



LAHORE DEVELOPMENT AUTHORITY

**INTEGRATED MASTER PLAN
FOR
LAHORE-2071**

**FINAL
VOLUME - II
ANALYSIS AND PROPOSALS**

**NES
PAK**

NATIONAL ENGINEERING SERVICES PAKISTAN (Pvt.) Ltd.

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FOR
LAHORE-2021**

**FINAL REPORT
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PREFACE

This report is the fourth deliverable required to be presented to Lahore Development Authority (LDA) towards the finalization of Integrated Master Plan for Lahore (IMPL), in accordance with the contract for Consultancy Services and Terms of Reference. The first draft of this report was submitted to LDA in July 1998. Various observations/ comments on the draft report were received and incorporated and the revised version in the form of second draft report was submitted to LDA in November 2002.

A series of presentations made to various government agencies, the technocrats and professionals including town planners, architects, engineers, builders, administrators etc. at various forums to invite their suggestions/ comments which were accordingly incorporated in this document. This report got clearance from the Project Steering Committee on June 23, 2004 and was approved by the Lahore District Council on October 06, 2004.

The published report on 1998 Population Census for Lahore District was available as from February 2001. Since population is the basic parameter for undertaking planning studies, the whole data base of this report was revised/ updated according to the latest census figures. The purpose of this exercise/ assignment is essentially to establish an integrated framework for the development of Lahore by the year 2021 and to create a sustainable working and living environment for its citizens while improving the quality of life.

The preparation of IMPL has been undertaken through a comprehensive process of data accumulation, processing, surveys, field visits, and analytical studies. Extensive discussions with public and private sectors including eminent professionals, civic personalities and special interest groups were also an important element of their participation in the plan formulation. IMPL in essence, therefore, is also intended to serve as a practical working document with sound basis, for the concerned authorities to adopt the proposals and recommendations, and proceed to plan implementation.

This report is divided and submitted into three separate volumes as follows:

- Volume-I Existing Scenario
- Volume-II Analysis and Proposals
- Volume-III Short Term Plan

Volume-I presents a review of existing scenario in Lahore and covers all aspects of the metropolitan area, namely historical background, physical characteristics, socio-economic profile, land development, land use, housing, transportation, community facilities, utility services, environmental issues and urban governance.

Volume-II of the report focuses on the analysis of the above situation and preambles the structure for plan making. It discusses key issues that are to be addressed, the growth components, potentials and constraints of Lahore Metropolitan Area (LMA). This is followed by the proposals for the Integrated Master Plan up to the year 2021. It presents recommendations in all sectors of urban development i.e. land use, land development, housing, transportation, community facilities, public utilities, infrastructure, environment and institutional framework.

Volume-III presents a list of projects identified in various sectors with tentative cost estimates for implementation during the first 5 years.

Apart from the three volumes of the report mentioned above, an Executive Summary is also given in a separate volume which presents the salient features of the three volumes of the Master Plan Report in a summarized form.

NESPAK gratefully acknowledges with gratitude the co-operation of LDA and its associated agencies such as WASA and TEPA including the Ex-Additional Director General (Town Planning) LDA, the Managing Director WASA, the Chief Traffic Engineer TEPA, for their help during formal and informal discussions at various stages of this assignment.

Special thanks are due to Mian Aamir Mahmood, District Nazim; Mr. Akhlaq Ahmad Tarar, Director General LDA; Mr. Khalid Sultan, District Coordination Officer; and Mr. Shaukat Jamal Khawaja, Chief Metropolitan Planner, LDA for their valuable contribution, guidance and help throughout during the preparation of this document.

Last but not the least, are the six Town Nazims of the City District Government, the District Officers (Planning and Coordination) of these Towns, Executive District Officer (Works and Services) and various officials of the City District Government who have directly or indirectly contributed during the Plan preparation. Thanks are also due to various other public agencies like Provincial P&D Department, Housing and Physical Planning Department, Transport Department, Environment Protection Department, Ex-Metropolitan Corporation Lahore (ex-MCL), Lahore and Walton Cantonment Boards, Parks and Horticultural Authority (PHA), Meteorological, Education, Health and Irrigation & Power Departments, Punjab Bureau of Statistics, Water and Power Development Authority (WAPDA), Sui Northern Gas Pipelines Limited (SNGPL), Pakistan Telecommunications Corporation Limited (PTCL), the private sector and numerous individuals who rendered their assistance and guidance on various occasions.

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INTEGRATED MASTER PLAN FOR LAHORE

VOLUME-II: ANALYSIS AND PROPOSALS

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LIST OF ABBREVIATIONS USED IN THE REPORT

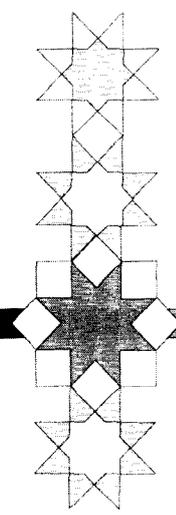
AC	Asbestos Cement
ACSR	Aluminum Conductor Steel Reinforced
ADB	Asian Development Bank
ADP	Annual Development Plan
Amp	Ampere (unit of electric current)
BOD	Bio-Chemical Oxygen Demand
BRB	Bambanwala Ravi Bedian Canal
CADPAD	Computer Aided Distribution, Planning and Design
CBD	Central Business District
CDG	City District Government
CDM	M/s Camp Dressers and Mckee
CDWP	Central Development Working Party
Cfs	Cubic feet per second
CI	Cast Iron
CMP	Chief Metropolitan Planner, LDA
COD	Chemical Oxygen Demand
CTE	Chief Traffic Engineer, TEPA
DG	Director General
DI	Ductile Iron
DMD	Deputy Managing Director
DO	Dissolved Oxygen
DTA	District Transport Authority
DTP	Director Town Planning, LDA
EIS	Environmental Impact Statements
EPA	Environmental Protection Agency
EPD	Environment Protection Department
E&T	Excise and Taxation Department
ft	Feet
GI	Galvanised Iron
gpcd	Gallons per capita per day
Ha	Hectare
HFL	High Flood Level
HIES	Household Integrated Economic Survey
HRT	Heavy Rail Transit
HT	High Tension
HUD&PHED	Housing, Urban Development and Public Health Engineering Department
Hz	Hertz (cycle per second)
IDA	International Development Agency
IMA	Inner Metropolitan Area
JICA	Japan International Cooperation Agency
Km	Kilometre
KV	Kilo Volt
KVA	Kilo Volt Ampere
KW	Kilo Watt
LCB	Lahore Cantonment Board
LCCHS	Lahore Cantonment Cooperative Housing Society
LDA	Lahore Development Authority
LGO	Local Government Ordinance
LHV	Lady Health Visitor
LIT	Lahore Improvement Trust
LMA	Lahore Metropolitan Area
LMC	Lahore Municipal Corporation
LPB	Lahore Protection Bund
Lpcd	Litres per capita per day
Lps	Litres per second
LRT	Light Rail Transit
LSP	Lahore Sanitation Programme
LT	Low Tension

LIST OF ABBREVIATIONS USED IN THE REPORT

LTR	Lahore Telecommunications Region
LUPTS	Lahore Urban Development and Traffic Study
LUTP	Lahore Urban Transport Project
m	metre
m ³ /s	cubic metres per second
mcf/d	million cubic feet per day
MCH	Maternity and Child Health Centre
MCL	Metropolitan Corporation Lahore
mcmd	Million Cubic Metres per day
MD	Managing Director
MEUAFW	Ministry of Environment, Urban Affairs, Forestry and Wildlife
mgd	million gallons per day
mpn	Most probable number
MTS	Model Town Society
MVA	Mega Volt Ampere
NCS	National Conservation Strategy Project
NEQS	National Environmental Quality Standards
NESPAK	National Engineering Services Pakistan (Pvt.) Limited
NGO	Non-Governmental Organisation
NTRC	National Transport Research Centre
O&M	Operation and Maintenance
ODA	Overseas Development Agency
P&E	Planning and Evaluation
RCC	Reinforced Cement Concrete
PCU	Passenger Car Unit
PDWP	Provincial Development Working Party
PHC	Primary Health Centre
PIHS	Pakistan Integrated Household Survey
PLGO	Punjab Local Government Ordinance
PMDF	Punjab Municipal Development Fund
PRTC	Punjab Road Transport Corporation
PTA	Provincial Transport Authority, Punjab
PTCL	Pakistan Telecommunications Corporation Limited
PUDP	Provincial Urban Development Project
PVC	Polyvinyl Chloride
ROW	Right of Way
Rs	Pakistan Rupees
RTA	Regional Transport Authority
SAP	Social Action Programme
SEC	Shalimar Escape Channel
SNGPL	Sui Northern Gas Pipelines Limited
SWM	Solid Waste Management
TDCP	Tourist Development Corporation Punjab
TDS	Total Dissolved Solids
TEPA	Traffic Engineering and Transport Planning Agency
TSS	Total Suspended Solids
UBD	Upper Bari Doab Canal
UD	Urban Development Wing, LDA
UET	University of Engineering and Technology, Lahore
UNEP	United Nations Environmental Programme
WADPA	Water and Power Development Authority
WASA	Water and Sanitation Agency
WHO	World Health Organisation

VOLUME II

ANALYSIS AND PROPOSALS



16.0 KEY ISSUES AND GUIDELINES

16.1 GENERAL

Analysis of the existing situation has brought to surface a series of problems and issues that are being faced by the citizens and the authorities alike. Amongst a varied and large number of issues, the most prominent and pressing issues needing immediate attention are:

1. Land Management and Housing
2. Traffic and Transportation
3. Sustainable Living Environment
4. Urban Governance
5. Finance

The key issues have a multiple and ripple effect on the spatial and socio-economic spheres of the metropolis and are a major cause of other problems being faced by the city. If the above issues are resolved effectively, there are reasons to believe that other issues would themselves be taken care of in due course. The future lines of action to overcome these issues are also discussed hereunder which would form a basis for the guiding principles in developing growth strategies and a framework for the Integrated Master Plan.

16.2 LAND MANAGEMENT AND HOUSING

Due to rapid socio-economic changes in LMA, congestion in central areas and sprawling suburbs, land needs to be managed more effectively. At present, land has become a speculative investment commodity for a number of reasons viz-a-viz securities against inflation, future uncertainties etc. Land speculation encourages urban sprawl and hinders orderly urban development. Feeble regulatory framework, pressures of political and private interest groups, powerful bureaucracy and ineffective enforcement hamper the ability of concerned departments to coordinate all the elements that have to act together to resolve land management issues. Lack of land management has also resulted into leap-frog or piecemeal development and undesirably low densities at the cost of prime agricultural land. Provision of urban infrastructure also becomes costlier and inefficient, and directly affects the already dwindling housing affordability of low and middle income groups.

There is thus need to meet the spatial needs of the existing and future population, giving due consideration to land economics, without compromising the efficient use of land. The infrastructure costs are to be minimised and an integrated land use pattern evolved, by in-fill development wherever possible. Again, the intensity of land development is to be optimised and the general form and directions of future growth of the city are to be determined distinctly. There is need to ensure land reservations for future city level land uses/functions related to collective benefit of the citizens. Private sector is to be encouraged to promote and finance housing for the low income group and construct public facilities.

Katchi Abadis are to be upgraded with basic infrastructure. The fate of those living in the river bed is to be decided. Urban renewal / redevelopment schemes should be undertaken for the identified older parts of the city.

16.3 TRAFFIC AND TRANSPORTATION

As a corollary to the above, the excessive linear growth and piecemeal development of Lahore is contributing towards long travel distances, travel time delays, congestion on roads and environmental pollution. The pattern and pace of Lahore's physical growth has led to increasing traffic congestion, lagging development of road and traffic systems and inadequate provision of public transport.

There is a need to introduce up-to-date and proficient urban traffic control system and efficiently link the residential areas with centres of employment, commerce and amenities. The poor are particularly affected by transport policies because their access to employment opportunities is critical and that they cannot afford to spend much on transport.

The overall purpose is thus to improve the road network, traffic and transportation systems with safety, convenience, economy and in an environmentally sustainable way. The recommendations with regard to accessibility and movement are also to support the proposed development corridors as well as high intensity development areas within LMA.

Roads and junctions need to be improved by enhancing their capacities through removal of encroachments, undertaking standard design procedures, parking controls etc. Missing road links especially in the south are to be added to ensure easy accessibility and to reduce unnecessary traffic burden on other roads. Efficient public transport system is required to meet the daily travel demand. Steps are required to segregate vehicular and pedestrian movements. There is need to develop a comprehensive road construction and maintenance programme for the city.

16.4 SUSTAINABLE LIVING ENVIRONMENT

The city's piecemeal growth in the past both in the formal and informal land markets has resulted in numerous problems including traffic congestion, unaffordable housing, incompatible landuses, infrastructural deficiencies and lack of social services. Main reasons that are eroding the sustainability of living environment are untreated sewage disposal in many parts of the city, unsafe water supply, poor drainage system, unhealthy sanitation and unsatisfactory disposal of municipal, hospital and industrial wastes. These problems are likely to worsen with the passage of time. Because of centralization and urbanization, all parts of the city are affected; inner areas because of higher densities and outer areas because of urban sprawl. The present state of living environment in Lahore is also a result of weak enforcement, lack of funds, absence of scientific and technical research on local urban environment, disrespect of law and oblivious community. The city environment is deteriorating and threatening its sustainability. In fact, the sustainability is at the threshold of desolation.

There is need to improve the quality of environment and ensure development of an environmentally sustainable and healthy city. Development of living areas and their environmental protection should be a unified concern. The significance of harmonising environmental concerns with planning and development of sustainable living areas is high, and so the two should be harmonised in an integrated fashion.

Availability of potable water is to be ensured on long term basis. Treatment of sewage is necessary instead of throwing raw sewage in the existing water bodies like Ravi River and the UBD Canal. Timely disposal of storm water drainage is required along with 100% collection of solid waste and its proper disposal at designated and developed landfill sites.

16.5 URBAN GOVERNANCE

Urban governance presents very difficult tasks under the best of circumstances. The problems faced by urban agencies are monumental, whereas the resources (e.g. manpower, finances, legislation etc.) to deal with these are exceedingly scarce. Even the best urban development strategy comes to a naught unless institutions are strong enough to implement it.

On the one hand, the local agencies have the primary legal responsibility for development of LMA, but there is lack of coordination amongst them; while on the other hand, a large number of federal and provincial agencies involved in city level development, lack initiative on the part of local authorities to improve their capacities and perpetuate dependency on provincial and federal agencies. The absence of coherent urban policy is compounded by the lack of an effective institutional framework for managing Lahore's effective development.

An appropriate institutional framework is to be established for plan implementation and city management with effective inter-departmental coordination (both horizontal and vertical), and to facilitate active community participation at all levels. Decentralization of urban management functions and fiscal powers is also required.

16.6 FINANCE

The ability of public sector to finance urban development is diminishing. Activities of local authorities are hampered due to weak revenue base, unsound budgetary process and delay in release of funds by the government. Private sector, on the other hand, plays limited role in city development and is confined to specific activities, with expectations of high returns. It is therefore essential that private sector should be encouraged and provided incentives to actively participate in developmental activities which should be market oriented.

There is need to enhance local resources, diminish reliance on public finances, and effectuate cost recovery. The purpose of urban development funding should also be to ensure that its benefits are effectively filtered down to the lower income communities.

17.0 GROWTH COMPONENTS

17.1 GENERAL

In urban areas the components of growth are (a) increase in population and (b) availability of employment opportunities, though both are directly related to each other. Accelerated population growth and surplus labour can create unemployment and poverty, while increased employment opportunities can accelerate migration and consequent population growth. Together these components of growth can make or break the socio-economic and spatial structure of the city. This chapter estimates and assesses the growth components (i.e. population and employment) of Lahore for the plan period. However, these forecasts may be subject to changes and even the best estimates can be outdated due to unforeseen circumstances and developments at the national and international levels. The implementing agencies and local authorities should therefore, conduct periodical review and modify the projections accordingly.

17.2 POPULATION GROWTH AND DISTRIBUTION

17.2.1 Growth in LMA

The records show that the population of LMA was 6.94 million in 1998; which is estimated to have been increased to 7.71 million in the year 2001. The urban proportion in the year 2001 forms 77% of the total LMA population, and is expected to decline to 73% by the year 2021. The reducing birth rate in urban areas is assumed to be the main factor contributing towards this decline.

The estimates of future population for rural and urban LMA have been made by following their respective past growth trends. The overall average annual population growth rates (during 1998-2021) are given in Table 17.1 whereas the estimated and incremental population figures are presented in Tables 17.2 and 17.3 respectively.

It may be noted from Table 17.1 that the population of urban areas of Sheikhpura District lying in LMA would grow comparatively at a higher rate than the population of urban areas of Lahore District; where as the rural population of the same district would increase with less than half the rate as that of the rural population of Lahore District.

17.2.2 Growth in Lahore

As mentioned in earlier parts of the report, the population of ex-MCL Area, after 1961, has grown with continuously declining rates. Likewise, the population of LCB, a decade later, also experienced similar trend.

TABLE 17.1
AVERAGE ANNUAL POPULATION GROWTH
RATES (1998-2021): LMA

DISTRICT	AREA	AVERAGE ANNUAL GROWTH RATE (%)
Lahore	Urban	2.82
	Rural	4.47
Sheikhupura	Urban	3.43
	Rural	2.07
Kasur	Urban	-
	Rural	2.54
LMA	Urban	2.83
	Rural	3.90
	Both	3.10

TABLE 17.2
AREA WISE POPULATION DISTRIBUTION IN LMA (1998-2021)

DISTRICT	AREA	POPULATION IN YEAR					
		1998	2001	2006	2011	2016	2021
Lahore	Urban ¹	5,209,088	5,774,886	6,706,402	7,717,361	8,798,459	9,936,841
	Rural ²	1,109,657	1,266,953	1,568,583	1,955,042	2,447,204	3,068,353
	Both	6,318,745	7,041,839	8,274,985	9,672,403	11,245,663	13,005,194
Sheikhupura	Urban ³	147,144	165,586	197,425	233,913	275,408	322,229
	Rural	351,868	376,096	416,667	461,615	511,411	566,579
	Both	499,012	541,682	614,092	695,528	786,819	888,808
Kasur	Urban	-	-	-	-	-	-
	Rural	120,834	131,097	148,614	168,471	190,982	216,501
	Both	120,834	131,097	148,614	168,471	190,982	216,501
LMA	Urban	5,356,232	5,940,472	6,903,827	7,951,274	9,073,867	10,259,070
	Rural	1,582,359	1,774,146	2,133,864	2,585,128	3,149,597	3,851,433
	Both	6,938,591	7,714,618	9,037,691	10,536,402	12,223,464	14,110,503

Average annual decline in growth rates⁴ has been taken as the basis for estimating future population for ex-MCL Area, Cantonment Area, Kahna Nau and Raiwind Towns. These growth rates include the component of in-migration to the said areas.

According to the forecasts, the population of ex-MCL Area would grow from 5.04 million in 2001 to 6.61 million in 2011 and 8.38 million by the end of the plan period (i.e. 2021) showing an overall increase of about 66% in 20 years (Table 17.4). The increase in the population of Kahna Nau and Raiwind Towns, as estimated for the plan period is about 83% and 77% respectively.

¹ Comprised of the population of ex-MCL, Lahore Cantonment and Kahna Nau and Raiwind Towns.

² Area includes the population of rural areas of Lahore District including those lying outside the LMA boundary.

³ Comprised of the population of Kot Abdul Malik, Ferozewala and Sharaqpur Towns.

⁴ Procedure adopted in determining these rates has been described in Section 3.1.5 under the head "Base Year Population".

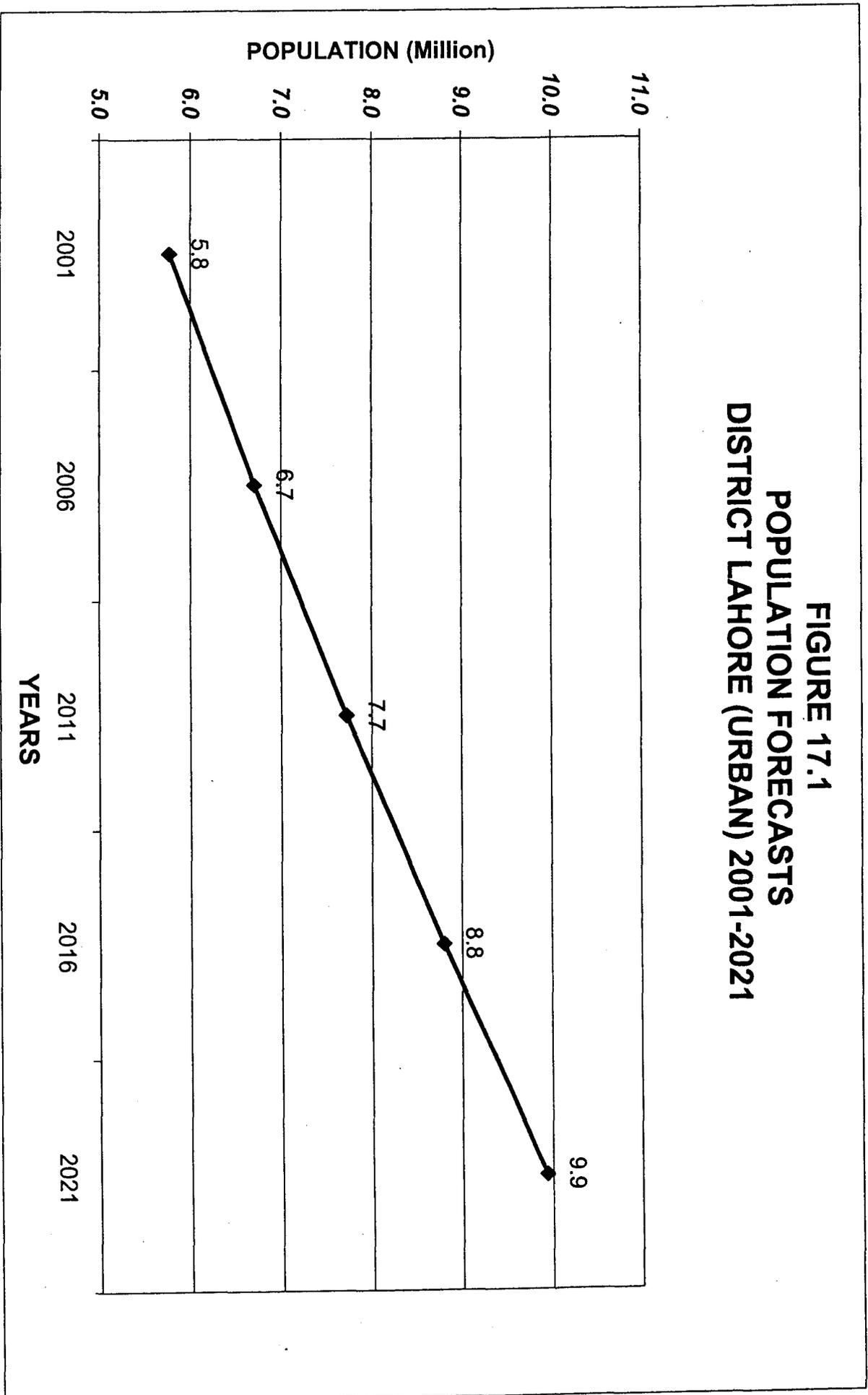
In 1998, the urban population of Lahore District was about 5.21 million which is estimated to rise to about 9.94 million by the year 2021 at an average annual growth rate of 2.82%. Similarly, the population of the entire LMA (including rural areas) is estimated to rise from 6.94 million in 1998 to 14.11 million in 2021. During the period 1998 to 2021, the incremental population of LMA is estimated to be about 7.17 million, while the incremental urban population in the same period will be around 4.9 million.

TABLE 17.3
LMA INCREMENTAL POPULATION IN THE PLAN PERIOD

District	Area	Population 1998	Incremental Population					
			Nature	2001	2006	2011	2016	2021
Lahore	Ex-MCL	4,577,744	Additional	464,763	757,878	813,599	861,834	900,186
			Cumulative	-	1,222,641	2,036,24	2,898,07	3,798,260
	Lahore Cantonment	565,751	Additional	93,323	161,074	183,940	205,255	223,511
			Cumulative	-	254,397	438,337	643,592	867,103
Other Urban (Kahna & Raiwind)	65,593	Additional	7,712	12,564	13,420	14,009	14,685	
		Cumulative	-	20,276	33,696	47,705	62,390	
Rural	1,109,657	Additional	157,296	301,630	386,459	492,162	621,149	
		Cumulative	-	458,926	845,385	1,337,54	1,958,696	
Sheikhpura	Urban	147,144	Additional	18,442	31,839	36,488	41,495	46,821
	Cumulative	-	50,281	86,769	128,264	175,085		
Rural	351,868	Additional	24,228	40,571	44,948	49,796	55,168	
		Cumulative	-	64,799	109,747	159,543	214,711	
Kasur	Urban	-	Additional	-	-	-	-	-
	Cumulative	-	-	-	-	-		
Rural	120,834	Additional	10,263	17,517	19,857	22,511	25,519	
		Cumulative	-	27,780	47,637	70,148	95,667	
LMA	Urban	5,356,232	Additional	584,240	963,355	1,047,44	1,122,59	1,185,203
	Cumulative	-	1,547,595	2,595,04	3,717,63	4,902,838		
	Rural	1,582,359	Additional	191,787	359,718	451,264	564,469	701,836
Cumulative	-	551,505	1,002,76	1,567,23	2,269,074			
Both	6,938,591	Additional	776,027	1,323,073	1,498,71	1,687,06	1,887,039	
Cumulative	-	2,099,100	3,597,81	5,284,87	7,171,912			

The urban share in the total district population in 1998, was about 82.4% which is expected to reduce to 76.4% by the end of the plan period. This reduction in the proportion of urban population is anticipated mainly because of two reasons: (a) the decrease in the birth rate, and (b) the decline in the number of in-migrants to Lahore (i.e. from 20.5% in 1981 to 17% in 1998). The population estimates, with five years interval, for LMA and Lahore District are illustrated in Figure 17.1.

FIGURE 17.1
POPULATION FORECASTS
DISTRICT LAHORE (URBAN) 2001-2021



17.2.3 Characteristics of Future Population

17.2.3.1 Age and Sex Composition

In the light of the changes in the age-sex structure during 1981-98, this is assumed that:

- i) The gap between male and female population would continue to lessen, and
- ii) The proportion of population in the younger ages would decline, and consequently there would be a corresponding increase in the proportion of active ages.
- iii) Based on the above assumptions, the age-sex composition for future population (of Lahore Urban) is estimated and presented in Table 17.5.

17.2.3.2 Household Size

Keeping in view the past trends (1981-98), it is assumed that the household size in ex-MCL Area would increase to 7.2 by the end of the plan period. Similarly the household size of Lahore Cantonment would rise to 7 and that of Kahna Nau and Raiwind Towns to 7.5. The total number of households in Lahore Urban by 2021 will be about 1.385 million. Area-wise distribution is shown as under:

Area	Number of Households
Ex-MCL	1,163,334
Cantonment	204,693
Kahna Nau	10,611
Raiwind	6,454
Total	1,385,092

17.3 EMPLOYMENT GROWTH

Employment growth of an area is primarily dependent on the national development activities that are likely to be adopted in the future, and secondly on the overall investment strategy of private sector. Presently, neither of these is very clear and is overshadowed by uncertainties. Therefore assessment of future employment in Lahore has been related to percent share of labour force, working population of 1998 Census as shown in Table 17.6.

Projections of working population by major employment sectors for the year 2021 are given in Table 17.7.

TABLE 17.5
POPULATION PROJECTION BY AGE AND SEX: LAHORE URBAN

YEAR	GENDER	TOTAL POPULATION	AGE GROUP						
			00-04	05-09	10-14	15-19	20-24	25-64	65+
1998	Both Sexes	5,209,088	624,670	676,890	681,999	600,607	525,644	1,933,968	165,310
	Male	2,741,403	318,045	348,321	352,589	308,656	275,448	1,045,473	92,871
	Female	2,467,685	306,625	328,569	329,410	291,951	250,196	888,495	72,439
2001	Both Sexes	5,774,886	663,534	734,566	754,200	671,619	594,236	2,174,822	181,909
	Male	3,028,602	337,689	377,061	388,267	342,838	308,614	1,172,675	101,458
	Female	2,746,284	325,845	357,505	365,933	328,781	285,622	1,002,147	80,451
2006	Both Sexes	6,706,402	718,926	824,217	872,503	790,014	710,208	2,580,624	209,910
	Male	3,497,904	365,881	421,847	445,983	399,111	364,132	1,385,869	115,081
	Female	3,208,498	353,045	402,370	426,520	390,903	346,076	1,194,755	94,829
2011	Both Sexes	7,717,361	767,877	915,279	1,000,170	920,681	840,421	3,032,923	240,010
	Male	4,002,984	391,092	467,148	507,578	460,343	425,517	1,622,009	129,297
	Female	3,714,377	376,785	448,131	492,592	460,338	414,904	1,410,914	110,713
2016	Both Sexes	8,798,459	807,698	1,005,664	1,135,881	1,062,854	984,548	3,529,942	271,872
	Male	4,538,117	412,061	511,900	572,256	525,968	492,386	1,879,688	143,858
	Female	4,260,342	395,637	493,764	563,625	536,886	492,162	1,650,254	128,014
2021	Both Sexes	9,936,841	835,688	1,093,052	1,277,878	1,215,276	1,141,743	4,068,143	305,061
	Male	5,095,741	427,533	554,926	639,006	595,182	564,099	2,156,518	158,477
	Female	4,841,100	408,155	538,126	638,872	620,094	577,644	1,911,625	146,584

TABLE 17.6
WORK FORCE DISTRIBUTION BY
ACTIVITY AND GENDER GROUPS IN 2021: LAHORE URBAN

GENDER	WORK FORCE (Total)	DIVISION OF WORK FORCE					
		Working	Looking for work	Laid off	Domestic work	Students	Others
Both Sexes	8,008,101	1,867,506	392,385	90,323	2,980,099	1,854,741	823,047
Male	4,252,587	1,786,399	391,225	89,477	196,234	972,909	816,343
Female	3,755,514	81,107	1,160	846	2,783,865	881,832	6,704

Source: NESPAK Estimates based on data given in Table 22 of 1998 District Census Report for Lahore

17.3.1 Employment Distribution

It is estimated that of the 2.33 million workers in the year 2021, about 1.42 million (or 61%) will be employed in the areas under the jurisdiction of ex-MCL/LCB, while the remaining 0.91 million workers (or 39%) will be employed in outer areas.

17.3.2 Household Income Projections

Household income by income groups for urban and rural areas of Punjab Province is available in Household Integrated Economic Survey, 1996-97 and has been discussed in Chapter 3 under Section 3.2.1. Based on this data, the weighted average total household income in 1996-97 for

Punjab urban areas was Rs. 6,950 while the same for Lahore Urban has been assumed to be Rs. 7758 in 1998.

The income groups have further been divided into three broad groups viz 'Low', 'Middle' and 'High'. The average monthly income of each group works out as Rs. 3,312, Rs. 6,603 and Rs. 15,956 respectively, in urban areas of Lahore District.

There is direct relationship between increase in per capita GNP and household income. The past data regarding growth in per capita income for the period from 1990-91 to 1999-2000 has been derived from "Pakistan Economic Survey 1999-2000".

It is estimated that during this period, per capita income in real terms grew at an average annual growth rate of 1.32 percent.

Based on the average annual growth rate, average monthly household income for three Income Groups i.e. 'Low', 'Middle' and 'High' has also been projected and is given in Table 17.8.

TABLE 17.7
PROJECTED WORKING POPULATION BY MAJOR EMPLOYMENT
SECTORS IN LAHORE URBAN - 2021

MAJOR ECONOMIC ACTIVITIES		WORKING POPULATION							
		1998#		2001		2011		2021	
		No.	%	No.	%	No.	%	No.	%
A.	Work Force	3,907,528		4,376,786		6,034,205		8,008,101	
B.	Working Population	911,244	100	1,020,676	100	1,576,925	100	2,327,654	100
B.1	Agriculture, Forestry, Hunting and Fishing	20,959	2.30	23,476	2.30	31,538	2.00	34,915	1.50
B.2	Mining and Quarrying	-	-	-	-	-	-	-	-
B.3	Manufacturing	92,036	10.10	103,088	10.10	159,269	10.10	235,093	10.10
B.4	Electricity, Gas and Water	4,556	0.50	5,103	0.50	7,885	0.50	13,966	0.60
B.5	Construction	253,326	27.80	283,748	27.80	449,424	28.50	698,296	30.00
B.6	Wholesale and Retail Trade and Restaurants and Hotels	154,911	17.00	173,515	17.00	275,962	17.50	430,616	18.50
B.7	Transport, Storage and Communication	67,432	7.40	75,530	7.40	124,577	7.90	195,523	8.40
B.8	Financing, Insurance, Real Estate and Business Services	58,320	6.40	65,323	6.40	102,500	6.50	153,625	6.60
B.9	Community, Social and Personal Services	169,491	18.60	189,846	18.60	298,039	18.90	446,910	19.20
B.10	Activities, Not Adequately Defined	90,213	9.90	101,047	9.90	127,731	8.10	118,710	5.10

Source: 1998 District Census Report, Lahore

TABLE 17.8
ESTIMATED AVERAGE HOUSEHOLD INCOMES - LAHORE
(2000 PRICE LEVEL)

YEAR	INCOME GROUPS (Rs./month)		
	LOW	MIDDLE	HIGH
2001	3,312	6,643	15,956
2011	3,776	7,574	18,192
2021	4,305	8,635	20,741

Source: NESPAK Estimates

18.0 DEVELOPMENT POTENTIALS, CONSTRAINTS AND CITY GROWTH

18.1 GENERAL

Human settlements always have some forms of potentials and constraints. An appreciation of these potentials and constraints is a prerequisite to understand the existing and future growth patterns. This chapter discusses development potentials and constraints of Lahore and their role in the evolution and evaluation of growth trends.

18.2 POTENTIALS

The present status of Lahore has not been attained in a matter of days. Some factors (e.g. River Ravi, trunk roads) gave an impetus to the transformation of a small town into a large city. Over a period of time, some additional potentials also contributed towards the growth and development of Lahore into a metropolis. Certain potentials that would continue to play an important role in the foreseeable future, and have to be recognized/considered in the plan formulation are:

18.2.1 Provincial Capital

Having been a provincial capital of the Province for about a thousand years, the city is likely to continue its political influence at the provincial and national levels. Moreover with an existing population of about 5.8 million, Lahore ranks second in the urban set up of Pakistan, and as a prime city follows Karachi at the apex of urban hierarchy. Together, these factors (i.e. provincial capital and the second largest city) attract substantial resources, both from the public and private sectors. Decision makers have got to streamline these potentials to their best utilization in developing Lahore.

18.2.2 Commercial and Trade Centre

As a commercial and trade centre of a high order, the city has a nationwide clientele. This sector of the urban economy has provided a strong stimulant to the brisk activities of the metropolis. Presently, a centralized commerce and trade nucleus is developed in and around the Walled City of Lahore. As the pressures on the infrastructure continue to increase, prospects of commercial and trade activities in the central business district will be at stake. The Integrated Master Plan has to ensure that this potential of the city is articulated to meet the demands of existing and future population in an adequate manner. The enhancement of this potential will improve the urban economy and also reduce unemployment in the city.

18.2.3 Professional and Educational Centre

Lahore is the historic seat of learning and intellectuals in Pakistan. As a professional, technical, scientific and educational centre, the city makes a significant contribution to the scholastic sphere of the country. Enhancement of this sector will be an important factor in the development of future generations, not only, of Lahore, but also country wide.

18.2.4 Major Transportation Routes/Terminals

As the city is well connected with other parts of the country by road, rail and air, this potential is one of the main elements in strengthening its role as a major political, commercial and educational centre. Lahore-Islamabad Motorway and the construction of new airport terminal will further promote these sectors. But the results of these ambitious road construction programmes cannot be meaningful if the other main terminals (i.e. truck, bus, rail etc.) are not easily accessible and mobility within the city is restrained. The growth of population and probable economic prosperity will result in higher level of vehicle ownership and also generate more trips. Thus it will lead to more pressures on the routes coming into and through Lahore, and also within the city. Land use and transportation proposals should therefore assure compatibility; amongst these sectors with a view to enrich the future status of Lahore.

18.2.5 Agricultural Land and Proximity of Rural Life

Lahore as a metropolitan city is surrounded by prime agricultural belt. This potential needs to be fully exploited in Lahore's favour in terms of agricultural produce. Urbanization and peripheral growth has already absorbed large tracts of agricultural land and rural settlements within the metropolis, and is diminishing this potential. Rational use of prime agricultural land must be a prerequisite in future plans. There is need to ensure compact and consolidated form of urban expansion instead of piecemeal development which rapidly consumes rich agricultural land.

18.2.6 Historical and Cultural Heritage

The city has a recorded history of about a 1000 years, while references to its existence can be traced to antiquity. It has a rich historical and cultural heritage which is proudly presented by the authorities and the citizens, to their honoured guests. Preservation and conservation of this prestigious characteristic of the city must be given due consideration in plan making.

18.2.7 Waterside Recreation

Rarely are metropolitan cities blessed with a combination of vivid potentials of agricultural land, historical/cultural heritage and water bodies/courses. The location of River Ravi and UBD Canal in the city presents great potentials for waterside recreation. Roadside parks along the canal have been rightly developed to provide passive recreation and a pleasant drive. The canal stands out as a distinctive landmark in the urban configuration, and in future growth of the city this feature will remain very important. On the other hand, River Ravi has been totally ignored from the view point of environment and recreation. Currently it is one of the main sources of sewage and solid waste disposal in the city; the odour and colour of the river are a testimony to this fact. Integrated Master Plan should revive the potential of waterside recreation along River Ravi by providing active and passive recreation along the river banks.

18.3 CONSTRAINTS

Development and growth of a city is usually affected by certain constraints and Lahore is no exception to this. Its future spatial, environmental and socio-economic evolution will be influenced by various factors, and plan making has to accommodate/address the following constraints:

18.3.1 Physical Constraints

The physical configuration of Lahore has been affected by these constraints:

- a) **River Ravi:** The area of the city and its hinterland consists of flat land gently sloping towards south and south-west directions. As such there is no physical hindrance in the expansion of the city. However the existence of River Ravi coupled with regular inundation of its flood plain potentially threatens the extension of the built up area in the north and north-west directions.
- b) **International Border:** The proximity of Indian Border in the east leaves only the southern and south-western directions for the city to expand.
- c) **Defence Restricted Areas:** The location of what is called "Restricted Areas" notified by the Army authorities and described below have further reduced the availability of land suitable for coherent expansion of the city.

i) **Ammunition Depot at Niaz Beg**

Area located within a radius of 1143 metres measured from the Niaz Beg Ammunition Depot was declared as a prohibited zone for construction as far back as 1984. Some of the areas affected by this notification consisted of large village settlements apart from number of duly approved housing schemes from the LDA, such as Canal View Cooperative Housing Society, Gosha-e-Ahbab Housing Society etc. Unauthorised building activity could not be controlled even with demolition operations conducted by the enforcement agencies. The area by now is extensively occupied by unapproved structures and the process is continuing.

ii) **Restricted Area under the Fortress Defence Policy**

It covers vast area located between River Ravi in the north, International Border on the east, Butcher Khana Distributary up to Ferozpur Road on the south and Defence Road on the west. Restriction on raising any kind of construction without obtaining NOC from the Corps Headquarters were imposed in December 1992. Despite the enforcement of restrictions construction activity has been going on and the area by now is littered with houses, industry, land sub-divisions, farm houses, shops, poultry farms in addition to six Phases of LCCHS and 17 other housing schemes sponsored by various cooperative societies. All this has happened in violation and disregard to the instruction of the controlling authority. The problem therefore, calls for a rethinking and review of the issue in the light of conditions existing on the ground (refer section 19.6.4).

As a result of these physical constraints, city development has been generally limited towards southerly direction. Growth strategies for Lahore will also be constrained by these physical barriers in the east and the existing growth trends towards the south has to be accepted till a positive change in relationship with the neighbouring India becomes a political reality to justify expansion in the east.

- d) **Portions of Inter-City Roads/Railway Line within Ex-Municipal Limits:** The intercity arterial roads such as G.T. Road, Multan Road, Sheikhpura Road and Ferozpur Road radiate from the central city and carry heavy intercity traffic.

While these roads provide intercity connections they also disrupt urban continuity and coherence since their crossing is required through grade separation. The same is also valid for railway tracks necessitating construction of overhead bridges and underpasses to facilitate linkages between various parts of the city.

