimates on population of Pakistan yet available, the number of cities had risen to 22 by 1969; still 4 in East Pakistan and 18 in West Pakistan and 11 of the later cities were in the Upper Indus Plain. Incidentally the Capital, Islamabad/Rawalpindi and the largest city, Karachi are outside this region.

two characteristics i) the special form and structure of cantonments and civil lines in major Indian cities as contrasted to the general overcrowding and amorphous layout of the native city, and, ii) the alien origin and western nature or colonial influence on commerce, trade and morphology of port cities. The urban situation in the port cities of India[27] is not much different from what has been described earlier in the case of the 'million' cities of Southeast Asia.

As for the cities of the mainland, Brush (1962) draws attention to the preponderance of old walled cities with forts and citadels in India. Further, many cities functioned as dual entities during the British period and still do so, with Connught Circus in New Delhi and Chandni Chowk in Old Delhi are examples of binuclear commercial pattern.[27] But in contrast to this, it can be said that all towns and cities of the UIP (including the historical cities of Multan and Lahore) have uni-nuclear commercial districts, and not a duality.

Amongst British geographers, Spate and Smailes have commented on the morphology and structure of towns and cities in the Subcontinent. Whereas Spate's treatment is confined to general aspects of urban growth with a stress on towns of the Gangetic Plain, Smailes (1969) has recently suggested a 'descriptive model' of the Indian city.(*)

(*) The three research articles from which Smailes (1969) has largely drawn his description of the Indian City, cover a wide territory, popularly known as Indo-Gangetic Plain and which contains a great variety of settlements both in size and form. Historically this variety ranges from pre-historic and early Aryan settlements to British and post Independence settlements.

However, both writers have indicated that Colony towns of the Punjab have a different matrix, but they go no further than a limited and cursory remark regarding planned origin and a 'special character'.[29]

Ginsburg (1965) pointed out that most Indian cities are the product of both indigenous and foreign traditions, but the welding of these traditions has tended toward the creation of not one, but two cities, side by side, each with its own morphological and functional pattern.[30]

Karan (1957) analysing 832 north Indian towns found that more than half of the towns have elongated form, which he attributes to their riverside location, which is prevalent not only because rivers are a source of water supply, or the focus of trade and commerce, but also carry much religious importance.[31] The role of Ganges front is very conspicuous in the towns of northern India which is related to Hinduism. In contrast to this, in Upper Indus Plains as already noted a rectangular type of settlement was adopted. Here no Colony town was located on a river but in agricultural surroundings -- a location far more suited to new railway and road pattern that were laid concurrently.

The establishment of a cantonment or 'civil' lines were an addition to an already existing large or strategically important town. Thus this category of development is common to all parts of the Subcontinent. However, port cities and Colony settlements were totally new creations and the two categories of towns belong to distinct areas and have different patterns. It can be said

that apart from these categories no other new towns were founded by the British.

The port cities grew as points of contact for foreign trade and commerce thus had an essentially alien element in their structure and form, like other port cities of the developing world. The Colony settlements grew as a consequence of regional economic development; their structure and form was an adaptation of the Western concepts, but they grew wholly as indigenous towns. This clear difference, that is being largely planned and young settlements, accounts for a difference in growth pattern from the towns in other parts of the Subcontinent.

C. URBAN GROWTH CHARACTERISTICS IN THE UIP

In the Upper Indus Plains urban centres are the product of a relatively homogeneous base and most of their features are of recent origin. A greater role of decision-making 'processes' is traceable in the location and urban functions and facilities within the towns. Although the planning and executive agencies have not been concerned much with the significance of a particular plan, a semblance of physical planning in overall urban form, structure and inter functional zoning has been noted earlier. Each successive project area had its own prototype settlement plan, although a rectilinear pattern remained common to all.

A descriptive model(*) of the Colony town is detailed

(*) Similar to Smailes's (1969) model of the Indian City.

in Table 8.1 which gives the basic functional units and their constituent morphology. Like the initial plan adopted in the early years of colonization, referred to in Chapter II, the suburban extensions have largely followed the earlier pattern (rectilinear) though radial layout of commercial and recreational units has also been adopted in certain cases. Another feature of urban extensions is more open spaces in between the housing units, moderate provisions for parks, playgrounds and some tree plantations. Provision for labour housing nearer to place of work i.e., within the industrial estates is also now adopted to some extent.

The establishment of Colony town is thus very much related to the developments in other pioneering areas of the world, save with the obvious differences in their physical environs and socio-historic background. Simultaneous laying of railways and other communication lines in the colony areas facilitated inter-urban mobility and trade. The establishment of British style educational and other social and economic institutions like hospitals, commercial firms, banks and cooperatives, introduced a new variety of urban functions. The addition of modern manufacturing units and the rise of tertiary occupations in recent years have added new significance to overall growth.

Urban growth characteristics as evidenced in the UIP over the years may thus be summarized as follows:

1. There is high correlation between rates of urban and economic growth in the region.

2. The growth of urbanization is closely paralleled by a comparable 'revolution' in the rural areas especially in Lyallpur, Sargodha, Montgomery and Multan districts.

TABLE 8.1 GROWTH STRUCTURE OF A COLONY TOWN IN THE UPPER INDUS PLAINS.

Stage	Functions	Layout	Architectural Style Building Types/Material
A. INITIAL PLAN	RESIDENTIAL	Regular grid	Traditional style, Pucca built; Later replacements
	MANDI (Market)	Regular/Bounded	Pucca built; Storage facilities, Sheds and Platforms
	MIXED TRADING & RESIDENTIAL	Superimposed and Ribbon like	Frontal Shops: Inner and upper floors residential
	MANUFACTURING/PROCESSING	Discrete/Separated	Part built: Open compounds: Storage
	EDUCATION & HEALTH/ ADMINISTRATION	Distinct: Regular Blocks	British-style Public Institutions: Clear cut morphological units
B. SUBURBAN EXTENSIONS			
(1) Satellite Towns	RESIDENTIAL	Rectilinear and Radial Pattern	Modern, quasi-western style; one or two storeys
	SHOPPING/COMMERCIAL	Regular arcaded blocks	Frontal shops: Inner and upper floors residential
(2) Industrial Estates	LARGE SCALE MANUFACTURING	Extensive: Bounded	Modern factories, mechanical and storage facilities
	Residential	Distinct, graded accommodation	Modern style detached dwellings/ terraced blocks for labourers

3. The simultaneous, or indeed prior, development of rural areas and agricultural expansion meant that the countryside enjoyed prosperity and was thus able to share the fruits of development along with the urban centres.

4. The rate of growth has been rapid both for major and medium sized urban centres. This makes the region distinct from those developing parts of the world where primacy of a single large city has often prevailed under the impact of external stimuli to growth.

5. Colony towns experienced physical planning and an open layout from the time of their creation, which is not evidenced in other parts of the Subcontinent.

6. Concentration of functions and degree of civic amenities is found according to the size or status of the town. But the policy of industrial dispersal has led to the establishment of industrial units in many small or medium size towns as well.

7. Expanding manufacturing industries and commerce have contributed to the tertiary services in most urban centres of the region.

8. As manufacturing and industry are new, these are mostly located in industrial estates within the cities or in industrial suburbs outside the municipal confines.

9. Civil administrative quarters and cantonments added to the earlier towns and cities represent a distinct sector, in their layout and civic amenties, when contrasted to the old sector of those settlements. But these have been overtaken and in part over-run by new commercial areas and residential quarters of the business and professional communities. The later additions and urban renewal is not only conspicuous in design but large in extent.

10. From the very beginning there were no special quarters for the aliens, as was so conspicuously found in the majority of cities in the developing world.

REFERENCES

1. BREESE, G. (1969) Ed. The City in Newly Developing Countries, is a study in similar context. In its preface Breese puts the crux of the matter: "Urbanism and urbanization occur in their present form as a result of varying histories from country to country, and even within countries." (Preface p.ix)

2. DAVIS, K. (1965) The Urbanization of Human Populations, in Cities, Penguin Books, pp.11-32.

3. McGEE, T.G. (1971) The Urbanization in the Third World, G. Bell & Sons Ltd., London, pp. 48-51.

4. Ibid. pp. 88 - 89.

5. GINSBURG, N., (1970) Reviews, Economic Development and Cultural Change, Vol: 18/2 pp. 286-87.

6. SJOBERG, G. The Rise and Fall of Cities, International Journal of Comparative Sociology, Vol. 4/2 September, 1963, pp. 107-120. Also in Breese (ed) 1969, pp. 219-231.

7. GINSBURG, N., (1958) Pattern of Asia, Prentice-Hall Inc., Englewood Cliffs, N.J. pp. 535.

8. A recent study of social behaviour, and willingness to adapt to modern technology is, KENNEDY, Mary, J., Punjabi Urban Society, in Maron, S. (Ed), Pakistan: Society and Culture, New Haven, 1957.

9. HILL, A.G., (1969), Aspects of Urban Development of Kuwait, Ph.D., Thesis, University of Durham, p.19.

10. FISHER, W.B., (1971) The Middle East, Methuen & Co., London, 6th Revised edition. pp. 136-141.

    FISHER, W.B., Middle East: Physical & Social Background, in The Middle East & North Africa, Europa Publications, London, 15th Edition, pp. 3-19.

11. FISHER, (1971) pp. 258-259.

12. CLARKE, J.I. (1971) Population Geography and the Developing Countries, Pergamon Press, Oxford, p.154.

13. BLAKE, G.H. (1971) 'Settlements in Israel's Negev, Desert', Geography, Vol. 56/2 April 1971, pp. 135-137.

14. BLAKE, G.H. (1970), Population and Settlement in Israel's Negev Desert, Paper presented at I.B.G. Symposium on Population Problems of Pioneer Areas, University of Sheffield, 23-25th September, 1970.

15. WEITZ, R., (1969) Settlements as a Challenge to the Future, Israel Year Book, p.72.
Also see SPIEGAL, E., (1967) New Towns in Israel.

16. GINSBURG, N., (1955), 'The Great City in Southeast Asia', American Journal of Sociology, Vol: 60/5 March, 1955, pp. 455-462.

17. HOSELITZ, B.F., (1955), 'Generative & Parasitic Cities', Econ. Devt. & Cultural Change, Vol: 3, April, 1955, pp. 278-294.

18. HAUSER, P.M., (1957) 'World & Asian Urbanization in Relation to Economic Development and Social Change', in HAUSER, P.M. Ed., Urbanization in Asia and the Far East, Unesco., Calcutta, p.87.

19. MURPHY, R. (1966), "Urbanization in Asia", Ekistics Vol. 21, No. 122 January 1966 pp. 8-17.

20. McGEE, T.G., (1967) The Southeast Asian City, G. Bell and Sons Ltd., London, P.17.

21. Ibid. p.23.

22. Ibid. p.18.

23. DWYER, D.J. (1968), 'The City in the Developing World & the example of Southeast Asia' Geography, No. 53, pp. 353-364.

24. GINSBURG, N. Urban Geography and "Non-Western" Areas, in HAUSER, P.M. & SCHNORE, L.F. (eds) The Study of Urbanization, New York p. 334

25. McGEE (1967) p.26.

26. HOSELITZ, B.F., (1959) 'The Cities of India and their Problems; Annals of Association of American Geographers, Vol: 49 (1959), pp. 223-231.

27. For a specific study of Indian port cities see:

MURPHY, R. (1964) 'The City in Swamps; Aspect of the site and early growth of Calcutta' Geographical Journal, Vol: 130 (1964), pp. 241-256.

BOSE, N.K. 'Calcutta: A Premature Metropolis', in Cities, Penguin Books, pp. 67-85.

28. BRUSH, J.E. (1962), 'The Morphology of Indian Cities' in TURNER, R., Ed. India's Urban Future, University of California Press, Berkely, pp. 57-70.

29. Their two specific articles are :

SPATE, O.H.K., (1958) 'Aspects of City in South Asia', Confluence, Vol:7 pp. 16-28.

SMAILES, A.E., (1969) 'The Indian City', Geographische Zeitschrift, Vol: 57/3 pp. 177-190.

30. GINSBURG (1965) pp.317-318.

31. KARAN, P.P. (1957) 'The Pattern of Indian Towns', Journal of American Institute of Planners, Vol: 23 (1957) pp. 70-75.

CHAPTER: IX

SUMMARY AND CONCLUSION

Since the beginning of the present century the Upper Indus Plain has ranked high among the regions of the Subcontinent of South Asia in terms of economic growth. In the period immediately before, environmental constraints did not allow any considerable growth, which fact is also evidenced in historical records. It then possessed idle wastelands, sparsely populated riverine tracts and smaller number of historico-administrative urban centres at trade nodes.

The region thus affords an opportunity for the examination of factors involved in the modernization of the economy, and growth of settlements in number and size as well as their improved physical structures. It reflects man's ability to control and at the same time accommodate himself to his physical and social environment. The study has therefore, focused on the growth of towns and the emergence of a regulated and highly improved townscape which is the result of concerted efforts under district and local administrative guidance.

Development of new town morphology is not universal in the region, yet it is common enough to be important and this aspect relates to the initiation of a change which is current in urban and intra-urban structures of today.

Regarding changes in local attitudes, Mary Kennedy's remark about adoptions and adaptations by the Punjabi urban society is well demonstrated, that is, those foreign elements which appear technologically advantageous or practical are accepted without serious reservations.[1]

The analysis has been directed towards the development of some interpretive ideas and hypotheses concerning the nature of urban growth in the region, rather than a definitive exposition of certain known or unknown facts. Nevertheless, the enquiry has taken into consideration socio-economic indices, increase in urban population as well as current town characteristics as evidenced in size, extent, household and housing density, connectivity and place of birth of the inhabitants. An evaluation of growth characteristics of urban centres in the UIP has also been made in comparison to towns and cities in other parts of the developing world.

Here we may first summarize the main findings of the study, whence some observations can be made in the light of overall socio-economic conditions and some possible trends in future development may be seen. In the preceding chapters a concerted effort and a deliberate attempt to open up wastelands through the development of irrigation potentials has been noted. In all 11 major colonization projects have been developed in the region since 1880's. Each colonization project added to the area under irrigation as well as assured regular supplies to the lands which earlier depended on seasonal canals or annual floodings. One notices that the measures taken and the motives behind such an activity were directed towards the increase in

agricultural production, the enhancement of economic prospects of a peasant society and the establishment of settlements of a type superior in comfort and hygiene. (Chapter II)

The Colony towns and rural settlements, that were established in the wake of irrigation extension exhibit a new style in morphology and functions as well as in their relationship to each other. Specific provision of a Mandi (market) is a clear indication of the importance and role assigned to the new urban centres. Location of each new Mandi town beside a railway line and development of roads and bridges across the region provided significantly improved access to all areas.

The upsurge in production and trade affected earlier urban centres which also experienced an unprecedented rate of increase and expansion. Later, growing economic prosperity of the agricultural community led to the addition of manufacturing in the functions of the well placed local service centres. Thus, despite the earlier absence of environmental possibilities, the expansion of trade and manufacturing effected a breakthrough in the traditional economy.

At the same time a large increase in agricultural output not only enabled the province to support other provinces of British India in the years of famine, but large quantities of cereals and cash crops were exported to other parts of the world. Investment in loan funds

for the development of irrigation potentials was paid off quickly and large profits accrued to the State thereafter. A fairly accelerated rate of capital investment in the non-agricultural sector of the economy has occurred in the past two decades. Another feature of note is the fact that the rate of growth has been widespread and not restricted to a few large agglomerations.

Comparable variation percentages within the urban and the total population reveal both relative and absolute increase of population in the region. However data pertaining to size classes show that the medium sized urban centres have grown in larger proportion as compared to very small or a single large city. In Chapter III the cumulative population of the various classes of city-sizes in the region has indicated a progression towards lognormalcy. This distinct pattern of urbanization is indicative of greater inter action among the constituting urban units.