- e) **Land Ownership:** Since most of the land within LMA is owned by the private sector, a large number of private housing schemes, mainly in the south, are being developed at very low densities (@ 100 to 120 persons per hectare) which do not provide for city level functions. To provide such high level functions and to undertake public sector projects, LDA has to acquire land at market prices which requires huge capital, and this somehow is a constraint to achieve the desired parameters of development.

18.3.2 Socio-Economic

Due to increased household size, overcrowding in housing areas prevails and may continue in certain parts of the city during the plan period. In the lower income group, affordability of new or separate houses by the joint family system is highly unlikely. However if women participation in economic activities increases, joint earnings of the family may lead to healthy living and housing standards.

Scattered and distant work locations in the city, and lack of labour housing in industrial areas is a constraint for working population. This is further accentuated by expensive and inefficient public transport system. Proximity of living and working areas has to be given prime consideration in the future plans.

18.3.3 Intangible Constraints

At times these constraints are not easily quantifiable but can be commonly seen and felt. Congestion on streets and pavements, children playing on the roads due to lack of play fields are a common feature in many parts of the city and are a restraint to the mobility of man and motor. Furthermore this also depicts a cluttered perspective of Lahore.

Another common and repetitive eyesore in the city is the repulsive townscape, whereby advertisements, wall chalkings, neon signs, sign boards and hoardings, electric and telephone cables, solid waste, street furniture and depleted housing are miserably abhorrent to the citizens and visitors alike. Not much can be done to rectify the urban design and townscape of Lahore as this would require bold actions. However, the aesthetical picture of the city has to be improved

wherever possible so that the visual image represents a civilized flavour, at least in new developments.

18.4 CITY GROWTH

Based on the potentials and constraints discussed above, Lahore has been experiencing growth in various forms as discussed hereunder:

18.4.1 Densification

The built up areas of the city are being densified through sub-division of larger plots, addition of rooms in existing housing units, in-filling vacant pockets of land, addition of storeys etc. Due to the unaffordability of a plot of land for housing by the low income group, the proximity of in-fill land pockets and availability of infrastructure, the densification process will continue to a certain limit where it does not lead to congestion and strain the existing physical and social infrastructure. This densification will not be able to accommodate, within the built up areas, the total incremental population estimated for the plan period. The balance (spill-over) population will have to be accommodated elsewhere.

18.4.2 Peripheral Growth

Apart from densification within the built up area, growth along the periphery is also continuing in the form of informal and haphazard sub-divisions of land. Such areas include Harbanspura, areas south of Khaire Distributary along both sides of Ferozepur Road, Shahdara area, river bed across Bund Road etc. Most of these areas lack even the basic infrastructure and amenities. There is no control on such land sub-divisions which are consuming prime agricultural land.

18.4.3 Growth Across Ravi

There are vast tracts of private vacant land available across River Ravi, which is close to the central core of Lahore due to presence of four road bridges over the river. Shahdara and other areas across River Ravi are however prone to flooding which has been discussed in detail in Volume-I of this Report. There is however a need for a detailed flood management study to be conducted, before encouraging developments along the right bank of the River. Such a study was also recommended to be carried out by 1965 Master Plan and the 1980 LUDTS Study. In spite of the fact that the area is prone to flooding, development is continuing.

18.4.4 Growth in the South-West

There are a number of housing schemes coming up, in and around the city, where large tracts of agricultural land are being absorbed. In fact, there is a trend to expand in the periphery and outer areas of the city, wherever cheap land is available.

This trend led to low density sprawl which resulted in uneconomical infrastructure developments. Due to dependency on one city centre, work distances and other intra-city journeys are increasing in different directions, putting extra traffic pressure on the already over-burdened roads/radials. Expensive trunk infrastructure is required to be extended in these low density areas. This trend may also further intensify ribbon developments along the major traffic arteries such as Ferozpur Road, Multan Road and G T. Road.

This pattern is more profound in the south-western corridor where private housing schemes are coming up in scattered form. These areas are getting farther and farther from the existing city centre and hence the congestion and chaos on the roads is increasing day by day. This scenario requires decentralization and development of commercial/trade/institutional centre in this area. Present piecemeal development will have to be consolidated by providing higher order functions and land allocations. Empty pockets (in-fills) need to be developed and the new and old areas integrated.

Bukhsh, Allama Iqbal and Nishtar Towns. In 1998 Census, the population is reported on municipal area (MCL) basis as these towns were delineated in 2001.

On the basis of ward-wise¹ 1998 Census data, population estimates were made for of the 150 newly formed Union Councils and that of the six towns in the Lahore City District² (refer Figure 19.2). Using the declining average annual population growth rates over the 1981-98 inter-census period, the populations of the towns were projected to 2021. The same methodology was applied for projecting the population of Cantonment, ex-urban settlements of Kahna Nau, Raiwind, remaining areas of District Lahore, and parts of Sheikhpura and Kasur Districts falling in LMA.

The population estimates of different components of LMA, and their respective incremental populations are given in Table 19.2. Under the new devolved set-up, since Lahore District is a City District, constituted by six Towns, the urban population of these towns, along with their incremental population are presented in Table 19.3³.

19.1.2.2 Absorptive Capacities, Densification and Spill-over

As seen in Table 19.1, the population density in the ex-MCL Area (201 pph) is about 3 times that of Lahore Cantonment (71 pph). Considering the density of Cantonment Area, large tracts of land lying vacant, larger plots and potential for plot sub-division and densification, there are sound reasons to believe that the incremental population of Cantonment (0.77 million) over the next twenty years, will absorb within the Cantonment and will not be spilled-over to other areas. The same applies to other spatial components of LMA, except for the ex-MCL Area. The current gross density of the ex-MCL area is more than 200 persons per hectare, and the incremental population over the next 20 years is estimated to be more than 3.3 million. Part of this will be absorbed in the ex-MCL Area, but there will be a high percentage of spilled-over population which will have to be accommodated in areas outside the ex-MCL limits.

In order to assess the absorbable and spilled-over incremental population of these six towns over the next 20 years, the current density of each union council falling in these towns was raised to an optimum level. Due consideration was given to prevailing densities and land use pattern in

¹ Called "Charges" in the 1998 District Census Report, Lahore.

² Vide Notification No. ADLG/LHR/ELEC/2001/1163, dated 29.5.2001, by the Ex-Deputy Commissioner, Lahore.

³ The population forecasts for the six towns in 2021 will be different than those given in Table 18.3. Because of limited absorption capacities in inner towns like Data Ganj Bukhsh and Ravi Towns, a significant percentage of incremental population will be spilled-over to outer (peripheral) towns like Nishtar and Allama Iqbal Towns. For details, refer Table 19.4.

19.0 URBAN GROWTH STRATEGY

19.1 LAND DEVELOPMENT

19.1.1 General

The demographic and spatial details about LMA have already been elaborated in earlier chapters. In order to comprehend the spatial development proposals elaborated in this chapter, it is pertinent to present here a gist of the LMA's aerial coverage and its population spread.

The LMA is spread in three districts i.e. Lahore and parts of Sheikhpura and Kasur Districts (refer Figure 19.1). The total area of LMA is 230,670 hectares while the population is more than 7.7 million. The details about different spatial units falling in LMA are given in Table 19.1.

It is clear that the ex-MCL Area covers only 11% of the LMA, but accommodates 65% of the total population. The above together with Cantonment cover only around 15% of the land area, but about three-fourth of the LMA's population is concentrated in these two units. These two, particularly the ex-MCL Area (in the context and along with, of course, the entire LMA) are thus the focus of attention.

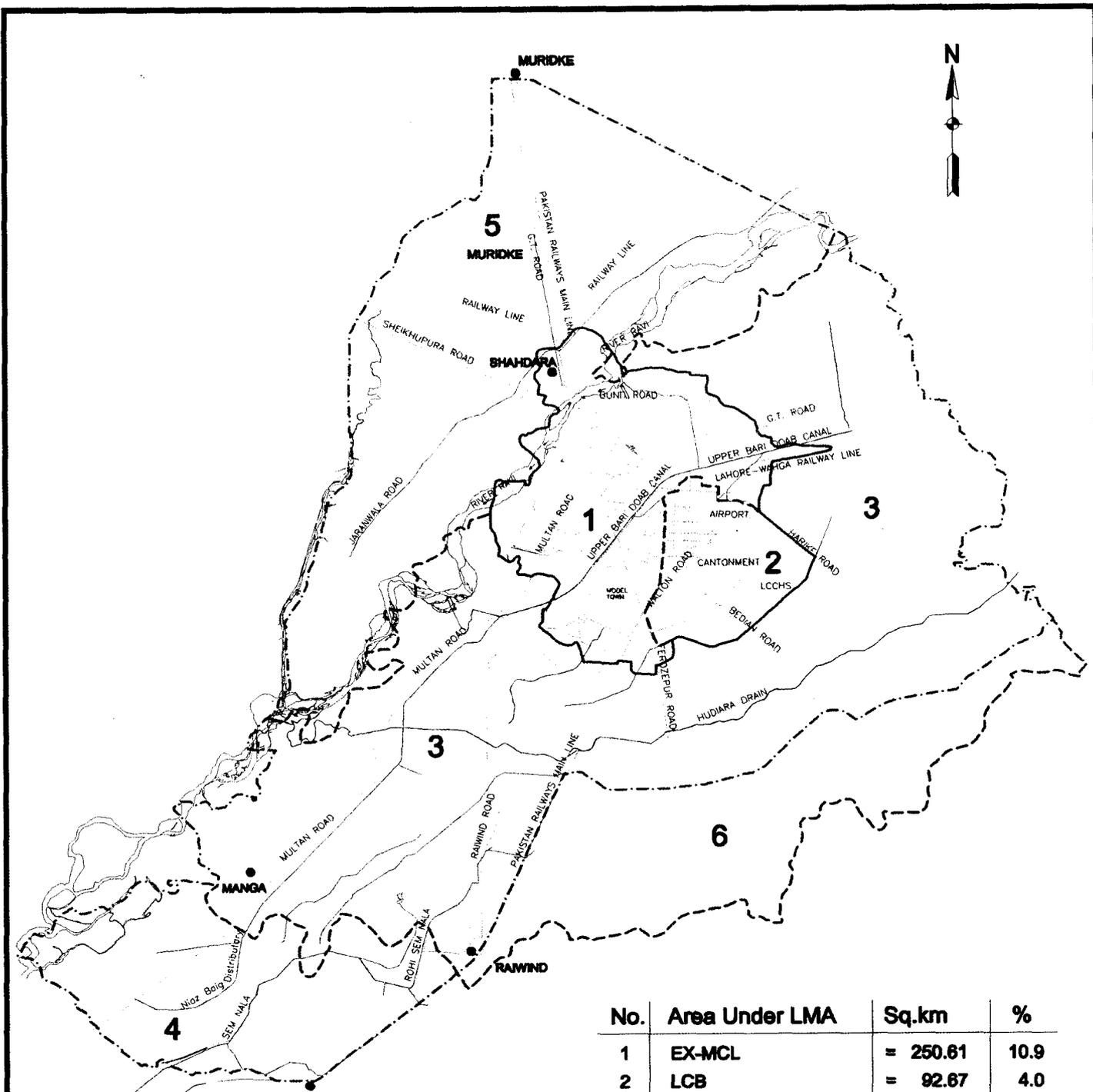
However it must be borne in mind that no spatial unit (urban or rural) can be planned in isolation. This is particularly true in case of Lahore, which being the provincial capital and a metropolis has a wide area of influence, spreading well beyond the provincial boundaries. Lahore thus has to be studied and planned not only in the context of LMA, but also in terms of its entire functional region, which has been delineated in Volume-I of this Report.

19.1.2 Incremental Population and its Allocation

19.1.2.1 Incremental Population of LMA (2001-2021)

The location and extent of future land requirements and the related proposals are a function of total incremental population during the plan period. Before elaborating proposals therefore, it will be in-place to present a summary of incremental population in the next 20 years; assess the capacities of existing urban areas to absorb some of the incremental population and estimate the balance population that will have to be accommodated in new areas.

Under the new Local Government System, the Lahore City District has been divided into six towns i.e. Ravi, Shalimar, Aziz Bhatti, Data Gunj

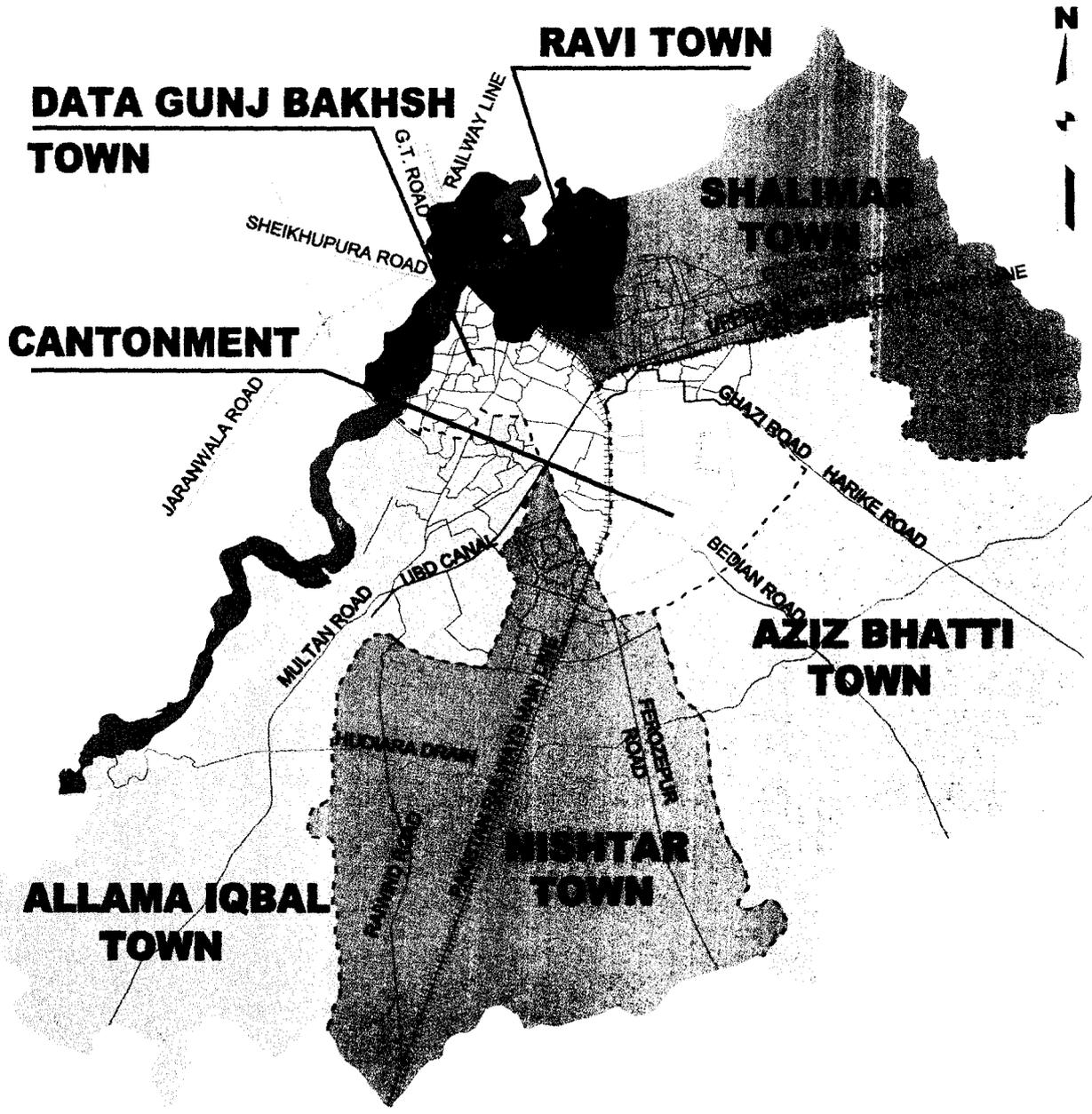


No.	Area Under LMA	Sq.km	%
1	EX-MCL	= 250.61	10.9
2	LCB	= 92.67	4.0
3	EX-Lahore Distt Council	= 1068.43	46.3
4	Kasur District	= 263.50	11.4
5	Sheikhupura District	= 631.49	27.4
	Total LMA	= 2306.70	100.0
6	Area of Lahore District Outside LMA.	= 306.6	

SCALE 1:400,000

LAHORE METROPOLITAN AREA

Fig: 19.1



LEGEND

UNION COUNCIL BOUNDARY —————

TOWN BOUNDARY - - - - -

ROAD —————

RAILWAY LINE —————

SCALE 1 : 320,000

BOUNDARIES OF SIX TOWNS IN LAHORE CITY DISTRICT

Fig: 19.2

these union councils, extent of available vacant/ low density pockets, potential for in-fill, sub-division of plots/houses and possibility of adding room/s in existing houses.

TABLE 19.1
AREAS OF SPATIAL UNITS FALLING IN LMA

District	Area (ha)	% Area	Population (2001)	% Population	Density (pph)
1. Lahore:					
1.1 Ex-MCL Area	25,061	10.9	5,042,507	65.05	201
1.2 Cantonment	9,267	4.0	659,079	8.50	71
1.3 Ex-District ⁴ Council Area	106,843	46.3	1,340,258	17.29	13
2. Sheikhpura	63,149	27.4	541,682	6.99	9
3. Kasur	26,350	11.4	131,097	1.69	5
Total	230,670	100.0	7,714,618	100.00	33

TABLE 19.2
ESTIMATED POPULATION FOR DIFFERENT COMPONENTS OF LMA

AREA	POPULATION	ESTIMATED POPULATION		INCREMENTAL POPULATION (2001-2021)
	1998	2001	2021	
Ex-Municipal Area	4,577,744	5,042,507	8,376,004	3,333,497
Cantonment	565,751	659,079	1,432,854	773,775
District Lahore Rural, along with Kahna Nau & Raiwind)	1,175,250	1,340,258	3,196,336	1,856,078
Part of District Kasur	120,834	131,097	216,501	85,404
Part of District Sheikhpura	499,012	541,682	888,808	347,126
Total	6,938,591	7,714,623	14,110,503	6,395,880

TABLE 19.3
ESTIMATED POPULATION FOR SIX TOWNS OF LAHORE CITY DISTRICT (URBAN UCS)

TOWNS	ESTIMATED POPULATION		INCREMENTAL POPULATION (2001-2021)	%
	2001	2021		
Ravi	1,282,474	2,130,318	847,844	25.44
Shalimar	738,291	1,226,376	488,085	14.64
Aziz Bhatti	291,440	484,112	192,672	5.78
Ganj Bukhsh	1,386,661	2,303,383	916,722	27.50
Allama Iqbal	725,091	1,204,953	479,862	14.40
Nishtar	616,820	1,025,135	408,315	12.25
Total	5,040,777	8,374,277	3,333,500	100.00

⁴ Includes Raiwind and Kahna Nau

Based on the (optimally) highest density achievable, the absorption capacity for incremental population in each town was estimated. The difference between the incremental population and the envisaged absorbed population in a town was the net spilled-over population. The results are presented in Table 19.4.

It is clear from Table 19.4 that on aggregate, 29% of the total incremental population will be absorbed within the urbanised areas of the six towns, while 71% will be spilled-over (to other areas within the City District). There are however, significant internal variations. The absorption capacity is lowest in Data Ganj Bukhsh Town (less than 13%), though more than 27% of the total incremental population will originate from this town. Ravi Town closely follows the trend. This is because their anticipated incremental populations are large, while absorption capacities are limited.

19.1.2.3 Allocation of Spilled-over Population to Different Areas

Having determined the spilled-over population from the six towns, the next step is to distribute it rationally in different parts of the City District. There are primarily following three areas, where the spilled-over incremental population of the next 20 years can be accommodated:

- ◆ Peripheral areas of the six towns (where applicable).
- ◆ The area in the south-west corridor, bounded by Johar Town/ Model Town in the north, Defence Road/Hudiarra Drain in the south, Multan Road in the west and Ferozepur Road in the east.
- ◆ Suitably located areas close to employment centres, primarily for high-density housing.

For spatial allocation of incremental population to different areas and the level of housing required, the income levels in each town were assessed. For this purpose, the income categories given in Household Income and Expenditure Survey, 1996-1997 were updated to year 2001 using Consumer Price Index. The percentage of households falling in each income category as given in the above survey report, was applied to the total households in the six towns, and the number of households falling in each income categories in each of the six towns were thus calculated. The income categories as per 2001 costs, and their distribution in the six towns are given in Table 19.5.

Area requirements are a function of population densities. Densities are normally based on the income level of population and the location of areas where the spilled-over population is to be absorbed. The proposed densities for different areas and the rationale behind these are given in Table 19.6.

TABLE 19.4
TOWN-WISE DETAILS OF ABSORBED AND SPILL-OVER POPULATION
(2001 – 2021)

TOWNS	INCREMENTAL POPULATION	POPULATION ABSORBED	SPILL-OVER	% ABSORBED	% SPILL-OVER
Ravi	847,844	131,246	716,598	15.48	84.52
Shalimar	488,085	187,109	300,976	38.34	61.66
Aziz Bhatti	192,672	35,845	156,827	18.60	81.40
Ganj Bukhsh	916,722	116,089	800,633	12.66	87.34
Allama Iqbal	479,862	305,402	174,460	63.64	36.36
Nishtar	408,315	198,130	210,185	48.52	51.48
Total	3,333,500	973,821	2,359,679	29.21	70.79

TABLE 19.5
INCOME DISTRIBUTION IN EACH TOWN

TOWNS	LOWER INCOME		MIDDLE INCOME		UPPER INCOME	
	Upto Rs. 6,000/-		Rs. 6,001-14,000		Above Rs. 14,000/-	
	%	Population	%	Population	%	Population
Ravi	50	358,299	40	286,639	10	71,660
Shalimar	50	150,488	40	120,390	10	30,098
Aziz Bhatti	50	78,414	45	70,572	5	7,841
Ganj Bukhsh	40	320,253	40	320,253	20	160,127
Allama Iqbal	45	78,507	40	69,784	15	26,169
Nishtar	40	84,074	40	84,074	20	42,037
Total		1,070,035		951,712		337,932

TABLE 19.6
PROPOSED DENSITIES

LOCATION	PROPOSED DENSITY	RATIONALE
Periphery	325 pph	At the periphery of the towns, adjacent to the existing built-up areas, most of the people absorbed will be low-income and middle income. An average density of 325 pph for these two groups, which is closer to the prevailing densities, is therefore proposed.
South-West	175 pph	Most of the area in the south-west, bounded by Multan Road, Ferozepur Road and Defence Road/Hudiarra Drain is already developed with formal housing standards having an average density of about 150 pph and is affordable only by high and some middle-income households. Hence the overall density of 175 pph is proposed.
High Density Zones	500 pph	In the Master Plan, some areas are specifically recommended to be allocated for the low-income people, which should be located closer to the centres of employment such as industrial clusters etc. These areas should mainly comprise of plot sizes of 3 to 5 marlas. Hence the density proposed is 500 pph.

Based on the rationale elaborated above and in the preceding sections, the area requirements for the next 20 years, for the spilled-over population of the six towns are worked out in Table 19.7.

TABLE 19.7
TOWNWISE AREA REQUIREMENT FOR THE SPILLED-OVER
POPULATION

TOWNS	REQUIRED AREAS (HECTARES)—2001-2021			
	PERIPHERY OF THE TOWN	SOUTH-WEST CORRIDOR	PROPOSED HIGH DENSITY AREAS	TOTAL AREA REQUIRED
Ravi	1014	1290	322	2627
Shalimar	426	499	150	1075
Aziz Bhatti	232	242	78	552
Ganj Bukhsh	-	3477	384	3861
Allama Iqbal	-	733	92	825
Nishtar	-	913	101	1014
Total	1672	7153	1127	9954

Currently, sufficient area (mostly developed) is available in the southwest and the anticipated demand for housing in this part will be met. The gross land required at the peripheries of the three northern towns is 1672 hectares, and is proposed to be developed around the urbanised areas of Ravi, Shalimar and Aziz Bhatti Towns. Data Ganj Bukhsh Town is bounded by built-up areas on all sides and does not have any peripheral vacant land. For Allama Iqbal and Nishtar Towns, because of their location, the peripheral area and the area in the southwest has the same meaning. High density zones, totaling 1127 hectares are proposed at the following four locations (as shown in the Proposed Master Plan-2021):

- ◆ **Ravi Town:** In Shahdara Area along Sheikhpura Road
- ◆ **Shalimar Town:** Along Mominpura Road, leading to the proposed Ring Road.
- ◆ **Aziz Bhatti Town:** Along Harike Road.
- ◆ **Nishtar Town:** Near Gawala Colony, between Railway Line and Ferozepur Road.

For obvious reasons, the low-income population tends to live where the employment and commercial opportunities are available. Accordingly, low-income housing areas are proposed closer to industrial, commercial and other employment generating activities, coupled with a programme of incentives providing affordable⁵ infrastructure and services.

⁵ The details about affordable infrastructure are provided in the next Chapter on Housing.

The developments in the proposed high density zones/low-income areas may take place on incremental basis. LDA or the private sector should provide for layouts giving plots and a minimum level of infrastructure like roads, and drains as well as land for commercial, educational and health facilities. In order to develop high density zones, private sector may be encouraged through incentives such as facilitating loans from various commercial institutions for land development. Occupants would be given ownership documents after they have built their houses and occupied these for at least two years. The people should be allowed to build with whatever material they can afford, and the public sector should service such land with bare minimum standards which people can afford. These may include brick-paved streets, public stand posts and covered drains. The National Housing Policy states that over 70% of the housing shortage and recurring demand is for the low income groups who are unable to secure a developed plot, construct or purchase a house and cannot even afford to rent a decent shelter.

It needs to be stated here that in accordance with the proposals of Lahore Structure Plan, 1980, LDA has channalised urban growth in the south-western corridor, south of Jauhar Town falling between Multan Road and Ferozepur Road. Most of the area up to Defence Road/ Hudiara Drain has already been utilised by private housing schemes approved by LDA. In fact new developments have also taken place further south across Defence Road/ Hudiara Drain and include Sharif Educational and Medical Complex and around 24 private housing schemes. The area up to Defence Road includes about 8000 hectares of developed land, and houses have been constructed only on 25% of the plots. The rest are lying vacant and are sufficient to meet the housing requirements till 2021.

19.1.2.4 Developments South of Hudiara Drain

Although during the plan period, major development pressure is proposed to be met through infilling the vacant pockets of land up to Hudiara Drain, but partial development will also continue on its south where a number of housing schemes have already sprung up and need to be integrated with the city Master Plan. For example, LDA has approved 24 housing schemes in that area. Chunian Industrial Estate also lies further south. Government is planning to establish an Export Processing Zone south of Hudiara Drain. Besides, rapid industrialization is taking place along Raiwind – Manga Road and Raiwind – Sundar Road. Government of Punjab has also allotted a site to establish Government College University, Lahore College for Women University and various government offices and institutions. To integrate these developments/ commitments, major infrastructure and landuses have been proposed south of Hudiara Drain to guide the future growth.

Detailed plans of proposed residential areas and housing schemes coming up there will contain all the necessary facilities like commercial areas, educational and health institutions, mosque/s, recreational areas etc. These areas will be self-sufficient to meet the day to day requirements.

19.2 LAND MANAGEMENT

An effective land management and development control system is required for Lahore. A major objective of urban land management is to reduce and to anticipate unplanned physical growth. Such growth causes high costs to the community because of irrational spatial patterns and speculation.

The formal measures aim at posing restrictions on the use that can be made of land; these include planning and zoning regulations, environmental controls, building regulations and limitations with respect to land tenure.

Urban development depends very much on the capability to actually implement planned physical growth patterns. In spatial terms, the proposals of Lahore Structure Plan (LUDTS) have generally been implemented. Planned developments for housing have taken place in the south-west, as proposed in LUDTS. The land for 'metropolitan centre' proposed in LUDTS has been acquired (towards north-west of the original site) in Johar Town and is now called 'Trade Centre' measuring about 1400 kanals. Out of this 400 kanals area has recently been allocated for development as EXPO Centre.

LDA currently does not have sufficient financial resources, which is severely limiting its effectiveness. Voluntary sale of private land to public authorities is, in theory, the fairest and most efficient method of land acquisition, involving willing buyers and willing sellers. However there are some practical difficulties confronting sellers and buyers alike. In a buoyant land market and under the condition of rapid urbanisation, the seller may not be tempted to sell his lands to the government because of justified fears of unnecessary delays in payments and in transactions. Instead he may well be tempted to sell to private sector buyers. In case of satisfying the needs of the low income groups it may be effective to use the cross-subsidies in various forms. (For example, the additional cost recovered through auction of commercial plots can be used to subsidise land for low income groups). Almost the entire land developed in the private sector by different housing cooperatives is acquired through negotiations with the owners in Lahore's fringes.

The National Housing Policy suggests measures like land banking and streamlined land acquisition procedures to overcome housing and developed land shortages. The need to formulate a rational land policy has been emphasized in the recommendations of the National Human Settlements Policy Study.

Land banking is a technique by which the public sector acquires privately owned land in advance of demand and then releases the land for development as needed. Land banking however, does not have a successful history in developing countries, as it requires huge resources and an efficient and powerful institution/agency. Hence the preferred option is Land Readjustment.

There are various forms of land readjustment/land pooling techniques. The aim of such schemes is to develop land and rationalize its delivery at little or no cost to the public sector at the urban fringes. This technique can equally be applied to redevelop inner city areas. Typically the process begins by declaring an area of privately owned land to be the subject of such a scheme. A layout plan of the area is prepared and calculations are made for the percentages of land required for roads, infrastructure and community uses. The cost of infrastructure and such services is calculated and a proportionate land is deducted which can yield the costs incurred on putting the infrastructure and community uses. The remainder of the land is returned to the owners, who now hold a developed smaller land parcel but one, which has increased in value because of the investment in infrastructure and services. The city meanwhile sells its share of the improved land to recover the cost of services installed. Alternatively, the city's share can be sold to provide low-income housing or any such priority needs to the disadvantaged groups.

An additional advantage of this technique is in the instance when the land to be developed is held in small fragmented parcels. The readjustment process can be used to consolidate and allow replotting of parcels into more rational and more viable plots for sale and development. Given adequate administrative setup and political, such programmes appear to meet many of the criteria for efficient and equitable land management.

In Land pooling, ownership of the land is transferred from the land owner to the pooling agency, consolidated and returned to the owner in one parcel. In Land readjustment, ownership remains with each landowner but the readjustment agency has the right to enter and undertake construction activities on the land. The technique may be used by LDA/Planning and Development Agency or selectively by a highway authority or a group of landowners on cooperative basis.

The benefits of land pooling/readjustment to the city authorities include the opportunity to structure urban fringe development as and when required with appropriate subdivision layouts, infrastructure, community land uses, at little or no cost to government. The landowner receives a net gain in the value of his land either because off-site services are made available and/or because he can develop land parcels that may not have been suitable for urban development separately. However, land readjustment/land pooling arrangement scheme does not necessarily ensure that land returned to the landowners will not be held vacant for speculative purposes. In such a case building/planning conditions and zoning laws need to be imposed on land returned to the owners. Alternatively, either the agency and private land owners or the land owners themselves could work out/

agree upon various profit sharing arrangements on land development. LDA should seriously examine this technique to guide future urban land development at the fringes and undertaking urban renewal projects in the CBD. This concept is also recommended in the National Human Settlements Policy Study under the nomenclature of ADR (acquire, develop and return).

Private sector formal and informal land developers and owner-builders increasingly dominate land development in Lahore. At the same time, LDA is increasingly beset by financial and management constraints. In such situation it is imperative for the public sector to develop a new relationship with the private sector in pursuing land and urban development objectives. The role of the public sector will be restricted to the provision of basic infrastructure to guide the general direction and form of urban growth and the use of limited tools for regulating land use. The city authorities will therefore need to adopt the general principle of legitimising the activities of the private sector and to apply basic environmental protection measures.

Few incentives to land development will be needed in the areas of preferred urban expansion. Such incentives can include: the rights of way for future infrastructure; purchase of selected sites for future community uses; financial incentives for commercial and residential development such as tax holidays; relaxation of building regulations to allow minimum affordable plot sizes, reduced land transaction charges, etc. The current trend of land development by private sector at the city fringes can be categorised in this cadre, where no financial or other incentives are provided by LDA or any other regulating authority.

19.3 RATIONALIZED LAND DEVELOPMENT PROGRAMME BY LDA

Over the years LDA has not been able to generate financial surplus to enable it to carry out large investments in trunk infrastructure. Its large asset of developed plots in various schemes has been depleted through policies of quota system and discretionary allotments by the bureaucracy and the politicians. A major problem has been the lack of land distribution strategy which could ensure a steady flow of serviced urban land for all segments of the population. Since the abolition of Punjab Acquisition of Land (Housing) Act 1973 in 1986, LDA has not been able to acquire land to launch any new housing scheme (except Jubilee Town undertaken in 1998) due to exorbitant market values of land. This has created a land bottleneck for LDA. To get out of this situation, LDA would have to examine the option of land readjustment. The land would not be acquired by LDA upon payment, but will be consolidated in a scheme framed by LDA with proportion required for roads and other amenities. It will be returned to original owners in the proportion held by them minus the land used for roads/streets and amenities. LDA, in order, to recover the cost of infrastructure will retain and dispose off a proportion of developed land through public auctions.

In line with the recommendations of the National Housing Policy, future housing schemes of LDA should be planned and developed keeping in view the target groups--mainly low income and middle income groups. A small proportion of plots targeted towards upper income groups may also be planned which would provide the required funds through auctions.

19.4 DUAL LAND MARKETS

Increasingly, cities in the developing countries are characterised by a dual land market in which a formal market, controlled by zoning, density and other statutory regulations and serving predominantly middle and high income households and businesses, contrasts with a rapidly growing informal market, characterised by a variety of settlement types, with few or no services. Informal land transactions are often subject to control by middlemen and serving predominantly low income households.

Existing regulations suggest that decision makers and planners continue to resist recognising the existence of this type of economic activity. It usually involves small, often family-based, labour-intensive households that would benefit from the allowance of mixed land use and freedom from harassment by authorities.

The emergence of informal land settlements reflects the inability of the formal land market to supply adequate land for the urban poor. In the case of Lahore, a vibrant informal land development sector is in existence in various parts of the city, which caters to the housing needs of the low income groups.

Investment in land is a prime vehicle for personal saving as alternative avenues for investment are either absent or not trusted. This practice leads to land speculation. The use of fiscal measures as an effective tool of managing land especially as a method of curbing speculation and price escalation has not been tried much in Lahore.

19.4.1 Formal and Informal Land Development in Lahore

In Lahore we can observe two institutions of different nature, which are involved in development of lands located on urban fringes. The first one is the formal sector which includes LDA and organized private sector. The other is the informal sector which develops land, also at the urban fringes but in a more relaxed manner and in an uncontrolled environment. The target groups of these two institutions are also different. While the formal sector caters to the upper and middle income groups, the informal sector caters to the shelter needs of the vast majority of low (and medium) income groups. On the other hand, the formal sector housing schemes are developed to high standards, the informal sector uses the incremental approach which makes the plots affordable to the specific target group. While most of the plots

developed in the formal housing market average between 250 to 420 sq.m (12 Marlas to 1 Kanal), the informal land market produces small-sized plots affordable by the low income groups averaging between 63 to 105 sq.m (3 to 5 Marlas). Further more, most of the plots (75% to 80%) in the formal housing market are held vacant probably in the hands of speculators, the plots in the informal sector are built upon immediately by the owners as they are in need of shelter.

The infrastructure in the formal sector schemes is put in well before the plots are handed over to the owners. This results in deterioration of the infrastructure by the time the scheme is occupied. Moreover there is general lag of five years between the launch of the scheme and completion of infrastructure at site. This time difference adds to the development costs and the market value of the plots is also enhanced, which is encashed by the allottees.

19.4.2 Land for Urban Poor

The housing shortage for the low income groups can be overcome through better access to land by the following measures:

19.4.2.1 Cross Subsidies

Cross-subsidies are common techniques for reducing land costs to low income groups. Such subsidies are often built into site and services projects, for example, whereby the profits from selling some of the plots at market prices for commercial use are utilised to subsidise the cost of other plots. This principle can also be applied in land readjustment schemes and has been recommended in the National Housing Policy as well.

19.4.2.2 Affordable Standards

Since the level of infrastructure and services is a major factor affecting the cost of land, the application of affordable standards can have a great impact on increasing low income groups' access to land. First, lower permissible standards can be introduced either city wide or in areas likely to serve low income groups. The second approach, that of incremental upgrading, may be more satisfactory because it allows more low income groups to have access to affordable land.

A strong sectoral recommendation of the National Human Settlements Policy Study is to reduce the plot sizes and rationalize bylaws and building codes in line with the financial affordability. Controls need to be reformed for low-income residential development to allow

incremental construction of shelter. Planning controls should be flexible to allow incremental installation of services.

19.5 URBAN RENEWAL FOR CENTRAL CITY AREAS

The National Housing Policy also suggests launching of a nationwide urban renewal programme with the participation of public and private sectors for old and dilapidated parts of the nation's cities.

Lahore has a unique cultural heritage manifested in its special architecture and urban design. Stronger focus is required on the Central City areas. Much of the commercial and administrative areas in the Central Lahore may be revitalized by effective control of changes in building use, upgrading the level of existing physical infrastructure and building conservation. The principal shopping streets have low rents standing on lands owned by the Evacuee Trust or Municipal Area. An urban revitalization programme for the Central City area needs to be prepared in line with the recommendations made in the Action Study on Urban Renewal Methodology submitted to LDA by NESPAK in 1998.

The Action Study Report on Urban Renewal identified areas requiring urban renewal and proposed the approach and methodology for implementing such projects. The criteria for identification of urban renewal sites included availability of sizable tracts of vacant land in high population density areas, land in the vicinity of high priced commercial property, aging and structurally unsound buildings, areas with deficient infrastructure, incompatible land uses etc. Some of the sites identified included:

- ◆ Victoria Park
- ◆ The area behind Panorama Shopping Centre.
- ◆ Strip on Mall Road between Hall Road and Beadon Road.
- ◆ Vacant space behind State Bank Building
- ◆ The Zeenat Clinic area on Lawrence Road.
- ◆ Property (mainly vacant) along Cooper Road near Holiday Inn.
- ◆ Property (mainly vacant) on Shakrahe-Fatima Jinnah-Lawrence Road Junction.

19.6 THE MASTER PLAN

The Integrated Master Plan for Lahore (IMPL) consolidates the earlier growth strategies suggested in the 1966 Master Plan and the 1980 Structure Plan (LUDTS). The bulk of the anticipated growth of population and functions will be following the southern direction. The area defined by Hudiara Drain, Defence Road, Multan Road and Ferozepur Road will be urbanised in the next 20 years.

The total area of LMA is 230,670 hectares (2,306 sq. km.). About 66.4% of this, according to proposed land use plan, will be vacant or under agricultural use. Residential area will be 13.64% of the total LMA covering about 315 sq. km. In urban areas, residential area generally varies between 40 and 50% of the total developed area. This is true even in Lahore Urban Area. But since the limits of LMA extend well beyond the urban area, the percentage area under residential use is less than 14%.

The proposed land use map is placed in a folder at the back of this report and the areas proposed under different land uses are given in Table 19.8.

TABLE 19.8
PROPOSED LAND USE IN LMA - 2021

S. No.	LAND USE	AREA (Ha)	%
1	Residential	31,460	13.64
2	Commercial	1,870	0.81
3	Educational	1,520	0.66
4	Institutional	1,020	0.44
5	Parks + Recreational	3,077	1.33
6	Industrial	15,105	6.55
7	Graveyards	660	0.29
8	Transportation	3,150	1.37
9	Vacant & Agricultural	153,210	66.42
10	Villages	3,820	1.66
11	Water Bodies	5,711	2.47
12	Cantonment	10,067	4.36
Total		230,670	100.00

The key recommendations/policies of the IMPL are discussed below:

19.6.1 Land Consolidation

In accordance with the proposals of LUDTS 1980, LDA has channelised urban growth in the southern corridor, in the area between Multan Road and Ferozepur Road, south of the localities such as Johar Town and Garden Town/Model Town. This area up to Defence Road/ Hudiara Drain is being utilised by private cooperative housing schemes approved by LDA as well as by few public sector housing schemes. These schemes are scattered and their linkages in terms of trunk infrastructure are missing. It is important to consolidate the growth in these schemes through provision of trunk roads, including rings and radials so that the multitude of these schemes can mature into living, thriving communities and the house building activities, which are slow at the moment, can pick up. In this context, the recently announced Lahore Ring Road is a step in the right direction.