On the physical side the colony towns exhibit a new type which stands out in sharp contrast to the earlier irregular and amorphous townscape. A rectilinear plan of roads and residential blocks, and functional categorization of different areas was adopted for all new towns while extensions in earlier urban centres and suburbs were also subjected to the new pattern.

All such efforts led to a societal change from within, rather than an imposed or alien influence. Chapter IV on spatial variations of urbanism supports the

view that modernization and urbanization is highly related to the development of irrigation potentials in each district. Districts of recent and current developments have attracted more people in aggregate, together with a larger increase in their urban population in recent decade. The analysis of town characteristics (Chapter V) has also brought out a higher percentage increase in colony towns as an important feature. With regard to housing and demographic structure, though pressure seems high on new and rapidly expanding centres like Lyallpur, Okara and Rahimyar Khan, a dividing line between new and earlier urban centres is difficult to draw.

A considerable shortage of housing accommodation and other facilities is the result of the influx of muhajirs ——————→ at the time of the Partition as well as highly increased in-migration to urban localities during the past two decades. This magnitude of housing problem is all too characteristic of contemporary urbanization in the developing world. The conditions and causes of large in-migration are still little understood. A recent study of Karachi (the largest and most industrialized city in Pakistan), has shown that in recent years natural urban increase has accounted for 60 per cent of the total population growth while urban migration accounted for only 40 per cent.[2]

The urban data used in this study do not differentiate between growth that has occurred from natural increase and from in-migration, as the Pakistan Census only enumerates

total urban increase or decrease in a given inter-censal period. However, a very high rate of increase shown by many towns in successive inter-censal periods owes more to migration(*) than natural increase in the case of the UIP.

Two major factors, an impetus to the economy and the establishment of Mandi towns, are thus responsible for a rapidly accelerating rate of change in socio-technological developments in the region. The two processes have been concurrently pursued and have effected a significant increase in the degree of urbanization. In the case of the economy to which agricultural sector still contributes nearly 70 per cent, emphasis on further agricultural improvement and development is crucial for sustained growth.

In recent years priority to manufacturing and industry in the country has caused a shift in emphasis from agriculture to industry, and the former has thus become under-invested both technologically and financially. The debate, industry versus agriculture in the country concerns this study only as a side issue. The Indus Water Treaty (1960) has brought into sharp focus the importance of irrigation waters for the region and its neighbouring lands (both in Pakistan and across the border in India)

(*) In the earlier period of Colonization, massive induced migrations occurred from the eastern districts of the Punjab to the Colony districts under state policy. (Chapter 2) This general mobility of population has been a contributary factor in many internal adjustments in the demographic characteristics of the population. Earlier and later mass mixing of the people has also reduced regional frictions and linguistic prejudices to a great extent.

in particular, and international concern and cooperation in general. Apart from Pakistan, seven nations, Great Britain, Canada, United States of America, Western Germany, India, Australia and New Zealand, as well as the World Bank, are financing the current Indus Water Replacement Works by contributions and loans.

As mentioned in the main text (page 56), by October 1973, India is to take off all the supplies from three eastern tributaries of the Indus, which are to be replaced by water from three western rivers, whose supplies are adequate for this purpose. This water transfer requirement is by far the largest of its kind in the world and has given rise to tremendous construction works in the region, which are now nearing completion.

The problems of water-logged lands and increasing salinity in the soil are also being tackled on a wider scale. Installation of a large number of tube-wells is serving dual purpose; a lowering down of sub-surface water table and re-channelling of seepage water to the fields. More important, for such endeavours as well as other use is the development of hydro-electric power at dam sites or along the big canals.

However, in the course of this agricultural progress, barrages and perennial canals, links and storage dams and tube-wells and hydro-electric stations could never be contemplated without a substantial advance in engineering and technology. Upto now all major efforts have been directed towards the expansion of the area under crops. This type of agriculture, like that in many other developing

countries is characterized by a high man-land ratio which results in the low real incomes.[3] For higher yields greater inputs of fertilizers, use of pesticides, improved seeds and, not least, some mechanisation is essential. Increased yields per hectare especially for cash crops like cotton and sugar-cane will require additional labour inputs in the fields as well as create more opportunity for trade and industry.

In the early years after colonization the bulk of the agricultural produce was exported as manufacturing was insufficiently developed. This export also included large quantities of surplus wheat produced in relatively less populated districts of that time. It would seem that the increased internal consumption has absorbed much of the surplus production of the cereals. However direct empirical evidence is available that the demand for sugar, clothing, bedding, furniture and footwear has also grown sufficiently to attract capital investment in such manufactured goods. Papanek (1967)[4] has drawn on specific instances of entrepreneurship among the trading communities of the region which coming from small towns in the region have taken up large industrial activity under such incentives.

All this means that larger production on the part of the farmer is essentially a contribution to the secondary and tertiary functions of the urban centres. In fact, in most developing economies, production for the market is an established feature of agriculture. Agricultural

sector is therefore, the only reliable measure of economic growth in the region which is devoid of mineral resources. In the light of earlier experience of trade expansion which led to economic prosperity of the Mandi towns any further increase in agricultural production can reasonably be considered as a contributory factor for accelerated urban growth.

A descriptive model of the Colony town is detailed in Chapter VIII which shows the essential features of its growth structure. The initial rectilinear plan of the Mandi towns has provided the infra-structural foundations for growing towns which possess several internal growth areas, and which have become some of the powerful growth points in the region. The high correlation between the rates of urban and economic growth has been noted especially in the case of new towns. However, as each settlement in the urban system can be characterized by some latent dimensions of variety in urban landscape, further extension and improvement in the morphology will depend on the economic functions and demographic character gathered by each centre. Since the early 1960's an additional factor encouraging urban growth has been the employment opportunities in tertiary occupations like banking and commercial institutions, insurance and hotelling in medium and large size urban centres.

The gradual breakup of large family groups in the wake of modernization and the desire to live in comfortable surroundings is a sign of individuals' progression. The social change is spreading quite perceptibly as more and more modern type, single or double storey dwellings,

interspersed with open spaces appear rapidly in all urban and suburban places. But more important are the needs and requirements of the middle and low income-group families for whom the cost of city life is overwhelming. Administrative efforts to provide congenial accommodation to such town dwellers, especially in new townships is a phenomenon of recent years.

The colony towns have followed a natural growth as against defined or regulated evolution. Any fixed targets for their size or extent would have been inadequate under the circumstances of increasingly accelerated rate of growth experienced by a large number of urban centres in the region. Lack of social and economic surveys, non-enumeration of in-migrants and meagre data on labour force restricts any worthwhile assessment of future urban growth. The forthcoming census, scheduled for September, 1972, would provide some of such essential data which may be helpful in further analysis. Physical planning in the developing countries is essentially a continuing process. As George Franklin (1972)[5] has remarked, in conditions of rapid change, with large unplanned movements of population, too rapid urban growth and limited resources, it helps meet urgent human, economic and social needs, and will enable land and other resources to be developed and utilized in as effective a way as possible under the circumstances.

Since 1965 the problems of urbanization and urban growth have attracted the attention of the Central Planning Commission. It has been realized that a national programme

of urban development as well as the adoption of long range policies is essential for balanced growth (Chapter VI) The many gaps in coordination and integration of economic planning on the one hand and physical and social planning on the other, are very apparent. The Commission is aware of this lack in conceptual awareness of comprehensive planning and the absence of systamatice administrative machinery.[6] It involves many economic constraints in the country as well as social attitudes of the society as a whole. However, a considerate administration can overcome many restraints and effect a change by a concerted effort in the socio-economic pattern of the society, as has been the case in the opening up of the wastelands.

There are already a number of important items which could be identified with future trends, some specifically within the region and others in the country as a whole. New Mandi towns have been designated in the Thal Development Area, and New Towns under the Taunsa Colonization Scheme are in the planning stage. Studies are also at hand for Master Plans of large urban centres and Metropolitan areas within the region. (Chapter VI & VII)

Areas of current development and colonization within the region may not be as equally productive as the earlier doab lands have been. Yet opening of still further lands, the creation of new settlements and provision of communications over wide areas is going to contribute to the economy of those parts of the region which have remained less attractive so far.

New Mandi towns are also being established in the Lower Indus Plains where the Ghulam Muhammad Barrage and the Gudu Barrage provide similar opportunities for agricultural extension over two separate areas of nearly a million and over 1.1 million hectares. The development schemes for these areas envisage the establishment of 22 and 26 Mandi towns respectively.[7]

Apart from such schemes for agricultural extension and settlement planning, emphasis is being laid on the development of small settlements and the provision of larger civic facilities for them. To achieve such a goal certain recommendations have been made to the government by a higher committee of experts in April, 1972.[8] The recommendations envisage the setting up of a National Physical Planning Board and an Agroville Development Fund in the country. It has been suggested that "Agrovilles" would meet the complimentary requirements of urban and rural life, encourage enhanced production and make provisions for the availability of better amenities in small settlements. Such an administrative step when fulfilled will not only raise the status of the small settlements over a widespread area but also reduce in-migration and the high concentration of population in larger urban agglomerations.

It has been shown here, that much can be done to develop a specific region, if there is a significant consensus, readiness to act and some skill to administer and manage resource potentials. Even if the policy remains

less explicit in the initial stages, the momentum of growth shapes the pattern, and adjustments can be made according to need and circumstances. All evaluations of the past performance and projections of future growth in the region are equally optimistic. It will be noted that such developments in the context of contemporary economic achievement have been pace setters in the case of the developing world.

REFERENCES

1. KENNEDY, M.J. Punjabi Urban Society, in MARON, S. (Ed) Pakistan: Society and Culture, New Haven, 1957, p.99.

2. HASHMI, S.S. The People of Karachi: Demographic Characteristics, Pakistan Institute of Development Economics, Karachi, (1965), p. 123ff.

3. MYRDAL, G. (1970) The Challenge of World Poverty, Penguin Books, pp. 90-91.

4. PAPANECK, G.F. (1967) Pakistan's Development: Social Goals and Private Incentives, Harvard University Press, pp. 40.

5. FRANKLIN, G.H. (1972) 'Planning in Developing Countries' Journal of Royal Town Planning Institute, Vol. 58/2, February, 1972 pp.49-50.

6. PAKISTAN PLANNING COMMISSION, Third Plan, Karachi (1965) pp.12-16.

7. WEST PAKISTAN YEAR BOOK 1970, Information Department, Government of West Pakistan, Lahore (1970), pp.70-72.

8. EMBASSY OF PAKISTAN, Press Release, London, dated 12.4.1972.

A P P E N D I C E S

A N D

B I B L I O G R A P H Y

APPENDIX I

VARIABLES

V A R I A B L E S

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	*TPOP*	1.000	0.937	0.907	0.927	0.922	0.911	0.900	0.912	0.895	0.947	0.923	0.911	0.884	0.896
2	*DENS*	0.937	1.000	0.844	0.936	0.918	0.854	0.830	0.855	0.822	0.916	0.869	0.825	0.783	0.824
3	*SEX*	0.907	0.844	1.000	0.957	0.970	0.999	0.999	1.000	0.999	0.947	0.995	0.967	0.969	0.999
4	*LTPC*	0.927	0.936	0.957	1.000	0.998	0.962	0.951	0.963	0.947	0.962	0.966	0.965	0.915	0.947
5	*LTML*	0.922	0.918	0.970	0.998	1.000	0.975	0.966	0.974	0.963	0.967	0.977	0.974	0.929	0.962
6	*ADPC*	0.911	0.854	0.999	0.962	0.975	1.000	0.998	1.000	0.997	0.955	0.996	0.963	0.965	0.998
7	*CHPC*	0.900	0.830	0.999	0.951	0.966	0.998	1.000	0.999	1.000	0.942	0.993	0.963	0.969	0.999
8	*MLIN*	0.912	0.855	1.000	0.963	0.974	1.000	0.999	1.000	0.997	0.953	0.996	0.966	0.968	0.998
9	*TOR*	0.895	0.822	0.999	0.947	0.963	0.997	1.000	0.997	1.000	0.939	0.992	0.961	0.969	0.999
10	*CHCR*	0.947	0.916	0.947	0.962	0.967	0.955	0.942	0.953	0.939	1.000	0.960	0.965	0.914	0.941
11	*CTVD*	0.923	0.869	0.995	0.966	0.977	0.996	0.993	0.996	0.992	0.960	1.000	0.964	0.961	0.991
12	*IRRD*	0.911	0.825	0.967	0.905	0.914	0.963	0.963	0.966	0.961	0.905	0.964	1.000	0.964	0.965
13	*CLIR*	0.884	0.783	0.969	0.915	0.929	0.965	0.969	0.968	0.969	0.914	0.961	0.964	1.000	0.969
14	*CLE*	0.896	0.824	0.999	0.947	0.967	0.998	0.999	0.998	0.999	0.941	0.991	0.965	0.969	1.000
15	*ALE*	0.944	0.759	0.986	0.906	0.928	0.983	0.990	0.982	0.991	0.906	0.975	0.948	0.955	0.991
16	*UPOP*	0.882	0.907	0.857	0.932	0.912	0.857	0.846	0.863	0.839	0.842	0.866	0.829	0.835	0.837
17	*USEX*	0.913	0.846	0.999	0.959	0.972	0.998	0.999	0.999	0.998	0.949	0.996	0.965	0.971	0.998
18	*ULIT*	0.902	0.886	0.985	0.979	0.987	0.987	0.982	0.986	0.981	0.954	0.985	0.936	0.935	0.980
19	*UMLT*	0.895	0.864	0.991	0.972	0.984	0.992	0.989	0.991	0.989	0.950	0.987	0.941	0.947	0.988
20	*UELT*	0.903	0.929	0.962	0.980	0.980	0.957	0.945	0.957	0.943	0.948	0.961	0.906	0.883	0.943
21	*UADC*	0.916	0.848	0.999	0.959	0.972	0.999	0.999	0.999	0.998	0.951	0.995	0.964	0.968	0.998
22	*UCPC*	0.904	0.842	0.999	0.957	0.970	0.999	0.999	0.999	0.999	0.950	0.994	0.966	0.964	0.999
23	*UMIN*	0.913	0.849	0.999	0.960	0.973	0.998	0.998	0.999	0.998	0.951	0.996	0.966	0.971	0.998
24	*UTOR*	0.897	0.835	0.999	0.953	0.967	0.998	0.999	0.998	0.998	0.947	0.993	0.959	0.963	0.998
25	*UCLE*	0.911	0.838	0.998	0.954	0.967	0.997	0.997	0.997	0.997	0.951	0.995	0.967	0.975	0.997
26	*NALE*	0.929	0.872	0.997	0.965	0.976	0.997	0.995	0.997	0.994	0.961	0.994	0.965	0.961	0.994
27	*POCH*	0.837	0.703	0.938	0.864	0.880	0.926	0.941	0.931	0.944	0.824	0.923	0.918	0.955	0.938
28	*UPCH*	0.759	0.649	0.858	0.794	0.815	0.859	0.864	0.853	0.867	0.800	0.859	0.826	0.896	0.857
29	*INDP*	0.871	0.803	0.991	0.939	0.957	0.990	0.993	0.989	0.994	0.928	0.978	0.938	0.946	0.994
30	*CDOT*	0.796	0.751	0.895	0.870	0.879	0.909	0.889	0.899	0.888	0.892	0.899	0.880	0.919	0.891
31	*NCOT*	0.659	0.588	0.771	0.707	0.716	0.755	0.773	0.763	0.775	0.639	0.775	0.789	0.804	0.766
32	*OSWP*	0.927	0.900	0.993	0.892	0.887	0.888	0.873	0.891	0.886	0.912	0.910	0.909	0.880	0.868