There are pockets of unutilized/vacant land available between planned housing schemes in the southern corridor. There is a need to effectively utilize these infill areas in conjunction with the surrounding schemes, as a matter of priority, so that overall development is compact and cost-effective. Currently, sufficient area (mostly developed) is available in the south-west between Multan Road and Main Railway Line, and keeping in view the growth trends, it is estimated that more than 70% of the anticipated demand for housing for the whole City can be met in this part. The area up to Defence Road includes about 8,000 hectares of developed land whereas houses have been constructed only on 25% of the plots. This area is sufficient to meet the urban requirements of the population desiring to settle in the south-west up to 2021. In fact new developments have also taken place further south across Defence Road and include Sharif Educational and Medical Complex and around 24 housing schemes approved by LDA.

As a matter of fact, to control low density linear growth at the cost of prime agricultural land and in the interest of reducing trunk infrastructure costs, the City Government/ LDA should encourage further developments in the form of in-fills of vacant pockets of land available in the north of Defence Road/Hudiara Drain within the plan period. This area up to Manga-Raiwind Road lying between Multan Road and both sides of the main railway line has been planned to guide the future growth and may preferably be reserved for developments beyond 2021.

19.6.2 In-fill/Densification

Apart from consolidation in the southern corridor, there are low density and vacant areas available within the built-up areas of the six towns. For each of these towns, the capacity to absorb incremental population was assessed during the land use survey and analysis of the areas covered by various union councils falling in each of these towns.

Around 30% of the housing requirements for the incremental population within ex-MCL Area will be met through densification and in-fill developments which will require upgrading of available infrastructure (which includes road network, water supply system, sewerage collection and disposal system, electricity, gas and telephone networks etc.) to take up the additional load and also removal of encroachments from public rights of way. For the remaining about 70% of incremental population new land will have to be developed primarily in the southern corridor, at peripheries of the City District Towns and in the high-density housing zones proposed at four different locations (refer section 19.1.2.3).

The gross land proposed to be developed at the peripheries of three towns (Ravi, Shalimar and Aziz Bhatti) as mentioned earlier, is 1,672 hectares. Data Ganj Bukhsh Town is bounded by built-up areas on all sides and does not have any peripheral vacant land. For Allama Iqbal Town and Nishtar Town, peripheral area is the southern corridor. Besides, as described above, high density zones totaling 1,127 hectares are proposed near Shahdara Area, along Mominpura Road, Harike Road and near Gawala Colony in Nishtar Town.

In order to check the horizontal spread of Lahore, there is need to encourage vertical growth in the form of residential flats, multi-storeyed office complexes etc.

19.6.3 Commercial Activities

The concentration of business activities in northern and central parts of Lahore has resulted in massive congestion in these areas. The situation calls for either rehabilitation or decentralisation of some of the commercial activities. For example, there is need to improve the circulation and vehicle parking arrangements in the existing wholesale markets like Fruit and Vegetable Markets at Badami Bagh, Akbari Market along Circular Road and Kabaari Market near Data Darbar area. At the city level, the present and future commercial activities are proposed to be channelised in the form of retail commercial, central area uses and general commercial areas (refer Chapter on Zoning Regulations).

At present, Retail Commercial Activities are existing generally in the form of commercial ribbons along main roads/streets and also in the planned markets in housing schemes and other areas. The Central Commercial Uses provide specialised shopping (wholesale as well as retail) and are located mostly towards south and south-east of the Walled City. The latter zone has been marked as such on the proposed Master Plan.

General Commercial Areas imply the higher order planned commercial zones in the new schemes, so as to reduce dependence on the existing Central Commercial Zone. The Trade Centre in Johar Town measuring about 1400 kanals is proposed to be developed for this purpose to meet requirements of the surrounding population and to ultimately reduce dependence on the CBD. This Trade Centre alone however, will not be able to meet the future needs of Southern Lahore. The present development trends in this corridor will be further accelerated with the development of proposed Lahore Ring Road.

Accordingly, considering the availability of uncommitted land and to ensure equitable distribution of commercial/ trade centres in the south, it is proposed that Business Districts may be developed south of Hudiara Drain, one each on both sides of the railway line (as shown in the proposed Master Plan) to cater for future commercial cum business activities as the city grows. Around 200 hectares (4800 kanals) each are proposed to be acquired for this purpose. This should duplicate major commercial activities so as to have lesser dependence on the existing CBD and hence reduce congestion in the northern and central parts of the metropolis.

Initially, the role of Business Districts proposed above will be subsidiary to the existing CBD. Later on, depending on the intensity of commercial activities and the market forces, these Business Centres are likely to become more self-sustaining.

It is important however, that the proposed Business Districts in the south may be taken up for development only after the proposed Johar Town Trade Centre becomes operational, and the Southern Lahore gets sufficiently habitated to justify the development of these Business Districts. However for reasons already stated, it is important to immediately initiate the land acquisition process.

These Business Districts are proposed to have the following landuses/ facilities:

- | | |
|--------------------------------------|-------------------------|
| - Commercial/Business Establishments | - Courts |
| - Public Buildings | - Entertainment |
| - Markazi Mosque | - Emergency Centres |
| - Educational Institutions | - Medical Facilities |
| - Utility Complexes/Offices | - Fire Station |
| - Transport related uses and Parking | - Future Reserve Areas. |

19.6.4 Growth in the Cantonment Area

According to the Fortress Defence Policy (FDP) December 1992, no development is to be allowed in the restricted areas of the Cantonment without obtaining NOC from the Corps Headquarters. Contrary to this, a number of housing schemes have emerged in this restricted area without getting approval of the competent authority.

As Cantonment area provides prime land for urban growth in close proximity of the built-up areas having necessary infrastructure and urban amenities, and because of the market forces, the pace of development in this corridor has been fast. There is nothing wrong with it, and in Cantonment where large tracts of vacant lands are available, should

absorb its own share of urban incremental population over the next 20 years. However, as the development in this area is not being restricted/discouraged, every prospective developer should obtain NOC from the Corps Headquarters as well as the Civil Aviation Authority before undertaking any development within the Cantonment area. The area between the Cantonment boundary and the international border be reserved for agricultural and related uses like farm-housing, poultry, dairy uses etc after obtaining necessary approvals from both the agencies mentioned above as well as the concerned Town Administrations. Being mainly under agricultural use, this area can cater for the supply of fruits and vegetables for the metropolis.

19.6.5 The Trapped Villages

Urban expansion not only swallows prime agricultural land but also entraps rural settlements within its fold. The development of new schemes is not coordinated with these villages. These settlements retain their rural character for years without having access to public services and facilities. As sizeable population lives in such villages located all around, it is proposed that these settlements should be upgraded with necessary infrastructure, to be at par or comparable to the surrounding urban areas.

19.6.6 Shifting of Incompatible Landuses

With the passage of time the emergence of incompatible land uses within the built-up areas of the city is source of nuisance and environmental hazards. Such obnoxious uses which are hazardous to the living environment are proposed to be shifted away from residential areas to their designated zones within a specified time (refer Chapter on Zoning Regulations). Among others, these include heavy industries developed within or closer to residential areas; Ammunition Depot near Thokar Niaz Baig; slaughter houses and cattle breeding sheds scattered at various locations closer to residential areas. The City Government is taking positive steps in the shape of shifting some of these slaughter houses in Lahore Meat Processing Complex near Shahpur Kanjra Village and the Meat Processing Plant located along GT Road behind Manawan Police Station.

The non-hazardous light and medium industries lying within the existing industrial areas should be confined to these areas without allowing any extension to these areas. The existing and proposed heavy industries should be contained/developed within Chunian Industrial Estate.

19.6.7 Industry

For zoning and locational purposes, industries have been classified as light-medium and medium-heavy⁶. Part of the area under Chunian Industrial Zone lies within the south-western boundary of LMA near Manga, where some large scale industries are in operation mainly along Lahore-Multan Road. Various industries are also operating in Kot Lakhpat Industrial Estate located between the main railway line and Township/ Green Town. However a large number of industries have been established in LMA and are continuously emerging along Multan Road, Raiwind Road, Raiwind-Manga Road, Katar Bund Road and the Defence Road along Hudiara Drain. These are quite large scale industries dealing in textile weaving, spinning, industrial chemicals, etc. and it is anticipated that the trend will continue if remained unchecked. These industries are developing in the form of linear belts along these roads. There are some pockets of concentrated development having direct access to these roads.

However, distinct types of industries (those which produce a lot of liquid effluent, like tanneries, textile processing units etc.) have been established along Hudiara Drain mainly along a part of Defence Road between Lahore-Raiwind Road and Multan Road. Further haphazard growth of such units should be prohibited as this area is now engulfed by the private housing schemes from all sides and its further growth may have serious repercussions on the environment. Such industries should only be allowed in the areas designated for various types of industries as shown in the Master Plan. Most of the industries do not treat their effluents which are ultimately discharged into the river with chances of polluting the aquifer.

According to the data collected by EPD, almost 90% of the industrial units in Lahore are without waste treatment facilities. All kinds of wastes are being disposed off freely having adverse effects on the environment especially within municipal limits. It is therefore recommended that no new industrial units or expansion of the existing ones within the municipal limits be allowed, except those falling within the proposed industrial estates where treatment of industrial wastes prior to disposal must be ensured. Part of the future needs for the land required for heavy industrial use could be met within the proposed Chunian Industrial Estate located towards the south of LMA along Multan Road. One km wide buffer zone around the Chunian Industrial Estate has been proposed to save the environment from industrial hazards.

⁶ For definitions/elaboration, please refer to Chapter on Zoning Regulations.

At the same time, it is important that the small and medium scale manufacturing sector should be encouraged, and measures be taken to further increase investment in this sector. In this regard following recommendations are made:

- Light-Medium Industrial Zones are proposed along Defence Road/Hudiara Drain, along western side of Ferozpur Road north of Kahna Nau, along Multan Road encompassing the existing industrial clusters and along parts of Bund Road and near Ferozewala along G.T. Road. However, location of industrial areas on Ferozpur Road has been optimally restrained. Similarly, the ribbon development of industrial areas along Multan/ Canal Road has also been discouraged so as to safeguard the posh residential areas existing along Canal Road.
- Medium-Heavy Industrial Zones are proposed along Raiwind-Manga Road, the already earmarked Chunian Industrial Estate, parts of Sheikupura Road, G.T. Road near Kala Shah Kaku and the Kot Lakhpat Industrial Area. The industrial zone along G.T. Road near Mahmood Booti is the existing Mominpura Industrial Estate in which 400 industries are already functioning and is proposed to be confined as an industrial cluster within its current boundaries.
- Export Processing Zone (1700 kanals) as notified by Government of Punjab is located along Sundar – Raiwind Road.
- Existing employment centres should be allowed to continue, as far as possible in their present locations, specially where favourably located in relation to residential areas.
- Industries which are polluting the environment, discharging untreated wastes into the water bodies, creating traffic congestion and related problems must be identified and detailed Action Area Plans be prepared to rectify such problems.
- Problems pertaining to industrial pollution or other hazards should be, as far as possible, removed at source (at the polluter's expense) before consideration is given to their relocation.

19.6.8 Public Facilities

For higher order facilities, such as town parks, stadiums, universities/ colleges etc., there are limited options available within the proposed planning area till 2021, as large chunks of uncommitted land in the south/south-west are not available. The higher order facilities therefore have to be lowered in status and decentralised/evenly distributed.

19.6.8.1 Education

Recommendations in this sector are based on the government's "Education for all by year 2010" policy. In order to ensure affordability of education by the disadvantaged class and to enhance the literacy rate, public sector should share the responsibility with the private sector in running schools. Double shifts may be encouraged in schools lying in congested areas/high density zones. Every effort should be made to properly equip the educational institutions with necessary facilities/infrastructure. In order to accommodate additional demand for university level education, besides the existing Punjab University Quide-Azam Campus, new areas have been earmarked for future higher educational institutions including universities in the south. These include a site in Allama Iqbal Town, south – west of Lahore Park and another site in Nishtar Town (currently not included in LMA but is part of District Lahore).

Other educational sites have been proposed near Raiwind Road in Nishtar Town south east of Lahore Park in line with the Government of Punjab's decision to shift Government College Lahore University and Lahore College for Women University. About 105 ha (260 acres) of land is allocated for Technical College allocated to the Provincial Labour Department at the junction of Raiwind Road/ Defence Road.

19.6.8.2 Health

Maximum efforts should be made to ensure supply of potable water. The rusted and leaking distribution network causing water contamination be replaced. Drainage system should be improved to check water ponding in depression areas which are source of insect breeding.

In the existing built up areas where vacant land is scarce, it is proposed that where possible the capacity of existing health centres/hospitals in terms of beds and other facilities should be increased to meet the deficiencies and the growing demands. A number of higher order health institutions have been proposed throughout the built-up and planned areas in the south.

19.6.8.3 Recreation

There is a need to have equitable distribution of proposed parks/recreational facilities throughout the city. Some of the major parks/recreational areas/uses are discussed below. There is a need to notify these as recreational areas and should be acquired by the relevant agencies such as PHA.

a) Parks and Play Grounds in the South

The existing Lahore Park south of Hudiana Drain may be developed to cater for the needs of the upcoming Southern Lahore. Additions in the form of zoo and botanical gardens, for which an area of 100 hectares is allocated, may also be developed adjacent to Lahore Park.

For active recreation, a stadium complex spread over 50 hectares is proposed to be located south of Defence Road along the eastern bank of UBD Canal. The complex should contain facilities both for indoor and outdoor games.

b) Regional Park and Recreational Facilities in the North/ North-East

The existing forest reserve located north of Rana Town, near the junction of GT Road and Motorway Link Road is proposed to be developed as a Regional Park. Zoological-cum-botanical garden, outdoor theatre, picnic sheds and restaurants may also be developed here. This park will cater for the recreational needs of not only northern part of Lahore, but will also attract visitors from the surrounding settlements. The park is proposed to spread over 300 hectares.

To meet the recreational land use deficiencies in the north and the northeast Lahore, one large play field and a public park are also proposed. The play field having an area of around 50 hectares is proposed to be located in Shalimar Town. This play field may be upgraded to a stadium at a later stage. The proposed park in the northeast is to be located along GT Road leading to Wagha. The area proposed is 50 hectares and may be developed with various amusement facilities, artificial lake, landscaping and fountains etc.

c) Riverside Recreation/ Developments

Appropriately selected areas along the riverside can provide very attractive locations for developing town level parks. Three parks have been proposed along the riverside, to exploit the river's recreational potential and to introduce boating, fishing and water games facilities. The locations are shown on the plan. The riverside parks are planned to be evenly distributed to facilitate access to most of the population in the City District. The locations of these parks are:

- Across Northern Bund Road on both sides of the river.
- Near Sabzazar Scheme west of Bund Road
- Near Chung Village.

Besides, a multi-purpose riverside development zone, (River View City) Comprising of Commercial, recreational and residential uses has been proposed in the areas bounded by the three bridges viz-a-viz Lahore Bypass Bridge, Sagian Bridge and old Ravi Bridge.

19.6.8.4 Institutional

There is need to shift/ decentralise large office establishments located in the CBD including the Civil Secretariat in order to overcome the current traffic congestion and circulation problems.

For various government offices/ institutions, areas have been earmarked on the Master Plan. These include around 150 ha between Canal Road and Multan Road near Mohlanwal Village. Large institutional areas have been earmarked near the proposed Business Districts south of Hudiana Drain on both sides of the railway line to meet the future requirements for institutional uses.

19.6.9 Special District

In order to meet the recent demands from the private sector for the construction of no limit high rise buildings in the Central Business District (CBD) of Lahore, few roads where limited land pockets can be utilized for the construction of such multi-storeyed structures may be considered on experimental basis and be declared as "Special District". Only specific uses may be permitted in these buildings which may include hotels, offices and institutions. The building plans in the Special District should only be approved subject to their adherence to applicable building regulations. The current building regulations shall also need to be revised to monitor development/ construction of such structures in the Special District. While granting building permissions for high rise structures, special consideration should be given to provision of vehicular parking, floor area ratio, safety, fire fighting arrangements, consideration for the disabled/special persons as per revised bye laws, availability of adequate infrastructure/ utility services and traffic circulation in the area etc. The plot area for such high rise buildings should not be less than 20 Kanals.

In the first phase some selected areas between Chairing Cross and UBD Canal along Shabrae-Quaid-e-Azam and along Egerton Road may be

considered for this purpose. In the second phase it may be extended to Gulberg Main Boulevard and Jail Road.

19.6.10 Housing for the Low Income

It is estimated that 150,000 people in Lahore live near stinking nullahs, in riverbeds, under the railway and road bridges and at the urban fringes without even rudimentary living facilities. At present the infrastructure standards of housing schemes developed by public as well as private sectors are unrealistically high when compared to the housing affordability of the low-income households. The use of affordable standards can have a great impact on increasing low-income groups' access to land. Besides, planning controls for these groups should also be flexible to allow incremental installation of services.

It needs to be stressed here that the spill-over low-income population tends to live where the employment and commercial opportunities are, and it will be difficult to shift these people to locations that are away from the work areas though efficient in terms of provision of physical infrastructure. Because of this, the low-income areas proposed are close to industrial, commercial and other employment generating activities, coupled with a programme of incentives providing affordable infrastructure and services. Locations for Low Income Housing are proposed in the Housing Chapter.

19.6.11 Katchi Abadis

There is need to continue the ongoing programme for the regularization and upgrading of Katchi Abadis now being executed by LDA. This programme may soon be taken over by the City District Government. This would provide for improving the Katchi Abadis layouts and a minimum level of infrastructure like roads, water supply and drains as well as land for commercial, educational and health facilities. The Katchi Abadis programme has suffered on account of financial constraints caused by slow cost recovery and absence of meaningful involvement of the communities in the upgrading process from inception of scheme to provision and maintenance of upgraded infrastructure. It is therefore important to actively involve the communities for a participatory approach to upgrading rather than purely engineering solutions.

19.6.12 Graveyards

The existing graveyards in the city are getting saturated and are not able to cope with the increasing demand. Accordingly, Miani Sahib Graveyard will continue to serve as a burial place for Data Gunj Bakhsh

Town. For other five towns separate burial places covering about 100 acres each have been proposed at following locations:

- i) Nishtar Town : Near Kahna Nau west of Ferozepur Road.
- ii) Allama Iqbal Town : South-West of Sharif Complex (north of Raiwind – Sunder Road).
- iii) Aziz Bhatti Town : Along Harike Road close to the proposed High Density Housing area.
- iv) Shalimar Town : North – East of the Mominpura Industrial area, adjacent to the proposed High Density Housing area.
- v) Ravi Town : South – East of Rachna Town.

Heavy tree plantation around these burial grounds is proposed to be undertaken to serve as a buffer with the residential areas.

19.6.13 Development of Satellite Towns Around Lahore

The net in-migration during 1981-98 to District Lahore has been assessed to be about 30% (Chapter-3). Over the next 20 years, the *incremental population* of District Lahore is estimated to be about 6.68 million (Chapter-17). If the past migratory trends continue, the migration component of incremental population is expected to be over 2 million. This is a large figure by any standards. In addition, there are a large number of commuters who come to Lahore daily for jobs and business.

Lahore has a wide area of influence as was determined through interviews with traders of major wholesale vegetable markets and through application of gravity model (Chapter-1). But obviously, the daily Commuters come from the towns/settlements in the vicinity of Lahore, mostly with a one-way travel time of about 90 minutes or within a radius of 75 kms. It is therefore recommended that the settlements falling within this distance from Lahore be upgraded/ developed as satellite towns having specialised facilities to curb in-migration to Lahore. Master Plans should be prepared for these towns ensuring provision of all the modern living amenities like health, educational and recreational facilities, and above all, job opportunities should also be provided.

Giving incentives to the private sector to divert a part of their investments from Lahore to these settlements can help in achieving the objective. This will also help to decrease commuters' flow to Lahore, and will encourage a proportion of migrants from other areas to settle in these towns instead of Lahore. Similarly, for the reasons narrated above, some of Lahorites may also like to shift to these areas. For this proposal to mature, concerted efforts by the Government as well as the private sector will be required. Good roads connecting these settlements with Lahore, along with frequent, fast, dependable and comfortable public transport (e.g. buses and train shuttle services) are also pre-requisites. The settlements that can be upgraded/developed for the purpose include Sheikhpura, Sharaqpur, Muridke, Raiwind, Bhai Pheru, Pattoki, Kasur, etc.

19.6.14 Validity of the Master Plan

It is proposed that this Master Plan should be approved and adopted by all agencies concerned for planning and development within the LMA. This document should remain valid until the preparation/ updation/ approval of another Master Plan to guide the city growth.

19.7 COMMERCIALIZATION POLICY ISSUES

According to the Punjab Commercialization of Property Rules, 2001, existing unauthorized commercialization is being regularized by the Commercialization Committee on payment of the prescribed commercialization fee plus 10% surcharge. This is being done subject to the condition that there is:

- a) no encroachment on public utility sites,
- b) violation of building bye-laws if any, has been compounded; and
- c) fee due from an owner for a parking plaza where one has been constructed by a development authority has been deposited by him.

The regularization of unauthorized commercialization may be decided on merits ensuring that the same is not:

- a) encroaching public rights of way;
- b) a source of traffic congestion/ bottlenecks;
- c) causing adverse environmental impacts;
- d) incompatible with predominant surrounding landuses.

Commercialization is a sensitive issue. Excessive and inappropriate commercialization may lead to such changes in land use and urban activities, which may harm the efficient functionality of an urban centre. As mentioned in Volume-I of this report, the commercialization policy presently in force suffers

from lack of details and is rigid in character. It must also take into account the jurisdictional requirements of City District being contemplated under the new Local Government System. Following changes in the existing policy may provide the desired flexibility and make it more meaningful:

- i. It must be obligatory for the Commercialization Committee to identify areas where request for change in land use can be considered by it. In other words indiscriminate commercialization must not be allowed to take place any where in the City District.
- ii. The requirement of providing NOC's from the neighbours may be dispensed with as it leads to black-mailing and sometimes causes prolonged litigation amongst its parties. Instead, the Commercialization Committee may invite objections from the public and dispose them off before an area is finally identified by it for allowing commercialization.
- iii. After receipt of 50% of the fee as down payment, the balance 50% may be made payable in 3 installments spread over a period of one year.
- iv. There may be no need to reduce the existing rate of fee for urban planned/ built up areas. A rebate of say 5% to 10% may however be allowed in case the payment of fee is made in lumpsum.
- v. Partial commercialization should be restricted to rural settlements and small properties (below 5 marla) allotted to low income groups in residential colonies as may be identified by the Commercialization Committee.
- vi. The rate of commercialization fee for rural settlements may be kept less than the rate of urban areas (say 20% instead of 25%) and it should be related to the yearly average sale price of land within the rural settlement.
- vii. The scope of uses permissible for temporary or annual commercialization be enhanced to include offices, banks, hospitals, clinics, educational institutions, information technology centres, guest houses, hostels, gymnasiums, museums, art galleries, beauty clinics/parlours subject to production of NOC from the neighbours and provision of prescribed parking facility. The layout of the residential premises and also the elevation and change in the structural design with a view to alter the nature of the building may not be done.
- viii. The rate of fee for permanent commercialization in respect of educational, information technology related institutions and hospital/ clinic needs to be lowered down substantially.

- ix. To manage the construction on properties under this policy specific provisions should be made in Building Regulations to regulate building lines, heights, mass and the parking requirements of the commercial buildings.
- x. Petrol/ CNG Stations may be located only along a primary/ secondary road having right of way of at least 30 metres. These should not be located within one to two km of an existing petrol/CNG station, unless on the opposite side of a primary road with minimum 50 metres right of way and having a dividing median strip. No petrol/CNG station may be located within 100m of a crossing of two primary roads or a round about.
- xi. To control illegal commercialization, power to seal the premises may be assigned to the controlling authority by amending the relevant laws, if necessary.
- xii. The Commercialization Committee should be re-constituted so as to include the local area town planner, traffic and infrastructure engineers on its membership.
- xiii. Apart from the commercialization of Walled City, various roads have been identified in the six towns for the purposes of industrialisation and commercialization and are divided in the following categories:
 - a. Roads for Industrialization
 - b. Roads for mixed commercial and industrial uses
 - c. Roads for commercialization

Roads for the above categories were identified in close coordination with the concerned officials of the City Government and are listed in Annex to Chapter-19.

It however needs to be stressed that change of existing land use to commercial use will only be permitted subject to payment of applicable commercialization fee and/ or other departmental charges, if any. This will not be applicable in the case of existing commercial areas/ markets which have already been regularized upon receipt of commercialization fee by the concerned authorities.

The commercialization fee will also not be applicable to those central areas which were declared commercial as per previous Master Plan for Lahore.

20.0 HOUSING

20.1 GENERAL

In Volume-I of this Report, the existing housing situation in LMA was evaluated. This Chapter provides policies and guidelines to improve the housing situation in Lahore, meet the existing backlog and future demand of housing for incremental population, particularly the urban poor in accordance with their affordability levels. Analysis of the existing situation has brought to surface a series of housing problems and issues that are being faced by the people. Amongst a varied and large number of issues, the most prominent and pressing issues needing immediate attention are:

- ◆ Increased housing congestion. The number of persons per house in District Lahore (Urban) has increased from 7.0 in 1980 to 7.1 in 1998.
- ◆ Unrealistic housing standards. The housing areas developed since independence, both by private as well as public sector are highly skewed in favour of upper and middle-income groups. The 'low-income housing schemes' developed by various housing agencies are well beyond the affordability of low-income groups. These groups form the major population segment of Lahore.
- ◆ The absence of planned efforts to meet the housing demands of the urban poor has resulted in spontaneous formation of Katchi Abadis in different areas of the metropolis, including prime urban land as well as very vulnerable catchment areas of River Ravi, nullahs and other unsafe areas.

The key issues have a multiple and ripple effect on the spatial and socio-economic spheres of the metropolis and are a major cause of other problems. If the above issues are resolved effectively, there are reasons to believe that other issues would themselves be taken care of in due course. It is said that 'If you can take care of housing, urban planning will take care of itself'.

20.2 HOUSING DEMAND

The envisaged population, household size and occupancy rate govern the housing demand. Whereas, income distribution determines level of infrastructure provision, type of shelter and the plot sizes. These planning parameters are discussed below:

20.2.1 Envisaged Population

Summary of population forecasts for all the spatial components of LMA are presented in Table 20.1 (ref. Table 19.2, Chapter 19)

The additional population of (ex) MCL and Lahore Cantonment Area during the period 2001-2021 is estimated to be 3.3 million and 0.77 million respectively (refer Table 19.2). The incremental population of other areas of the City District (rural areas along with Kahna Nau and

Raiwind Towns) in aggregate, is estimated to be about 1.86 million. The estimates about parts of Districts of Sheikhpura and Kasur falling within LMA are also given in the above referred Table. For LMA as a whole, the additional population over the next 20 years (2001-2021) is expected to be about 6.4 million, while the gross population (including the existing stock) will be over 14.1 million (refer Table 19.2).

20.2.2 Household Size and Housing Occupancy

A household means a group of persons living together and depending on the same kitchen. A person living alone is also considered to constitute a household. According to District Census Report (DCR), 1998, the total number of households in District Lahore (Urban) are 731,348¹. According to the same Report, the number of housing units in District Lahore (Urban) is also the same i.e. 731,348². The conclusion is thus one household per house. However this does not imply less pressure on housing, as persons per housing unit in Lahore District (Urban) have increased from 7.0 in 1980 to 7.1 in 1998. Table 20.2³ gives a comparison of 'indices of congestion' in 1980 and 1998. Based on these, inferences have also been drawn and are presented in the same table.

20.2.3 The Housing Demand

Housing demand has been calculated separately for each spatial component which include (ex) MCL, Lahore Cantonment, (ex) rural areas of District Lahore to get the City District Total, and also parts of Districts of Sheikhpura and Kasur, and then added to get the LMA Total.

Housing Demand has been worked out by calculating the backlog till the base year (2001) and the houses required for the additional population during the period 2001-2021. The backlog was calculated by subtracting the houses required till 2001 using the optimal figure of 6 persons per house, from the actual stock in 2001. The houses required for additional population (2001-2021) were obtained by dividing this population with 6. Gross housing demand till 2021 was obtained by adding the following:

- i Houses required till 2001@ 6 persons per house.
- ii Houses required for the incremental population of the period 2001-2021 using the figure of 6 persons per house.
- iii Sub-standard housing in 2001 (using the percentages of houses having outer walls made of unbaked bricks/earth bound, wood/bamboo and others, as given in the District Census Report).
- iv Obsolete houses by the year 2021, using the obsolescence factor of 2% per annum for currently standard houses.

¹ District Census Report, Lahore, 1998, Table-41, Page-288.

² As above, Table-42, Page-289.

³ As Above, Table 3.1, Page-69

Based on the above, the housing demand in the LMA and its constituent parts is presented in the Table below:

TABLE-20.1
HOUSING DEMAND IN LMA – 2021

Area	Backlog in 2001	Addl. Houses required (2001-2021)	Gross Demand in 2021
Ex-MCL	130,206	555,583	685,789
Cantonment	17,018	128,962	145,980
Raiwind & Kahna Nau	1,893	9,113	11,006
District Lahore (Rural)	32,715	300,233	332,948
Sub-Total (Lahore City Distt.)	181,832	993,891	1,175,723
Kasur (Rural)	3,385	14,234	17,619
Sheikhupura (Urban)	4,276	26,107	30,383
Sheikhupura (Rural)	9,711	31,747	41,458
Total LMA	199,204	1,065,979	1,265,183

Thus we have to provide land for 1,265,183 units by the year 2021, which includes existing shortage of 199,204 housing units and 1,065,979 units for the incremental population at the dwelling occupancy (household size) of 6.0. However, for sub-standard and obsolete structures, land is not to be provided because over the time it is assumed that the house owners would improve their houses.

It however needs to be pointed out that except for (ex) MCL area, all other constituent parts of LMA are either rural areas or have adequate land available for absorption of additional population. Only (ex) MCL area is mostly built-up, and will have major portion of the LMA's incremental population during the next 20 years. Most of the ex-MCL population will spill-over and will have to be absorbed in areas outside the ex-MCL Area. The population of this area is therefore the focus of attention for housing purposes.

In order to meet the housing requirements of over 840,000 units for ex-MCL, cantonment, Raiwind and Kahnu Nau Areas, till 2021 (i.e. around 42,000 housing units per year), a revolving plan needs to be set up. On annual basis, even if 50% of the housing units are provided by the government agencies (i.e. 21,000 plots per year), an amount of Rs. 2 billion will be required for purchase of land and another Rs. 4 billion for development and provision of site infrastructure. This entails that a total of Rs. 6 billion will be required per year to develop a site and services scheme providing about 20,000 plots. If these funds are provided for one year, then the same can be used as revolving fund for the subsequent years because this amount can be revolved through sale of plots.

In this Chapter, the emphasis has been on estimation of dwelling units for the incremental population, as against the assessment of land requirements in the previous chapter. It is pertinent to co-relate the two for better comprehension of assumptions and tying up the loose ends. Based on the incremental population during 2001-2021, the number of dwelling units required for the ex-MCL and the Cantonment Areas are presented in Table 20.3.

TABLE 20.2
INDICES OF CONGESTION IN 1980 AND 1998
IN DISTRICT LAHORE

INDEX	1980	1998	INFERENCES
Persons per housing unit	6.9 ⁴	7.1	Implies increased congestion in housing units as pace of house construction lagged behind the population growth.
Persons per room	3.3	3.0	Because of high cost of house construction and dwindling real incomes, the trend towards adding additional room/s to the existing houses increased instead of building separate houses, to accommodate the growing population.
Room per housing unit	2.1	2.4	Thus on average, the number of rooms per housing unit increased from 2.1 in 1980 to 2.4 in 1998.
Housing Units with one Room (%)	47.9	32.8	These statistics support the above inferences. The houses with one room have decreased significantly, while housing units with 2-4 rooms have increased. The number of housing units with 5 or more rooms is more than doubled.
Housing Units with 2-4 Rooms (%)	48.2	58.4	
Housing Units with 5 & more Rooms (%)	3.9	8.8	

TABLE-20.3
HOUSES REQUIRED FOR INCREMENTAL POPULATION
OF EX-MCL AND CANTONMENT AREAS (2001-2021)

AREA	POPULATION (2001)	POPULATION (2021)	INCREMENTAL POPULATION	HOUSES REQUIRED ⁵
Ex-MCL	5,042,507	8,376,004	3,333,497	555,583
Cantonment	659,079	1,432,854	773,775	128,962
Total	5,701,586	9,808,858	4,107,272	684,545

The housing requirements of incremental population in the ex-MCL area are proposed to be provided at the vacant in-fill sites available within the built-up areas in the south-west corridor, at peripheries of the six towns and in the high-density housing zones proposed at four different locations.

Around 29% of the housing requirements for the incremental population in ex-MCL Area will be met through densification and in-fill development, while for about 71%, new land will have to be developed. Aggregate statistics for the six towns⁶ forming the ex-MCL Area are given in Table-20.4.

⁴ The number of persons per housing unit as per 1980 Housing Census, was 6.9 in Lahore District and 7.0 in Lahore District (Urban).

⁵ @: 6.0 persons per dwelling unit

⁶ Chapter 19, Table 19.3

Table-20.5 below presents composite statistics about spillover population allocated in different parts of LMA, proposed densities, land requirements and the estimated number of housing units required.

TABLE-20.4
HOUSING REQUIREMENTS FOR INCREMENTAL POPULATION OF
(Ex) MCL AREA: IN-FILL Vs SPILL-OVER

INCREMENTAL POPULATION	ABSORBED IN BUILT-UP AREA	SPILL-OVER	NUMBER OF HOUSES REQUIRED (@6 PERSONS PER HOUSE) FOR:	
			ABSORBED POPULATION	SPILL-OVER POPULATION
3,333,500	973,821 (29.21%)	2,359,679 (70.79%)	162,304	393,280

TABLE-20.5
HOUSING REQUIREMENTS FOR INCREMENTAL SPILL-OVER POPULATION

PROPOSED LOCATION	LAND REQUIRED ⁷ (HA)	PROPOSED DENSITIES (PPH) ⁸	POPULATION ALLOCATED	NO. OF DWELLING UNITS REQUIRED ⁹
Peripheries of Towns ¹⁰	1672	325	543,400	90,567
South-West Corridor	7153	175	1,251,775	208,796
High Density Zones	1127	500	563,500	93,917
Total	9952		2,359,679¹¹	393,280

20.3 LOW INCOME HOUSING

It is not the destiny of the poor of Lahore to live near stinking nullahs, in riverbeds, under the railway and road bridges and at the urban fringes without even rudimentary living facilities. They also need a decent living environment, appropriately located and reasonably serviced. Low-income housing needs to be planned and developed with dexterity, in accordance with the affordability levels of end users, fiscal incentives and institutional support. The National Housing Policy states that over 70% of the housing shortage and recurring demand is for the low income groups who are unable to secure a developed plot, construct or purchase a house and cannot even afford to rent a decent shelter.

At present, the housing policies of government and private housing sectors are highly skewed in favour of upper and middle-income groups. The affordability of most low-income households is very low and cannot afford conventional housing. The infrastructure standards are unrealistically high when compared to the housing affordability of the low-income households. Zoning requirements regarding minimum plot size, materials used and construction methods means that even the cheapest publicly produced house usually exceeds the recipient's capacity to repay.

⁷ Chapter 19, Table 19.6.

⁸ Chapter 19, Table 19.5

⁹ @7.0 persons per dwelling unit

¹⁰ Ravi, Shalimar and Aziz Bhatti Towns.

¹¹ Total differs due to rounding

Even if some of the low-income households succeed in obtaining plots in formally planned schemes; they are pushed out by market mechanism. The poorer people have different priorities than living in a relatively decent locality. They need money for more pressing needs. As a result, they are attracted by the price offered for their plot, sell it to relatively well-off families and go back to live in another Katchi Abadi. They may become slightly richer in the process, or may be able to meet some of their pressing needs, but their housing problem remains unsolved. A pragmatic and practical approach is required to solve the problem. Failure to do so will result in expansion of existing Katchi Abadis, formation of new squatter settlements and continued tendency to settle on highly vulnerable lands prone to flooding and other risks. At present more than 100,000 persons are squatting in River Ravi bed in the open flood plain. This situation is highly undesirable and calls for immediate corrective actions in the form of innovative and affordable approaches.

These approaches can be in the form of public-private ownership. At present, public sector is more interested in middle and upper income housing because of better returns. The government should pay particular attention to attract private sector in low income housing as well. The approach has to be self-sustaining and government should allocate minimum resources for this purpose. Land should be secured / assembled from the concerned land owners in the private sector under a formal agreement and a percentage of planned/developed plots be returned to the original owners. Trunk infrastructure should be laid and subsidized. Infrastructure standards should be kept low and the development should be incremental, keeping in view the affordability of target households. Government should recover the incurred cost by retaining certain percentage of developed land. The above approach will encourage private sector and will reduce responsibilities of the public sector in providing affordable housing to the poor of Lahore.

What are the household income levels of Lahore's poor, what amount can they afford for housing and what kind of housing falls within their affordability? An attempt is made below to answer these questions.

20.3.1 Affordability Analysis

The household income is calculated in the Chapter on Socio-economic Features. In order to determine housing affordability, a thumb rule is that a household can afford a total outlay not exceeding 2.7 times its annual income¹². If past personal savings and loans from relatives etc. are included, the affordability may be stretched to a capital investment equal to 3.5 times the annual household income. The affordable investment in turn dictates the standards of housing infrastructure and the area of plot purchasable. The housing affordability in Table 20.6 has been calculated as per stretched criteria, given the current income distribution of households in Lahore.

¹² National Reference Manual on Planning and Infrastructure Standards, Govt. of Pakistan, Chapter 4, Page-45.

This rule of thumb is however only a crude method of assessing housing affordability. Detailed financial models have been constructed to determine the affordability. These take into account household propensity to save, interest rate of loan and repayment period. The capital affordable can be calculated as:

$$\text{Capital affordable per household} = \frac{\text{Annual Ability to pay}}{\text{Capital Recovery Factor} + \text{Down payment}}$$

The ability to pay depends upon the income distribution of the target groups and the affordable payments for housing. The 'Capital Recovery Factor' (CRF) depends on interest rate and repayment period and can be determined from mortgage tables. The rate of interest has a strong influence on the affordable level of investment; the lower the rate, the higher the affordability. Repayment period also influences the affordability. Lesser the repayment period, higher the monthly payment and vice versa. The CRF thus permits calculating what annual payments would be necessary to repay a loan over a given period of time at a stated interest rate. The total payment is a combination of both interest and the principal amount.

The CRFs based on different financial options are presented in Table 20.7. Housing affordability for different income groups for various repayment periods, at interest rates of 7%, 10% and 15% have been calculated and presented in Tables 1, 2 and 3 respectively in Annex A to Chapter-20.

TABLE-20.6
AFFORDABILITY FOR HOUSING

% HHs	Cumulative percentage of Households	Av. Annual HH Income (Rs). (2000-2001) ¹³	Housing Affordability ¹⁴
0.47	0.47	12,210	42,735
1.26	1.73	20,333	71,164
3.19	4.92	28,462	99,619
5.74	10.66	36,592	128,073
6.18	16.84	44,722	156,527
7.68	24.52	52,852	184,982
7.80	32.32	60,982	213,436
15.24	47.56	73,176	256,118
12.17	59.73	89,436	313,026
8.48	68.21	105,696	369,935
31.79	100	170,716	597,505

¹³ Source: Table 19.6

¹⁴ National Reference Manual on Planning and Infrastructure Standards, Govt. of Pakistan, Chapter 4, Section 4.1, Page 45.