		15	16	17	18	19	20	21	22	23	24	25	26	27	28
1	*TPOP*	0.844	0.882	0.910	0.902	0.895	0.903	0.910	0.904	0.913	0.897	0.911	0.929	0.837	0.759
2	*DENS*	0.759	0.907	0.846	0.886	0.864	0.929	0.848	0.842	0.849	0.835	0.838	0.872	0.703	0.649
3	*SEX*	0.986	0.857	0.999	0.985	0.991	0.952	0.999	0.999	0.999	0.999	0.998	0.997	0.938	0.858
4	*LTPC*	0.976	0.932	0.959	0.979	0.972	0.980	0.959	0.957	0.960	0.953	0.954	0.965	0.864	0.794
5	*LTML*	0.928	0.912	0.972	0.987	0.984	0.980	0.972	0.970	0.973	0.967	0.967	0.976	0.880	0.815
6	*ADPC*	0.993	0.857	0.998	0.987	0.992	0.957	0.999	0.999	0.998	0.998	0.997	0.997	0.926	0.859
7	*CHPC*	0.990	0.846	0.999	0.982	0.989	0.945	0.999	0.999	0.998	0.999	0.997	0.995	0.941	0.864
8	*MLIN*	0.982	0.863	0.999	0.986	0.991	0.957	0.999	0.999	0.999	0.998	0.997	0.997	0.931	0.853
9	*TOR*	0.991	0.839	0.999	0.981	0.989	0.943	0.998	0.999	0.998	0.999	0.997	0.994	0.944	0.867
10	*CHCR*	0.956	0.842	0.949	0.954	0.950	0.948	0.951	0.950	0.951	0.947	0.951	0.961	0.824	0.800
11	*CTVD*	0.975	0.866	0.996	0.985	0.987	0.961	0.995	0.994	0.996	0.993	0.995	0.994	0.923	0.859
12	*IRRD*	0.968	0.829	0.965	0.936	0.941	0.906	0.964	0.960	0.966	0.959	0.967	0.965	0.918	0.926
13	*CLIR*	0.955	0.835	0.971	0.935	0.947	0.883	0.968	0.964	0.971	0.963	0.975	0.961	0.955	0.896
14	*CLE*	0.991	0.837	0.998	0.980	0.988	0.943	0.998	0.999	0.999	0.998	0.997	0.994	0.948	0.857
15	*ALE*	1.000	0.771	0.986	0.961	0.974	0.911	0.985	0.986	0.985	0.987	0.994	0.974	0.942	0.873
16	*UPOP*	0.771	1.000	0.856	0.868	0.857	0.882	0.853	0.852	0.858	0.847	0.853	0.864	0.809	0.714
17	*USEX*	0.986	0.856	1.000	0.986	0.992	0.953	0.999	0.998	1.000	0.997	0.998	0.996	0.940	0.867
18	*ULIT*	0.961	0.868	0.986	1.000	0.998	0.987	0.987	0.984	0.987	0.981	0.979	0.988	0.901	0.811
19	*UMLT*	0.974	0.857	0.992	0.998	1.000	0.976	0.993	0.990	0.992	0.988	0.985	0.991	0.916	0.831
20	*UELT*	0.911	0.882	0.953	0.987	0.976	1.000	0.956	0.951	0.954	0.947	0.943	0.963	0.841	0.737
21	*UADC*	0.985	0.853	0.999	0.987	0.993	0.956	1.000	0.999	0.999	0.997	0.997	0.998	0.932	0.854
22	*UCPC*	0.985	0.852	0.998	0.984	0.990	0.951	0.999	1.000	0.998	1.000	0.997	0.996	0.933	0.857
23	*UMIN*	0.985	0.858	1.000	0.987	0.992	0.954	0.999	0.998	1.000	0.996	0.998	0.996	0.939	0.855
24	*UTOR*	0.987	0.847	0.997	0.981	0.988	0.947	0.997	1.000	0.996	1.000	0.996	0.994	0.932	0.858
25	*UCLE*	0.994	0.853	0.998	0.979	0.986	0.943	0.997	0.997	0.998	0.996	1.000	0.994	0.945	0.879
26	*NALE*	0.974	0.864	0.996	0.988	0.991	0.963	0.998	0.996	0.996	0.994	0.994	1.000	0.918	0.939
27	*POCH*	0.942	0.809	0.940	0.901	0.916	0.841	0.932	0.933	0.939	0.932	0.945	0.918	1.000	0.920
28	*UPCH*	0.873	0.714	0.867	0.811	0.831	0.737	0.854	0.857	0.865	0.858	0.879	0.839	0.920	1.000
29	*INDP*	0.995	0.819	0.989	0.985	0.988	0.942	0.992	0.992	0.989	0.991	0.986	0.987	0.922	0.827
30	*CDOT*	0.874	0.753	0.894	0.880	0.883	0.856	0.897	0.893	0.894	0.893	0.901	0.892	0.828	0.785
31	*NCOT*	0.784	0.702	0.791	0.739	0.747	0.690	0.761	0.760	0.779	0.762	0.781	0.738	0.904	0.946
32	*OSWP*	0.831	0.846	0.884	0.861	0.856	0.861	0.880	0.879	0.886	0.878	0.887	0.892	0.789	0.800

		29	30	31	32
1	*TPOP*	0.871	0.796	0.659	0.927
2	*DENS*	0.803	0.751	0.588	0.900
3	*SEX*	0.991	0.895	0.771	0.883
4	*LTPC*	0.939	0.870	0.707	0.892
5	*LTML*	0.957	0.879	0.716	0.887
6	*ADPC*	0.990	0.900	0.755	0.888
7	*CHPC*	0.993	0.889	0.773	0.873
8	*MLIN*	0.989	0.899	0.763	0.891
9	*TOR*	0.994	0.888	0.775	0.866
10	*CHCR*	0.928	0.892	0.639	0.912
11	*CTVD*	0.979	0.899	0.775	0.910
12	*IRRD*	0.938	0.890	0.780	0.909
13	*CLIR*	0.946	0.919	0.804	0.880
14	*CLE*	0.994	0.891	0.766	0.868
15	*ALE*	0.986	0.874	0.734	0.831
16	*UPOP*	0.819	0.753	0.702	0.846
17	*USEX*	0.999	0.894	0.791	0.884
18	*ULIT*	0.990	0.886	0.739	0.861
19	*UMLT*	0.988	0.883	0.747	0.856
20	*UELT*	0.942	0.856	0.690	0.861
21	*UADC*	0.992	0.897	0.761	0.880
22	*UCPC*	0.992	0.893	0.760	0.879
23	*UMIN*	0.989	0.894	0.779	0.886
24	*UTOR*	0.991	0.893	0.762	0.878
25	*UCLE*	0.994	0.901	0.781	0.887
26	*NALE*	0.987	0.892	0.738	0.892
27	*POCH*	0.922	0.828	0.904	0.789
28	*UPCH*	0.827	0.785	0.846	0.800
29	*INDP*	1.000	0.869	0.723	0.817
30	*CDOT*	0.869	1.000	0.654	0.849
31	*NCOT*	0.724	0.654	1.000	0.713
32	*OSWP*	0.817	0.849	0.713	1.000

UPPER INDUS PLAIN

URBAN CHARACTERISTICS

Correlation Matrix of 32 Variables

APPENDIX I (i)

LIST OF ADMINISTRATIVE DISTRICTS INCLUDED IN THE FACTOR ANALYSIS OF URBAN CHARACTERISTICS IN CHAPTER IV.

Number	District	Enumerated Population	Percentage Urban Population.
1	GUJRAT	1,326,012	12.7
2	SARGODHA	1,467,621	19.4
3	MIANWALI	746,733	19.0
4	LYALLPUR	2,683,838	21.4
5	JHANG	1,078,747	16.0
6	SIALKOT	1,596,383	15.9
7	LAHORE	2,479,687	59.1
8	SHEIKHUPURA	1,080,619	12.7
9	GUJRANWALA	1,291,886	26.7
10	MONTGOMERY	2,134,072	11.2
11	MULTAN	2,702,354	21.4
12	MUZAFFAGARH	989,878	7.4
13	D G KHAN	776,620	12.5
14	BAHAWALNAGAR	822,827	12.8
15	BAHAWALPUR	735,524	18.8
16	RAHIMYAR KHAN	1,015,715	11.2

.. .. ..

APPENDIX II

UPPER INDUS PLAIN

TOWN CHARACTERISTICS

Correlation Matrix of 28 Variables

VARIABLES		V A R I A B L E S													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	'TOTPOP'	1.000	0.398	0.468	0.510	0.426	0.437	0.425	0.397	0.355	0.346	0.352	0.385	0.381	0.476
2	'POPDNY'	0.398	1.000	0.765	0.732	0.793	0.805	0.785	0.777	0.713	0.717	0.669	0.689	0.908	0.734
3	'LITRAT'	0.468	0.765	1.000	0.985	0.928	0.980	0.949	0.982	0.958	0.950	0.932	0.775	0.766	0.941
4	'FLITRA'	0.510	0.732	0.985	1.000	0.877	0.941	0.909	0.955	0.939	0.939	0.939	0.732	0.728	0.955
5	'POPCHG'	0.426	0.793	0.928	0.877	1.000	0.971	0.953	0.920	0.952	0.941	0.794	0.818	0.709	0.927
6	'SEXRTO'	0.437	0.805	0.980	0.941	0.971	1.000	0.970	0.981	0.933	0.934	0.884	0.822	0.810	0.904
7	'AVPPHH'	0.423	0.785	0.949	0.909	0.953	0.970	1.000	0.945	0.887	0.884	0.829	0.803	0.792	0.903
8	'AVRHHH'	0.397	0.777	0.982	0.955	0.920	0.981	0.945	1.000	0.980	0.975	0.945	0.789	0.782	0.925
9	'POOPHH'	0.355	0.713	0.958	0.939	0.852	0.933	0.887	0.980	1.000	0.994	0.973	0.722	0.716	0.906
10	'LITERH'	0.346	0.717	0.950	0.939	0.841	0.934	0.884	0.975	0.994	1.000	0.964	0.721	0.719	0.905
11	'HHSHRH'	0.352	0.669	0.932	0.939	0.794	0.884	0.829	0.945	0.973	0.964	1.000	0.668	0.665	0.903
12	'DWHOUG'	0.385	0.989	0.775	0.732	0.818	0.822	0.803	0.789	0.722	0.721	0.668	1.000	0.994	0.722
13	'DWHELD'	0.381	0.998	0.766	0.728	0.799	0.810	0.792	0.782	0.710	0.719	0.665	0.994	1.000	0.729
14	'PPUCHS'	0.476	0.734	0.941	0.955	0.827	0.904	0.903	0.925	0.906	0.905	0.903	0.722	0.729	1.000
15	'PSPUHS'	0.304	0.758	0.813	0.750	0.805	0.860	0.809	0.863	0.825	0.817	0.749	0.786	0.773	0.677
16	'PRACHS'	0.245	0.618	0.757	0.670	0.896	0.859	0.799	0.774	0.704	0.689	0.615	0.667	0.634	0.555
17	'DSCYRL'	0.347	0.652	0.811	0.737	0.891	0.864	0.815	0.813	0.765	0.755	0.690	0.677	0.660	0.681
18	'DSCYRD'	0.326	0.600	0.789	0.717	0.888	0.837	0.789	0.785	0.734	0.718	0.684	0.623	0.605	0.645
19	'NRLRDG'	0.582	0.749	0.945	0.922	0.909	0.946	0.924	0.917	0.868	0.851	0.822	0.764	0.748	0.884
20	'NRDRDG'	0.631	0.781	0.938	0.927	0.896	0.935	0.899	0.920	0.879	0.875	0.858	0.785	0.774	0.866
21	'OWNOCU'	0.359	0.791	0.955	0.918	0.902	0.960	0.936	0.984	0.968	0.970	0.920	0.808	0.797	0.897
22	'RENTED'	0.533	0.760	0.940	0.914	0.928	0.951	0.929	0.906	0.841	0.823	0.799	0.777	0.765	0.883
23	'FREE'	0.344	0.646	0.812	0.771	0.874	0.862	0.832	0.808	0.732	0.713	0.686	0.657	0.654	0.723
24	'PRYSCH'	0.983	0.292	0.388	0.428	0.343	0.357	0.347	0.319	0.284	0.276	0.275	0.285	0.281	0.398
25	'HEDUTH'	0.982	0.438	0.569	0.607	0.512	0.533	0.510	0.498	0.468	0.449	0.456	0.432	0.425	0.557
26	'HNPOST'	0.863	0.555	0.658	0.709	0.590	0.619	0.584	0.600	0.562	0.555	0.500	0.530	0.531	0.652
27	'TBANKS'	0.980	0.370	0.501	0.545	0.446	0.467	0.449	0.429	0.391	0.379	0.391	0.355	0.357	0.508
28	'THOSPL'	0.980	0.382	0.511	0.548	0.457	0.477	0.460	0.442	0.406	0.397	0.405	0.370	0.370	0.506
		15	16	17	18	19	20	21	22	23	24	25	26	27	28
1	'TOTPOP'	0.304	0.245	0.347	0.326	0.582	0.631	0.359	0.533	0.344	0.983	0.982	0.863	0.980	0.980
2	'POPDNY'	0.758	0.618	0.652	0.600	0.749	0.781	0.791	0.760	0.646	0.292	0.438	0.555	0.370	0.382
3	'LITRAT'	0.813	0.757	0.811	0.789	0.945	0.938	0.955	0.940	0.812	0.388	0.569	0.658	0.501	0.511
4	'FLITRA'	0.750	0.670	0.737	0.717	0.922	0.927	0.918	0.914	0.771	0.428	0.607	0.709	0.545	0.548
5	'POPCHG'	0.805	0.893	0.891	0.888	0.909	0.896	0.902	0.928	0.874	0.343	0.512	0.590	0.446	0.457
6	'SEXRTO'	0.860	0.839	0.864	0.837	0.946	0.935	0.960	0.951	0.862	0.357	0.533	0.619	0.467	0.477
7	'AVPPHH'	0.809	0.799	0.815	0.789	0.924	0.899	0.936	0.929	0.832	0.347	0.510	0.584	0.449	0.460
8	'AVRHHH'	0.863	0.774	0.813	0.785	0.917	0.920	0.984	0.906	0.808	0.319	0.498	0.600	0.429	0.442
9	'POOPHH'	0.825	0.704	0.765	0.734	0.868	0.879	0.968	0.841	0.732	0.284	0.460	0.562	0.391	0.406
10	'LITERH'	0.817	0.689	0.755	0.718	0.851	0.875	0.970	0.823	0.713	0.276	0.449	0.555	0.379	0.397
11	'HHSHRH'	0.749	0.615	0.690	0.684	0.822	0.858	0.920	0.799	0.686	0.275	0.456	0.590	0.391	0.405
12	'DWHOUG'	0.786	0.667	0.677	0.623	0.764	0.785	0.808	0.777	0.657	0.285	0.432	0.530	0.355	0.370
13	'DWHELD'	0.773	0.634	0.660	0.605	0.748	0.774	0.797	0.765	0.654	0.281	0.425	0.531	0.357	0.370
14	'PPUCHS'	0.677	0.555	0.681	0.645	0.884	0.866	0.897	0.883	0.725	0.398	0.557	0.652	0.508	0.506
15	'PSPUHS'	1.000	0.736	0.745	0.702	0.790	0.792	0.881	0.762	0.686	0.237	0.392	0.441	0.317	0.326
16	'PRACHS'	0.736	1.000	0.645	0.851	0.759	0.752	0.752	0.773	0.647	0.190	0.332	0.393	0.271	0.296
17	'DSCYRL'	0.745	0.845	1.000	0.945	0.762	0.783	0.796	0.827	0.762	0.275	0.422	0.491	0.358	0.377
18	'DSCYRD'	0.702	0.851	0.945	1.000	0.769	0.740	0.751	0.817	0.766	0.257	0.402	0.482	0.352	0.371
19	'NRLRDG'	0.790	0.759	0.782	0.769	1.000	0.936	0.879	0.945	0.832	0.503	0.659	0.699	0.600	0.598
20	'NRDRDG'	0.792	0.752	0.783	0.740	0.936	1.000	0.898	0.907	0.779	0.555	0.708	0.762	0.649	0.659
21	'OWNOCU'	0.881	0.752	0.796	0.751	0.879	0.898	1.000	0.864	0.732	0.280	0.457	0.554	0.378	0.395
22	'RENTED'	0.762	0.773	0.827	0.817	0.945	0.907	0.864	1.000	0.900	0.462	0.614	0.669	0.571	0.573
23	'FREE'	0.686	0.847	0.762	0.764	0.832	0.779	0.732	0.900	1.000	0.278	0.426	0.497	0.383	0.380
24	'PRYSCH'	0.237	0.190	0.275	0.257	0.503	0.555	0.280	0.462	0.278	1.000	0.967	0.783	0.979	0.982
25	'HEDUTH'	0.392	0.332	0.422	0.402	0.659	0.708	0.457	0.614	0.426	0.967	1.000	0.858	0.979	0.983
26	'HNPOST'	0.441	0.393	0.491	0.482	0.699	0.762	0.554	0.669	0.497	0.783	0.858	1.000	0.842	0.837
27	'TBANKS'	0.317	0.271	0.358	0.352	0.600	0.649	0.378	0.571	0.383	0.979	0.979	0.842	1.000	0.992
28	'THOSPL'	0.326	0.296	0.377	0.371	0.598	0.659	0.395	0.573	0.380	0.982	0.983	0.837	0.992	1.000