TABLE 20.7
CAPITAL RECOVERY FACTORS (CRFs) BASED ON
VARYING REPAYMENT PERIODS AND INTEREST RATES

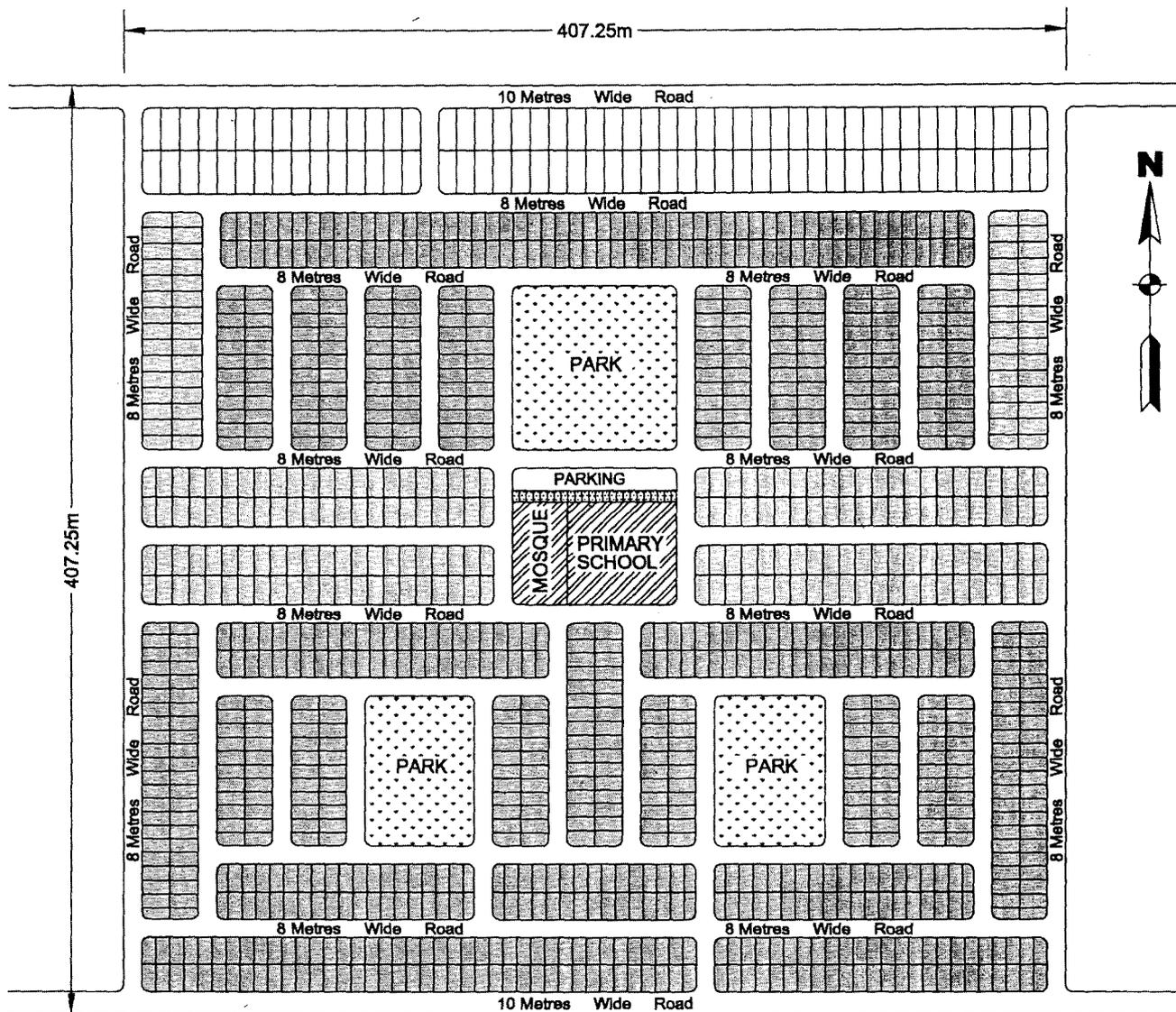
Year	5%	7%	10%	12%	15%
3	0.367209	0.381052	0.402115	0.416349	0.437977
5	0.230975	0.243891	0.263797	0.277410	0.298316
7	0.17282	0.185553	0.205405	0.219118	0.240360
10	0.129505	0.142378	0.162745	0.176984	0.199252
15	0.096342	0.109795	0.124059	0.146824	0.171017
20	0.080243	0.094393	0.117460	0.133879	0.159761
25	0.070952	0.085811	0.110168	0.127500	0.154699

The principle of 'real' low-income housing is a means of allowing low-income groups to obtain shelter, which might not otherwise be able to afford to do so. The degree to which such projects achieve this objective depends on the required level of cost recovery, which in turn depends on the standards adopted for plot sizes, infrastructure and the degree of subsidy involved. Cross-subsidies is a common technique to facilitate provision of housing services to low income groups. Such subsidies are often built into site and services projects, for example, whereby the profits from selling some of the plots at market prices for commercial use are utilised to subsidize the cost of other plots. This principle can also be applied in land readjustment schemes and has been recommended in the National Housing Policy as well.

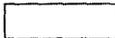
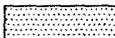
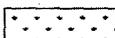
The application of appropriate (affordable) standards can have a great impact on increasing low-income groups' access to land. Besides, planning controls for these groups should also be flexible to allow incremental installation of services.

20.3.2 The Proposed Housing Services Packages and Cost Estimates for Low-Income Groups

What kind of housing infrastructure can the low-income groups afford? The costs obviously vary with housing standards. Based on a typical low income-housing module, costs have been calculated for a package of infrastructure services that are relatively of low standard, but environmentally safe and cost effective. The purpose of preparing these estimates is to compare costs with the capital affordable for housing by different income categories of low income households and thus, reach meaningful conclusions. The proposed module (Figure 20.1) and cost estimates are summarized in Table 20.8. The details of costs and relevant land use and infrastructure details are provided in Annex B to Chapter-20.



LENGEND:-

TOTAL AREA	= 16.585 Hectares	72 m ² PLOTS		882 Nos
SALEABLE AREA	= 9.950 Hectares	90 m ² PLOTS		236 Nos
TOTAL RESIDENTIAL POLTS	= 1214	150 m ² PLOTS		96 Nos
POPULATION	= 8,620	PUBLIC BUILDINGS		2 Nos
AV. GROSS DENSITY	= 500 pph	SHOPS		24 Nos
		PARKS		3 Nos

SCALE 1 :3000

**A TYPICAL LAYOUT PLAN
FOR LOW INCOME HOUSING SCHEME**

Fig: 20.1

TABLE-20.8
LOW INCOME HOUSING MODULE AND COSTS

S.No.	SERVICES	DESCRIPTION	GROSS AMOUNT (Rs)
1	Roads	Brick soling, earthwork for shoulders, compaction of earth	Rs. 2,560,410
2	Water Supply	Complete network, but with house connection to 20% of houses and stand posts for the 80%.	Rs. 4,657,276
3	Sewerage System	Complete network along with septic tanks	Rs. 10,112,596
4	Storm water Drainage	Punjab Standard Drains Type-I and V.	Rs. 945, 640
5	Electrification		Rs. 5,868, 000
6	Total Cost		Rs. 24,143,922
7	Saleable Area		9.95 hectares (4,758 marlas)
8	Cost of services per saleable marla ¹⁵		Rs. 5,076 (Say Rs. 5,100)
9	Cost of land per saleable marla ¹⁶		Rs. 10,500
10	Total Cost per marla (Land plus Services)		Rs. 15,600
11	Total Cost for 3 marla plot		Rs. 46,800
12	Total Cost for 4 marla plot		Rs. 62,400
13	Total Cost for 5 marla plot		Rs. 78,000

20.4 HOUSING AFFORDABILITY Vs COSTS: A COMPARISON FOR DIFFERENT INCOME GROUPS

The housing and land costs given in Table 20.8 and the affordability options under various financial terms have been compared in Table 20.9. The inferences may be summarized as follows:

- About 5% of the households, with average annual household income up to Rs. 28,462 (about Rs. 2,375 per month) cannot afford even 3 marla plot serviced with low cost infrastructure, and hence need state intervention through zakat/other social funds for housing.
- About 6% households with average annual income of about Rs. 36,500 (Rs. 3000/month) can afford 3 marla plot at very soft 7% interest rate over 15 years.

15 As presented in the Table, the proposed low income housing schemes are based on relatively lower infrastructure standards such as brick paved roads, complete water supply network but with 20% house connections and 80% stand posts; and hence lower costs.

16 Land costs is a tricky matter and there are significant variations from place to place depending on a number of factors. Discussions with property dealers suggest that generally costs vary between Rs. 250/m² to Rs. 350/m² (Rs. 5,000 per marla to Rs. 7,500 per marla) at the peripheral areas of Lahore. For the purposes of cost estimation for low-income housing, the average figure works out to be Rs. 300/m² (Rs. 6,300 per marla). As narrated in earlier sections, the area under residential plots, roads and open spaces in a typical low income-housing module is 16.585 hectares (165,850 m²). The total cost of this land @Rs 300/m² works out to be Rs.49,755,000. The saleable area in the typical housing layout is 99,500 m². The cost per m² of net residential area is thus Rs. 49,755,000 / 99,500=Rs. 500 per m² (say Rs. 10,500 per marla).

- Slightly more than 6% household earning about Rs. 45,000 per year (3,750 per month) can afford 3 marla plot at 10% interest rate over 15 years.
- About 8 % can afford 4 marla plot at the above terms.
- About a similar percentage can afford 5 marla plot at 7% over 15 years.
- More than 27% households earning between Rs. 73,000 to about Rs. 90,000 per annum can afford 5 marla plot at 10% over 15 years.
- Households earning more than Rs. 106,000 per annum are about 40%, and fall in middle/upper income categories. For analysis in this section, these are not the target groups.

20.5 KATCHI ABADIS

Associated to the low income group would be the ongoing programme for the regularization of Katchi Abadis now being executed by LDA. This may soon be taken over by the City District Government. By adopting the low-income housing guidelines elaborated above, growth of existing and formation of new Katchi Abadis is likely to come to an end. A programme of providing serviced land is required to be undertaken by LDA (ref. Section 20.2.3). Such a programme will have to provide land quickly so as to have a positive impact on the land market. This would provide for layouts giving plots and a minimum level of infrastructure like roads, water supply and drains as well as land for commercial, educational and health facilities. Occupants would be given ownership documents after they have built their houses and occupied them for at least three years. In this way, the problem of vacant plots can be curtailed. The areas should be selected on priority basis where such informal development has picked up and they are located in the vicinity of traditional villages.

Side by side, the implementing agency should, on intensive scale carry out a programme of upgrading the existing Katchi Abadis in Lahore. The programme has suffered on account of financial constraints caused by slow cost recovery and absence of meaningful involvement of the communities in the upgrading process from inception of scheme to provision and maintenance of upgraded infrastructure. It is therefore important to actively involve the communities for a participatory approach to upgrading rather than purely engineering solutions.

The National Housing Policy restricts the role of the government to the development of major infrastructure and preparation of more realistic criteria for regularization of Katchi Abadis based on locational, environmental and ecological factors. It also recommends involvement of private sector and NGOs in the upgrading process.

TABLE-20.9

HOUSING AFFORDABILITY VS COSTS: A COMPARISON UNDER VARYING FINANCIAL OPTIONS

Category	% of HHs	Cumulative % of HHs	Average Annual HH Income in Lahore (Rs in 2000-2001)	7 Years:			10 Years:			15 Years:			Remarks: ¹⁷
				15%	10%	7%	15%	10%	7%	15%	10%	7%	
				I	0.47	0.47	12,210	7,622	8,919	9,873	9,194	11,257	
II	1.26	1.73	20,333	12,669	14,849	16,437	15,307	18,741	21,422	17,834	24,585	27,779	
III	3.19	4.92	28,462	17,761	20,783	23,007	21,425	26,231	29,984	24,962	34,411	38,882	
IV	5.74	10.66	36,592	22,837	26,723	29,582	27,548	33,728	38,552	32,096	44,245	49,993	
V	6.18	16.84	44,722	27,908	32,657	36,151	33,666	41,218	47,114	39,224	54,071	61,096	
VI	7.68	24.52	52,852	32,984	38,597	42,726	39,789	48,714	55,683	46,358	63,905	72,207	
VII	7.8	32.32	60,982	38,055	44,532	49,296	45,907	56,204	64,244	53,486	73,731	83,310	
VIII	15.24	47.56	73,176	45,665	53,436	59,153	55,086	67,443	77,091	64,181	88,474	99,968	
IX	12.17	59.73	89,436	55,812	65,310	72,297	67,327	82,430	94,221	78,442	108,134	122,182	
X	8.48	68.21	105,696	65,959	77,184	85,442	79,568	97,416	111,351	92,704	127,794	144,396	
XI	31.79	100	170,716	106,544	124,676	138,014	128,526	157,357	179,866	149,745	206,426	233,244	

¹⁷ Cost of plot (land + services) minus the capital affordable at different financial terms, gives the balance amount available for shelter.

Cost of plot (land+services) is:

3 marlas: Rs. 46,800

4 marlas: Rs. 62,400

5 marlas: Rs. 78,000.

Balance amount for shelter is:

First 3 categories: Not applicable

Category IV: Rs. 3,193

Category V: Rs. 7,221

Category VI: Rs. 1,505

Category VII: Rs. 5,310

Category VIII: Rs. 10,474

Category IX: Rs. 30,134

21.0 TRANSPORTATION

21.1 ROAD NETWORK

Having reviewed various aspects of transport sector and associated issues, Transport Strategy is proposed in the context of administrative and financial capacity of the city. Policies and proposals are framed for developing road network, operation and management of transport infrastructure, operation of public transport, development and operation of public transport terminals, developing mass rapid transit system, institutional capacity building, mobilizing financial resources for transport sector and programmes related to road safety, environmental aspects and parking in the city.

21.1.1 Policy for Road Development

Following strategy is suggested with respect to road development during the plan period in the Metropolitan Area of Lahore:

- Selection of all road projects in future should be based on rigorous appraisals and feasibility studies derived from comprehensive traffic analysis, impact assessment and road safety audit ensuring value for the money so spent.
- Non-Motorized transport in particular vulnerable road users (i.e. pedestrians, bicyclists etc.) are required to be mainstreamed by providing facilities for their mobility.
- Public transport priority operations are required to be incorporated in the road layouts of major travel corridors.
- Consistent policy and design approach for road hierarchy should be adopted through well-documented guidelines for authorities, consultants and the constructors alike.
- There is need for more pragmatic approach towards the issue of road maintenance and effective management; curbing the causes of road deterioration through effective controls; building controls as well as controls through introduction of performance based contracts, placing effective maintenance management system, raising adequate funding for economically sustainable programme and introduction of improved private sector contracting capability and participation of private sector to assist the organizations.
- Use of technology-led solutions and Management Information System (MIS) have to be adopted in conjunction with other infrastructure for effective asset management in transport sector.
- Multi-pronged approach is suggested in preparing this programme which aims at:

- (a) giving priority to capacity enhancement of road schemes
- (b) introducing supplementary works to enhance the efficiency of already executed road projects
- (c) initiating road schemes in less privileged areas with the purpose to improve access to mobility of the urban poor.

21.1.2 Short Term Investment Programme

Selection of road projects is based on the road development strategy developed for the metropolis, based on field surveys and discussions held with various departments, public representatives at City Government level and the Town Nazims. Project selection covers all possible areas of improvement required to ensure sustainable improvements in the traffic conditions. It takes into account the areas of opportunities for delivery of investment programme, various threats envisaged and organizational capacity for delivery of the services. Whole range of areas of improvement which lead to significant betterment in traffic situations are made part of the programme and cover capacity enhancements of major city road network, new road projects, projects required to enhance the utility of road schemes implemented during past few years, introduction of comprehensive operational and maintenance management system for city road system, traffic engineering and management projects and development and management of bus and freight terminals. Various categories of these programmes and selected projects falling thereof are discussed here:

a) Capacity Improvement Projects

The programme covers improvement of Ravi Bridge, Ravi Road, Ravi Link Road, GT Road from Cooperative Stores to Do-Moria to Yadgar Chowk (Part Grade Separation), and Multan Road from Chouburji to Niazbeg. The improvements proposed on Multan Road (being an important major arterial road) are discussed below:

- **Improvement of Multan Road**—Multan Road like other inter-city roads needs to be improved to enhance its capacity to meet growing traffic demand. In physical terms, the road is divided in two sections. The section between Chauburji and Scheme Morh is more urbanised and highly congested. Whereas second half is wide enough to incorporate proposed improvements. Immediate improvements include expropriation at crossings like Yateem Khana, Samanabad Morh, Scheme Morh and Wahdat Road Junctions, and at grade junction improvements. There is need to ensure the establishment of exact right of way, removal of encroachments, provision of footways at extremes of rights of way, banning the parking and limiting on-road commercial activity together with general road pavement and allied

infrastructure improvements for a three-lane duel carriageway facility.

In the long run grade-separation needs to be provided at Yateem Khana, Samanabad Morh, and Wahdat Road Junctions. Property acquisition for a 3-lane duel carriageway with service road facility needs to be planned for the entire road length.

b) New Road Projects

In order to improve access to the new airport terminal and the overall circulation pattern of the city, additional approaches to the Airport, extension of Sagian Road to G.T. Road in the north – west, and the construction of Lahore Ring Road are proposed as shown in Figure 21.1.

c) Lahore Ring Road

Lahore Ring Road is a major component of the package of New Projects of Short Term Programme. LDA has been pursuing this project since 1980. A feasibility study and detailed design for a portion of this project was completed in 1992 through M/s. Mott Mac Donald and World Bank financing and acquisition of certain stretches of the project were completed. LDA in 1999 awarded the project to M/s Daewoo on BOT basis and signed concession agreement with M/s Daewoo. LDA this time changed the alignment and asked Daewoo for carrying out its feasibility study as BOT project. Study was awarded to Mott Mac Donald who recommended the concession that proposed alignment is not feasible both on technical and financial grounds, therefore alternative options were proposed.

Lately, the project is being looked after by TEPA/LDA and Communications & Works Department of Government of the Punjab. Both the organizations are sticking to the 1999 Study alignment inspite of the fact, that the study has strongly rejected the proposed alignment. Major study concerns against the alignment are, its location away from the built-up limits, hence less traffic volumes to justify its construction; its positioning against the current and anticipated travel direction and; its location with respect to competitive routes of Multan Road and Raiwind Road in particular. Consultant, therefore proposed following options in order of priority.

- i) 1992 Study Alignment.** In spite of encroachments in certain areas of its alignment, it is still a best alignment with minor modifications on technical and financial grounds.
- ii) Intermediate Alignment.** Mott Mac Donald, in 1999 Study has proposed another route which is slightly longer

than 1992 Study route and connected old route crossing at Ferozpur Road with Shahpur Interchange bypassing WAPDA Town and other new developments close to Johar Town.

- iii) **1999 Study Alignment with Modifications.** In this option 1999 Study route alignment is proposed except its section between Shahpur Interchange and proposed Interchange on Raiwind Road, Defence Road at Bhoptian which is proposed to be shifted either on east of Raiwind Road or on Multan Road bringing another Interchange at Multan Road, Defence Road Junction.

Proposed alignment section between Shahpur Interchange and Raiwind/ Defence Road Interchange, currently being pursued by Punjab Government, passes through a number of committed housing schemes of both private and public sector (like Eden, Abid City, Agric Society, Al-Jannat, Public Health, LDA Avenue-I). Feasibility of this alignment becomes questionable because of parceling problem (cutting through the residential areas) and high cost of providing crossing facilities.

d) **Supplementary Works to Previous Programmes**

For the improvement of road network capacity, few sections of important roads which were left un-improved under the Lahore Road Rehabilitation Project (LRRP) needs to be improved. These include GT. Road (East), Ferozpur Road in the southern outskirts, approaches/ links to Main Boulevard and Park Road.

- e) **Area Traffic Management, Parking and Traffic Control Programmes** for Central Area and selective signal control and traffic management throughout the city is to be carried out. This will include all related aspects covering the road network improvements, road safety, inter-linking of signals, junction improvements, parking, removal of encroachments etc. All these activities have to be supplementing / complementing each other to improve the overall traffic situation in a particular area.
- f) **Introduction of regular operation and maintenance (O & M) system** with comprehensive asset management enabled through state of the art GIS and application of Infrastructure Management Information System. The whole road network is an asset which needs to be managed properly and comprehensively keeping in view its improvement, maintenance, drainage, removal of encroachments, well coordinated provision of utility services etc.
- g) **Initiation of Bus Terminals development and operational management.**

21.1.3 Long Term Investment Projects

Apart from implementing backlog of the short-term programme this will cover implementation of whole range of projects aiming at capacity enhancement of existing road network, addition of new roads and arterial network proposals in CSTS¹ and Structure Plan proposals of 1980's supplemented with grade separation facilities on major arteries outside central area. Small-scale improvements in the network required for traffic control, area traffic management and parking management together with Road Maintenance Management activities are also suggested to be delivered to satisfactory level.

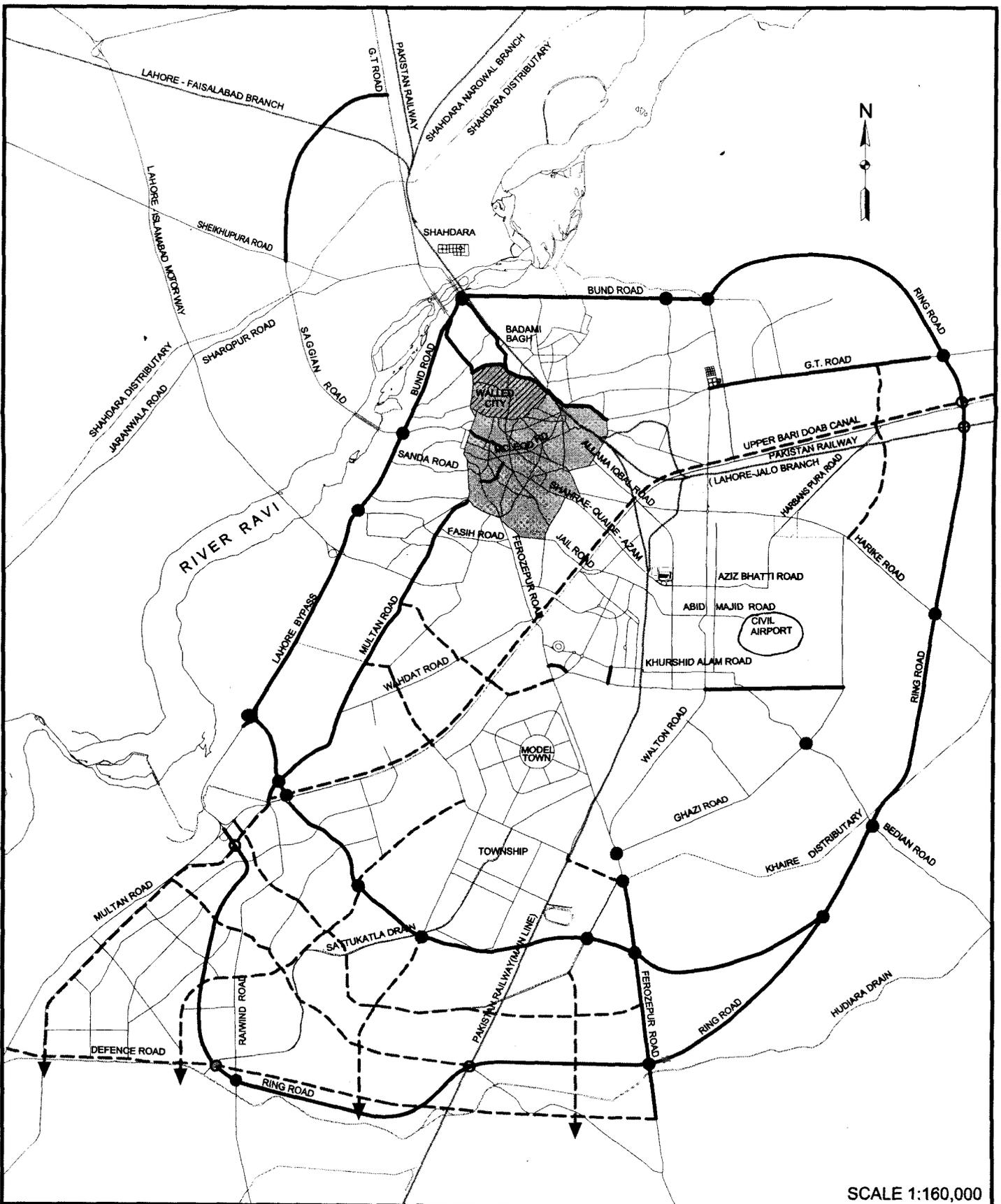
a) Capacity Improvement Projects

These projects include the following:

- i) Canal Bank Road
 - ii) Introduction/improvement of a semi-ring from Katchery Road to KE Medical College gate to McLeod Road Crossing to Fane Road to Begum Road up to Lytton Road
 - iii) Continuation of improvement of main Boulevard in Garden Town, New Muslim Town, Allama Iqbal Town and Multan Road in the west and, Cantonment and Shalimar Link Road in the east.
 - iv) Extension of M. Shaukat Ali Road to Wahdat Road and Multan Road on western side and Ferozpur Road to Harike Road to GT Road in the eastern side.
- b) New road projects covering construction of Defence Road, introduction of second Ring Road in the south and the network proposed for fast expanding suburban area between Multan Road and Ferozpur Road.
 - c) Grade separation on major routes outside central area, area traffic control in the city in conjunction with area traffic management and parking.
 - d) Replacing rail road level crossings in the entire Metropolitan Area through grade separation and/ or through provision of service roads.
 - e) Continuous operation and management activities as per requirement of the infrastructure.

Beside measures to be taken throughout the Metropolitan Area, as discussed above, major road projects proposed are shown in Figure 21.1.

¹ Comprehensive Study on Transportation System in Lahore by JICA, August 1991.



LEGEND:-

- LONG TERM PROJECTS - - - - -
- GRADE SEPARATION ●
- SHORT TERM SCHEMES —————
- CENTRAL AREA TRAFFIC MANAGEMENT ▨
- PROPOSED FLYOVER ○

PROPOSED MAJOR ROAD PROJECTS Fig: 21.1

21.1.4 Size of the Programme

Programme size mainly depends on how quickly and effectively newly formed City District Government can mobilize municipal financial resources and take along the private sector as a partner in city development and operation and management activities. City requirement for first five years is estimated for an outlay of Rs. 24,992 million (Table 21.1). Of this around Rs. 4,000 million needs to be designated towards operation and management activities which shall be reduced to 10 to 15% as the quality of delivery improves and effective controls are exercised.

21.2 ROAD MAINTENANCE MANAGEMENT

Primary focus of the Transportation Infrastructure Asset Management component of this Plan is to reduce the backlog of road and street maintenance and to provide institutional mechanism for sustainable routine and periodic maintenance. enhancement of institutional capacity within the framework of city government remains key elements of this programme.

A multi-pronged approach is suggested for overall programme development. It necessitates actions through planning and building control strategies curbing the causes of road and street pavement deterioration. It would also focus on improving the contractual capacity and procedures for procurement of road and street maintenance works, introducing performance based contracts for road sector enabling the private sector to share the responsibility and risks of maintenance requirements and placing an effective programme utilizing state of the art technology solutions.

Programme Development would cover preparing inventory of roads and streets and related utilities and assessment of required maintenance backlog reduction, designing eligibility criteria for project selection and preparation of contracting packages for each Town sub-districts.

Various tasks required to prepare this programme include preparation of digitized mapping with suitable scales and reproduction features, for an interface to inventory and condition assessment of roads and streets required for this work. Inventory recording system is to be unified and integrated with other utility providers/operators. Information system through condition surveys is to be streamlined through design of procedures for different levels of inspection and reporting. As a policy framework for the coordination of utilities in the city, some form of unification of site condition inspections must be sorted out with other utility providers/operators.

Contract preparation of maintenance works must be carefully examined specifically pooling into one Bill of Quantities for common activities required for all utilities i.e., clearing, cleaning, tidying up and localized repairs of drainage equipment, road, footway, street sign, street furniture and utilities equipment on the street.

Criteria for project selection prioritization should be based on local knowledge and may include, social factors i.e., population densities, and education needs, health programmes and transport and traffic needs and zonal concentration of urban activities.

Pilot programmes must be initiated in every town of the City District. Once digitized mapping is available updating of condition information through regular and well-designed inspections would facilitate monitoring and plan formulations for new programmes in a realistic manner and thus help reduce the backlog of road and street maintenance.

TABLE 21.1
FIRST 5-YEAR PROGRAMME FOR TRANSPORTATION SECTOR

(Million Rs.)

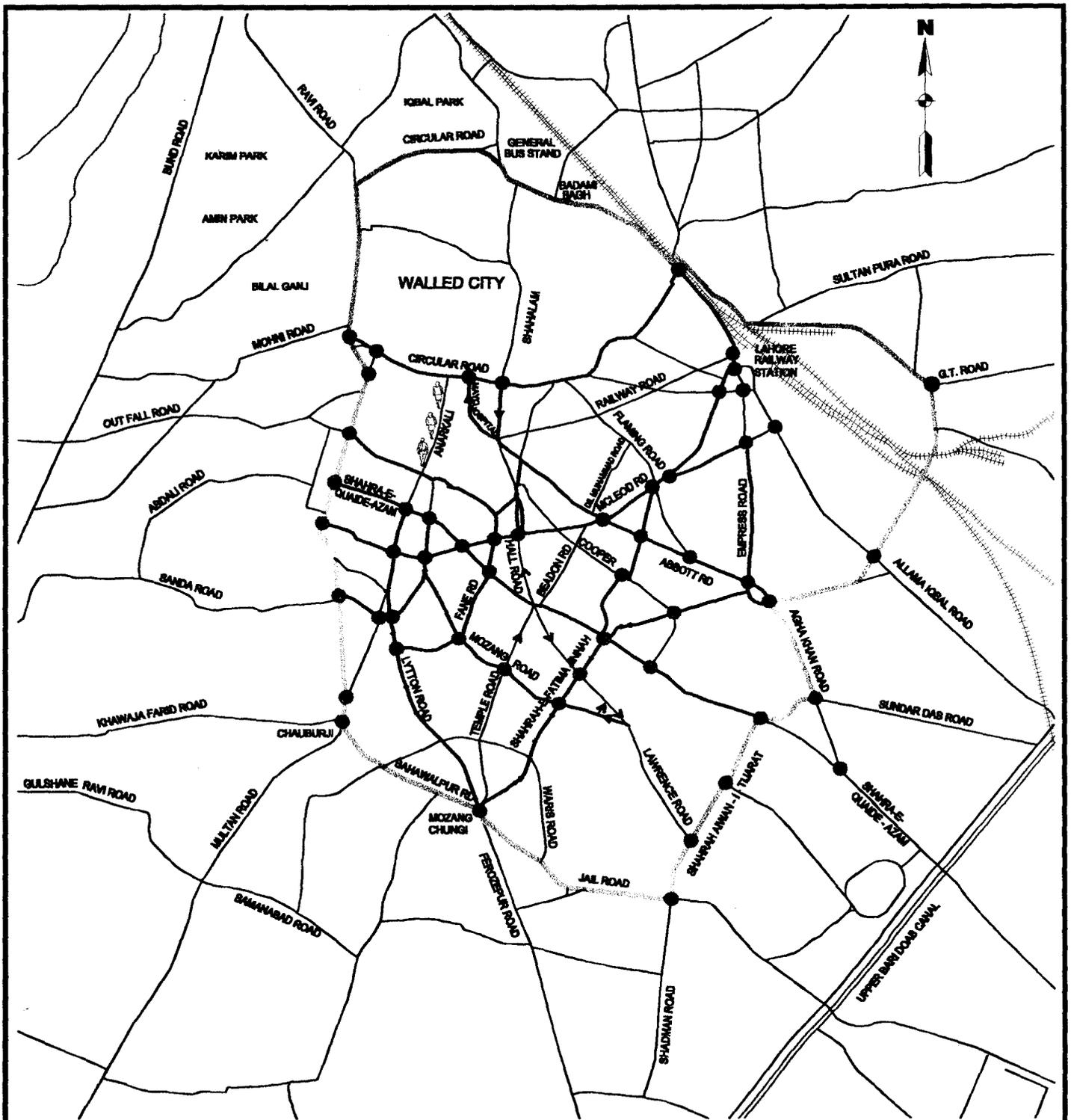
Sr.No.	DESCRIPTION	YEARS					TOTAL
		1	2	3	4	5	
1.	Private Sector Participation Projects						
	a. Ravi Bridge including Ravi Road, Ravi Link Road	74	120	240	210	-	644
	b. Lahore Ring Road	1,500	3,500	3,500	4,500	3,000	16,000
	c. Development of Public Transport Terminals	-	300	300	450	150	1,200
	Sub-Total	1,574	3,920	4,040	5,160	3,150	17,844
2. i)	Public Sector Projects						
	a. G.T. Road	-	-	25	276	50	351
	b. Multan Road	160	160	-	-	-	320
	c. Approaches to Airport	100	200	200	200	95	795
	d. Supplementary Works to LRRP	50	32	-	-	-	82
	e. Area Traffic Management/Control	50	100	100	100	60	410
	f. Link Sagian Bridge with G.T.Road	100	150	200	-	-	450
	g. Operation & Maintenance	300	700	1,000	1,000	1,000	4,000
	Sub-Total	760	1,342	1,525	1,576	1,205	6,408
ii)	Projects in hand by TEPA						
	Provision of Missing Links in the South	100	100	150	200	190	740
	Total	2,434	5,362	5,715	6,936	4,545	24,992

21.3 CENTRAL AREA TRAFFIC ENGINEERING AND MANAGEMENT SCHEME

Central area for any city accommodates core commercial and other regional level activities on which the city and urban region as a whole is dependent upon. Circulation efficiency of central area, therefore, is of paramount importance for fostering the economic activity in the city. Given the road infrastructure, aim for Central Area Traffic Management should be to dovetail and tailor the traffic circulation, operation of road related public transport and parking facilities in such a manner that maximum passenger mobility is achieved.

21.3.1 Location and Extent of the Area

Central area in geographical terms in Lahore can be defined as an area bounded by Ravi Road from Yadgar Chowk, Eik Moria to Cooperative Stores Junction in the north, Shalimar Link Road, Garhi Shahu Chowk,



LEGEND:-

- CENTRAL AREA BOUNDARY 
- ROAD IMPROVEMENTS 
- URBAN TRAFFIC CONTROL 
- PEDESTRIANISED STREET 

SCALE 1 : 40,000

CENTRAL AREA TRAFFIC MANAGEMENT AND URBAN TRAFFIC CONTROL

Fig: 21.2

Shimla Hill, Davis Road/Shahrae-Quaide-Azam (SQA) Crossing to Shadman Chowk on Jail Road in the east, Qartaba Chowk to Chauburji in the south and Lower Mall, Bhaati Chowk and Yadgar Chowk on Ravi Road in the west (Figure 21.2).

21.3.2 Traffic Management Strategy

Following strategy is suggested for Traffic Management in the Central Area:

- a) Enhance the capacity of the peripheral and major network intercepting the Central Area through remodeling, controlled access and on-street parking restrictions.
- b) Improve the secondary road network for enhancing accessibility to the area with controls on parking. Apply mobility improvement measures through imposition of regulations and controls.
- c) Raise the level of service of the local streets. If necessary apply traffic calming and other control regulations to provide safe environment for pedestrians and traffic alike.
- d) Maintain the pavement condition of all roads to a satisfactory level.
- e) Raise the level of control through signaling and introduce central control in coordination with traffic police.
- f) Liberate footways and provide continuous lanes for two wheelers and proper facilities for crossings of bicycles on major roads, and
- g) Introduce public transport priority schemes on all major corridors.

Basic theme of the traffic management strategy is to introduce a system of improvement, which is cost effective, operationally efficient, environmentally sustainable, socially just, politically acceptable and aimed at improving the mobility of urban passengers rather than vehicles.

Following site-specific programme of improvement is suggested in the light of the proposed strategy in the central area.

21.3.3 Capacity Enhancement of the Peripheral Route

- a) Improvement of G.T. Road from Yadgar Chowk, Do-Moria to Cooperative Stores and Ch. Rehmat Ali Road from Eik Moria to Railway Station is already proposed in the Road Improvement Programmes discussed above. Later is a grade-separation solution with its feasibility available with TEPA-LDA. Former is a high-speed facility having three-lane duel- carriageway from Eik Moria to

Cooperative Stores through extensive expropriation from government land. Between Eik Moria Crossing to Yadgar Chowk it should have controlled access and grade separation at major crossings.

- b) Improving the accessibility of Mughalpur Road to Garhi Shahu Bridge was left incomplete during recent reconstruction of the Garhi Shahu Bridge.
- c) Enhancing capacity of Durand Road close to Garhi Shahu Chowk, through expropriation, junction redesign and grade separated pedestrian crossing facility for Girls College.
- d) Consolidating previous work on Davis Road through progressive parking control. Initially parallel parking be introduced leading to complete restrictions on roadside parking. Effective control on off-street parking and in particular approaching ramps from private properties.
- e) Initiation of detailed engineering feasibility for a grade-separated solution for Davis Road/SQA Crossing and its execution in conjunction with Canal/SQA Crossing grade-separation.
- f) Improvement to service road arrangement on various crossings on Jail Road. Completion of acquisition proceedings and at grade improvements at Qurtaba Chowk. Feasibility of grade-separation solution for Qurtaba combined with Link Jail Road, Ferozepur Road Junction and Link Jail Road, Jail Road Junction with possibility of utilizing Ichhra Depot for limited inter-city and city feeder services.
- g) Improving the capacity of Bahawalpur Road partly with grade-separation and partly with access control. Improving access to Sagian Bridge with junction rearrangement at Katchery Road/Lower Mall Crossing. Improvement to junctions at Crescent Model School and Karbala Gamey Shah with grade-separated pedestrian facilities at Crescent Model School and Data Darbar. Completion of works at Bhaati Gate as envisaged for the Data Darbar Complex Project.
- h) Grade-Separation at Yadgar Chowk along with consolidation of previous work on Ravi Road.

21.3.4 Capacity Improvement of Main Network

With exception of one junction at SQA with Aiwane-Iqbal Road; where there is possibility of grade separation all other network is proposed to be upgraded through at grade solutions involving traffic engineering, management proposals and improving efficiency through economical and technology –led solutions. Following specific proposals are suggested for improving the capacity of the main network.

a) **Sharahe-Quaide-Azam**

Complete access control throughout the length of the road is proposed, with no U-turn facility. Grade separation at Davis Road and Aiwane-Iqbal Road junction is required. Introduction of hook-turn facility at Alfah, Regal and G.P.O Crossings. Reorganizing one-way system around YMCA and providing right – turning at YMCA through specific widening of carriageways and creating space for reserved lane for right turners to be operated upon signal staging at Boota Mal Crossing. Operate bicycle way from High Court Crossing to Mian Mir Bridge on Service road with specific arrangements at crossings. In areas having no possibility of service road, combined lane for motorcycles and bi-cycles may be provided. This arrangement should continue for all major corridors until feasibility for segregated bus lanes is carried out for bus-intensive operations.

b) **Empress Road / Egerton Road / Queens Road Corridor**

This requires total restrictions for parking on Queens Road, control on U-turns and remodeling of junction with Mozang Road. Providing controlled parking at 60° on both sides and integrating service road opposite Faletti's on Egerton Road. Controlling parking on Empress Road between Shimla Hill to Nicholson Road with parallel parking and enforcing 'no parking' onward to Railway Station.

c) **McLeod Road / Nicholson Road Corridor**

Controlled parallel parking on road sections having more than 3-lane carriageway, with daytime restriction on these sections.

d) **Abbot Road / Nisbat Road Corridor**

Completion of minimum width of 2-lane dual carriageway, with expropriation at narrow points, having complete restrictions on parking during daytime between Shimla Hill and Mayo Hospital. Reinforcing one-way for Bansanwala Bazar and Mayo Road and part of Gawalmandi Road falling south of Nisbat Road.

e) **Allama Iqbal Road**

Controlled parking in sections having 3-lane carriageway and complete ban on parking in Railway Station Area, except for public transport utilizing the roadsides as bay facility.

f) Inner Circular Road

Reinforce non-motorized transport (NMT) parking lanes. Control parking in various sections keeping a balance between mobility and parking demand. Introduce off-site parking arrangements taking into account parking demand of the adjacent commercial markets. Control and restrict pedestrian crossing facilities. Incorporate public transport operation facilities and roadside terminating points, well defined and segregated from moving traffic at Bhaati, Lohari, outside Shahalmi and Dehli Gates.

g) Montgomery Road

Ensure 4-lane facility with parking restriction from Cooper Road to Abbot Road Junction and single parking at 45° in position from Abbot Road Junction to McLeod Road Junction.

h) Mozang Road

Make it a dual carriageway with parking restrictions during daytime. Complete the acquisition proceedings for Safanwala Chowk and complete remodeling as planned earlier along with crossing at Queens Road. Introduce one way on part of Mozang Road in front of the offices of Board of Intermediate and Secondary Education, part Lawrence Road and part Mason Road. Carve out and make available 4-lane access on Farid Kot Road from Jain Mandar to Mozang Road, through parking control.

i) Lytton Road

Complete the acquisition process and at grade improvement at Qurtaba. Retrieve and maintain footways and exercise control through parallel kerb parking. Rationalize gaps in the median. Continue 2-lane dual carriageway through expropriation both through Old Anarkali and Road in front of Police Head Quarters Building.

j) Proposed Semi-Ring Road in the Central Area

A semi-ring of secondary roads in the city centre needs to be upgraded, as being strategically located to share the traffic load and for cross distribution to major corridors converging in the central area. This semi-ring of roads comprises of Katchery Road, road in front of King Edward Medical College, Patiala Link Road, Shorish Kashmiri Road, Fane Road and Begum Road up to Lytton Road. Improvements suggested include a two-lane dual carriageway to be achieved through expropriation at selected points together with room for footways and improvement of road crossings. This corridor will help siphon off and distribute market traffic on major radials.

21.3.5 Improvement of Secondary Road Network

All other prominent roads other than primary network discussed above fall under this category. Width of these roads may vary and some of the roads are duel carriageways but because of their location and type of operating traffic they fall under the lower category. They too need to be properly maintained with controlled parking arrangements depending upon the availability of the road space for mobility and competing requirement for parking.

21.3.6 Area Wide Improvements

Some of the interventions and controls are suggested to be taken throughout the central area and need to be sustained as a regular feature of urban roads and traffic management. These include maintaining the road pavement of entire hierarchy in a reasonable condition through organized operation and management for the system designed on modern state of the art Assets Management Programme, retrieving the foot ways and make these available for pedestrian movements through effective and regular inspections and checks, reinforcing one-way system through self-enforcing traffic engineering measures except road sections recommended otherwise, centralized signal control and traffic supervision in collaboration with traffic police, parking control on all primary and secondary networks and imposition and enforcement throughout the area, of traffic regulations and controls duly posted and marked through signage. We are not proposing extensive off-street parking facilities through public sector, however we do suggest rationalizing parking standards for commercial building projects in the private sector and effective operational control thereof in conjunction with strict time-based on-street parking control. Traffic Management Schemes proposed in the Central Area are shown in Figure 21.2.

21.4 PUBLIC TRANSPORT

Significant increase in number of buses and minibuses is observed during the last decade. However, the supply of public transport has never kept pace with the increasing travel demand for Lahore. Current public transport operations do not portray true picture of city demand. Income levels being comparatively low, there is significant level of latent demand, which currently is being met through other modes. In spite of the fact that number of licensed operators has increased dramatically, least improvements are observed in the quality of operations.

Current free for all situations with more than 23,000 operators (including 18,000 rickshaws) and least regulatory controls is the worst example of exploiting scarce road space resources. It needs a bit of planning, recognizing competition as the best way of securing good value for money and providing quality service through

appropriate controls and improved institutional, road pricing and financial arrangements as elaborated hereunder.

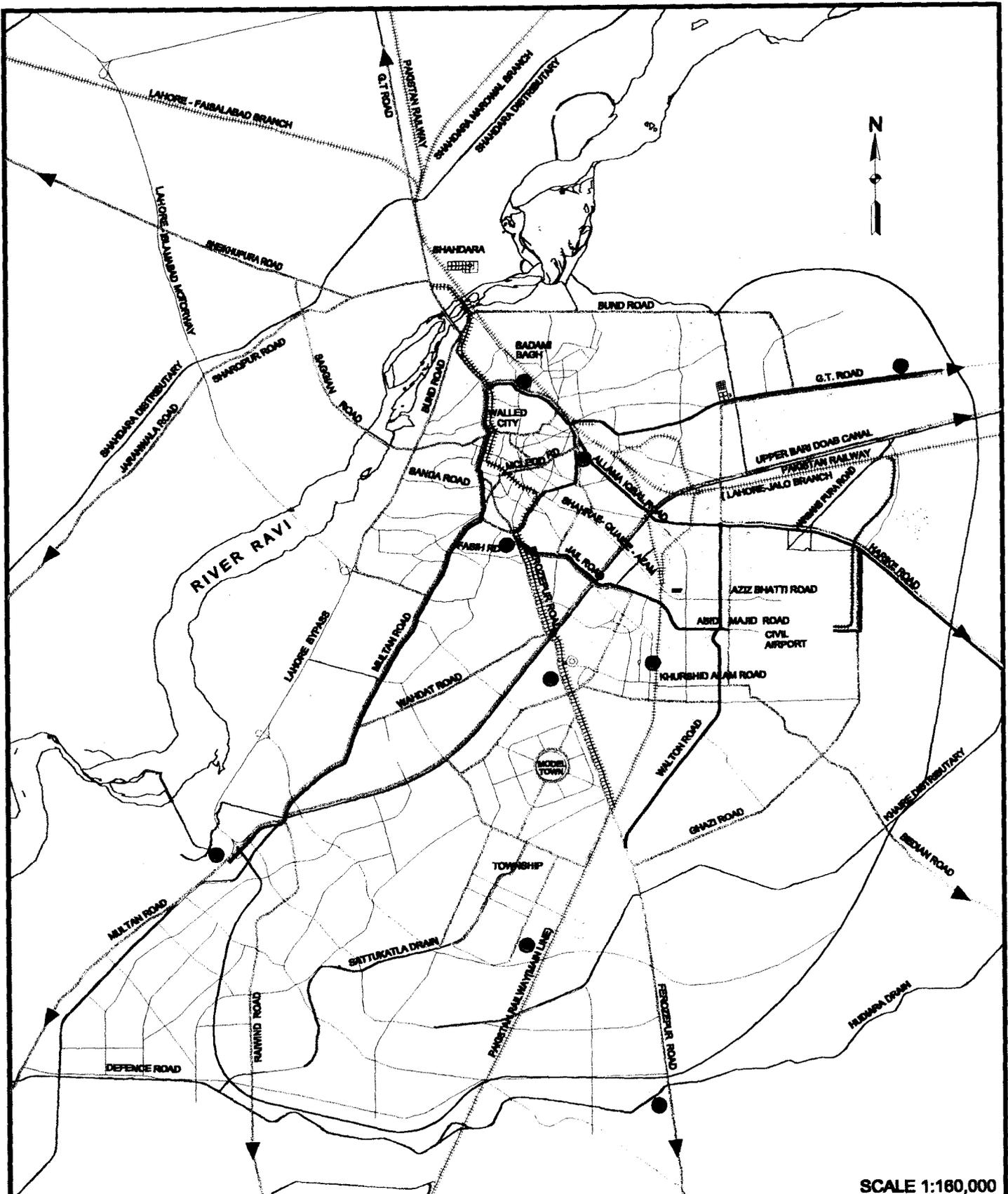
21.4.1 Operations

- Having good response for franchised operations all major routes where PRTC used to operate must be utilized for bus operations. Minibus operation must be restricted to feeder service on low frequency routes.
- Franchises are to be allocated through competitive tendering open freely to private operators and associations of small owner operators. This should be extended even to feeder routes over a period of time.
- Franchised contracts between operators and regulatory authorities need to define duties and rights of the parties in a complete consistent way as possible. Since fares are controlled, contracts should define for the adjustment to account for general cost inflation as well as defining the compensation for any discretionary fare adjustment.
- Potential of mini bus operators needs to be mobilized through legalizing associations and through structuring franchising arrangements to participate in competitive process. Idea being not to dislodge par-transits but to bring them within formal arrangement where regulatory body could limit their dealings to Umbrella Associations only.
- To overcome the environmental issue arising out of the public transport operation switching to gas operated buses needs serious consideration as in case of Delhi in India.

21.4.2 Terminals

Upgrading and operation of intercity terminals at Badami Bagh and at Railway Station together with limited facility at Multan Road with associated facility of depots must be entrusted to private sector with complete deregulation of provision of services with respect to terminals in the city. For city services, facility should be associated with inter-city terminals as well through carving spaces from planned housing colonies for small scale turn round facilities. Depot facility of defunct PRTC, instead of being sold to overcome budgetary shortfalls has to be allocated for city franchises and inter-city operations.

City Government is planning to extend the approved project of LRT from Bhatti Chowk to Shahdara in the north and from Kot Lakhpat Bridge to new airport terminal through Cantonment Area in the south. Government suggests to shift the proposed facilities of passenger transfer stations at proposed LRT terminals. The proposal is supported subject to feasibility of extending proposed LRT project.



SCALE 1:160,000

LEGEND:-

- | | | | |
|------------------|-----------|------------------------|-----------|
| NORMAL BUS ROUTE | ————— | BUS TERMINALS/DEPOTS | ● |
| BUS TRANSIT | ————— | PROPOSED HRT EXTENSION | - - - - - |
| LRT | + + + + + | | |
| HRT | + + + + + | | |

PROPOSED ROUTE ALIGNMENTS FOR MASS RAPID TRANSITS AND OTHER BUS OPERATIONS

Fig: 21.3

21.4.3 Mass Rapid Transits

- Given the present motorization trends, income levels and to keep the congestion within reasonable limits, radials having major concentration of traffic and demand for public transport movements need to be utilized for mass rapid transits. Light Rail Transit (LRT) Project having approval of the Government and Financial commitment needs tracking.
- Currently City Government has shown interest to extend the LRT project limits to Shahdara in the north and to Airport Terminal in the south on an expression of interest from an unknown trade group. It is proposed that such proposals must be reviewed critically through specialists before making any commitments and policy decisions. Government should pursue for financial arrangement for approved project.
- Parallel to LRT project proposed on Ferozpur Road Corridor, other corridors need to be planned for Bus Rapid Transits. In a recently completed Trans Millenio: Bogotá's Bus Rapid Transit System in Latin America, passenger carrying capacity to the tune of 360,000 passenger per day have been achieved with 162 articulated and 60 feeder buses. Proposed capacity improvements of road projects for Lahore thus need to be dovetailed for Bus Rapid Transits.
- Services offering must be invited from private sector for operating electric-operated trolley buses on at least four major public transport corridors in Lahore City.
- Heavy rail transit, utilizing existing track and extending facilities required for exclusive operation of local service at existing and relocation of some old stations also needs to be taken up on urgent basis.
- Feasibility for reactivating abandoned railway tracks in Cantonment Area for local rail services should be examined together with access facilities to new Airport Terminal building. This could be achieved either through extension of link from Mehfoozपुरa Station or Walton Station.
- Proposed route alignments for Mass Rapid Transits and other bus operations are shown in Figure 21.3.

21.5 PARKING

Current practice of indiscriminate provision of parking and charging thereof throughout the city must be reviewed in the context of the following:

- Parking control must be treated as means of traffic management on area-wide basis,
- Provision of On-Street parking is to be rationalized with priority of utilizing maximum road capacity for moving traffic.
- Parking provision for commercial buildings is to be controlled in a manner to be economically viable and administratively enforceable. Road capacity utilization, in particular within Central Area has reached to a point that additional volumes generated because of parking spaces have to be cautiously dealt with. Parking both along roadside and in a precinct have therefore to be dealt with in the context of Area Traffic Management.
- Parking control is more of a professional function; therefore needs to be delivered through a professional body like TEPA.
- Parking Cess, where necessary, is proposed for commercial buildings in lieu of parking provisions under building regulations.

21.6 ROAD SAFETY

A comprehensive urban road safety policy requires a multi-sectoral approach including programmes for driver training and testing, education, publicity aimed at selected groups of road users, vehicle road worthiness testing, securing funds for road safety, community participation, monitoring and research. Traffic management actions in support of road safety include:

- i) **Accident Reporting** - data currently being collected by traffic police is incomplete and of poor quality. Accident policies and programs need to be based on sound and improved databases requiring training of traffic police and effective data processing system.
- ii) **Accident Data Analysis** - systematic and periodic transfer of data from traffic police to TEPA for systematic evaluation for programme planning and improved procedures development is recommended.
- iii) **Accident Prevention** - as part of its role in planning traffic strategy and designing of traffic management schemes, TEPA should;
 - Promote safety as integral part of scheme planning and design and in particular attention to, designing into schemes" measures to (1) control speeds (2) calm traffic, (3) meet the needs of the vulnerable road users including pedestrians and cyclists; and
 - The concept of safety audits; in which all but the simplest of the schemes are subject to scrutiny by the traffic management designers who were not involved in the original scheme planning and design, needs to be in place and rigorously implemented.

- iv) **Accident Reduction** - the traffic agency should approach safety on a comprehensive basis and a priority task should be the conduct of a safety review of the city traffic system and preparation of a comprehensive Traffic Management Safety Programme which shall help alleviate specific safety problems.
- v) **Traffic Regulation Enforcement** - for safe traffic operations, enforcement of traffic regulations cannot be denied. Traffic police need to be trained and properly equipped.
- vi) **Safety as part of Road Projects** - a more collaborative approach between traffic police and the road authority is required in scheme planning and designing the road projects. There is also need for more rigorous (1) definition of systematic safety programmes within road projects, (2) definition of safety targets and (3) monitoring of the targets and indicators.
- vii) **Accident Research & Prevention Cell** - There is need to develop an Accident Research and Prevention Cell in Lahore under the Traffic Police with proper manpower, equipment and other logistics to monitor road accidents.

21.7 INSTITUTIONAL ASPECTS

For the City of Lahore having acquired the status of a Metropolis on the account of its size and population, require specific organizational arrangements to manage its infrastructure and to render services in the transport sector. In the context of Devolution Plan it is suggested that TEPA should be restructured and elevated to a status of Metropolitan Transport Authority to deliver all functions related to transport sector. Present resources of TEPA, DRTA and Engineering Wing of District Government must be merged together and made part of the proposed organization. Its placement in the context of Local Government can be decided by the Government.

The proposed organization needs to have two distinct wings of infrastructure and operation. Transport Planning, Traffic Engineering, procurement, O&M of infrastructure should rest with the former wing, whereas Vehicles and Driver Licensing, Registration, Public Transport Operation and Regulation may be assigned to the later. The following is proposed to strengthen the proposed organization.

- For capacity building and smooth functioning of the proposed organization as a service provider, its management for initial four to five years is suggested to be run in collaboration with the private sector.
- Police should continue enforcement of traffic regulations as independent body.

- The proposed organization should establish an administrative structure with clearly identified and allocated responsibility for all necessary technical functions in urban transport.
- A training strategy needs to be developed at the government level for professional and technical skills in urban transport as to fill the widening gap between service demand and quality supply not only for Lahore but also for the benefit of other urban areas in the province.
- Regulatory authority within the proposed organization for public transport operations needs specific attention with respect to professional staffing and developing skills to regulate the service on commercial lines.
- Collaboration between authorities is recommended at both nationally to share available skills and internationally to further develop the skills and experience.
- Strategic land use and transport plan at Metropolitan level needs preparation and updating on regular basis jointly by the City District Government/LDA and the proposed organization. Detailed planning both for land use and transport should be aligned to the strategic plans.
- Traffic police should be trained in limiting traffic violations and steps taken to improve their mobility and communication. They need to be more collaboratively involved in transport and safety policy planning.
- Planning and operating responsibility within the proposed organization should remain under separate wings. Further technical regulation should remain separated from procurement and economic regulation.
- Operating agencies should remain fully commercialized and privatized.
- The development of new competitive private service suppliers should be encouraged through legal recognition of associations.
- The proposed organization should develop professional service procurement and contract enforcement skills.

21.8 FINANCIAL ASPECTS

Most of the major infrastructure projects like Ring Road and Bus and Freight Terminals need to be financed through private sector participation but success of such projects lies in clear understanding of the Government towards viability of the projects and mechanism of successful handling of private sector financed projects;

There is general perception of tolling the BOT projects but fact remains that tolling though helps in recovery of road investment but also prevents adequate utility in urban situations therefore shadow charging of the facility needs to be explored.

Similarly most of the urban road projects may not be feasible on BOT Basis that need to be combined with other projects in Transport Sector with lucrative returns.

21.8.1 Fare Levels

Controls on fares need to be reviewed in the context of an assessment of the effects of the control on the service and in the context that an appropriate level of service can continue to be financed.

21.8.2 Financing Transport Sector

- Transport Sector financing needs to be collaborated through public sector financing, private sector participation in infrastructure finance and finally institutional possibilities of mobilizing pricing devices.
- Urban Transport Fund (UTF) needs to be created where contributions from all resources are deposited.
- Local borrowings can be secured against general municipal revenues.
- Local taxes need to be reassessed including property tax, export tax and other tax like impositions to supplement user charges (just like French Versement Transport” is a payroll tax and Val Transporte” in Brazil is obligation imposed on employers to bear commuting cost of employees).
- Betterment tax needs to be charged as a consequence of infrastructure improvement. Strong development controls can lead to sound base for infrastructure contributions.
- In addition to above, fuel tax and direct charges of service users like intercity terminals and road pricing may be used as proxy against congestion. Similarly parking fees and parking cess may be imposed as contributions towards infrastructure improvements.
- Taxes on different fuels should be structured to reflect their relative contributions to urban air pollution, again in conjunction with structuring vehicle license duties.
- In the interest of efficient service supply, transport operators should operate competitively with purely commercial objectives, financial transfers being achieved through contracts between regulatory authority and operators for supply of service.
- Given the degree of interaction between modes, urban transport financial resources should be pooled together in the proposed UTF at the level of the proposed Road and Transport Organization.

- Private sector financing for transport infrastructure should be raised through competitive concessions (like BOT, franchising etc.) supported by public sector contributions as long as these have been subject to proper financial analysis.

21.9 ENVIRONMENTAL ASPECTS

To arrest the fast deteriorating environment, largely due to the traffic situation, following measures are suggested:

- i) **On awareness** - Development of better understanding of the health impacts of emissions from transport, initiation of programmes for analysis on levels and sources of ambient air pollution, dissemination of knowledge on environmental impacts of transport modes and education campaigns on efficient vehicle operation and maintenance.
- ii) **On performance standards** - On improving the emissions controls some technological priorities are required with respect to elimination of lead from gasoline, replacement of two stroke by four stroke motor cycles, cleaning up of high mileage heavy polluting vehicles and introduction of computerized inspection regimes for all types of traffic administered through centralized private contractors.
- iii) **On managing demand** - Technological and fiscal measures need to be supplemented with coherent transport management strategy including priority for public transport investment including improved conditions for walking and cycling, traffic management including rigorously enforced priorities for public transport on congested and environmentally sensitive routes and traffic calming and other measures of demand management.
- iv) **On incentive systems** - Providing incentives in the shape of tax structure for environmentally efficient mode, vehicle size and fuel type.
- v) **On institutions** - Making it essential for the institutions to introduce environmental impact assessments as an integral part of transport, physical planning and road building activities. Development of technical competence and probity in administration as an essential prerequisite for effective action in this regard and development of concerted action between jurisdictions and tiers of the government.

22.0 COMMUNITY FACILITIES

Lahore suffers from a number of problems in the delivery of education and health services and the availability of recreational facilities. The deficiencies are quantitative, qualitative and institutional in nature. The problems are further compounded by the scarcity of fiscal and other resources and by the tendency of allocating a low level of priority to social infrastructure, which is a universal dilemma of developing countries.

Education, health and recreational facilities will continue to be provided by a combination of public and private agencies in Lahore. Though a greater role of the private sector would definitely reduce the government's burden, the public sector will yet have to continue its involvement to redress imbalances that the private sector cannot handle because of its very nature. The continued involvement of the public sector will also be necessary so that the needs of the poorer segments of society are met in an equitable manner.

22.1 EDUCATIONAL FACILITIES

There is a shortage of all kinds of educational facilities. The content and quality of the courses being taught leave a lot to be desired. With the exception of the high-cost institutions, the condition of buildings, furniture and equipment (if any) is generally deplorable. Most of the institutions in the private sector are without adequate open areas.

The private schools providing quality education in general are expensive and most people cannot afford their fees. Majority of the private schools is however; home based tuition and coaching centres, having little or no facilities/equipment. Many of the Government primary schools, particularly in rural areas are also in deplorable condition without having even the basic facilities.

Out of about 982,000 students enrolled in various types of primary schools, only 14% could enroll themselves in Punjab Government and ex-MCL schools. The reason for this meagre intake is primarily the deficient physical capacity of these schools. A review of data on existing situation shows that the average number of students in Government primary schools is 297 and in ex-MCL schools is 138 only.

22.1.1 Education Policy and Existing Education Pattern

According to the National Education Policy and Implementation Programme¹, the present four tier system: primary, secondary, college and university will be replaced by a three tier system of elementary (I-VIII), secondary (IX-XII) and university education in a phased manner. In the first phase, classes IX and X will be added to Intermediate Colleges and XI and XII will be added to selected high schools. The degree colleges will be gradually converted from current 2 years to 4 years B.A/B.Sc.

¹ Government of Pakistan, Ministry of Education, Islamabad 1979.

degree colleges. The students admitted to IX class will complete their secondary education in 4 years (i.e. up to the current XII class) and then these students will complete their B.A./B.Sc. in another 4 years.

To make the prevailing education pattern consistent with the proposed three-tier education system, the Directorate of Education, Punjab has to prepare a comprehensive action plan relating to reshuffling and adjustment in the education levels of various institutions. Private sector can also be directed to take immediate steps in this regard and forced to comply with the proposed education system. However, for the purpose of master plan, the educational facilities are estimated on the basis of the prevailing four-tier education system as its conversion to three-tier system may take another 20 years or more.

22.1.2 Targets and Standards

It would be desirable to develop schools, colleges, etc. that are pragmatically distributed and reasonably accessible from various residential localities, and that impart good education as well as knowledge and skills that are suited for gainful employment and match the manpower requirements of the local and regional economy. A severe paucity of resources prevents the realization of such a lofty aim. Even if schooling opportunities were available for all children in this age group, it is quite possible that many children would yet not be enrolled due to the all-too-obvious socio-economic reasons. It is perhaps because of these/similar reasons that the various Five Year Plans as well as earlier Master Plans for Lahore, Karachi, have worked with conservative targets.

One of the most important national goals is universal literacy. The provision of primary education to all children in this age group is considered to be the most effective means of achieving this goal.

The Integrated Master Plan for Lahore would aim at providing a gradually increasing level of educational opportunity in subsequent plan periods. Apart from a shortage of resources, the lack of adequate space in existing built-up areas limits the construction of more schools. As population increases, some of the burden of additional requirements will have to be met by schools in adjacent (newly) planned communities and by resorting to double-shifts, and other non-conventional measures. The aim is to increase the throughput of existing facilities.

Though 100% enrolment at primary level is a desirable goal, many constraints and considerations preclude its realization. The targets set by some earlier Five-Year Plans and city Master Plans could not be achievable due to various factors. The recommendations and targets of some of these plans/planning agencies are summarized in Table 22.1.

TABLE - 22.1
ENROLMENT TARGETS OF SOME EARLIER PLANS AND STUDIES
(As Percentage of School Age Population)

(A)	8th Five Year Plan (1993-98)	Boys	Girls
	Primary (I-V):	95.5%	81.6 %
	Secondary (VI-X)	54.5%	30.2 %
(B)	Comprehensive Study on Transportation System in Lahore (JICA, 1991)		
	Year	1990	2000
		2010	
	Primary (%)	86	93
	Middle/High(%)	58	59
		61	
(C)	Karachi Master Plan 2000 (MP & ECD, KDA, 1991)		
	Primary (I-V)	100%	
	Middle and Secondary (VI-X)	90%	
	Tertiary (XI-XIV)	20%	
	University	5%	
(D)	National Reference Manual on Planning and Infrastructure Standards (NRM) (Ministry of Housing and Works, Islamabad, 1986)		
		Boys (%)	Girls (%)
	Primary (I-V)	100	100
	Middle (VI-VIII)	90	60
	Secondary (IX-X)	61	48

College: Based upon data of 1984-85, the NRM recommends, for Punjab, participation rates of 9.8% and 4.7% for boys and girls for classes XI-XII and 2.8% and 1.8% for classes XIII and beyond respectively. It further recommends that, for predominantly urban areas, rates for college enrolment be doubled.

The enrolment targets are estimated on the basis of the past trends and are shown in Table-22.2 in successive five-year plan periods (FYP) for Lahore.

The proposed enrolment targets for primary school age group are based on the government policy to have "Education for all by year 2010". Secondary school enrolment is enhanced to meet the national targets. As the government's literacy drive becomes more popular, its effect on college/university enrolment is also expected to improve.

As indicated in Chapter 9, most of the educational statistics pertain to the period 1999-2000 and 2000-2001. The population and enrolment data of 1981 and 1998 from "District Census Reports" for Lahore have been used as benchmarks for developing future targets as well as requirements for each 5-year plan period.

TABLE 22.2
ENROLMENT TARGETS BY AGE GROUP AND
EDUCATION LEVEL FOR URBAN LAHORE 2001-2021

Education Level	Age Group	Student Population(%)		Per Annum Increase in Student Population (%)	Estimated Enrolment (%)				
		1981	1998		2001	2006	2011	2016	2021
Primary I-V	05-09	8.78	65.93	3.36	70	85	100	100	100
	10-14	38.60	58.48	1.17	62	64	66	68	70
Secondary VI-X	10-14	9.76	13.33	0.21	15	16	17	18	19
	15-19	22.75	32.56	0.58	37	39	41	43	45
	20-24	4.81	4.37	- 0.03	4	4	4	4	3
College Intermediate XI-XII	15-19	3.45	6.43	0.18	7	8	9	10	11
	20-24	3.16	5.56	0.14	6	7	8	9	10
College Degree XIII-XIV	15-19	0.40	1.09	0.04	1.0	1.3	1.5	1.7	2
	20-24	1.81	4.93	0.18	5	6	7	8	9
	25-29	0.43	1.60	0.07	1.8	2.2	2.6	3	3.5
University M.A/M.Sc.	20-24	0.32	1.20	0.05	1.35	1.60	1.85	2.10	2.35
	25-29	0.12	1.09	0.06	1.25	1.55	1.85	2.15	2.45
Vocational (Certificate/ Diploma)	15-19	0.11	0.06	- 0.003	0.05	0.04	0.03	0.02	0.01
	20-24	0.16	0.20	+ 0.002	0.20	0.21	0.22	0.23	0.24
	25-29	0.05	0.09	+ 0.002	0.09	0.10	0.11	0.12	0.13

22.1.3 Facility Size and Hierarchy

The standards for the size and area of various education institutions are drawn out in the light of the guidelines given in the NRM². Appropriate adjustment in the area has been made keeping in view the scarce land and financial resources. A comparison of existing area per education institution with that of proposed, as specified in various documents and by various authorities, is presented in Table 22.3 while the proposed capacity by type of institutions is highlighted in Table 22.4.

22.1.4 Future Requirements

22.1.4.1 Primary Schools

Based on the current students-school ratio and the estimated student population, the number of existing schools are worked out as 3,991. Among these 645 are registered primary schools in which only 17% of the total student population have been enrolled. The remaining 83% of the students of primary level are expected to be attending the un-registered, schools or informal home based tuition and coaching centres. As these schools/ centres are substandard entities with small spaces and little education and related facilities, dependency on these is proposed to be reduced to 50% by the end of the plan period. This may be done through

² NRM based its recommendations for preliminary planning on variables like size of supporting population, access, threshold capacity of a standard institution, urban density, pressure on urban land.

strict but viable policy measures for the private sector, for example increasing the provision of new schools by the public sector; enhancing the intake capacity of existing primary schools, and; where possible, arranging double shift in registered schools.

To determine the incremental demand, the intake capacity (average number of students per school) of registered schools is proposed to be enhanced to 300 students per school from the existing 246 students per school. The incremental demand with five-year intervals is presented in Table 22.5.

TABLE-22.3
ANALYSIS OF ALLOCATIONAL STANDARDS FOR
EDUCATIONAL INSTITUTIONS

SOURCE	STANDARDS (AREA IN HECTARE)				
	Primary	High	College	Vocational Institutions	Polytechnics
Lahore Master Plan, 1966	2.33	6.88	8.09	-	-
NRM	0.61 to 1.01	1.52 to 2.12	3.04 to 7.08	3.04 to 5.06	3.04 to 5.06
Education Department ³ Government of Punjab	0.08	0.67	-	-	-
Existing Situation	0.05 to 0.11	0.17 to 0.37	-	-	-
Recommended	0.20 to 0.40	0.61 to 1.21	2.43 to 4.86	2.43 to 4.86	2.43 to 6.07

TABLE-22.4
TYPE AND PROPOSED CAPACITY FOR VARIOUS
EDUCATIONAL INSTITUTIONS

SR.NO.	TYPE OF INSTITUTION	CAPACITY (No. of Students)
1.	Primary School (2 Sections per class & 30 students/ section)	300 *
2.	Secondary School (2 Sections per class & 50 students/ section)	500 *
3.	College (XI - XIV) (4 to 5 Sections per level 60 students/ section)	1, 200 *
4.	Vocational, Commercial, Technical Training Institute	450 **
5.	Polytechnic Institute	250 **
6.	University	10,000 **

* Proposed in the light of the existing intake capacity.

** As recommended by NRM.

22.1.4.2 Secondary Schools

In the light of the enrolment targets, the secondary schools (middle and high) have been assessed to be 936 in the year 2001; whereas the existing schools are 933, showing a backlog of only 3 schools. To cope with the incremental demand, another 876 schools would be required in the plan period (Table 22.5). Presently, the contribution of private (registered) organizations towards making provision of secondary

³ The Department requires minimum area from the community free of cost to develop primary and high schools.

TABLE - 22.5
PROPOSED ADDITIONAL EDUCATIONAL FACILITIES
FOR URBAN LAHORE, 2001 - 2021

Years	Primary Schools ¹			Secondary Schools			Colleges				
	Estimated Student Population	Number of Schools Required		Estimated Student Population	Number of Schools Required		Estimated Student Population	Number of Colleges Required		Area Required For Additional Colleges (Ha)	
		Additional ⁵	Total		Additional ⁶	Total		Additional ⁷	Total		
2001	981,800	-	3,991	385,398	3	936	2	128,296	38	112	92
2001-06	1,258,986	924	4,915	476,113	181	1,117	110	178,168	42	154	102
2006-11	1,575,391	1,055	5,970	581,125	210	1,327	128	239,915	51	205	124
2011-16	1,778,063	676	6,646	700,868	239	1,566	146	314,800	62	267	151
2016-21	1,987,567	698	7,344	823,923	246	1,812	150	405,939	76	343	185
Total 2001 - 21⁸		3,353	-	-	879	-	536		269		654

¹ The average number of students per registered primary school is 246. Based on this, the number of primary schools, in 2001, would have been 3,991. The registered schools, according to the records, are 645 enrolling about 17% of the total student population of primary level. The remaining 83% of the student population is assumed to be enrolled in 3,346 un-registered private schools.

² Additional requirements (for primary schools) are estimated on the basis of an enhanced intake average of 300 students per school.

³ The average number of students per secondary school, at present, is 411. Based on this average, there is a shortage of 3 secondary schools. Additional requirements are estimated on the basis of an enhanced intake average of 500 students per secondary school.

⁴ The average number of students per college is 1,142. Based on this average, there is a backlog of 38 colleges. Additional requirements are estimated on the basis of an enhanced intake average of 1,200 students per college.

⁸ For future requirements of primary schools, secondary schools and colleges, 30% are proposed to be financed by the public sector and 70% by private sector.

schools is substantial (about 55%) which, in the light of one of the objectives of the Eighth Five Year Plan⁸, would increase to 60% by the end of the plan period.

22.1.4.3 Colleges

At present there are 74 intermediate and degree colleges in Lahore while the need, as determined, is of 112; indicating a shortage of 38 colleges altogether. The shortage is proposed to be met jointly by the public and private sectors in the proportion of 1:2 respectively by the end of the mid plan period. The same ratio may also be followed to meet the incremental demand of 231 colleges during the period 2001-21.

22.1.4.4 Technical, Commercial Training and Vocational Institutes

During the period 1994-95 to 1999-2000, the enrolment in the existing institutes has declined, no provision of any new Government polytechnic or vocational institute has been made in the plan period. For instance, in the 3 Polytechnics the enrolment in 1994-95 was 2,870, which in 1999-2000 had decreased to 2,592. Similarly in the vocational institutes, the enrolment in 1994-95 was 1,698, which in 1999-2000 had become 1,186 despite an increase in the number of institutes from 18 to 20.

The number of commercial training institutes remained the same (i.e. 13) in the above said period but their enrolment had increased from 2,004 in 1994-95 to 2,457 in 1999-2000. Considering the average number of students per institute (which at present is quite low i.e. 189), it is suggested that each of the commercial training institutes should enroll at least 450 trainees-a minimum intake standard recommended by NRM.

22.1.4.5 University Level Education

The population of students of M.A/ M.Sc and higher level would increase from 8,700 in 1998 to about 48,500 in 2021. That means 4 more universities each enrolling an average of 10,000 students would be required by the end of the plan period.

Three of the degree colleges namely Government College, Lahore College for Women and Kennaired College have already been made autonomous and given accreditation powers. The former two colleges have already been granted the status of (private) universities.

At least one more university, by the public sector, may be established in Lahore almost at par to the existing Quaide-Azam Campus. This university, in addition to the common fields of education at Master,

⁸ Broadening of the resource base for financing of education through increased allocation and encouraging private sector's participation in provision of educational facilities at all levels (page 300).

M.Phil and Ph.D. levels, may offer advance courses of international standard in the fields of science and technology including computer sciences. As sufficient land is available within the Quaide-Azam Campus, during the plan period, the proposed university can be accommodated within the same compound. As the city expands south of Hudiarra Drain, large areas have been reserved for such educational uses.

22.1.5 Distribution of Educational Institutions

The union council is the smallest administrative unit under the new local government system, comprising of, on the average, a population of about 40,000. Depending upon the proportion of student population in each union council, Table 22.6 shows the envisaged distribution for primary and secondary schools.

**TABLE 22.6
THRESHOLD POPULATION FOR SCHOOLS**

Level of Education	Proportion of Student Population *(%)		No. of Schools		Threshold Population per Institution	
	2001	2021	2001	2021	2001	2021
Primary ¹ (I – V)	17.00	20.00	22-33	26-27	1,800	1,500
Secondary ² (VI – X)	6.67	8.29	5-6	6-7	6,700	5,700
College ³ (XI – XIV)	2.22	4.09	0-1	1-2	78,000	29,000

* As percentage of total population.

1. Two sections per class, each section would comprise of 30 students.
2. Two sections per class, each section would comprise of 50 students.
3. 4 to 5 sections per level, each section would comprise of 60 students.

22.1.6 Conclusions and Recommendations

- 1) This section of the report has attempted to identify a preliminary figure of the number of educational facilities and approximate land area required based upon certain standards and criteria.
- 2) All attempts should be made to reserve and preserve the required land for educational purposes in all the zones of the metropolitan area to be opened up and developed for future growth of Lahore.
- 3) Reservation and development of land (and facilities) alone will not ensure an improvement in enrolled student population and the quality of education. Coordinated efforts by agencies, private and public, concerned with education will have to be made to reduce/eliminate all other problems (some of which have been identified in the Report on Existing Situation) and overcome qualitative, quantitative, managerial and operational deficiencies.
- 4) Innovative and non-conventional measures are required for meeting present deficiencies and future needs of educational facilities in localities where urban land is at a premium.

- 5) In order to enhance the intake capacity, the physical conditions of Government primary and secondary level institutions must be improved. The institutions having no building or having structurally dangerous buildings must be provided with new building as per requirements. The institutions with inadequate buildings must be extended. The institutions requiring repairs must be maintained as per requisite standards. The institutions deficient in ancillary facilities must be equipped with such facilities.
- 6) A flexible and adaptive approach needs to be adopted so that resource shortages (monetary, human, skills) can be surmounted. Maximum use has to be made of existing and proposed buildings, etc. through innovative timetables, double-shifts etc. so that the maximum number of students can be enrolled.

A multiple shift system in secondary and higher institutes may have to be implemented for quite some time. Costs of buildings, furniture and fixtures may thus be saved to some extent. Nevertheless, land for the required number of facilities must be reserved in new settlements and safeguarded from encroachment/other uses.

- 7) Both the public and the private sectors need to be involved. The imbalance in quality and quantity of facilities between the "have" and "have-nots" needs to be reduced.
- 8) The socio-economic and technological levels prevailing in the society largely determine the type and number of professional and vocational institutes. Economic development can, however, be fueled/catalyzed by initiating programmes that train people in new skills, which are required by new technologies and industry. Relevant skills and size of manpower can be identified in coordination with regional/local businesses and manufacturing houses.
- 9) Seats of higher learning and professional education attract a lot of scholars from areas beyond the metropolitan boundaries. This has been one of Lahore's traditional roles. Due consideration should be given to this factor in allocating land and resources and location of these facilities in the master plan of the metropolis.

22.2 HEALTH FACILITIES

There are great deficiencies in both the preventive and curative health care services of Lahore. The city suffers from severe quantitative shortcomings, as indicated by such obvious indices as numbers of beds and doctors, etc., as well as qualitative deficiencies. Many of the most needy cannot afford the medical services and care they require.

Sanitation and a substantial portion of preventive health services for Lahore may have to be provided by the public sector. At the very least, planning, management and administrative responsibilities will best be borne by the public agencies/local government. Some of these services may be usefully combined with the lowest unit of curative health services.

22.2.1 Targets and Standards

The frequency of occurrence of various diseases, environmental pollution and poor diet of our population requires that our medical services should be better. This unfortunately is not so. Substantial improvement is required in both curative and preventive health facilities.

Existing facilities are being provided by both the public and private sectors. Some of the health institutions in Lahore are being run by autonomous agencies. The costs of good medical services are beyond the means of majority of the population.

National plans have sought to provide 5 hospital beds per thousand population. Resource constraints have prevented this target from being achieved. Various urban master planning studies have attempted more conservative targets. The year 2000 Master Plan for Karachi, for example, adopted 2 beds per thousand persons as its goal.

The number of beds in various health institutions in Lahore is 14,307. This gives a ratio of about 2.48 beds per thousand population in the year 2001. Table-22.7 shows a summary of some relevant standards recommended/used in other studies/plans.

TABLE-22.7
HOSPITAL BEDS PER 1000 POPULATION
(RECOMMENDED IN VARIOUS MASTER PLANS AND STUDIES)

	REFERENCE	RECOMMENDATION
A)	National Long Term Target	5 beds per 1000 population
B)	Eighth Five Year Plan	0.63 beds per 1000 population in 1993 and 0.69 beds per 1000 population in 1998
C)	Master Plan for Greater Lahore, 1966	5.67 beds per 1000 population
D)	National Reference Manual, 1986	2 beds per 1000 population (Medium Term National Target, year 2003)
E)	Karachi Master Plan, 2000	2 beds per 1000 population

To bridge some gap between the existing situation and the Long term National Targets, a gradual increase in the beds-population ratio is proposed (refer Section 22.2.3).

22.2.2 Hierarchy and Contents of Facilities

Not all patients need the same type of treatment. Simple but timely medical attention is often adequate for routine disorders of the body.

Specialized and sophisticated treatment and facilities should be concentrated at a higher level in relation to a threshold and size of population served. A sound combination of preventive and curative health service can thus be associated with each level of facility. Scarce resources are thus optimally utilized and a suitable range of services is placed within convenient access of the population served. Four levels⁹ of facilities are proposed:

- i) **Primary Health Centre¹⁰:** These will look after elementary health and dietary education of all sections of society, mother & child health, family planning, immunization, malaria eradication and diarrhea control, and coordinate area sanitation. Simple curative services will be provided. These will be staffed by one/two doctors, dispenser-compounder, a few nurses, LHV, a social worker, etc. Though basically an out-patient facility, these will have 2 to 4 beds for short stay of patients needing observation, controlled administration of drugs, drips etc.
- ii) **Community Hospital/Polyclinic:** This facility will have 20 to 50 beds for medical, surgical and maternity purposes. It will have a number of doctors and a dentist as well. A suitable number of para-medical staff will be available. It will have a laboratory and radiology facilities.
- iii) **General Hospital:** The general hospital will also have a number of specialists in addition to general practitioners. It will have comprehensive laboratory and radiology facilities. Its 250 to 350 beds will provide in-patient care in medicine, general surgery, orthopedics, eye, ENT, gynae-obstetrics, etc.
- iv) **Specialist Hospital/Par Excellence Facility/Teaching Hospital:** This facility may have up to a thousand beds and all specialities. It will be well equipped and staffed. Any one (or more) of such hospitals may also be planned as a teaching hospital.

Table 22.8 summarizes the hierarchy, content/capacity, and service population of these health care facilities for each five year plan period (FYP). As there is a functional interdependence between various levels of facilities, there is an almost constant relationship between the number of hospitals of a particular level and the next higher (or lower) level facility. Each facility has an optimal size/bed capacity below (or above) which its resources are improperly utilized.

⁹ These levels are devised in the light of the hierarchy and service population recommended by Karachi Development Plan, 2000.