APPENDIX II (A)

LIST OF URBAN CENTRES INCLUDED IN THE FACTOR ANALYSIS OF TOWN CHARACTERISTICS IN CHAPTER V.

Number	Urban Centre	Status	Enumerated Population (1961)
1	LAHORE	M & C	1,296,477
2	LYALLPUR	M	425,248
3	MULTAN	M & C	358,201
4	GUJRANWALA	M	196,154
5	SIALKOT	M & C	164,346
6	SARGODHA	M & C	129,291
7	JHANG	M	94,971
8	BAHAWALPUR	M & C	84,377
9	MONTGOMERY	M	75,180
10	QASUR	M	74,546
11	OKARA	M	68,299
12	GUJRAT	M	59,608
13	KHANEWAL	M	49,093
14	DERA GHAZI KHAN	M	47,105
15	CHINIOT	M	47,099
16	RAHIMYAR KHAN	M	43,548
17	SHEIKHUPRA	M	41,635
18	BAHAWALNAGAR	M	36,290
19	KAMALIA	M	35,248
20	HAFIZABAD	M	34,576
21	BUREWALA	M	34,237
22	AHMADPUR (E)	M	32,423
23	KHANPUR	M	31,465
24	MIANWALI	M	31,398

Number	Urban Centre	Status	Enumerated Population (1961)
25	GOJRA	M	29,665
26	WAZIRABAD	M	29,399
27	PAKPATTAN	M	27,974
28	JARANWALA	M	26,953
29	CHISTIAN	M	26,041
30	KAMOKE	M	25,124
31	KHUSHAB	M	24,851
32	LALAMUSA	M	22,633
33	HAROONABAD	M	22,575
34	BAHAUDDIN	M	22,295
35	BHAKKAR	T	21,749
36	CHICHAWATNI	T	21,380
37	DASKA	M	20,406
38	MUZAFFARGARGH	M	14,474

M Municipality.

M & C Municipality and Cantonment.

T Town

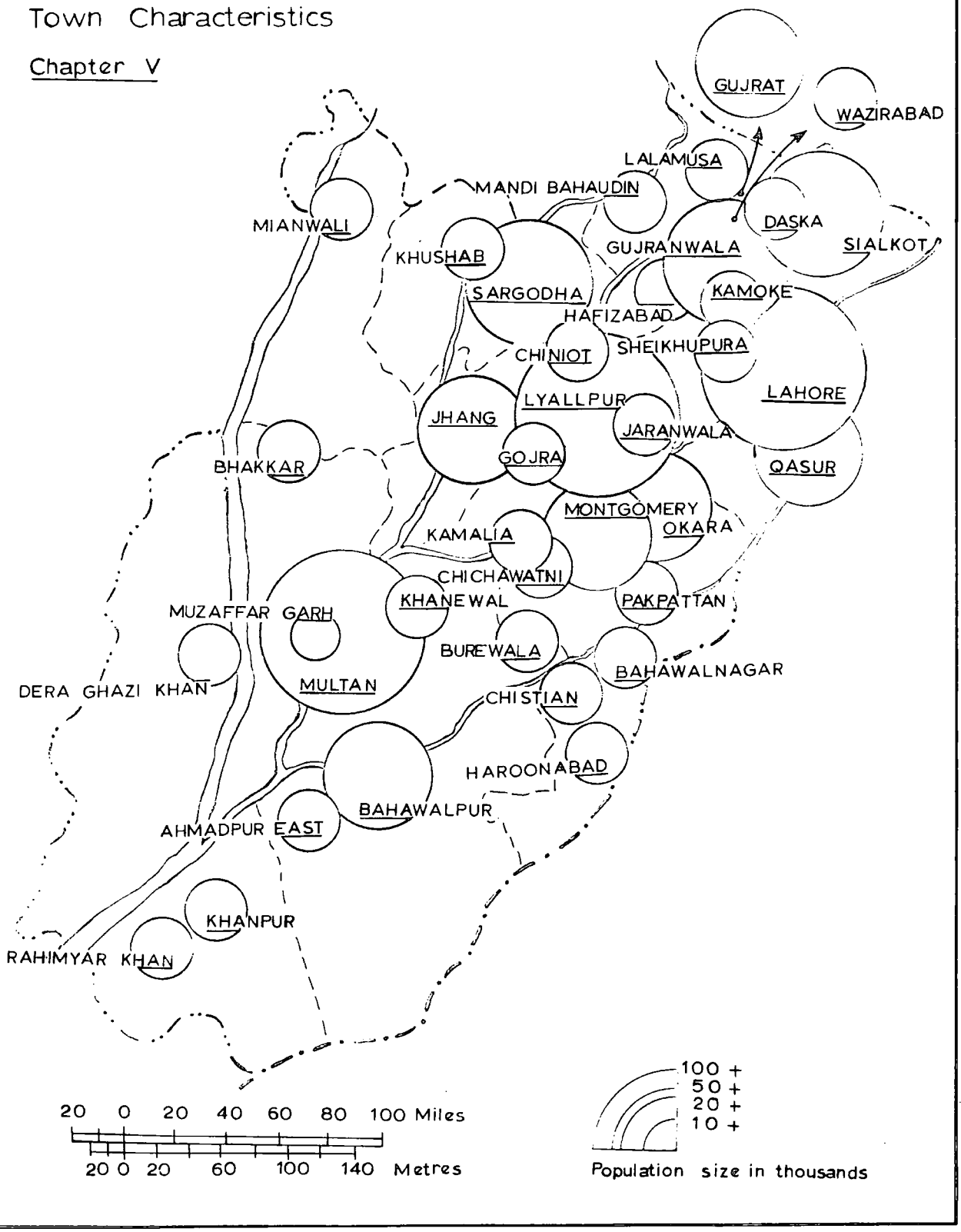
.. ..

UPPER INDUS PLAIN

REFERENCE MAP FOR FACTOR ANALSIS

Town Characteristics

Chapter V



Azhar 10:71

SELECT BIBLIOGRAPHY

The Bibliography is divided into three parts:

A. Books and Theses.

B. Articles and other papers.

C. Special Reports and Statistical sources.

A. BOOKS AND THESES:

AHMAD, K.S. (1964) A Geography of Pakistan, O.U.P. Karachi.

AHMAD, Q.S. (1965) Indian Cities: Characteristics & Correlates, Department of Geography, University of Chicago.

BERRY, B.J.L. & SMITH, Kathrine B.L. (1972) (Eds) City Classification Handbook: Methods & Applications, John Wiley and Sons, New York.

BOKHARI, M.H. (1968) Lyallpur: A Study in Urban Geography, unpublished Ph.D., Thesis, University of London.

BREESE, G. (1966) Urbanization in Newly Developing Countries, Princeton University Press.

_____ (1969) The City in Newly Developing Countries: Readings in Urbanism and Urbanization, Prentice Hall, N.J.

BUCKLEY, R.B.(1905) The Irrigation Works of India, 2nd Ed. London.

CALVERT, H.B.(1936) The Wealth & Welfare of the Punjab, 2nd Ed.Lahore.

CARTER, H. & DAVIES, W.K.D. (1970) Urban Essays: Studies in Geography of Wales, Longman, London.

CHAUDHRY, M.M.(1966) Lahore: A Geographical Study, unpublished Ph.D., Thesis, University of London.

CHISHOLM, M. (1971) Research in Human Geography, Heinemann, London.

CHORLEY, R.J. & Haggett, H.P. (1969) Models in Geography, 3 volumes, Methuen, London.

CLARKE, J.I. (1971) Population Geography & the Developing Countries, Pergamon Press, Oxford.

_____ (1972) Population Geography, 2nd Ed., Pergamon Press, Oxford.

COLE, J.P. (1969) Quantitative Geography, John Wiley & Sons,London.

DARLING, Sir Malcolm L., (1947) The Punjab Peasant in Prosperity and Debt, 4th Ed., O.U.P.

DAVIES, W.K.D. & CARTER ?

EBERHARD, W. (1967) Settlement & Social Change in Asia, Hongong University Press.

FISHER, W. B. (1971) The Middle East, 6th Ed., Methuen, London.

GIBBS, P.J.(Ed)(1961) Urban Research Methods, D. Van Nostrand Co. N.J.

GRIGG, D. (1970) The Harsh Lands, Macmillan, London.

HAUSER, P.M. & SCHNORE, L.F. (1965) The Study of Urbanization, John Wiley & Sons, N.Y.

HILL, A.G. (1969) Aspects of the Urban Development of Kuwait, un-published Ph.D., Thesis, University of Durham.

JONES, E. (1966) Towns & Cities, O.U.P.

KUREISHY, K.U.(1957) Urban Development in West Pakistan, unpublished Ph.D., Thesis, University of London.

MARON, S. (1957) Pakistan: Society & Culture, New Haven.

McGEE, T. G. (1967) The Southeast Asian City, G. Bell & Sons, London.

McGEE, T. G. (1971) The Urbanization Process in the Third World, G. Bell & Sons Ltd., London.

MICHEL, A.A. (1967) The Indus Rivers: A Study of Effects of Partition,

MINER, H,(Ed)(1967) The City in Modern Africa, Pall Mall, London.

MOSER C.A. & SCOTT, W., (1961) British Towns: A Statistical Study of their Social & Economic Differences, Centre for Urban Studies Report No.2, Edinburgh.

MYRDAL, G. (1971) The Challenge of World Poverty, Pelican Books.

PAPANECK, G.F.(1967) Pakistan's Development: Social Goals & Private Incentives, Harvard University Press.

PAUSTIAN, P.W.(1930) Canal Irrigation in the Punjab, Columbia University Press.

ROBSON, B.T. (1969) Urban Analysis: A Study of City Structure with Special Reference to Sunderland, C.U.P.

SJOBERG, G. (1960) The Preindustrial City: Past & Present, The Frees Press of Glencoe, Illinois.

SMAILES, A.E. (1966) The Geography of Towns, 5th Ed. Hutchinson, London.

SPATE, O.H.K. & LEARMONTH, A.T.A. (1967) India & Pakistan, 3rd Ed., Methuen, London.

TREVASKIS, H.K. (1928) The Land of the Five Rivers, O.U.P.

TURNER, R. (1962) India's Urban Future, University of California Press, Berkeley.

B. ARTICLES & OTHER PAPERS:

AHMAD, K.S. (1 'Climatic Regions of West Pakistan', PGR, 6/1, Jan. 1951, pp.1-35.

_____ 'Urban Population in Pakistan', PGR, 10/1, Jan.1955.

AHMAD, K.S. & KUREISHY, K. U. 'Growth of Settlements in West Pakistan', PGR, 16/2, July, 1962, pp.1-13.

BERRY, B.J.L. 'City Size Distributions & Economic Development', EDCC, 9, July, 1961, pp.537-588.

_____ 'A Method for Deriving Multifactor Uniform Regions', Przeglad Geograficzny, 33/2, 1961, pp.263-279.

BERRY, B.J.L. & GARRISON, W.L. 'Alternative Explanations of Urban Rank-size Relationship', AAAG, 48, 1961, pp.83-91.

BREESE, G. 'Urban Development Problems in India', AAAG., 53, 1963, pp.253-265.

DAVIS, K. 'The Origin & Growth of Urbanization in the World', American Journal of Sociology, 60, 1955, pp.429-437.

DAVIS, K. & GOLDEN, Hilda H., 'Urbanization & Development of Pre-Industrial Areas', EDCC., 3, 1954-55, pp.6-21.

DWYER, D.J. 'The City in the Developing World & the Example of Southeast Asia', Geography, 53, 1958, pp.353-364.

FISHER, W.B. 'Geographical Contributions to Development Surveys', Advancement of Science, 25/124, Dec. 1968, pp.158-170.

FRYER, D.W. ' The 'Million City' in Southeast Asia', Geographical Review, 43/4, Oct. 1953 pp.474-494.

HAMEED, A. 'Thal Development Project', Geographia, 3/1, 1964, pp.43-50.

HAUTAMAKI, L. 'The Use of Multivariate Methods in Regional Geographical Analysis', Fennia, 99, 1969-70, pp.5-25.

HOLZNER, L. 'World Regions in Urban Geography', AAAG. 57/4 Dec. 1967, pp.704-713.

HOSELITZ, B. F. 'Generative & Parasitic Cities', EDCC, 3, 1955, pp.278-294.

KHOSLA, A.N. 'Development of Indus River System', India Quarterly, 14/3, July, 1958, pp.233-253.

KUREISHY, K.U. 'Urbanization of West Pakistan in Relation to Aridity' PGR., 21/2, 1967, pp.1-13.

MURPHY, R. 'Urbanization in Asia', Ekistics, 21/122, Jan. 1966, pp.13-17.

MAYOR, H. M. 'Cities & Urban Geography', Journal of Geography, Jan., 1969, pp.6-19.

POCOCK, D.C.D. & WISHART, D. 'Methods of Deriving Multifactor Uniform Regions, I.B.G. Transanctions, 47, Sept.1969 pp.73-98.

SMAILES, A.E. 'The Indian City', Geographische Zeitschift, 57/3, 1969, pp.177-190.

SPATE, O.H.K. 'Aspects of City in South Asia', Confluence, 7, 1958, pp.16-28.

VAPNARSKY, G.A. 'On Rank-size Distribution of Cities: An Ecological Approach', EDCC, 17/4, 1969, pp.584-595.

C. SPECIAL REPORTS & STATISTICAL SOURCES:

* **GOVERNMENT OF INDIA**, Census of India, Decennial Census Reports from 1881 to 1941.

* _____, Imperial Gazetteer of India, 1908, especially Vols. XVI, XVII and XVIII.

* GOVERNMENT OF THE PUNJAB, Census of the Punjab, 1868, London, 1870.

* _____, Colony Mannual, 1913 and 1922.

* _____' Colony Reports, Yearly from 1902-35.

* _____' Gazette of the Chenab Colony, Lahore, 1905.

GOVERNMENT OF PAKISTAN, Census Reports, 1951, 1961. Including Bulletins and Reports on 16 districts under study.

_____, Pakistan Planning Commission, 5 Year Plans, 1955, 1960 and 1965.

GOVERNMENT OF WEST PAKISTAN, Year Book of West Pakistan, 1970.

THAL DEVELOPMENT AUTHORITY, Handbook, Jauharabad, 1954.

* H. M. S. O. Report of the Royal Indian Irrigation Commission, 1901-1903, London 1903.

U. N. O. Demography Year Book. Especially 1955, 1968, 1969 & 1970.

WORLD BANK Water & Power Resources of West Pakistan, 2 Volumes, 1968.

* Available at the India Office Library.

Ashaw
2.8.72
— have the well old Durham

.. ..