¹⁰ Primary health centre represents dispensary and maternity & child health centre.

22.2.3 Future Requirements

In view of the rationale described in earlier sections and the proposed health facilities (Tables 22.9 and 22.10), a gradual increase in beds per 1000 population is required. It culminates at 3.50 beds per 1000 persons during the last five years of the plan period (Table 22.11).

To achieve the planned target of 3.50 beds per 1000 persons by the year 2021, immediate steps are required to equip the existing dispensaries, maternity and child health centres, private hospitals and government (general) hospitals with the required number of beds as specified in Table 22.11. This deficiency is suggested to be met during the first two FYP periods i.e. by the year 2011.

The incremental demand in terms of number of facilities and hospital beds, has been determined on the basis of the recommended service population (as described in Table 22.8) and presented with five years interval in Tables 22.9 and 22.10. According to the statistics given in these tables, 497 primary health centres, with bed strength of 1491, are required by the end of the plan period. That means each union council of City District Lahore would have two primary health centres (one dispensary and one maternity & child health centre).

To make the distribution of health facilities more equitable, middle order health facilities in terms of polyclinics are proposed. A total number of 198 polyclinics are required by the year 2021. That means each town of City District Lahore would be equipped with about 33 polyclinics.

The requirements of higher order health facilities¹¹ such as general and specialist hospitals are also determined and presented in Table 22.9. A total of 50 general hospitals, at least 8 for each town of City District Lahore, would be required by the end of the plan period; whereas the number of specialist/teaching hospitals are proposed to be increased from their existing strength of 10 in 2001 to 15 by the year 2021.

Among the 5 proposed specialist hospitals, it is suggested that 2 of the existing hospitals should be upgraded through provision of additional beds and requisite medical facilities. These hospitals include Shalimar Hospital along Shalimar Link Road and Nawaz Sharif Social Security Hospital along Multan Road. Among the three new specialist hospitals, one each is proposed south of Sabzazar Housing Scheme, one along Raiwind Road and the third between Ferozepur Road and railway line in the west of the proposed high density housing area.

¹¹ The higher order facilities would be shared equally by the private and public sectors, whereas in case of polyclinics the private share is assumed to be 70%.

A total of 21 new general hospitals are proposed including the two to be upgraded. Out of these 13 is to serve the Southern Corridor while the remaining 8 are in the existing built up areas. The provision of lower order health facilities is being taken care of in the proposed housing schemes in the Southern Corridor and land sub-divisions/infilling in the existing built up areas.

TABLE 22.8
HEALTH CARE FACILITIES BY HIERARCHY,
CAPACITY AND SERVICE POPULATION

YEAR/ PERIOD	SERVICE POPULATION PER:			
	Primary Health Centre* (2-4 beds)	Polyclinic (20-50 beds)	General Hospital (250-350 beds)	Specialist/Teaching Hospital (400-1000 beds)
2001	55,000	69,000	186,000	577,000
2001-2006	45,000	65,000	188,000	581,000
2006-2011	35,000	60,000	191,000	585,000
2011-2016	25,000	55,000	195,000	592,000
2016-2021	20,000	50,000	200,000	600,000

* Includes dispensary and maternity & child health centre.

TABLE: 22.9
NO. OF HEALTH CARE FACILITIES REQUIRED (2001-2021)
(CUMULATIVE)

Year	Primary Health Centres (2-4 Beds)	Polyclinics (20-50 Beds)	General Hospitals (250-350 Beds)	Specialist/Teaching Hospitals (500-1000 Beds)
2001(existing)	105	84	31	10
2001-2006	149	103	34	10
2006-2011	220	129	40	11
2011-2016	352	160	45	13
2016-2021	497	198	50	15

TABLE: 22.10
NUMBER OF BEDS¹² REQUIRED (2001-2021)
(CUMULATIVE)

Year	Primary Health	Polyclinics	General Hospitals	Specialist/ Teaching	Total Beds Required
2001 (existing)	0	1583	3957	8767	14307
2001-2006	447 ¹³	4120	5780	8000	18347
2006-2011	880	5805	7200	9350	23235
2011-2016	1408	7200	8550	11050	28208
2016-2021	1988	9900	9500	13500	34888

¹² The number of beds required in the initial five years has been calculated on the basis of average number of beds in each facility (refer Table 22.9). In subsequent five year periods, the number of beds per facility have been gradually increased, but is kept within the upper limit proposed.

¹³ The proposed number of beds in all the health facilities include the additional beds required/proposed in existing health facilities, as calculated in Annex to Chapter-22.

**TABLE: 22.11
HOSPITAL BEDS - POPULATION RELATIONSHIP (2001-2021)**

Year	Population	Population ('000')	Number of Beds (Cumulative) ¹⁴	Required Standard (beds per 1000 population)	
				Calculated ¹⁵	Rounded
2001	5,774,886	5,775	14,307	2.48	2.48
2006	6,706,402	6,706	18,347	2.74	2.75
2011	7,717,361	7,717	23,235	3.01	3.00
2016	8,798,459	8,798	28,208	3.21	3.25
2021	9,936,841	9,937	34,888	3.51	3.50

22.2.4 Land Required For Health Care Facilities

The range of covered area required for various functions varies substantially and is reflective of the functional requirements and method of delivery of a particular health service, level of technology, socio-economic conditions and life style/habits of users, climate, etc. The site area required for accommodating one such functional unit also varies widely. There may be examples of efficient and usable hospitals that are built on whatever small area was available to the sponsoring agency. The dictates of flexibility, adaptability, expansion, addition of new services, local climate and customs, abundance or scarcity of urban land, etc. need to be considered in developing criteria for allocation of land for BHU, hospital, etc.

The standards given in the NRM are being adapted for the Lahore Master Plan in the light of standards used for similar services in the Karachi Master Plan for 2000. Because urban land is a costly commodity and in short supplies, it is appropriate to reduce the land allocation cited in NRM by taking into account a nominal component of multi-storey design. The area requirements are summarized in Table-22.12.

In order to ensure provision/availability of health facilities for the lower income groups, keeping in view their affordability, it is recommended that total provision of Primary Health Centres and 50% provision of Polyclinics and General Hospitals should be undertaken by the public sector.

¹⁴ Refer Table 22.10

¹⁵ Number of required beds divided by population in thousands.

TABLE-22.12
LAND REQUIRED FOR HEALTH FACILITIES DURING
FYP 2001-2006 TO 2016-2021

FYP	Description	Primary Health Centre (@ 0.25 ha.)	Polyclinic (@ 1 ha. Each)	General Hospital (@ 3.5 ha.)	Specialist Hospital (@ 20 ha. each)	Total Area (ha) Required during FYP
2001-2006	Numbers land required	44 11.00	19 19	3 10.5	- -	40.50
2006-2011	Numbers land required	71 17.75	26 26	6 21.0	1 20	84.75
2011-2016	Numbers land required	132 33.00	31 31	5 17.5	2 40	121.50
2016-2021	Numbers land required	145 36.25	38 38	5 17.5	2 40	131.75
Total 2001-2021)	Numbers land required	392 98.00	114 114.00	19 66.5	5 100.00	- 378.50

Source/reference: "Karachi Master Plan 2000," "National Reference Manual", "Master Plan for Greater Lahore 1966" and other relevant sources.

22.2.5 Conclusions and Recommendations

- 1) The concerned authorities, the city administration and the entrepreneurs in the private sector who are engaged in delivering health care should coordinate their activities and develop a comprehensive programme that addresses resource shortages and the objectives of affordable, accessible and effective preventive and curative health care.
- 2) Adequate number of health care workers should be trained and deployed, specially at the lower level facilities.
- 3) Land reservations must be made well in advance and land so allocated must be conserved and prevented from being misused. Land set aside for social needs has a tendency of being misappropriated in our society. Sites reserved for these facilities need to be constantly monitored to prevent encroachment and usurpation.
- 4) Deficiencies of health facilities in existing residential areas, specially high-density areas, cannot be easily met by construction of new facilities. Other innovative solutions (including expansion/addition at sites that have suitable vacant space) need to be explored and developed for such areas that are short of land.
- 5) Where feasible, new facilities in new zones of the city (suitably modified/ enhanced) may partially fulfil the needs of adjoining localities that are short of land or where expansion and new construction cannot be undertaken for other reasons.

- 6) Existing hospital buildings, etc. (specially those in high density localities) that are dilapidated or have completed their useful life should be pulled down and replaced with buildings that have been designed to more economical space standards. This measure will enhance the efforts at reducing deficiencies/backlog in built-up areas that are short of open land.
- 7) Research into procedures, etc. needs to be undertaken so that the number of bed-days per patient are reduced. This, and other measures oriented towards improving efficiency/effectiveness, will increase the throughput per facility. It will thus be possible, to an extent, to reduce existing deficiencies and backlog with no (or minimum) new construction being required in built-up areas.

22.3 RECREATIONAL FACILITIES

Various types of recreational facilities available to the metropolitan population have been described in Volume-I of this Report. These are broadly grouped into:

- Out-door spaces,
- Venues providing contact with nature,
- Organised sports,
- Entertainment and cultural activities,
- Historical sites,
- Libraries and museums.

These groups are not mutually exclusive. It is recommended that in future private sector should be encouraged in providing recreational facilities. During the first five years 80% of the cost involved is proposed to be borne by the private sector for provision of such facilities.

The need, availability and utilization of recreational facilities present a complex relationship of socio-economic conditions, and habits and attitudes towards recreation specific to a society. These needs are generally not expressed as directly as, for example, needs of food, health services, etc. Nevertheless, though these are subtle needs, gross neglect or in-adequacy of required facilities has numerous negative influences on the society.

With the exception of open spaces (and associated facilities), almost all other forms of recreation and entertainment have a market/commercial aspect that is linked to the degree of affluence of a society. These commercial aspects govern the availability and utilization pattern of such facilities as cinema halls, theatres, bowling alleys, etc. It can be said that affluence creates its own demands of recreation. No demand standards can thus be laid down for such forms of entertainment.

22.3.1 Cinemas, Auditoriums

Cinemas, theatres, museums, etc. are generally associated with the “down-town” or city centres. A well-defined cinema district already exists in Lahore. Expansion of population and development of new settlements will inevitably give rise to more of such needs. The rapidly developing fields of satellite and cable TV, together with other forms of audio-visual entertainment, have had an adverse effect on cinemas. Main commercial centres in proposed schemes with good linkages to all major parts of the city and parking, etc. should be reserved where, as per demand, theatres and cinemas can be developed. Very often such functions integrate well with the major shopping areas and form a multi-activity zone. If grouped around a pedestrian mall (or, a vehicle-free zone), these zones may become very attractive for users. Safe and convenient parking areas and provision of proper public transport facilities are extremely essential.

The NRM suggests 5 seats per 1000 population for cinema halls and a site area of about 6,000 sq.m for a 1000 seat cinema (including parking space). The NRM suggests a first class auditorium for a population of 0.5 million. These auditoriums may serve as theatres as well and should have about 500 seats each. A site of about 4,000 sq.m is adequate for one such auditorium.

Based on the NRM standards, 21 additional cinema houses, with a total seating capacity of about 21,000 are required to be developed in Lahore by 2021 (Table 22.13). Similarly an additional 8 auditoriums covering a total area of 3.2 hectare are proposed in the plan period.

TABLE 22.13
CINEMA HOUSES REQUIREMENTS DURING PLAN PERIOD

PERIOD (FYP)	ADDITIONAL SEATS	ADDITIONAL CINEMAS	AREA (HECTARE)
2001-2006	4,658	5	3.0
2006-2011	5,055	5	3.0
2011-2016	5,405	5	3.0
2016-2021	5,692	6	3.6
Total	20,810	21	12.6

22.3.2 Theme Parks and Nature-associated Venues of Recreation

Lahore and its outskirts have substantial potential of recreational opportunities based upon association with nature specially water. If developed, through land reservation and incentives, these resources have potentials of providing a variety of out-door recreation. Some of these, such as parks, could be developed, maintained and operated by the city administration. The concept of a nominal user charge should be introduced. Existing forest reserves (and those proposed), the river, canal,

orchards, etc. provide many such possibilities. Such zones and resources can also attract the private sector that may venture into the business of multi-activity amusement parks and theme parks.

Apart from enhancements of existing museums and the planetarium, a new science museum of natural history should be considered as a viable facility for the recreational-cum-educational needs of Lahore. The science museum is proposed to be located in close vicinity or within Quaide-Azam Campus.

22.3.3 Open Spaces

Planned and incidental open spaces provide opportunities for active and passive outdoor recreation. Incidental open spaces, depending upon size and location, provide relief in what may become pavement and buildings *ad infinitum*. These spaces are the “lungs” of the city. Incidental open spaces are quite often the only open space that satisfy the needs of informal play, etc. in congested, old parts of the city.

22.3.3.1 Targets and Standards

The present ratio of 0.42 hectare of planned open spaces per 1000 population has been achieved through extra-ordinary efforts, made by the local planning authorities over the last 20 years. This ratio closely corresponds to the minimum level of 0.485 hectare per 1000 population as proposed in the NRM. Keeping in view the financial and physical resource constraints, a ratio of 0.50 hectare per 1000 population is being recommended to be attained by the end of the plan period. Based on the above mentioned target, the total additional land area required to be developed as open spaces for both active and passive recreation is presented in Table 22.14

TABLE 22.14
LAND REQUIREMENTS FOR OPEN SPACES 2001–2021

Period (FYP)	Proposed Ratio (ha per 1000 persons)	Population	Total Land Required (ha)	Additional Land Required (ha)
2001 – 2006	0.43	6,706,402	2,850	600
2006 – 2011	0.45	7,717,361	3,480	630
2011 – 2016	0.47	8,798,459	4,130	650
2016 – 2021	0.50	9,936,841	4,950	820

22.3.3.2 Distribution of Open Spaces

(a) Active Recreation

One of the most frequent and important uses of open spaces comprises formal and informal outdoor and indoor games.

i) Stadium Complex

In addition to the existing facilities, a new Stadium Complex having an area of 100 ha comprising grounds for cricket, hockey, track and field events, and gymnasium, etc. is proposed across Defence Road south of Hudiara Drain, on the eastern side of UBD Canal. This would be a modern facility with all provisions of seating, public facilities, parking etc. If planned as a single facility, the seating capacity would be 20,000 to 25,000 persons.

ii) City Play Ground/Club

A city level play ground complex cum club comprising of an area of about 50 hectares is proposed for the residents residing in the North-east Lahore. If a sufficiently large space can be reserved, a gymnasium-cum-indoor sports centre can be added later. This complex may be upgraded to a stadium at a later stage.

iii) Community Playgrounds

A combined play field of approximately 2 ha for cricket, hockey, etc. suffices for about 100,000 population. If safety, security and management can be ensured, simple toilet and changing facilities would be provided. By the end of the plan period, 50 community play grounds, covering an area of about 100 ha are required.

iv) Neighbourhood Playgrounds

A combined field of about 1.5 ha for hockey, cricket, etc. basically for teenagers of the locality is allocated for every 25,000 persons. A total number of 200 play grounds covering an area of 300 ha are required during the plan period.

(b) Passive Recreation

The importance of well-distributed and accessible open spaces closer to residential areas is increasing. The following three categories of major parks are proposed within LMA:

i) Regional Park

To cater for the recreational needs of the city and its catchment area, the existing forest reserve, located north of Rana Town near the junction of G. T. Road and Motorway Link Road, is recommended to be developed as a regional park. Covering an area of 300 ha, the

park would comprise of zoological and botanical gardens, a small outdoor theatre, picnic sheds and restaurants etc.

ii) Riverside Amusement Parks

Three riverside parks are proposed to exploit river's recreational potential and introduce boating, fishing and water game facilities. These parks are planned to be evenly distributed to facilitate the residents of all the towns in the city district. One of these parks, having an area of about 250 ha, is located across the Northern Bund on both sides of the river; while the other two are located across the Western Bund; one (about 150 ha) adjacent to Sabzazar Housing Scheme, and the other (about 300 ha) near Chung Village.

iii) Town Parks

The existing Lahore Park, in the south of Hudiana Drain may be developed/extended to cater for the needs of the growing Southern Lahore. Additions covering an area of 100 ha, including a zoo and botanical gardens are proposed to be developed adjacent to Lahore Park. Another town park measuring about 50 ha is proposed North-east of Lahore for passive recreation. This would include wide range of amusement facilities, fountains, artificial lake, landscaping, etc.

Table 22.15 shows guidelines for allocation/provision of spaces for passive recreation.

TABLE-22.15
PASSIVE RECREATION STANDARDS AND PLAN PERIOD REQUIREMENTS

Sr. No.	TYPE	DESCRIPTION	ALLOCATION CRITERIA (POP)	TOTAL AREA (HA)	TOTAL NO. OF PARKS/ AND AREA (HA)
1.	Regional Park	Zoological and botanical gardens, a small outdoor theatre, picnic sheds restaurants, etc.	More than 2 million	250-300	1 No. 300 ha
2.	Riverside Park	Boating, fishing, water games, etc.	1-2 million	150-300	3 Nos. 700 ha
3.	Town Park	Wide range of amusement facilities, fountains, lakes, landscaping etc.	500,000-1,000,000	50-100	2 Nos. 150 ha
4.	Neighborhood Park	Wide range of child play fixtures, walking and jogging paths.	25,000	2.5	200 Nos. 500 ha
5.	Mohalla Park	Tot-lots with slides, swings, seesaws, other spaces with some turfing	6,250	1.0	500 Nos. 500 ha

23.0 INFRASTRUCTURE DEVELOPMENT

23.1 WATER SUPPLY

23.1.1 General

Study of the existing water supply services gives an impression that provision of water supply to Lahore is an easy proposition as sweet water is available in the aquifer and tubewells can be installed whenever and wherever these are needed to abstract water. So far WASA has succeeded to serve 70% of the population. There is a big question mark whether this situation will continue as such. There will, definitely, be a limit on abstraction of ground water. The presence of brackish water towards South and South Western side beyond Hudiarra Drain, warrants to think about it and necessary remedial steps need to be taken while planning for the future.

In spite of the fact that WASA is supplying 290 mgd water to 431,336 consumers at the rate of 94.69 gpcd, yet there are complaints of low pressure during peak hours of summer season. Public, occasionally, complains of contamination in water, as well.

23.1.2 Population Projections

Population in each of WASA subdivision is estimated by including the population of the particular Metropolitan Corporation zones lying in that subdivision. Population figures of each subdivision for the years, 1998, 2001, 2006, 2011, 2016, 2021 have been calculated as shown in Table 23.1 and used for future planning in WASA service area. Population projections in Cantonment area are also shown in Table 23.2.

23.1.3 Per Capita Water Consumption

According to WASA records, per capita water consumption varies from 227 to 454 liters per day (lpcd) which is equivalent to 50 to 100 gallons per capita per day (gpcd) and accordingly the water supply network is designed for average figure of 363 lpcd or 80 gpcd. These calculations of per capita consumption of water per day, have been based on consumption of water through existing domestic meters, which is questionable particularly when direct pumping is done in the presence of air in the water network. The consumers having metered connections generally complain about the higher billing charges. The figure of 363 lpcd is on the higher side as compared to the figures used in other Asian countries.

The substantial decline in the water table of aquifer and high pumping cost fully justifies to reconsider the average consumption figure of 363 lpcd (80 gpcd). As already worked out, WASA is pumping 290 mgd for 431,336 consumers with average household size of 7.1 persons. A

detailed study is immediately required to critically examine (i) Direct pumping system. (ii) Incomplete water distribution network. (iii) Leakages in the system. (iv) Un-metered connections. (v) Illegal connections. (vi) Excessive pumping hours. (vii) High capacity of tubewells. (viii) Billing system. (ix) Procedure of sanction of a new connection and suggest remedial measures with the following objectives:

- (i) To reduce lpcd figure
- (ii) To check decline in water table.
- (iii) To reduce pumping cost.
- (iv) To make WASA financially viable organization.

**TABLE NO. 23.1
POPULATION PROJECTION IN VARIOUS SUB - DIVISIONS OF WASA**

SUB-DIVISION	POPULATION					
	1998	2001	2006	2011	2016	2021
Growth Rate/Annum*		3.02	2.84	2.66	2.48	2.30
Shahdara	316,199	348,331	400,684	456,887	516,421	578,605
Data Nagar	170,028	187,306	215,458	245,679	277,692	311,130
Misri Shah	335,866	369,996	425,606	485,304	548,542	614,593
Baghbanpura	400,261	440,935	507,207	578,351	653,712	732,428
Ravi Road	239,890	264,267	303,986	346,625	391,792	438,969
City	160,734	177,068	203,680	232,250	262,513	294,123
Shimla Hill	166,617	183,548	211,135	240,750	272,121	304,888
Mustafa Abad	105,496	116,216	133,683	152,435	172,298	193,045
Mughalpura	509,171	560,912	645,216	735,718	831,586	931,720
Krishan Nagar	257,189	283,324	325,907	371,621	420,045	470,624
Mozang	105,032	115,705	133,095	151,764	171,540	192,196
Ichra	253,607	279,378	321,368	366,445	414,195	464,069
Samanabad	350,105	385,682	443,649	505,878	571,797	640,649
Allama Iqbal Town	264,535	291,417	335,216	382,236	432,043	484,066
Gulberg	202,450	223,023	256,543	292,527	330,644	370,458
Garden Town	146,207	161,064	185,272	211,259	238,788	267,541
Industrial Area	206,544	227,533	261,730	298,442	337,331	377,950
Township	93,347	102,833	118,288	134,880	152,456	170,813
Green Town	102,682	113,116	130,118	148,369	167,702	187,895
TOTAL	4,385,960	4,831,658	5,557,846	6,337,424	7,163,220	8,025,765

* The areas such as Walled City will contribute to the population at the above specified growth rate, but the area being saturated the population will shift to the new areas

**TABLE NO. 23.2
POPULATION PROJECTION IN CANTONMENT AREA LAHORE**

YEAR	1998	2001	2006	2011	2016	2021
Growth Rate/Annum		4.81	4.47	4.13	3.79	3.45
Population	565,751	651,379	810,572	992,364	1,195,221	1,416,123

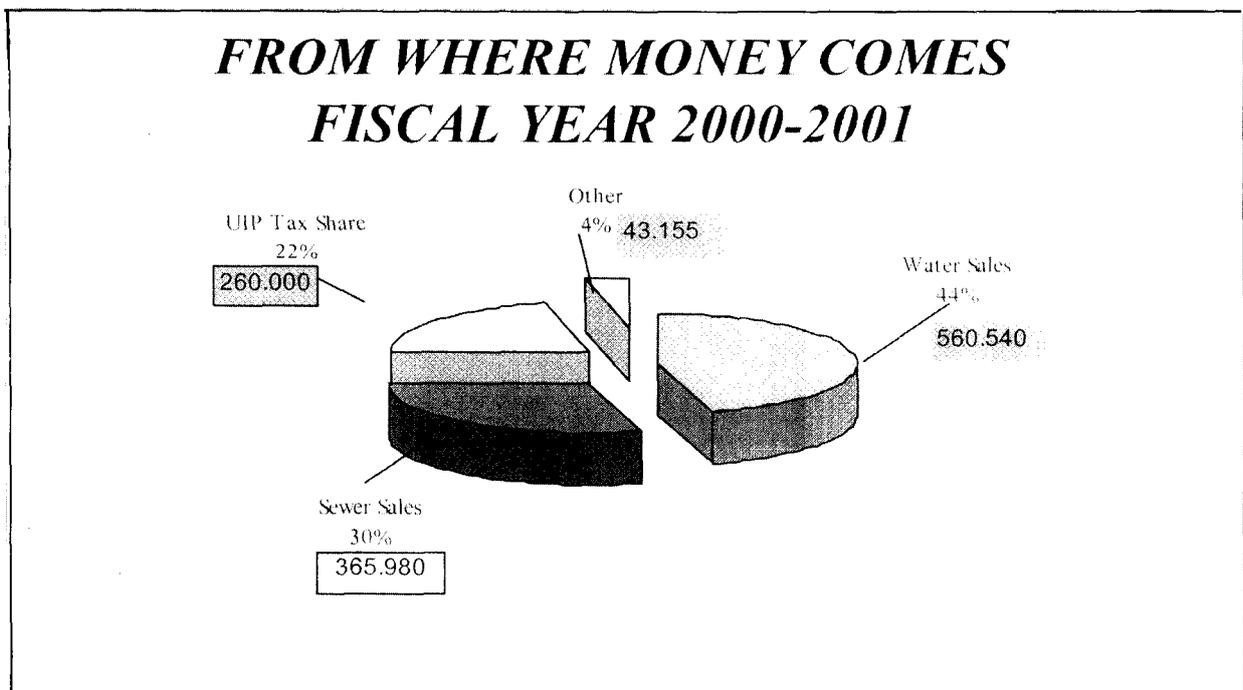
23.1.4 Financial Status of WASA

During the last three and a half decades, WASA have made an investment of Rs. 5,726 million in the form of capital expenditure on water supply, sewerage and drainage services, and in the year 2001, is under a debt of Rs. 5,316 million to be paid back (interest included).

23.1.4.1 Source of Income

During financial year 2000-2001, WASA has generated an income of Rs. 1229.675 million through sale of water, sewage, aquifer charges and share of property tax, as shown below:

	Rupees in million	%
• Water supply	560.540	44
• Sewerage & Drainage	365.980	30
• Share from Property Tax	260.000	22
• Miscellaneous	43.155	04
TOTAL	1229.675	

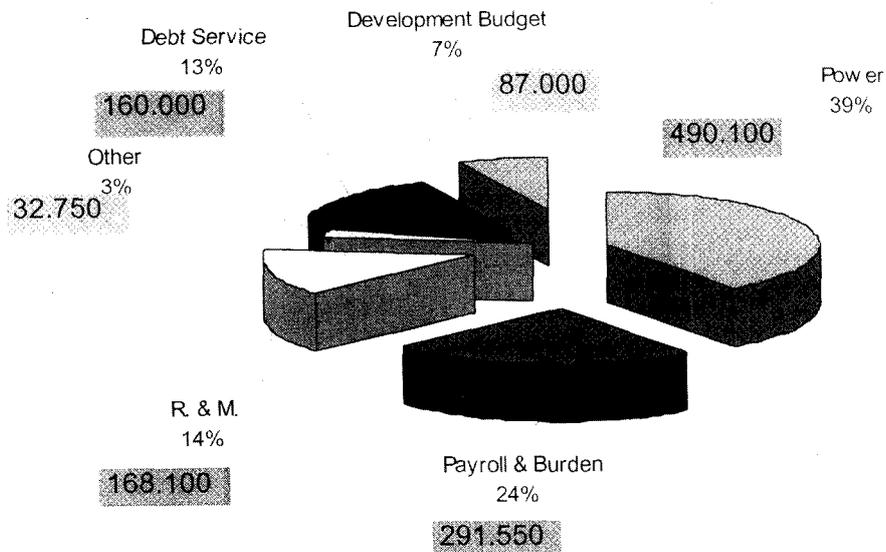


23.1.4.2 Expenditure

During 2000-2001 total operating cost was estimated at Rs. 982.50 million as detailed below:

	Rupees in Million	%
• Power	490.10	39
• Payroll & Burden	291.55	24
• Repair & Maintenance	168.10	14
• Other Expenses	32.75	03
	982.50	
• Debt Service	160.00	13
• Contribution Towards Development Budget	87.00	07
Total Operating Cost	1229.50	

WHERE THE MONEY GOES FISCAL YEAR 2000 - 2001



23.1.4.3 Production Cost

WASA is producing 290 mgd at a cost of Rs. 982.50 million per year. The production and its disposal cost per 1000 gallons works out to Rs. 9.28 against a recovery of Rs. 7.94. The deficit along with payment of debt service and expenditure on development is met out of the share from property tax.

23.1.5 Unaccounted for Water (Water Loss)

The volume of unaccounted for water is very high in the distribution system. The factors contributing to water loss are:

- (i) Direct pumping system.
- (ii) Incomplete water distribution network.
- (iii) Leakages in the system.
- (iv) Un metered connections.

- (v) Illegal connections.
- (vi) Excessive pumping hours.
- (vii) High capacity of tubewells.
- (viii) Billing system.
- (ix) Procedure of sanction of a new connection.

23.1.5.1 Un-Metered Connections

Un-metered connections are billed on the basis of Annual Rental Value (ARV) which itself is erratic and, at the same time, does not have any relation, what so ever, with the usage of water. At present WASA is pumping 290 mgd at a cost of Rs. 9.28 per 1000 gallons. Each house is being supplied 20,869 gallons per month at a cost of Rs. 193.66. Assuming that there is no other loss within the system the un-accounted for water (water loss) works out to be $(22,047,000 / 30) (1000 / 9.28) = 79.191$ mgd which is 27.30 % of the total production. The details have been worked out in the Table 23.3.

TABLE 23.3
STATEMENT OF PRODUCTION COSTS Vs RECOVERY OF REVENUES

Annual Rental Value Group	No. of Water Supply Connections	% age of Total Water Supply Connections	Water Rate / Month including Sewerage Charges	Average Expenditure on Water Production/ Month/Connection	Less (Excess) Paid by the Consumer /Month /Connection	Total Less (Excess) Paid by the Consumer/ month
Rupees	Nos.	%	Rupees	Rupees	Rupees	Rs. in million
UP TO 400	177,208	40.91	70.55	193.66	123.11	21.816
401 - 500	46,136	10.65	108.80	193.66	84.86	3.915
501 - 720	58,436	13.49	185.30	193.66	8.36	(0.488)
721 - 1000	10,860	2.50	323.00	193.66	(129.34)	(1.404)
1001 - 1500	6,824	1.57	455.60	193.66	(264.94)	(1.807)
1501 - 2388	1,933	0.44	479.40	193.66	(285.74)	(0.552)
2389 - 3061	882	0.20	510.00	193.66	(316.34)	(0.279)
3062 - 4499	386	0.09	533.00	193.66	(339.34)	(0.130)
TOTAL						22.047

23.1.5.2 Illegal Connections

Out of total houses of 630,971 that exist in WASA jurisdiction, 431,336 have legal water supply connections where as the remaining 199,635 houses have the following status:

- (i) Either use water from the public stand post or from the tap of their neighbours.
- (ii) Or use hand pump.
- (iii) Or illegal connection exists.

It is not possible to enlist the exact number of illegal connections unless a door to door survey is conducted.

23.1.5.3 Leakage

Leakage from the system is mainly from the GI pipes of service connections. 28.83 % of water connections are more than 25 years old. GI pipes have a maximum life of 25 years after which these are badly corroded and start leaking. A good percentage of the remaining connections have inferior GI pipes. Similarly old CI pipes of distribution networks were laid even before 1947 and therefore these are bound to leak. A careful estimate is that 10 to 15 % of the water produced is wasted through such leakages.

23.1.5.4 Direct Pumping/Incomplete Design of Distribution System/4-cusec Wells

All the above factors lead to an un-equal pressure in the water supply system and ultimately cause water losses in the form of either un-accounted-for water or head losses.

23.1.5.5 Supply Hours

WASA is pumping water up to 16 hours a day. Any reduction in pumping hours will substantially reduce un-accounted for wastage of water. The resultant saving on energy cost will help WASA to be a financially viable organization. Simultaneously water source depletion would also be checked.

23.1.5.6 Billing System

For intermittent supply, area based billing system is the most economical and trouble free system. Different slabs could be fixed for different plot areas. WASA has already fed plot areas in its billing computer model.

23.1.5.7 Sanction of a New Connection

There are a number of disputed properties in Lahore where at present, obtaining a new connection is rather impossible, and therefore such properties, ultimately install illegal connection. Even if, such consumers, have not been able to obtain connection, WASA is deprived of additional revenue. Cases have also been noticed where poor people cannot afford to pay Rs. 5,000 (meter cost + security etc.) at the time of getting a new connection and ultimately install illegal connection. Efforts must be made to accommodate such consumers by simplifying the procedure of providing a new water connection.

There are only 30% metered connections whereas 70 % connections are un-metered having no control on flow of water. Most of the consumers

keep their water taps open and sometimes even do not replace / repair faulty taps as they are not financially affected by wastage of water. The colossal wastage of water has severe implications on the city water supply system.

On the one hand, the water source is being depleted rapidly while on the other hand consumers are not getting water at reasonable price. The expenditure on electricity charges of WASA is on the increase. The wastage of water also generates huge quantity of sewage, which also has to be pumped again at a very high cost.

23.1.6 Overhead Reservoirs

Due to direct pumping when the tubewells are stopped at night, negative pressure develops in the pipelines which sucks the sewage and other injurious material thereby causing water quality problems. It is, therefore, imperative that overhead reservoirs should be provided and the system should be kept under pressure all the time. This would not only meet the water demand during the peak hours but also eliminate the water quality problems.

Overhead reservoirs (one million gallon capacity each) were initially proposed by Japanese Consultants in 1969 which was later on reviewed by NESPAK and it was found that at the 1986 tariff for electricity there was a saving of Rs. 43,000 per day and the saving on the energy cost over a year would have paid for an ellipsoidal welded steel tank of one million gallon capacity overhead reservoir at 80 feet height. In addition, the peak hours demand could have been met and the consumers would normally have no water shortage during the electricity breakdowns.

The economics of such tanks was demonstrated to the World Bank in 1986 Report and the Bank agreed to provide funds for two such tanks on experimental basis one in the Liberty Market and the other in Badami Bagh Area.

Five overhead tanks each 4.5 million liters (one million gallon) capacity, 24 m (80 ft.) high and 12 m (40 ft.) deep (ellipsoidal welded steel tanks) are proposed on experimental basis in the initial stage up to the year 2007. The location of other tanks has to be determined through the detailed computer modeling of water distribution system considering the available water sources, their location, pipe network, water demands etc.

23.1.7 Ground Water Quality

During the aquifer study of 1992 (by M/s NESPAK and Binnie & Partners), a survey on water quality was carried out within the metropolitan area. The survey revealed that the ground water quality is normally satisfactory in the WASA service area as this is regularly being monitored by WASA Laboratory. This ground water is free from any

pollution until it gets into the distribution network without any aforementioned balancing tanks. The distribution network is subjected to negative pressure and it sucks-in the polluted stagnant water around the leaks. The study also observed that the water quality deteriorates in South-Western areas located away from River Ravi.

A reconnaissance survey and field check on existing water points at 50 locations in the South and South Western parts of Lahore have now (March 1998) been carried out to study the area-wise and vertical distribution of chemical quality of ground water and the possible interaction among various sources of recharge and discharge.

The field data indicates that ground water quality is generally satisfactory in the area between River Ravi and Lahore-Raiwind Road whereas it deteriorates in the South-Western parts of Lahore after Hudiara Drain near Bhopattian. The investigation carried out so far indicates that the water-bearing strata with relatively fresh ground water are normally encountered at a depth of 400 ft. in the Southern parts of Lahore. Expansion of pumping field towards South should be based on systematic investigations and studies to avoid movement of saline ground water into fresh ground water aquifer.

23.1.8 Replenishment of Aquifer

It is definitely a blessing that the aquifer is sustaining such a large abstraction of water through tubewells. Definite source of replenishment of water aquifer is a mystery. Artificial replenishment through any method would hardly create any positive effect on the aquifer. However, in future the aquifer could create serious problems if abstraction of water is not planned and controlled. It is now high time that water budgeting must be done by:

- (i) Use of surface treated water.
- (ii) Reduction in pumping hours.
- (iii) Controlling population of Lahore City.
- (iv) Reduction in per capita supply.

23.1.9 Ground Water Abstraction

WASA, in the year 2001, is producing an average of 290 mgd of water to the citizen in its service area from 316 tubewells of different capacities, installed at a depth varying from 150m to 180m. Water demand would increase to 499 mgd by the year 2006, 639 mgd by 2011, 789 mgd by 2016 and 964 mgd by 2021.

23.1.9.1 Future Tubewell Requirements

The existing water distribution of WASA is linked with 79.5 km main grid of 12"-30" diameter. The tubewells in operation in a particular sub-division do not mean that the tubewells are serving the population of that particular sub-division. The Main Grid is interconnected and is meant to transfer water from one area to another, and is, in fact, serving the purpose of storage as well. It appears that there are two distinct divisions of the Main Grid i.e. North and South operational circles. It is, therefore, more practical to calculate the tubewells requirement for the population of North and South Circles, and the same is given in Table 23.4.

**TABLE 23.4
FUTURE REQUIREMENT OF TUBEWELLS (4 CUSEC)**

Year	Circle	Population	% of Population to be Served	Requirement of Tubewells (Nos. of 4 cusec)	Existing (4 cusec) Tubewells	Additional Requirement of Tubewells (4 cusec).	Replacement of Tubewells (4 cusec)	Total Requirement of Tubewells (4 cusec)
2006	N	3,046,654	75 %	190	131*	53	24	77
	S	2,511,187	75 %	157	112	45	22	67
						TOTAL		144
2011	N	3,473,996	84 %	243	190	53	39	92
	S	2,863,422	84 %	201	157	44	31	75
						TOTAL		167
2016	N	3,926,675	92%	300	243	57	42	99
	S	3,236,540	92%	248	201	47	30	77
						TOTAL		176
2021	N	4,399,498	100%	367	300	67	57	124
	S	3,626,262	100%	302	248	54	44	98
						TOTAL		222

*This figure represents equivalent of 4 cusec Tubewells.

23.1.10 Water Budget

From Table 23.4, it can be concluded that for 100% water supply service to the population of WASA area, in year 2021, the abstraction of ground water would be 964 mgd from 669 Nos. of 4 cusec tubewells. This huge abstraction is likely to create serious problems. It is now high time to plan water budgeting to check rapid decline in static water table. It is proposed that at least 300 mgd must be added to the water supply system from the North East side by treating the surface water and 300 mgd transported from the North and North West well centers. Thus treated and transported water must be brought to the center of the city. The Northern area must be served from independent tubewells. For implementation of this plan 600 cusecs of surface water has to be arranged through an independent canal. Similarly a chain of 185

tubewells of 4 cusec capacity each has to be installed along River Ravi. The future requirement of water has been given in Table 23.5.

23.1.11 Per Capita Consumption

It is right time to reduce per capita consumption from 80 gpcd to 50 gpcd. This would automatically reduce wastage of water and force people to construct water reservoirs and thereby help to meet peak hour demand. This would also help to delete the tubewells required for peak day demand. In brief the requirement of tubewells would be reduced considerably.

**TABLE 23.5
FUTURE WATER REQUIREMENT UP TO YEAR 2021**

YEAR	No. OF TUBEWELLS	POPULATION SERVED	ABSTRACTION OF GROUND WATER
2001	316	70 %	290 mgd
2006	347	75 %	499 mgd
2011	444	84 %	639 mgd
2016	548	92 %	789 mgd
2021	669	100 %	964 mgd

23.1.12 Tubewell Capacity

Generally wherever potable water is available in the aquifer in Pakistan, 1.5 to 2.0 cusec capacity tubewells are installed for water abstraction. Even LCB, MTS and other private housing schemes are abstracting ground water through 2 cusec capacity tubewells. Perhaps, only WASA has installed 4 cusec wells since 1967 on the recommendations of foreign consultants. Apparently there has not been any problem to get 4 cusec discharge from a well. But the decline in water table, wastage of water and higher cost of pumping warrant to review the size of tubewell to make it financially viable. Besides it has been experienced that discharge of tubewell rapidly reduces to two cusecs in a span of 5 to 8 years inspite of the fact that the strainers of different material such as stainless steel, copper, PVC and fibre glass has been tried.

An exercise has been carried out to compare the pumping cost of 4 cusec well vis a vis 2 cusec well which shows that 2 cusec tubewells are economical as shown in Table 23.6.

**TABLE 23.6
COMPARISON OF 4 CUSEC vs 2 CUSEC CAPACITY TUBEWELLS**

Capacity of Well	No. of Tubewells	Size of Motor	Total Units Consumed	Total Payment (Rs)	Cost /unit (Rs)	Average per cusec Pumping cost for month of June 2001
4 Cusec Wells	226	150 HP	8,922,169	44,654,964	5.02	Rs. 49,397
2 Cusec Wells	76	80 HP	1,163,587	5,831,928	5.01	Rs. 38,367

23.1.13 Life of a Tubewell

An exercise was carried out to determine average life of a 4 cusec tubewell. WASA installed 414 Nos. of 4 cusec wells from 1967 to date. Average life of a 4 cusec well works out to be 15 years. Mostly, locally manufactured machinery and materials have been used in the installation and operation of a tubewell. The information obtained has been given in Table 23.7.

TABLE 23.7
LIFE OF 4 CUSEC TUBEWELLS

Year	No. of Tubewells Installed	No. of Tubewells Abandoned
1967	2	-
1968	3	-
1969	18	-
1970	1	-
1972	1	-
1973	1	-
1974	1	2
1975	18	4
1976	15	4
1977	9	1
1978	16	2
1979	33	-
1980	10	11
1983	6	1
1984	11	11
1985	15	5
1986	43	-
1987	19	7
1988	5	1
1989	10	1
1990	16	5
1991	18	6
1992	23	6
1993	20	12
1994	7	19
1995	21	12
1996	10	5
1997	15	10
1998	41	13
1999	14	14
2001	7	-

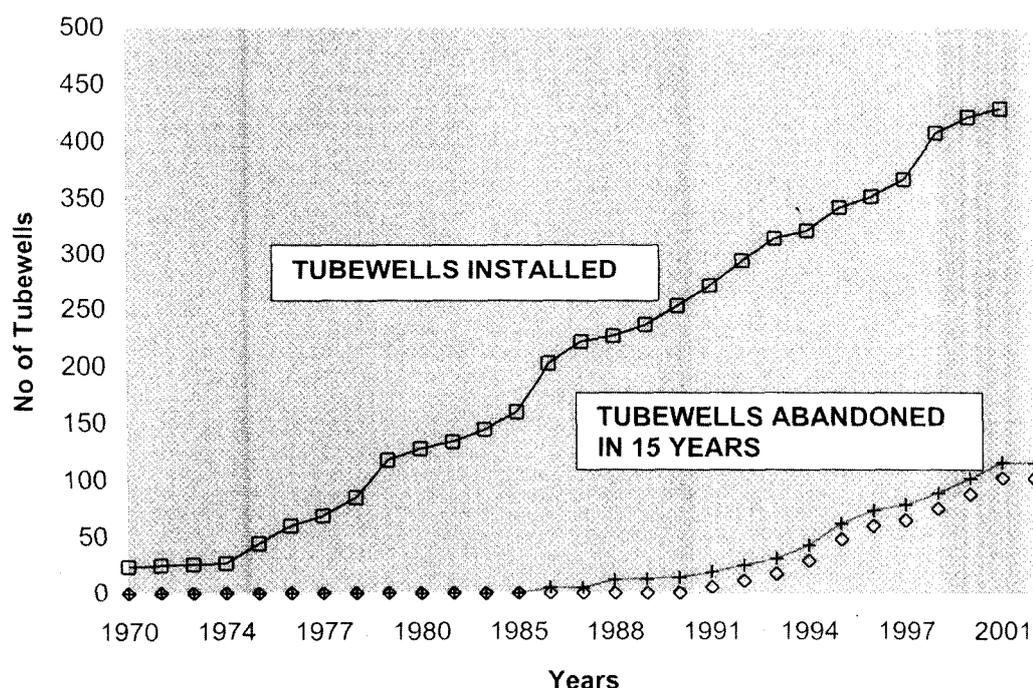
A graphical presentation shown in Figure 23.1 indicates that life of a 4 cusec tubewell is 15 years.

23.1.14 Rehabilitation of Tubewells

It has been experienced that a rapid reduction in discharge of a 4 cusec well is mainly due to the deposit of oxides which reduce the effective inflow area of the strainers. WASA from time to time tried to rehabilitate the tubewells by chemicals as well as simple air blowing method. The success is debatable. The air blowing method has definitely

shown some improvements in the discharge. A regular periodic air blowing once in a year of each tubewell will definitely enhance the average life of a tubewell to 20-25 years. In addition it would help in stabilizing the water table, stop pumping of air into the water supply system and above all reduce pumping cost to some extent as well.

FIG. 23.1 TUBEWELLS INSTALLED VS ABANDONED



23.1.15 Static Water Table

Lahore City has expanded in all directions. Towards North, the population of Shahdara Town has increased from 50,000 in 1967 to 348,331 in 2001. Towards West, inhabitation has taken place across the Protection Bund. The population of Baghbanpura and Mughalpura subdivisions is 440,931 and 560,912 respectively in year 2001, which indicates its expansion towards East. The general planned trend of Lahore city expansion is towards South West. The population of Township area has already reached 443,482. Accordingly the tubewells have been installed all over to meet the demand of water. Locations of tubewells in Lahore are shown in Volume-I of this report.

The contours of static water table of the year 1987 and that of year 2000 have been exhibited in Volume I of this Report, which indicate that:

1. The lowest contour has gone down from 192 metres above sea level in 1987 to 182 metres above sea level in 2000 i.e. 32.8 ft in 13 years.

2. The lowest contour remained in the center of the city with slight movement towards South East.
3. The highest contour has gone down from 200 metres above sea level in 1987 to 196 metres above sea level in 2000 i.e. 13.2 ft in 13 years.
4. The contour close to River Ravi does indicate decline of 13.21 ft but still are very close to each other. This indicates that River Ravi and the area beyond is the main source of under ground water.

23.1.16 Well Centres

WASA installed 16 tubewells of 4 cusec capacity each during Phase-II and 14 tubewells of 4 cusec capacity during Phase-III, close to River Ravi in the form of well centres to check water table and the results have been encouraging. In case WASA can manage to carry water from the water wells to the centre of the city, further decline of water table can be controlled. This requires in-depth study whether or not WASA should continue with the well centres and to what extent.

23.1.17 Distribution System

It was estimated that 30% of population is yet to be served with WASA water in year 2001. Keeping in view population up to 2021, WASA has to provide distribution system for additional population of 4,534 million. Figure 23.2 shows the proposed extension of the water supply trunk infrastructure in the Southern Corridor. Average water supply distribution cost works out to Rs. 402 per person; therefore Rs. 1,822 million would be required to cover 100 % population up to 2021 gradually. In order to cover 75%, 84%, 92% and 100% population in 2006, 2011, 2016 and 2021 respectively, it is estimated that Rs. 316.6 million, Rs. 464.33 million, Rs. 509.22 million and Rs. 577.11 million would be required during these years. As the city has expanded haphazardly, and accordingly water supply system has been laid, there is a need for computer aided analysis of the distribution system of Lahore and to provide additional linking and looping to improve the system. Such exercises could be conducted through the consultants along with training to the WASA staff. This future feasibility study by WASA would also determine the optimum location of tubewells and the size of distribution lines.

23.1.17.1 Main Grid

Foreign Consultants designed Main Grid system in late sixties, and accordingly 103,806 Rft Ductile Iron Pipe (18" diameter) was laid. Later on it was extended and additional length of 171,540 Rft. DI pipe (9,054 Rft. of 12" Ø, 36,630 Rft. of 16" Ø, 44,208 Rft of 20" Ø, 56,160 Rft. of 24" Ø and 25,488 Rft. of 30" Ø) was laid. For effective utilization of the Main Grid a required pressure has to be maintained which is only

possible if inputs and outputs are controlled. A computer model needs to be prepared and updated incorporating field changes. The values must be adjusted regularly to maintain required pressures. This would require a comprehensive network of pressures recording system and the critical points of the Main Grid. Consultants could be useful for implementation of the suggestions. This activity could even be privatized.

23.1.17.2 Automation

Presently all the tubewells are operated manually. For 316 Nos. of tubewells in operation, WASA has to engage 1,216 operators (3.85 persons per tubewell) costing Rs. 72.72 million per annum. Market is flooded with the instruments that could make it fully automatic so far its operational activities are concerned. A panel can be designed or got designed for this purpose. The total cost of automation of 316 tubewells would be 50% of annual cost of operational staff. This would enable each sub-division to operate tubewells while sitting in their office. This needs immediate consideration.

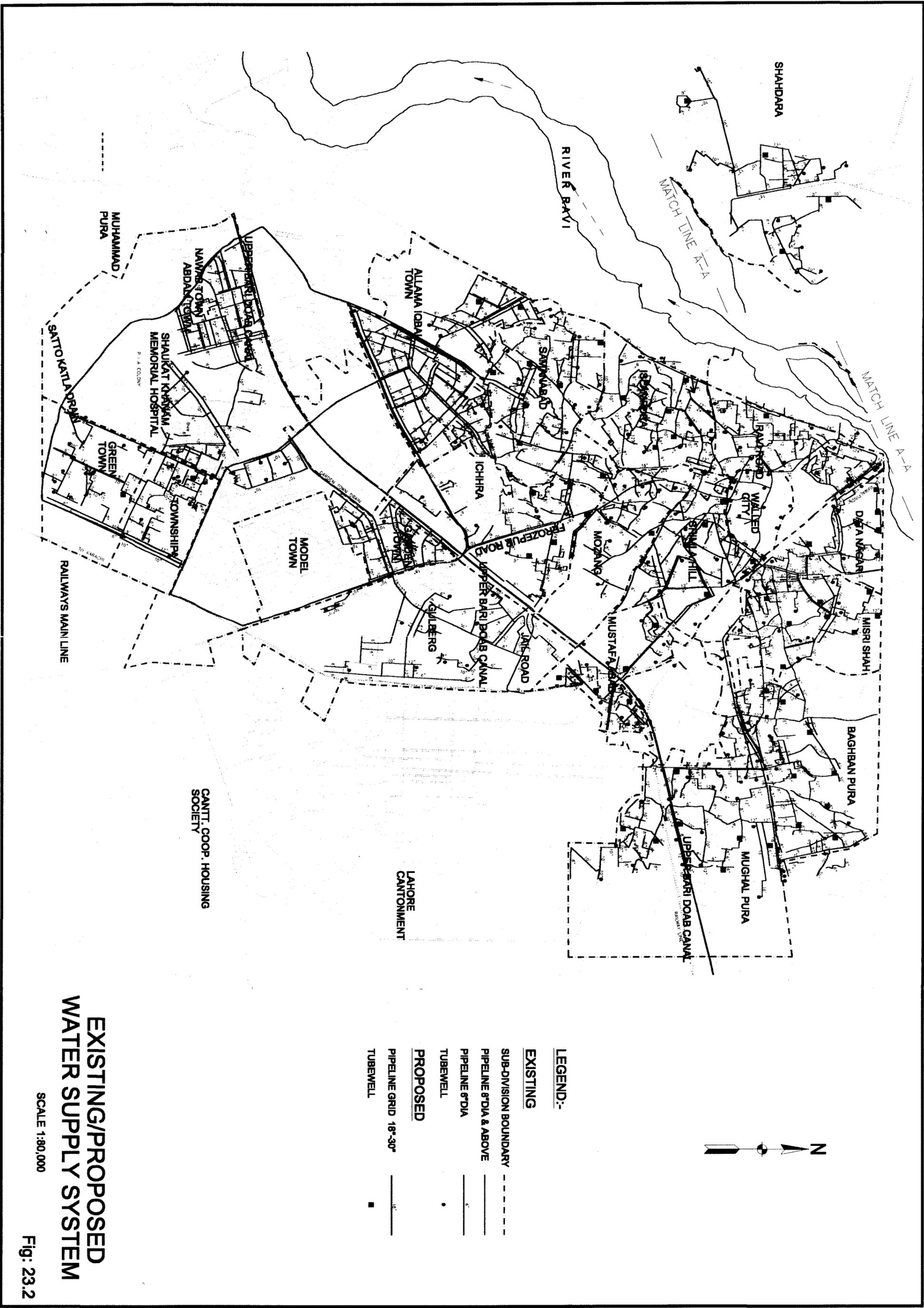
23.1.18 Computerization

There are 19 operational sub-divisions in WASA at present. The number of water supply connections in each sub-division varies from 8,010 to 43,317 which can not be justified. There is a need to re-organize sub-divisions keeping in view the number of connections and the Main Grid System, The total numbers of sub-divisions can also be reduced and the expenditure thus saved could be utilized to mobilize the staff for immediate attention to the complaints for effective control on the operation of the tube wells and maintenance of the water supply system. The sub-division must be equipped with the computer to make them efficient. Only first step needs to be taken i.e. preparation of a simple software, appointment of a qualified operator and supply of a computer.

23.1.19 New Water Supply Connections

WASA controlled area has a population of 4,831,655 with 630,971 dwelling units out of which 431,336 dwellings have obtained legal water supply connection, and the rest, either have their own arrangements or are without connection. Some of these must be using WASA water but not paying, and the same can be categorized as:

1. Can't afford to pay water charges
2. Can't pay initial security and meter cost which amounts to Rs. 5,000 for even a one room property.
3. Property ownership dispute.
4. Clever people
5. Accumulated arrears



SHAHDARA

RIVER RAVI

MATCH LINE A-A

MATCH LINE A-A

MUHAMMAD PURA

NAVAB TOWN
ABDUL TOWN

SHAUKAT KHANAM
MEMORIAL HOSPITAL

ATLAMA IGBA
TOWN

SAWAKHABAD

ICHHRA

WALLED CITY

DATA MANSAR

MISRI SHAH

BAGHBAN PURA

MUGHAL PURA

LAHORE
CANTONMENT

CANTT. COOP. HOUSING
SOCIETY

MODEL
TOWN

RAILWAYS MAIN LINE



LEGEND:-

EXISTING

SUB-DIVISION BOUNDARY

PIPELINE 8" DIA & ABOVE

PIPELINE 8" DIA

TUBEWELL

PROPOSED

PIPELINE GRID 18" 30"

TUBEWELL

**EXISTING/PROPOSED
WATER SUPPLY SYSTEM**

SCALE 1:80,000

Fig: 23.2



EXISTING

- 1 SHAHDARA SEWERAGE DISTRICT
- 2 NORTH SEWERAGE DISTRICT
- 3 NORTH EAST SEWERAGE DISTRICT
- 4 CENTRAL SEWERAGE DISTRICT
- 5 SOUTH CIVIL LINES SEWERAGE DISTRICT
- 6 SOUTH WEST SEWERAGE DISTRICT
- 7 SOUTH EAST SEWERAGE DISTRICT
- 8 NISHTAR TOWN SEWERAGE DISTRICT
- 9 JOHAR TOWN SEWERAGE DISTRICT

PROPOSED

- 10 NORTH FAR EAST SEWERAGE DISTRICT
- 11 EASTERN SEWERAGE DISTRICT
- 12 FAR SOUTH WEST SEWERAGE DISTRICT

LEGEND:-

- SEWERAGE DISTRICT BOUNDARY - - - - -
- EXISTING SEWER ———
- PROPOSED SEWER - - - - -
- PUMPING STATION (EXISTING) [Symbol]
- PUMPING STATION (PROPOSED) [Symbol]
- SEWAGE TREATMENT PLANT (PROPOSED) [Symbol]



EXISTING/PROPOSED SEWERAGE SYSTEM

SCALE 1:120,000
Fig: 23.3

The authorities must make efforts to redress the above factors so that new consumers are encouraged.

23.1.19.1 Comprehensive Survey

A comprehensive survey is required after designing a proper detailed questionnaire. This can easily be carried out through a number of private parties at a cost of Rs.20 per house surveyed. Expenditure of Rs. 12.61 million thus made would definitely generate much more revenue in one year. Let young, un-employed, literate people do this job.

23.1.20 Metered Connections

There is no doubt that meters check wastage of water. But 99% complaints of all sorts about connections relate to metered connections. Majority of the metres are damaged. Thirty percent connections are metered and out of which 40.17% are billed on actual readings. There are other methods suitable to our circumstances that can check wastage considerably. Definitely metered consumers suffer more than getting benefits in terms of wastage of water. Only commercial consumers are exception. Perhaps 50 gpcd supply rate with 8-10 hours pumping billed on area basis could be most suitable for WASA under the present circumstances. It has the following good points:

1. WASA income would go up
2. WASA O & M expenditure would reduce
3. Complaints would be minimized
4. Corruption will come down
5. Wastage of water would reduce
6. People shall get 24 hours water
7. Water rate shall come down
8. WASA would become financially viable organization
9. Water table decline would be checked
10. Collection would be easier.

23.2 SEWERAGE SYSTEM

23.2.1 General

In spite of the fact that WASA has spent Rs. 5,726 million on the original capital works of water supply, sewerage and drainage since 1967, yet the development of sewerage system in Lahore lagged behind due to rapid increase in population. There are built up areas which are deficient of lateral sewers, trunk sewers and pumping stations. Some of the areas have system but due to inadequate capacity of trunk and lateral sewers and pumping capacity, have overflow problems. It is estimated that on the average 45.83% of population is still to be served with sewerage system.

Most of the private housing schemes have developed their internal sewerage system and started pumping in the agricultural fields or in the storm water drains whichever is available in the vicinity. There is hardly any trunk sewer which could be used to collect and dispose off the sewage from these schemes. Some of the private housing schemes are facing difficulties as their sewage disposal areas are being developed. The situation has been analyzed for private housing schemes and WASA area and the short and long term measures are proposed to improve the system.

23.2.2 Population Projections for WASA Service Area

The population of each WASA sub-division (based on 1998 Census) has been worked out and projected for 2001, 2006, 2011, 2016 and 2021. The total population for WASA and Cantonment area in 2021 would be 8,025,762 and 1,432,854 respectively (Tables 23.1 and 23.2) and the same figures have been used to calculate deficient sewerage services and the required ones in future to serve 100% population by 2021.

23.2.3 Requirement of Trunk Sewers

WASA is operating its sewerage system in the following 9 districts as shown in Figure 23.3.

1. Shahdara Sewerage District
2. North Sewerage District
3. North-East Sewerage District
4. Central Sewerage District
5. South Civil Line Sewerage District
6. South-West Sewerage District
7. South-East Sewerage District
8. Nishtar Town Sewerage District
9. Johar Town Sewerage District

The above sewerage districts cover 54% (connected directly) of Lahore urban area. The expansion has necessitated to develop the following new sewerage districts:

1. North Far-East Sewerage District
2. East Sewerage District
3. Far-South West Sewerage District

Figure 23.3 also shows the trunk sewerage infrastructure proposed to be extended in the Southern Corridor.

Cantonment Area presently having a population of 659,074 is looked after by the Cantonment Board. Population in 2001 in each Sewerage District and the population served is given in Table 23.8.

**TABLE 23.8
SEWERAGE DISTRICTS POPULATION**

S. No.	SEWERAGE DISTRICT	SUB-DIVISION OF WASA	POPULATION 2001	% AGE SERVED	POPULATION SERVED
1	Shahdara	Shahdara	348,331	100	348,331
2	North	Data Nagar	187,306	100	187,306
		Misri Shah	369,996	100	369,996
		Baghbanpura	440,935	30	132,280
		Mughalpur	560,912	35	196,319
					885,901
3	North-East	Baghbanpura	440,935	70	308,654
		Mughalpur	560,912	55	308,501
					617,155
4	North Far-East District I	Mughalpur	560,912	10	56,091
					56,091
5	North Far-East District II	New			
6	Central	Ravi Road	264,267	100	264,267
		City	177,068	100	177,068
		Shimla Hill	183,548	100	183,548
		Mustafabad	116,2216	100	116,216
		Islampur	283,324	10	28,332
		Mozang	115,705	10	11,570
					781,001
7	South Civil Lines	Islampur	283,324	90	254,991
		Mozang	115,705	90	104,134
		Samnabad	385,682	80	308,545
		Ichhara	279,378	50	139,689
		Gulberg	223,023	70	156,116
					963,475
8	South-West	Samanabad	385,682	20	77,136
		Ichhara	279,378	50	139,689
		Iqbal Town	291,417	100	291,417
					508,242
9	South-East	Garden Town	161,064	45	72,478
		Gulberg	223,023	30	66,906
		Green Town	443,482	100	443,482
		Quaid-e-Azam Town			
					582,866
10	Johar Town	Garden Town	161,064	45	72,478
11	Nishtar Town	Garden Town	161,064	10	16,106
12	Far South-West				
13	Cantonment		659,074	100	659,074

23.2.3.1 Shahdara Sewerage District (Trunk Sewers)

WASA developed Shahdara Sewerage District since 1967 and has established the following services:

SHAHDARA DISTRICT EXISTING SYSTEMS

Disposal Station		Trunk Sewer	
Name	Pumping Capacity	Size	Running Length
Farkha Abad	111 cfs	24"Ø to 60"Ø	11.64 Km.
Shahdara Town	24 cfs	24"Ø to 30"Ø	2.43 Km.
		24"Ø to 36"Ø	

SHAHDARA DISTRICT FUTURE REQUIREMENTS

Year	Population	% age of Population Served	Population Served	Present Pumping Capacity	Required Pumping Capacity	Present T. Sewer Capacity	Required T. Sewer Capacity
2001	348,331	82.00	278,664	135 cfs.	119 cfs.	78 cfs.	119 cfs.
2006	401,659	85.00	341,410		145 cfs.		145 cfs.
2011	457,999	87.00	398,459		170 cfs.		170 cfs.
2016	517,678	90.00	465,910		198 cfs.		198 cfs.
2021	580,013	100.00	580,013		247 cfs.		247 cfs.

23.2.3.2 North Sewerage District (Trunk Sewers)

This is a low lying area. Practically the whole of rain water has to be pumped. Recently WASA has implemented a combined sewerage and drainage system in this district at a cost of Rs.500 million against foreign aided project and Punjab Government loan in the form of ADP. This new system has been successfully completed and commissioned with most satisfactory results.

NORTH DISTRICT EXISTING SYSTEM

DISPOSAL STATION		TRUNK SEWER	
Name	Pumping Capacity	Size	Running Length
Shad Bagh	160 cfs .	24"Ø to 60"Ø	21.25 Km.
Khokhar Road	168 cfs .		

NORTH DISTRICT FUTURE REQUIREMENTS

Year	Population	% age of Population Served	Population Served	Present Pumping Capacity	Required Pumping Capacity	Present T. Sewer Capacity	Required T. Sewer Capacity
2001	885,901	46.00	407,514	328 cfs.	174 cfs.	176 cfs	174 cfs.
2006	1,021,530	70.00	715,071		305 cfs.		305 cfs.
2011	1,164,816	80.0	931,853		397 cfs.		397 cfs.
2016	1,316,597	90.00	1,184,937		505 cfs.		505 cfs.
2021	1,457,133	100.00	1,457,133		621 cfs.		621 cfs.

* This district may reach a point of saturation and the requirements will have to be adjusted accordingly.

23.2.3.3 North-East Sewerage District (Trunk Sewers)

The domestic waste water of this district was disposed off through Sukh Nehar open drain. Recently WASA has laid trunk sewer along with pump station against Punjab Urban Development Foreign Aided Project.

NORTH-EAST DISTRICT EXISTING SYSTEM

DISPOSAL STATION		TRUNK SEWER	
Name	Pumping Capacity	Size	Running Length
Mahmood Booti	168 cfs	48"Ø to 7' x 8' conduit	6.45 Km.

NORTH-EAST DISTRICT FUTURE REQUIREMENTS

Year	Population	% age of Population Served	Population Served	Present Pumping Capacity	Required Pumping Capacity	Present T. Sewer Capacity	Required T. Sewer Capacity
2001	617,155	52.00	320921	168 cfs	137 cfs	140 cfs	137 cfs
2006	711,640	70.00	498148		212 cfs.		212 cfs.
2011	811,459	80.00	649167		276 cfs.		276 cfs.
2016	917,196	90.00	825476		352 cfs.		352 cfs.
2021	1,027,638	100.00	1027638		438 cfs.		438 cfs.

23.2.3.4 Central Sewerage District (Trunk Sewers)

This district was developed before 1947 and is being operated with some addition of sewers and pumping capacity. WASA recently has implemented Walled City Sewerage and Draining Project at a cost of Rs. 520 million against ADP programme. This includes a pump station with 100 cusec capacity which has been operated.

CENTRAL DISTRICT EXISTING SYSTEM

DISPOSAL STATION		TRUNK SEWER	
Name	Pumping Capacity	Size	Running Length
Main Out Fall I	175 cfs	24" x 36" egg shaped sewer to 60" Ø	32.21 Km.
Main Out Fall II	102 cfs		
Main Out Fall	87 cfs		
Walled City	100 cfs		

CENTRAL DISTRICT FUTURE REQUIREMENTS

Year	Population	% age of Population Served	Population Served	Present Pumping Capacity	Required Pumping Capacity	Present T. Sewer Capacity	Required T. Sewer Capacity
2001	781,001	56.00	437,361	464 cfs	186 cfs	276 cfs	186 cfs
2006	900,570	70.00	630,399		269 cfs.		269 cfs.
2011	1,026,890	80.00	821,512		350 cfs.		350 cfs.
2016	1,160,698	90.00	1,044,628		445 cfs.		445 cfs.
2021	1,300,461	100.00	1,300,461		554 cfs.		554 cfs.

23.2.3.5 South Civil Lines Sewerage District (Trunk Sewers)

This district was developed during the late fifties at the time when Gulberg Housing Scheme was developed by Lahore Improvement Trust. Later on WASA added conduits in order to shift the Pump Station out of the city and at the same time provided pump station against Foreign Aided Project.

SOUTH CIVIL LINES DISTRICT EXISTING SYSTEM

DISPOSAL STATION		TRUNK SEWER	
Name	Pumping Capacity	Size	Running Length
Gulshan-e-Ravi	320 cfs.	24"Ø to 11'x7' Conduit	28.44 Km.

SOUTH CIVIL LINES DISTRICT FUTURE REQUIREMENTS

Year	Population	% age of Population Served	Population Served	Present Pumping Capacity	Required Pumping Capacity	Present T. Sewer Capacity	Required T. Sewer Capacity
2001	963,475	59.00	568,450	320 cfs	242 cfs	192 cfs	242 cfs
2006	1,110,980	70.00	777,686		331 cfs.		331 cfs.
2011	1,266,813	80.00	1,013,450		432 cfs.		432 cfs.
2016	1,431,885	90.00	1,288,697		549 cfs.		549 cfs.
2021	1,604,303	100.00	1,604,303		683 cfs.		683 cfs.

23.2.3.6 South-West Sewerage District (Trunk Sewers)

This district was developed at the time when Allama Iqbal Town Housing Scheme was implemented. Later on Pump Station was shifted out of the city and 7' x 11' conduit was laid.

SOUTH-WEST DISTRICT EXISTING SYSTEM

DISPOSAL STATION		TRUNK SEWER	
Name	Pumping Capacity	Size	Running Length
Multan Road	160 cfs.	24"Ø to 7' x 11' Conduit	23.76 Km.

SOUTH-WEST DISTRICT FUTURE REQUIREMENTS

Year	Population	% age of Population Served	Population Served	Present Pumping Capacity	Required Pumping Capacity	Present T. Sewer Capacity	Required T. Sewer Capacity
2001	508,242	58.00	294,780	160 cfs	126 cfs	240 cfs	126 cfs
2006	586,052	70.00	410,236		175 cfs.		175 cfs.
2011	668,256	80.00	534,605		228 cfs.		228 cfs.
2016	755,333	90.00	679,800		290 cfs.		290 cfs.
2021	846,285	100.00	846,285		360 cfs.		360 cfs.

23.2.3.7 South-East Sewerage District (Trunk Sewers)

The district was developed while developing Garden Town, Faisal Town, LMP Blocks and Township areas. The pumping station needs to be shifted out of the city.

SOUTH-EAST DISTRICT EXISTING SYSTEM

DISPOSAL STATION		TRUNK SEWER	
Name	Pumping Capacity	Size	Running Length
L,M,P Blocks D/S	130 cfs	24"Ø to 48" Ø	29.46 Km.
Township I	50 cfs		
Township II	53 cfs		
Township III	47 cfs		
Township IV	20 cfs		

SOUTH-EAST DISTRICT FUTURE REQUIREMENTS

Year	Population	% age of Population Served	Population Served	Present Pumping Capacity	Required Pumping Capacity	Present T. Sewer Capacity	Required T. Sewer Capacity
2001	582,866	50.00	291,433	250 cfs	124 cfs	103 cfs	124 cfs
2006	672,101	70.00	470,471		200 cfs.		200 cfs.
2011	766,374	80.00	613,099		261 cfs.		261 cfs.
2016	866,236	90.00	779,612		332 cfs.		332 cfs.
2021	970,543	100.00	970,543		413 cfs.		413 cfs.

23.2.3.8 Johar Town Sewerage District (Trunk Sewers)

This district is in the making and is being developed by WASA. At present the pumping station is within the scheme and need to be shifted out of the area.

JOHAR TOWN DISTRICT EXISTING SYSTEM

DISPOSAL STATION		TRUNK SEWER	
Name	Pumping Capacity	Size	Running Length
4 intermediate P/Stations	47 cfs .	21"Ø to 66"Ø	14.79 Km.

JOHAR TOWN DISTRICT FUTURE REQUIREMENTS

Year	Population	% age of Population Served	Population Served	Present Pumping Capacity	Required Pumping Capacity	Present T. Sewer Capacity	Required T. Sewer Capacity
2001	72,478	50.00	36,239	12 cfs	15 cfs	76 cfs	15 cfs
2006	83,574	70.00	58,502		25 cfs.		25 cfs.
2011	95,297	80.00	76,238		32 cfs.		32 cfs.
2016	107,714	90.00	96,943		41 cfs.		41 cfs.
2021	120,685	100.00	120,685		51 cfs.		51 cfs.

23.2.3.9 Nishtar Town Sewerage District (Trunk Sewers)

WASA has recently developed this district.

NISHTAR TOWN DISTRICT		EXISTING SYSTEM	
DISPOSAL STATION		TRUNK SEWER	
Name	Pumping Capacity	Size	Running Length
Nishtar Town	39 cfs.	21"Ø to 6' x 7' Conduit	08.29 Km.

NISHTAR TOWN DISTRICT				FUTURE REQUIREMENTS			
Year	Population	% age of Population Served	Population Served	Present Pumping Capacity	Required Pumping Capacity	Present T. Sewer Capacity	Required T. Sewer Capacity
2001	16,106	50.00	80,53	39 cfs	3 cfs	60 cfs	3 cfs
2006	18,572	70.00	13,000		6 cfs.		6 cfs.
2011	21,177	80.00	16,942		7 cfs.		7 cfs.
2016	23,936	90.00	21,542		9 cfs		9 cfs
2021	26,818	100.00	26,818		11 cfs		11 cfs

23.2.3.10 North Far-East Sewerage District-I (Al-Faisal Town)

At one of the tail of Mian Mir Drain near Joray Pull (across Cantonment area) a new district is developing. Presently domestic waste is being pumped into the drain. It is likely to expand. There is a need to lay a trunk sewer along with pumping station near Charar Drain which ultimately leads to Hudiara Drain.

23.2.3.11 North Far-East Sewerage District-II (Wahga Border)

During the last three decades, Baghbanpura and Mughalpura areas have expanded abnormally. The normalization of relationships with India in the near future would encourage the expansion of population along G.T Road towards Wahga Border. This new sewage disposal system is the future need and therefore, should be planned now.

23.2.3.12 Far-South West Sewerage District

It has been observed that most of the private housing schemes have come up in this district. Statistics indicate that LDA has approved 181 Private Housing Schemes over an area of 15,904 acres. The details of plots in private housing schemes are as under:

AREA	No. Of Plots
3 Marlas	883
4 Marlas	243
5 Marlas	7,234
7 Marlas	1,961
8 Marlas	602
10 Marlas	22,719
15 Marlas	3,584
1 Kanal	41,196
2 Kanal	8,868
4 Kanal	67
6 Kanal	158
8 Kanal	185
Total	87,750

There are unapproved housing schemes in the area as well as a number of private housing schemes are in the pipe line. It is expected that 200,000 inhabited houses will come up in the private schemes. Most of the owners of the private housing schemes have provided internal infrastructure. There is a need for the provision of Trunk Sewers along with pump stations on priority basis. Houses have been constructed on hardly 5-10 % of the developed plots (87,750 Nos.). It is still time to ask the plot owners to deposit trunk infrastructure cost at the time of the approval of the building plans. The amount thus collected may be used for the provision of trunk infrastructure without burdening the Government. WASA must implement such schemes before it is too late. Government attention is also needed to address this future issue, in time.

23.2.3.13 Cantonment Area Sewerage District

LCB is looking after this area. Presently most of the domestic waste is disposed off into the Mian Mir Drain at its starting point which passes through the centre of Lahore City causing serious environmental hazard. It was learnt that the LCB got comprehensive Sewerage Schemes prepared twice through WASA in 1986 and by NESPAK in 1999 but these are yet to be implemented. The present population of this district is 659,074 and is projected to 1,432,854 in 2021.

23.2.4 Lateral Sewers

It has been estimated that Rs.380 per person would be required to provide lateral sewers. The sub-division wise requirement of lateral sewers has been worked out and is shown in Table 23.9.

23.2.5 Improvement in Sewerage System

Preparation of sewerage master plan is required for the improvement and re-habilitation of sewerage system. Five yearly requirements of trunk

sewers, pumping stations and the lateral sewers have been calculated. It has been assumed that 70%, 80% 90% and 100% sewerage will be provided by the years 2006, 2011, 2016 and 2021 respectively. The present deficiencies in trunk sewers and the required pumping capacities have also been calculated for each sewerage district.

At present the sewerage system is partially combined. The sewers are overloaded during heavy rains as these are not designed to accommodate storm water. The city has flat topography and it is difficult to drain the whole area by gravity through the construction of storm water drains. It is therefore desirable to drain the storm water through storm water drains as far as possible and make some provision in the sewers to meet the short fall. For this purpose storm water should be separated at the house level where the roofs are connected with sewers and discharge the storm water into sewers. This will save the sewers from overloading and silting.

23.2.5.1 Construction of Additional Pumping Stations

The requirement of the pumping capacity of each of the pumping stations is calculated for the years 2006, 2011, 2016 and 2021. The existing and the required capacities of pumping stations are shown in Tables given under Section 23.2.3 which show that the present capacities of all the pumping stations are inadequate. Some of the pumping stations have additional capacity and new sewage pumps could be installed to meet the requirements of 2006. Future pumping capacities are based on 230 gpcd and 100% service in 2021.

23.2.5.2 New Pumping Stations

It is observed that three new sewerage districts are in the pipe line which must now be planned and developed.

a) Far-East Sewerage District-I

Ghaziabad and Al-Faisal Town have grown rapidly in the last two decades. There is no satisfactory arrangement for the disposal of its waste water in these areas. A new sewerage district needs to be developed by laying a Trunk Sewer from Joray Pul to Charar Drain along with a pump station. WASA must prepare comprehensive plan of this area and identify its boundaries. A 60 inches dia trunk sewer with 50 cusec capacity pump station is suggested.

TABLE 23.9
REQUIREMENT OF LATERAL SEWERS

S.No	Sewerage District	2001			2006			2011			2016			2021		
		Population	% age Served	Additional Population to be served	Cost Rs. (in Million)	Additional Population to be served	Cost Rs. (in Million)	Additional Population to be served	Cost Rs. (in Million)	Additional Population to be served	Cost Rs. (in Million)	Additional Population to be served	Cost Rs. (in Million)	Additional Population to be served	Cost Rs. (in Million)	
1	Shahdara	348,331	0.82	(4,470)		85,238	32,390	99,511	37,814	114,103	43,359					
2	North	885,901	0.46	307,557	116,871	216,782	82,377	253,085	96,172	661,717	110,274					
3	North East	617,155	0.52	177,227	67,346	151,019	57,387	176,309	66,997	202,162	76,821					
4	North Far East I	56,091	0.48	18,351	6,973	13,726	5,215	16,024	6,089	18,373	6,981					
5	North Far East II			-	-	-	-	-	-	-	-					
6	Central	781,001	0.56	193,038	73,354	191,113	72,622	223,116	84,784	255,833	97,216					
7	South Civil Lines	963,475	0.59	209,236	79,509	235,764	89,590	275,246	104,593	315,607	119,930					
8	South West	508,242	0.58	115,456	43,873	124,368	47,259	145,195	55,174	166,485	63,264					
9	South East	582,866	0.50	179,038	68,034	142,629	54,198	166,513	63,275	190,931	72,553					
10	Johar Town	72,478	0.50	22,263	8,459	17,736	6,739	20,705	7,867	23,742	9,022					
11	Nishtar Town	16,106	0.50	4,947	1,880	3,941	1,497	4,601	1,748	5,276	2,004					
	TOTAL		53.29		466,302		449,280		524,515		601,428					
	%age served				70 %		80 %		90%		100%					

b) Far-East Sewerage District- II

Baghbanpura and Mughalpura are growing fast towards Wahga Border. Normalization of relationship with India would further attract the public in the area. This area needs to be properly designed and required trunk sewer and pump station near River Ravi need to be planned to meet the requirements of year 2021.

c) Far-South West Sewerage District

By 2021, 200,000 houses are likely to be constructed in this area with a population of 1,400,000. Even in 2001 about 20,000 houses have already come up. Development of industrial area along Raiwind Road and Raiwind-Manga Road would accelerate the construction of houses. The private housing schemes situated along Sattu Katla Drain are providing relief, so far as its disposal of waste water is concerned, whereas the other housing schemes need proper disposal point. It is estimated that a pump station on Hudhara Drain with 596 cusec capacity would be required along with trunk sewer of the same capacity by 2021. WASA can prepare a self-financing scheme to undertake above works.

23.2.5.3 Shifting of Pump Stations

- a) LMP Blocks pump station is in the middle of the populated area. Similarly there are 4 pump stations for Township (Quaide-Azam Town) area. All these pump stations dispose off sewage into the Sattu Katla Drain. Possibility of combining all of these pump stations need to be explored to arrive at a most economical solution. The re-habilitation of Sattu Katla Drain would provide a cheaper solution. By 2021 a pump station of 421 cusec capacity would be required along with trunk sewer of the same capacity.
- b) Johar Town pump station with 24 cusec capacity has been constructed near Shaukat Khanam Memorial Hospital. This would require shifting by 2021 with at least 48 cusec capacity.
- c) The tail end of Gulberg III (G and H Blocks), Muftpura and Modern Colony and LMP Blocks, Gulberg III are experiencing serious problems of sewer overflow. There is a need to lay a new trunk sewer along Ferozepur Road from Garden Town Crossing to Sattu Katla Drain along with pump station. It is estimated that 48 inch dia trunk sewer with 30 cusecs capacity pump station at Sattu Katla Drain would be required by the year 2021.

23.2.6 Future Planning

Summarizing the above it is recommended that following six new sewerage districts need to be planned:

1. Area bounded by Johar Town Sewerage District
2. Area bounded by Sattu Katla around Multan Road
3. Area bounded by Sattu Katla and Hudiara Drain toward Western side of Railway Line
4. Area bounded by Ferozpur Road and Railway line
5. Area served by Charar Drain
6. Area bounded by Wahga Border and the Eastern Lahore.

23.2.6.1 Rehabilitation of Sewers

Haphazard expansion of the city, incomplete sewerage system and under capacity trunk sewers are the causes of over flow of sewers particularly in low lying areas. This results silting up of the sewers as well. WASA, recently, has implemented a programme of construction of sewers in deficient areas at a cost of Rs.100 million. The proposed trunk sewers along with lateral sewers will further gradually ease out the extra load on the existing sewerage system.

23.2.6.2 Lift Stations

In addition to eleven main pump stations, WASA is operating 61 lift stations in the city to provide relief to the public. 50% of the lift stations are causing double pumping of domestic waste water. In future planning, all efforts must be made to eliminate double pumping as much as possible.

23.2.6.3 Oldest Sewerage System

The Central Lahore as well as Circular Road have egg-shaped brick sewer which was laid during the late thirties. It is likely to provide services even up to 2021 but parallel trunk sewer would be required to set aside the overloading and under sizing due to population expansion.

23.2.7 Waste Water Treatment

At present no facility for treatment of sewage exists in the city and untreated waste water is being discharged into River Ravi. The details are given in Tables 23.10 and 23.11.

**TABLE 23.10
PUMP STATIONS DISCHARGING INTO RIVER RAVI**

S.NO.	NAME OF DISPOSAL STATION	MAX CAPACITY
1	Farkha Abad	111 cusec
2	Saeed pura	10 cusec
3	Shahdara Town	24 cusec
4	Forest Colony	28 cusec
5	Main Out Fall I	175 cusec
6	Main Out Fall II	102 cusec
7	Main Out Fall III	87 cusec
8	Walled City	100 cusec
9	Gulshane-Ravi	320 cusec
10	Multan Road	160 cusec
11	Mahmood Booti	168 cusec
12	Shadbagh	160 cusec
13	Khokhar Road	168 cusec
14	Ali Park	4 cusec
	Total	1,641 cusec

**TABLE 23.11
PUMP STATIONS DISCHARGING INTO SATTU KATLA DRAIN**

S.NO.	NAME OF DISPOSAL STATION	MAX CAPACITY
1	Johar Town	24 cusec
2	LMP Blocks	130 cusec
3	Township I	50 cusec
4	Township II	53 cusec
5	Township III	47 cusec
6	Township IV	20 cusec
7	Private Housing Schemes	100 cusec
	Total	424 cusec

In addition Mian Mir Drain, Sukh Nehar and Chota Ravi Drain also discharge sewage (during dry weather) directly into River Ravi. The Hudiara Drain, coming from India carries industrial waste which is also discharged into River Ravi.

WASA has plans to treat waste water at five places that is Shahdara, Shadbagh, Babu Sabu, Ferozepur Road and Hudiara Drain. 900 acres of land near Babu Sabu west of Lahore Bypass has already been purchased. Construction is held up due to lack of funds. It is recommended that an economical solution for treatment of waste water based on oxidation ponds (on already purchased land) be designed and implemented for immediate relief.

There is no doubt, that River Ravi does contribute towards the recharge of aquifer. Disposal of untreated sewerage into the River is likely to pollute the aquifer. In fact, the shallow water is already affected. Presence of nitrates in the aquifer in Sanat Nagar has been reported. At

present, during dry weather, River Ravi has hardly any discharge to dilute sewage. Immediate remedial measures are required.

23.3 DRAINAGE SYSTEM

23.3.1 General

The city of Lahore is generally flooded during the rainy season causing inconvenience to the residents and damage to the roads and property. The main drains in some of the areas were constructed but due to encroachments their rights of way have drastically been reduced whereas the storm run-off has increased manifold due to urbanization. The problems of the main drains also affect the functioning of the secondary and tertiary drains joining these main channels.

23.3.2 Sewage Disposal in Storm Water Drains

At present most of the storm water drains are being used as sullage carriers which is not only hindering the storm water disposal but also creating environmental hazards. The industrial effluent is also being disposed off in these drains.

The sewerage and drainage systems for Lahore are partially combined. Their operation as separate systems is only possible if it starts from residences where waste water and rain water arrangement should be separated. This can now be implemented in new housing schemes.

23.3.3 Improvements in the Drainage System

During the last four decades, WASA has been making efforts to improve water and sewerage systems but very little work was done on drainage. Lahore being a flat city and therefore disposal of sewage and storm water is a difficult proposition. Pumping cost makes it uneconomical. People hardly afford to pay the present water and sewerage rates and any additional burden cannot be justified. It is very simple to propose construction of new drainage system that would drain off 5 years or 2 years frequency storm, but it would require huge investment. Drainage system is not a producing item. People cannot afford extra expenditure.

WASA has constructed 61 lift stations to improve sewerage facilities and mostly storm water drains have been used as disposal point. The disposal of sewerage into the drains along with dumping of solid wastes by the public and the encroachments have made the drains an environmental hazard.

Under the circumstances explained above, it is advisable that WASA should prepare drainage schemes that would address the following problems.

1. The dumping of solid wastes into the drains is eliminated.
2. The existing encroachments are removed and future tendency is checked.
3. Prepare economical proposals.
4. Plan the disposal of rain water of atleast 5 years frequency storm.
5. The maintenance of drain is facilitated.
6. It should be self financing drainage scheme.
7. It should be practically self cleaning drain.

23.3.4 Short Term Plan for Improvement of Drainage System

23.3.4.1 Shahdara Drainage District

It is a rapidly growing district. Railway Line is a barrier that has divided the Shahdara Drainage District into East & West sides. Presently there is no storm water drainage system in the Eastern part, which needs to be planned and executed. The Western part has a drainage network of 13,500 Rft which needs to be expanded to the deficient areas.

23.3.4.2 Upper Chota Ravi Drainage District

WASA has recently completed and operated a comprehensive drainage system in this area at a cost of Rs 500 million along with a drainage pumping station. Efforts have also been made to provide secondary drains. There is a need to provide full coverage of storm water disposal by adding secondary drains in the deficient areas. The completed drainage works has shown excellent results during the last two rainy seasons.

23.3.4.3 Lower Chota Ravi Drainage District

WASA is implementing Rs 520 million sewerage and drainage improvement schemes in this area. The scheme has been designed by NESPAK. The successful completion of this scheme would provide the required relief. Secondary drain in the deficient areas would however be required.

23.3.4.4 Mian Mir Drainage District-I

This drainage district has acute drainage problems during the rainy season. At present the ponding time in low lying areas is between 8-12 hours for a moderate rain fall intensity. NESPAK in association with MGI Consultants were engaged for the preparation of the scheme for the improvements which needs to be pursued to ensure that self-finance scheme is prepared and implemented. Central drain is a secondary drain of Mian Mir Drain and passes through the most congested area of Central Lahore. A complete rehabilitation of Central Drain is work of the highest priority.

23.3.4.5 Mian Mir Drainage District-II

There exists a main drain which is 14,000 Rft in length, and is presently not operating due to the absence of secondary drain and the same needs to be taken up on priority basis so that storm drainage facilities could be provided to Allama Iqbal Town.

23.3.4.6 Sattu Katla Drain

This drain is 100 ft wide and 56,000 Rft in length. It was observed that the drain is being encroached which needs to be checked. Consultants may be engaged to study and propose a self-financing scheme for this area along with preparation of secondary drains on priority basis.

23.3.5 Long Term Planning

Since the major city growth is towards south and south-western sides, new drainage district such as Sattu Katla Drainage District-II consisting of private housing schemes is proposed for proper functioning of drainage system. Secondary and tertiary drains have to be constructed after carrying out further studies. Similarly Charar Drain has to be activated for providing storm water relief in the south-eastern side of the city.

23.3.6 Future Development and Cost

It is estimated that WASA will need Rs 20.858 billion for water supply, sewerage and drainage services up to 2021. The details are given in Table 23.12.

23.4 SOLID WASTE MANAGEMENT

23.4.1 General

As already discussed only 70% of the solid waste generated in the city is presently being collected by various government and non-government agencies (NGOs). Due to non availability of proper disposal sites and facilities, most of this waste either ends up in depression areas in and around the city or is being dumped along roadsides in certain designated areas. The future increase in population coupled with enhanced industrial/commercial activities would further aggravate this situation if not tackled effectively.

**TABLE 23.12
FUTURE CASH FLOW (Million Rs.)**

Year	2006	2011	2016	2021	Million Rs Total
WATER SUPPLY					
Distribution system	316	464	509	577	1,866
Main Grid (75 % of Distribution.)	237	348	381	432	1,398
Tubewells	720	835	880	1110	3,545
Installation of Water Meters (Revolving Fund)	300	-	-	-	300
Miscellaneous 10%	127	165	177	212	681
Sub-Total	1,700	1,812	1,947	2,331	7,790
SEWERAGE					
Lateral Sewage	466	449	524	601	2,040
Trunks Sewage (125% of Laterals)	582	561	655	751	2,549
Pump Station (75% of laterals)	349	336	393	450	1,528
Miscellaneous (10%)	140	134	157	180	611
Sub-Total	1,537	1,480	1,729	1,982	6,728
DRAINAGE					
Main Drain	1,000	700	700	600	3,000
Secondary Drain	1,000	700	700	600	3,000
Miscellaneous	100	90	80	70	340
Sub-Total	2,100	1,490	1,480	1,270	6,340
Total	5,337	4,782	5,156	5,583	20,858

Note: Treatment of waste water will be additional cost

23.4.2 Waste Generation Projections

23.4.2.1 Service Areas

Considering various factors including physical barriers like River Ravi main Karachi- Peshawar Railway Line and UBD Canal, ease in operation and management of solid waste, location of suitable landfill sites with respect to economical feasible collection frequency and travel time, the city has been proposed to be divided into five sectors. The sector boundary covers the area lying within the ex-MCL and Cantonment limits (covering present eight zones of the city and nine wards of Cantonment) including MTS and LCCHS and future expanded areas. A brief description of the proposed service areas boundaries of the five sectors for the solid waste management is given below:

a) **Sector I -Northern Lahore and Adjoining Areas**

This area lies to the north east of the city between the UBD Canal and the Lahore Peshawar Railway Line. The main areas in this sector include railway colony/railway workshop, Chah Miran, Misri Shah, Data Nagar, Bund Road, Darogha Wala, Shadbagh. For the sake of this study the areas in the above sector will be termed as Northern Lahore and adjoining areas. This sector has a present population of 1,326,904 with an area of 6,568 hectares.

b) **Sector II -City Centre and Adjoining Areas**

This sector consists of the Walled City, Anarkali, Gwalmandi, District Courts, Landa Bazar, Badami Bagh, Shadman etc. but also includes some comparatively remote areas like Gulshane-Ravi, Allama Iqbal Town etc. This sector has a present population of 1,816,836 with an area of 8,629 hectares.

c) **Sector III- Southern Lahore**

This sector consists of Gulberg, Walton, Garden Town, Township, General hospital, Kot Lakhpat and recently developed Johar Town. This sector has a present population of 761,293 with an area of 5554 hectares.

d) **Sector IV- Lahore Cantonment and Adjoining Areas**

This sector lies mostly to the south- east of Lahore Karachi Railway Line and UBD Canal. Various areas included in the sector are the Lahore Cantonment, LCCHS, Saddar Bazar, Dharampura, Cavalry Ground etc. This area has a present population of 739,297 with an area of 11,196 hectares.

e) **Sector V- Shahdara and Adjoining Areas**

This sector consists of the areas located across River Ravi including Shahdara and Jia Musa. This sector has a present population of 139,297 with an area of 2,436 hectares.

It is considered that the division of Greater Lahore into the above five (5) sectors will be helpful in the collection and management of solid waste especially in the identification of landfill sites for the respective sectors. This would in turn reduce the haulage distance from various locations in the city to the landfill sites and as such reduce the cost and time of transportation/disposal of solid waste resulting in an economical solid waste disposal system.

23.4.2.2 Population Projection and Solid Waste Generation

As already indicated about 0.55 kg/capita/day of solid waste is generated in the city of Lahore. On the basis of this it is estimated that presently 1 million tons per annum of solid waste is generated within the city which is estimated to increase to 2 million tons per annum by the end of the planning horizon.

23.4.3 Solid Waste Collection

Broadly speaking the present solid waste collection can be classified into the following two categories.

- i) Primary Collection System
- ii) Secondary Collection System

23.4.3.1 Primary Collection System

Primary collection system consists of street cleaning and collection of solid waste from the source and its disposal into the nearest bin/container. At present street cleaning is entirely handled manually by sweepers/sanitary workers. It has been proposed that in future mechanical sweeping machines will be introduced to improve efficiency.

At present the following methods of municipal solid waste collection are employed in the city of Lahore:

- i) Door to door collection by the agencies.
- ii) Solid waste disposal into the bins/skips/containers or filth depots by the residents.

23.4.3.2 Secondary Collection System

The secondary collection system of waste consists of collection of solid waste from bin/container to the final disposal site in major parts of the city. Collection by the agencies is generally through the bins/skips/containers and door to door collection is employed on a very limited scale in certain areas of the city like LCCHS, MTS, some new housing schemes, pilot areas selected by Lahore Sanitation Programme (LSP) and various other NGOs.

Both methods have their merits and demerits. Method (ii) is comparatively cheaper for the agencies since the sweepers/house maids from individual houses dump the solid waste into the containers/bins. However, it is observed that this method has many visible demerits. Firstly the placement of a container/bin is almost always resented by the surrounding population who wants the containers to be placed away from their houses. Since these containers are mostly open at the top they become a source of nuisance especially as litter is sometimes thrown

around the containers/filth depots instead of being deposited inside. Again if the collection of solid waste by the concerned agency is delayed due to any reason it starts stinking very badly especially in the summer season creating an unhealthy environment for the nearby residents. The door to door collection if carried out on a regular basis has the potential of keeping an area clean from haphazardly dumped solid waste and or stinking filth depots. Door to door collection appears to be the most feasible option considering all above factors. Since the method can not be adopted immediately for the whole city, the following means of collection of solid waste are suggested for various areas of the city employing combination of door to door collection and collection from the bins and ultimately leading towards complete door to door collection.

i) Congested Residential Areas

Solid waste may be picked-up from individual houses through pick-ups and/or three wheeler rickshaws to the nearest container/bin and then transported to the final disposal point. It may be advisable to utilize stationary tractor trolleys as bins stationed at appropriate locations in which solid waste is disposed off through the "Ramps" especially made for that purpose. The trolley once full will be replaced with an empty trolley and taken to the landfill site. The above arrangements will serve as a mobile transfer station.

ii) Residential Schemes in the Private Sector

There should be a move towards door to door collection in the schemes run by private sector/posh areas from where solid waste can be carried out by trucks to the final disposal point as is being practiced in LCCHS and some other areas.

iii) Commercial Areas

The disposal from commercial areas should be carried out by lifting the solid waste from the skips/containers and delivering it at the final disposal site.

23.4.4 Ultimate Disposal/Treatment of Solid Waste

The following methods for ultimate disposal of solid waste are generally employed:

- i) Composting
- ii) Sanitary Landfilling
- iii) Incineration

The above three mechanisms with their merits and demerits are briefly described below:

23.4.4.1 Composting

It is a process through which organic contents of the solid waste are converted into fertilizer specially when the organic contents are available in high proportion. This procedure is in use in many rural communities of the country. However due to non-biogradable material like plastic etc. and scavenging activities this matter is not cost affected for disposal of large quantities of urban solid waste. The requirement of greater land area/ time for composting also limits its application/use.

23.4.4.2 Incineration

Incineration can be applied by burning the solid waste at high temperature. This is a very expensive process and is not cost effective on large scale for urban solid waste. Also the only byproducts are injurious gases (for which expensive air pollution prevention mechanisms are needed) and ash (which is almost useless). Hence this method is not recommended for Lahore Solid Waste Management (SWM).

23.4.4.3 Sanitary Landfilling

Sanitary land filling involves the disposal of solid waste on or in the upper layers of earth's mantle (a portion of the earth lying between the crust and the core). Various parameters for selection of landfill sites include available land area, hauling distance: solid wastes characteristics, surface water hydrology, geologic and hydrogeologic conditions, local environmental and climatic conditions and ultimate use of sites. In this method with the degradation of biogradable material certain gases like methane and carbon dioxide are generated which sometimes amount to 90% of the total gas volume produced. The methane gas from the land fill can be utilized for production of energy and the left over stabilized material can be used as a solid conditioner if the landfill site is to be recycled or completed landfill could be used for development of open space/park.

23.4.4.4 Recommended Disposal Method

Due to comparatively simple operation sanitary landfilling which has been successfully adopted in other parts of the world is recommended to be a suitable disposal method for Lahore Municipal Solid Waste.

23.4.5 Proposed Landfill Sites

Over the past many years various studies have been carried out to select possible landfill sites located around the city. In the 1991 World Bank (WB) Study, 11 sites were evaluated based on their capacity, hauling

distance, access, hydrogeological conditions, nuisance, access of operation and infrastructure. These are listed below.

- (i) Sheikhpura Road
- (ii) Babu Sabu
- (iii) West of New Bund
- (iv) Upper Bari Duab Canal
- (v) Mahmood Booti
- (vi) Karal
- (vii) Bansi Nagar
- (viii) Triddle Wali
- (ix) Mohlanwal
- (x) Sundar Village
- (xi) Kahna Kachha

Out of the above mentioned sites, the sites along Sheikhpura Road, Mohlanwal, Mahmood Booti, Kahna Kachha, west of New Bund and Babu Sabu were recommended for selection in the study report.

A fresh reconnaissance survey was carried out by NESPAK to access the latest situation of the proposed landfill sites. Since the solid waste collection and disposal for the city of Lahore is being carried out based on five sectors, it was considered preferable if the respective landfill sites for each sector could be selected in areas closer to the boundary of each sector. Brief description of the potential landfill sites which have been identified for the five sectors (shown in Figure 20.4) is given below.

23.4.5.1 Sector I - Mahmood Booti Site

The above site is located across Bund Road (on the river side) at a distance of approx. 4 Km from Darogha Wala (on GT Road) and about 6 Km from Shalimar Gardens. Presently the area is in a depression about 5 to 6 metres deep in which stagnant water is standing. The site is located on the north side of the Bund Road which is a major highway linking GT Road with Ravi Bridge bypassing the city. The site was recommended by the World Bank Supervision Mission in early 1990 due to its proximity to the city centre/northern area, total available area (about 20 hectares), hydrogeological conditions and the possibility of later use of this site as an industrial site and / or recreational spot. The City District Government at certain spots in the proposed landfill sites are already been dumping solid wastes in the open. The procurement of land at this site has already been completed. All environmental precautions including placing of physical visual barrier through the plantation of trees is recommended to save the surrounding areas from any negative environmental effects. However 5 water supply tubewells are located close to the south eastern boundary of the proposed landfill site requiring close water quality monitoring of this well field.

23.4.5.2 Sector II – Landfill Sites West of New Bund

The City District Government has been dumping solid waste along the Northern Flank of the Lahore Bypass close to the Babu Sabu Outfall Drain on the other side of Lahore Bypass and on the shoulders of the approach road leading from Bund Road to Saggian Bridge. This practice is highly undesirable, both from aesthetic as well as environmental points of view.

Two landfill sites were proposed under the WB Study, one in Babu Sabu area and the other on the west of New Bund, both located in the bed of River Ravi. The second site appears to be more suitable because of its close proximity to the road. This site was visited by NESPAK. The site would require construction of a temporary access road into the river bed. The major demerit of this landfill site is its location in the flood plain of River Ravi for which some protection measures have to be devised.

23.4.5.3 Sector III- Kahna Kachha Site

The WB Study considered it a very suitable and convenient landfill site. This site is located about 9 Km from the Ferozpur Road Railway Crossing. According to the WB Study, the site comprised of about 33 hectares with an average depth of about 1.5 metres. It is in the close vicinity of certain new housing developments coming up along Defence Road i.e. Institute of Engineers (IEP) Town, NESPAK Phase-II, Pakistan Rangers Colony, and Valencia. IEP Town is located just across the railway line opposite the proposed landfill site for which a lot of development work already seems to have taken place. NESPAK team's visit to this proposed landfill site revealed that it is located very close to Defence Road and Karachi-Lahore Railway line, at a distance of 1.5 Km south-east of Kahna Kachha Railway Station.

Part of the proposed site is barren, while the rest is reportedly being irrigated. Due to some wild plantation on the North-Western periphery of the landfill site, a "Physical Barrier" already exists, which needs to be further reinforced.

23.4.5.4 Sector IV-Potential Landfill Site(s) along Bedian Road

The following three potential landfill sites have been considered for selection of a possible site for Sector IV.

- a) Site along Bedian Road near Mannawala Village
- b) Site along Bedian Road near Guhawawala Village.
- c) Site close to Fazal Park Housing Development.

LCB is presently employing open area dumping for their solid waste on the first two sites along Bedian Road. The first dumping site is located at about 0.5 Km off Bedian Road ahead of Mannawala Village (located

about 3 km from Defence Road-Bedian Road Intersection) The site is surrounded on all sides by residential area and is not considered to be a suitable site for dumping of solid waste even for present requirements.

The second dumping site is located behind the Guhawawala Village about 3 km away from Bedian Road. LCB is presently dumping most of its solid waste at this location. A brick-paved-cum-metalled road from Bedian Road leads to the site finally ending into the site through a katcha track. The other alternative/shorter route to the dumping site is through the Guhawawala Village, which is presently being utilized by the LCB solid waste carriers. This practice of carrying solid waste in open trucks through the narrow streets of the village is however environmentally undesirable. Part of the existing track is katcha as described above, which can create problems in the rainy season. This landfill site is located in a comparatively open area, but only a little area with depression is available. Therefore, this site can only partially meet the requirements of landfill site for Cantonment area.

The third site, which is not presently in use, but was looked into, is on the eastern side of Bedian Road near Fazal Park (a new housing scheme in progress). This site is located about 300 m off Bedian Road (approximately 2 Km from Defence Road-Bedian Road Intersection). This site appears to be the most suitable but would require further investigation.

Since all the three sites alone do not meet the area requirement of the sector, therefore, it is suggested to use all the three sites with the third one as the main site.

23.4.5.5 Sector V- Potential Landfill Site(s)

Three potential landfill sites have been investigated and evaluated for this sector.

a) Sheikhpura Road

The proposed site in the WB Study for Shahdara Area was shown to be located near the confluence of Sharaqpur Road and Sheikhpura Road, about 9 km away from the city centre. No such open area exists at present, since due to the construction of new houses and the Saggian Bridge Bypass the proposed land has already been utilized.

NESPAK survey team therefore looked for possible alternative site(s) on both sides of Sheikhpura Road up to Lahore-Islamabad Motorway (located about 15 km from the city centre and about 10 km from Shahdara). One of the probable landfill sites was identified on the western side of Kot Abdul Malik (located 8 km from Ravi Bridge). This site has some scattered houses on two

sides. Also the Kot Abdul Malik population across the brick-paved road resides only about 300 metres away. The area of the land is around 3 to 4 ha (8 to 10 acres). However, there is no direct access to this site except through the congested roads/streets of Kot Abdul Malik, which will not only be unsuitable for the passage of large sized disposal trucks but also environmentally very undesirable (unless some smaller vehicles or donkey carts are utilized) There are also some private dwellings located close to this site as cited above.

b) Kalakhatai-Narang Road

A small site is available along Kalakhatai Road near Haji Kot (3.5 km from G.T Road). This site is about 1 to 1.5 metres deep and partially not in use, with some cultivation on the rest of the land. The site is located about 6 km from Shahdara within easy access. The site appears to be suitable. The only demerit of the site is its closeness to the surrounding population.

The selection of the suitable landfill site is first step for effective disposal of solid waste. Unfortunately this aspect has been ignored badly. The disposal site is now a days, a gold mine if properly organized. It is suggested that a detailed study be carried out through consultants for identifying disposal sites along with suggestions to privatize their aspects.

23.4.6 Area Requirement for Landfill Sites

The following parameters have been considered while working out the area requirements of the five potential landfill sites:

- Planning Horizon-Year 2021
- Operational Cycle -3 year
- Per capita Waste generation -0.55 Kg/day
- Compacted Density of Waste-850Kg/m³
- Depth of Landfill-4metres

Based on the above parameters, the required volume and area of the land fill site up to the year 2021 for 3 years operation in each sector is presented in Table 23.13.

Each landfill site would typically consist of the following major components:

- Workshop
- Car-Wash
- Petrol-Diesel Tank
- Staff Building with Septic Tank
- Weigh Bridge

- Office Building
- Guard House
- Fencing

23.4.7 Collection Equipment and Vehicle Requirements

The following parameters have been considered while calculating the equipment and vehicle requirements for each of the five sectors with the assumption that the locations of landfill sites are as suggested in Section 23.4.5

- Planning Horizon-year 2021
- Per Capita Waste Generation -0.55 Kg/day
- Collection Efficiency - 80%
- Volume of Skip-25m³
- Volume of Container -12m³
- Loose Density of Solid Waste in Skip-300 Kg/m³
- Loose Density of Solid Waste in Container-500 Kg/m³
- Density of Solid Waste in Truck -500 Kg/m³
- Number of Trips of Collection Vehicles-2 to 3
- Volume of Compacted Truck-13m³
- Compacted Density of Waste at Landfill -850 Kg/m³

Based on the above parameters the required number of skips, containers, trucks and other ancillary equipment in each sector is presented in Table 23.14. The number of jeeps and motor cycles for the supervisory staff has been worked out on the basis of the staff requirement.

TABLE 23.13
VOLUME OF SOLID WASTE GENERATED FROM EACH SECTOR AND LAND REQUIREMENT
FOR SANITARY LANDFILL FOR THREE YEAR OPERATION

Year	Population	Daily Generation		Daily Collection		Yearly Volume (m ³)	Volume for three year (m ³)	Landfill Volume (m ³)	Landfill Area for 3 Years operation (Volume/depth x10000)x1.2+ha
		Per Capita Kg.	Total Kg	Collection Efficiency	Total Weight (Kg)				
1	2	3	4 = 2*3	5	6 = 4 * 5	8 = 7*365	9 = 8*3	10 = 9	11 = (10/(4*10)) 1.2
SECTOR I									
1998	1,494,298	0.55	821,864	0.70	575,305	247,043	741,128	741,128	22
2001	1,625,262	0.55	893,894	0.70	625,726	268,694	806,082	806,082	24
2006	1,853,232	0.55	1,019,277	0.80	815,422	350,152	1,050,455	1,050,455	32
2011	2,094,717	0.55	1,152,094	0.90	1,036,885	445,251	1,335,752	1,335,752	40
2021	2,346,948	0.55	1,290,821	1.00	1,290,821	554,294	1,662,882	1,662,882	50
SECTOR II									
1998	2,046,037	0.55	1,125,320	0.70	787,724	338,258	1,014,774	1,014,774	30
2001	2,225,357	0.55	1,223,946	0.70	856,762	367,904	1,103,712	1,103,712	33
2006	2,537,500	0.55	1,395,625	0.80	1,116,500	479,438	1,438,314	1,438,314	43
2011	2,868,148	0.55	1,577,481	0.90	1,419,733	609,650	1,828,951	1,828,951	55
2021	3,213,511	0.55	1,767,431	1.00	1,767,431	758,956	2,276,867	2,276,867	68
SECTOR III									
1998	857,333	0.55	471,533	0.70	330,073	141,737	425,212	425,212	13
2001	932,472	0.55	512,860	0.70	359,002	154,160	462,479	462,479	14
2006	1,063,266	0.55	584,796	0.80	467,837	200,895	602,684	602,684	18
2011	1,201,815	0.55	660,998	0.90	594,898	255,456	766,369	766,369	23
2021	1,346,529	0.55	740,591	1.00	740,591	318,019	954,056	954,056	29
SECTOR IV									
1998	832,563	0.55	457,910	0.70	320,537	137,642	412,927	412,927	12
2001	905,531	0.55	498,042	0.70	348,629	149,706	449,117	449,117	13
2006	1,032,546	0.55	567,901	0.80	454,320	195,091	585,272	585,272	18
2011	1,167,092	0.55	641,901	0.90	577,711	248,076	744,227	744,227	22
2021	1,307,625	0.55	719,194	1.00	719,194	308,830	926,491	926,491	28
SECTOR V									
1998	224,440	0.55	123,442	0.70	86,409	37,105	111,316	111,316	3
2001	244,111	0.55	134,261	0.70	93,983	40,357	121,072	121,072	4
2006	278,351	0.55	153,093	0.80	122,474	52,592	157,776	157,776	5
2011	314,621	0.55	173,042	0.90	155,738	66,876	200,627	200,627	6
2021	352,506	0.55	193,878	1.00	193,878	83,254	249,761	249,761	7

**TABLE 23.14
REQUIREMENT OF COLLECTION EQUIPMENT AND VEHICLES**

S. No.	DESCRIPTION	UNITS	EXISTING	2006	2011	2016	2021
1	Skips (2m ³)	Nos.	500	---	---	---	---
	Skips (2.5m ³)	Nos.	500	1647	1821	1646	1005
2	Containers (12m ³)	Nos.	150	309	531	822	1130
	Containers (10m ³)	Nos.	78	---	---	---	---
3	Compactors	Nos.	34	74	82	75	45
4	Arm Rollers	Nos.	23	113	194	301	414
5	Mechanical Sweepers	Nos.	---	5	---	5	---
6	Chain Bulldozers	Nos.	2	14	22	33	44
7	Jeeps /Pickups	Nos.	6	5	0	5	0
8	Motorcycles	Nos.	26	10	0	10	0
9	Brooms	Nos.	---	19,450	25,076	30,578	37,403
10	Hand Carts	Nos.	150	1,756	5,108	6,610	8,086
11	Mobile Transfer Stations	Nos.	---	94	137	188	228

23.4.8 Collection and Disposal of Hospital Waste

The medical waste management in various hospitals of the city of Lahore has already been discussed. Only four hospitals in the city have proper waste disposal facility in the form of incinerators, whereas the remaining use the municipal waste disposal system.

For effective and efficient hospital waste management system it is suggested that all the major hospitals in the city should have their own incineration facility, which would also serve small hospitals/clinics/labs located in the close proximity of the major hospital. This would reduce the hazards of transporting infectious material to the landfill site. The hospital/medical waste should be segregated from the beginning by colour coding the various plastic bags/containers to avoid undue pressure on the incineration facility.

23.4.9 Identification of Future Needs and Services

23.4.9.1 Estimation of Future Requirements

The number of skips, containers, transport vehicles, compactors, arm-rollers, hand carts etc. have been worked out along with manpower requirements for all the five sectors including proposed staff at landfill site(s) etc. as shown in Table 23.14.

23.4.9.2 Short Term Plan

The Short Term Plan is based on the immediate requirements for the first five years. The vehicles and equipment requirements have been worked out for the first 5 years.

23.4.9.3 Long Term Plan

The long term plan is based on the overall requirement to cater for the needs up to the planning horizon i.e. year 2021.

23.4.10 Management of Solid Waste Through Private Operator

Like almost every country/city in the world, the collection of solid waste along with its disposal is carried out by the public. The half hearted efforts made by ex-MCL have also shown good results. Participation of NGOs is also encouraging. It is suggested that the City District Government should divide the system into two parts.

- (i) Part I**
Purchase, construction, operation and maintenance of landfill site by a private party.
- (ii) Part II**
Collection of solid waste from each house/shop/factory and its disposal to the nearest landfill site by a private party.

23.4.11 Implementation Strategy and Schedule

a) Implementation Strategy

The strategy for solid waste collection and management in the City of Lahore is outlined below:

- The solid waste collection efficiency in the City should be increased from 70% to 100% within the planning horizon.
- Utilization of open trucks/vehicles for solid waste collection and disposal should be discontinued by replacement with covered vehicles.
- Door to door collection system to be extended to other parts of the city in a phased manner in due course of time.
- If the proposed initiative by ex-MCL for privatization of the solid waste collection goes ahead, verifiable performance indicators should be developed / enforced for measuring the efficiency of the proposed privatization initiative.
- There should be a move from stationary transfer stations in the next five (5) years, towards mobile transfer stations after which all the solid waste should be directly disposed off, to the landfill site(s)

- New landfill site(s) should be developed in the proposed five sector(s) of the city by the concerned authorities i.e. the City District Government/LCB etc. Open dumping of solid waste in scattered areas of the City should be discontinued.
- Mixing of hospital medical waste with the general refuse is not a desirable practice.
- Waste segregation should preferably start from individual waste generating points/sources, which can be carried out by bringing minor improvements in the present system.
- Regional incinerators should be installed at various major hospitals, catering for the hospital waste of nearby hospitals / clinics etc.
- There should be greater emphasis on public participation and awareness about solid waste collection
- The role of private sector / NGOs should be encouraged.

24.0 PUBLIC UTILITIES

24.1 ELECTRICITY

Recommendations for improvement of power transmission and distribution network including street lights are discussed in this section. WAPDA and the City District Government have to raise funds to implement these recommendations. It is learnt that the City District Government is taking measures under its maintenance programme to improve the existing street light luminaries, which should be taken into consideration while implementing the recommendations.

24.1.1 Grid Stations

Transmission and grid station capacities are generally adequate to meet the growing demand of Lahore City for the near future if reinforcement plans prepared by WAPDA as a result of system studies, are followed as an ongoing activity. Transformer capacities of 17 grid stations are required to be enhanced where the demands have exceeded 80% of their installed capacities. Besides providing WAPDA with proper tools and necessary equipment, a proper maintenance record should also be maintained by it indicating status of each equipment at the time of maintenance and a date for the next maintenance required. Special programme for thorough checking for adequacy of protection, cables and other ancillary equipments such as current transformers (CTs) and potential transformers (PTs) as well as electrical and mechanical operation of the breakers at all grid stations should be organised.

It is however, suggested that a detailed study may be carried out to improve the performance of all the grid stations, which will indicate the quantum of work required and hence the financial requirements.

As LMA is a large and important load centre, firm grid supply (i.e. no loss of supply in the event of loss of one transformer) should be provided to consumers. This would require additional transformers in all grid stations. This is a policy matter required to be looked into by WAPDA.

24.1.2 Distribution System

Proper master planning and detailed engineering is the key to overall improvement of any distribution system. The first and foremost emphasis is therefore to be laid on proper master planning and detailed engineering design. The rule of thumb adhoc planning should give way to computer-aided analysis and planning to overcome complex problems. This would require updated maps and database for

distribution system. As part of its policy for computer-aided planning and design, WAPDA has acquired Software CADPAD (Computer-aided Distribution Planning and Design) and has prepared maps and digital data base for 25 out of 38 grid stations in Lahore. Unfortunately, the maps and database have not been updated to incorporate day to day changes/additions/alterations etc. It is, therefore, essential that the digital database and maps, for the 25 grid stations should be updated and survey and mapping undertaken to cover the remaining grid stations. Based on this updating, the system should be analyzed for overloadings, under voltages, technical losses and protection co-ordination using CADPAD or other suitable software such as EDSA etc. or other NESPAK in-house developed versions. Following the studies, distribution system (11 kV and LV) reinforcement/ replacement etc. should be proposed.

There is a need to frame out the preventive maintenance programmes to identify and repair/replace the following:

- a) damaged or leaning structures
- b) structures without proper earthing
- c) spans with improper sags and loosely connected service connections
- d) overhead lines in close proximity to building posing danger to public
- e) improper clamps
- f) defective or damaged meters
- g) inadequate protection
- h) non-standard jumpers
- i) defective service cables

As part of the above programme, overhead lines would be replaced by underground feeders in densely populated areas to reduce technical losses and offer safe and reliable supply to the consumers. The proper tools and equipment should be purchased for properly trained personnel. Some of 11 kV lines passing over houses and other buildings require re-routing / shifting.

24.1.3 Street Lights

Street light system is maintained/managed jointly by WAPDA, the City District Government and other agencies. In general, Lahore has inadequate street light facilities. The overall system requires complete and thorough renovation in a planned way and a comprehensive

programme should be organised to make the existing luminaries functional and expand its scope to cover left over areas taking into account the actual illumination requirements. The existing street lights should be surveyed and mapped to identify:

- a) broken or missing fixtures
- b) location-wise types of lighting
- c) defective chokes, capacitors, reflectors
- d) missing binding clamps, connectors, supporting pipe etc.
- e) number and type of control switches

Damaged equipment and accessories as indicated above should be repaired or replaced.

The distribution system operating the street lights should be examined for its adequacy and proper control/metering etc.

Fluorescent lamps and gas discharge lamps of high pressure mercury vapour are generally used for their good white colour rendering capability and fairly high efficacy. But with the particular emphasis on the conservation of energy, the gas discharge lamps of low and high pressure sodium vapour, with very high efficacy are very effective. Low pressure sodium vapour lamps rendering yellowish coloured light are not generally appreciated by the public. High pressure sodium vapour lamps with golden-yellow coloured light are recommended for use on main roads, so as to give good aesthetic impression and pleasant night time environment. Efficient and long life high pressure mercury vapour lamps will be generally preferred in lanes and narrow streets. However, wherever space does not permit specially in narrow streets, incandescent lamps should be used. The existing luminaries, may be relocated or interchanged with the help of the City District Government, so as to give uniform pattern of light distribution on each road or lane.

24.2 GAS SUPPLY

The highest demand for gas connections is for residential purposes which is growing @ 8% per annum as compared to the urban population growth of about 3% per annum. Current national energy policies also assign priority to residential customers as compared to other customers. Since gas is more economical and efficient than electricity, the households prefer switching over to gas appliances such as stoves, gas heaters etc. and thus putting increased pressure on gas connections.

The main distribution network is well spread in built-up areas of the city. As the city grows in the south, additional investment in this corridor for laying the distribution network will be required to meet the demand. Areas where the network already exists should be given priority since these are already occupied and do not need any major investment to provide service. It is estimated that the current gas supply of 30 mcm per day (i.e. 1050 mcf) is required to be augmented by another 30 mcm per day during the plan period to cater for the pending and new demands.

During the current fiscal year SNGPL intends to spend Rs. 1.4 billion on its infrastructure development. This will entail giving connection to 100,000 domestic consumers, 4,000 commercial consumers, 150 large industrial consumers and laying of 1,100 km of transmission lines.

24.3 TELEPHONE

Currently there are about 9.2 telephone connections per 100 persons which gives a telephone line density of one line per 11 persons (or one line per 1.6 households). The rate per 5 minute local call is Rs. 2.80. The existing subscribers have to pay a line rent of Rs. 261 per month and a sales tax of 15% on PTCL dues. The new subscriber has to pay Rs. 4,390 for telephone connection which includes installation fee, security and telephone set. The present set up of receiving customer complaints and responding to the service calls needs improvement.

The increasing use of mobile telephones has reduced the consumer's dependence on the conventional fixed line telephone system. Nevertheless, the increase in internet usage has also resulted in added telephone revenues of the PTCL.

25.0 FLOOD MANAGEMENT AND GROWTH POSSIBILITIES ACROSS RIVER RAVI

25.1 GENERAL

Catastrophic floods have been inflicting serious damage to Lahore City and the suburbs especially the right bank of River Ravi since pre-independence days. However, since 1947, two unprecedented floods (1955 and 1988), exceeding the design recurrence interval of all existing flood protection works have hit the city area inflicting unaccountable losses. The design capacity of Lahore Railway Bridge is 7,080 cumecs (250,000 cfs), which has badly been undermined due to silt deposition. The observed discharges of the two above-mentioned floods under unprotected upstream conditions were 7,333 cumecs (259,000 cfs) and 9,230 cumecs (326,000 cfs). It has been estimated that the peak flows of these floods, under breachless conditions, (i.e. assuming no breaches and spillages occur upstream) are 15,345 cumecs (542,000 cfs) and 16,310 cumecs (576,000 cfs) respectively.

More than 1000 small and large industrial units and over 30 housing colonies have been established on the right bank of River Ravi. Due to flood flows, nearly 500 industrial units with more than 6,000 labour force and about 20 colonies, villages and towns are adversely affected. Construction of Islamabad - Lahore Motorway (M-2) has provided protection to areas across the road while it has adversely affected areas on the upstream with a population of about 200,000 people. Rachna Town, Ferozewala, Imamia Colony, Wandiala Dial Singh are the worst affected colonies.

Recently 100-moria bridge has been widened by adding another 50 bays. It has provided some protection to the people of the area from the flows of Bhed Nullah. Expansion of Lahore across River Ravi would require that flood flows of nullahs and surplus flows of the river be properly managed through the addition of bays in the existing bridges and construction of a number of embankments to contain the flows along the colonies. Some areas would require local protection while comprehensive flood management plan would require proper channelization of flows to River Ravi. Proper feasibility studies are required to formulate a comprehensive and cost effective solution for the flood problem of the area.

Studies carried out by NESPAK for the interaction of Thein Dam, recently completed by India, on River Ravi has indicated that reduction in flood peak to the tune of only 11% for major floods encountered during 1955 and 1988 would be possible. This is because of the fact that all major tributaries outfall into the river below Thein Dam. Thus for all times to come, Pakistan is likely to face flood problems of River Ravi unless a comprehensive flood management plan is executed to safeguard the areas. The study would have to take into account the top levels of all existing embankments and the Motorway.

25.2 THE RECOMMENDED STRATEGY

Strategic planning calls for grouping the proposed measures into convenient packages to be implemented over the coming decades in the foreseeable future. The plans have to be flexible enough for adjusting to evolving conditions and scenarios as a result of human interventions and natural phenomena.

It has been considered prudent to divide the flood management programme into two packages viz.

- Short Term Plan
- Long Term Plans

Details of these groups of activities have been described below:

25.2.1 Short Term Plan

The Short Term Plan has been prepared after considering the current status of existing flood protection facilities vis-a-vis the socio-economic requirements of the respective protected area. Comprehensive discussions in this regard have also been carried out with various concerned officers of Irrigation and Power Department, Government of Punjab.

It has been envisaged that eight of the existing flood protection works of Lahore City require short term improvement measures. These are:

1. Babakwal Spur
2. Hockey Spur of Shahdara Flood Protection Bund
3. T-Head Spur No. 4 of Shahdara Flood Protection Bund
4. T-Head Spur No. 2 of Shahdara Flood Protection Bund
5. Dowel of Mahmood Booti Bund
6. Sloping Spur No. 3 near Furrakhabad
7. L-Spur of Tie Bund
8. Shahpur Kanjran Spur

In addition to the above remodelling/repair works, the flood protection of Shadiwal Village requires the construction of a new spur. This being an immediate and essential requirement of the area, has been included in the Short Term Plan. Delays in the execution of the scheme may result in the total destruction of the village.

All the existing flood protection facilities constructed for the safety of Lahore City have been described in Volume-I of this report. Table 25.1 presents a phased programme for execution of the needed works of Short Term Plan. The proposed works are also shown in Figure 25.1.

All costs have been based upon the item rates mentioned in CSR-1979 (Punjab Irrigation Department) with up-to-date premiums up to 2000.

TABLE 25.1
IMPROVEMENTS REQUIRED DURING SHORT TERM PLAN

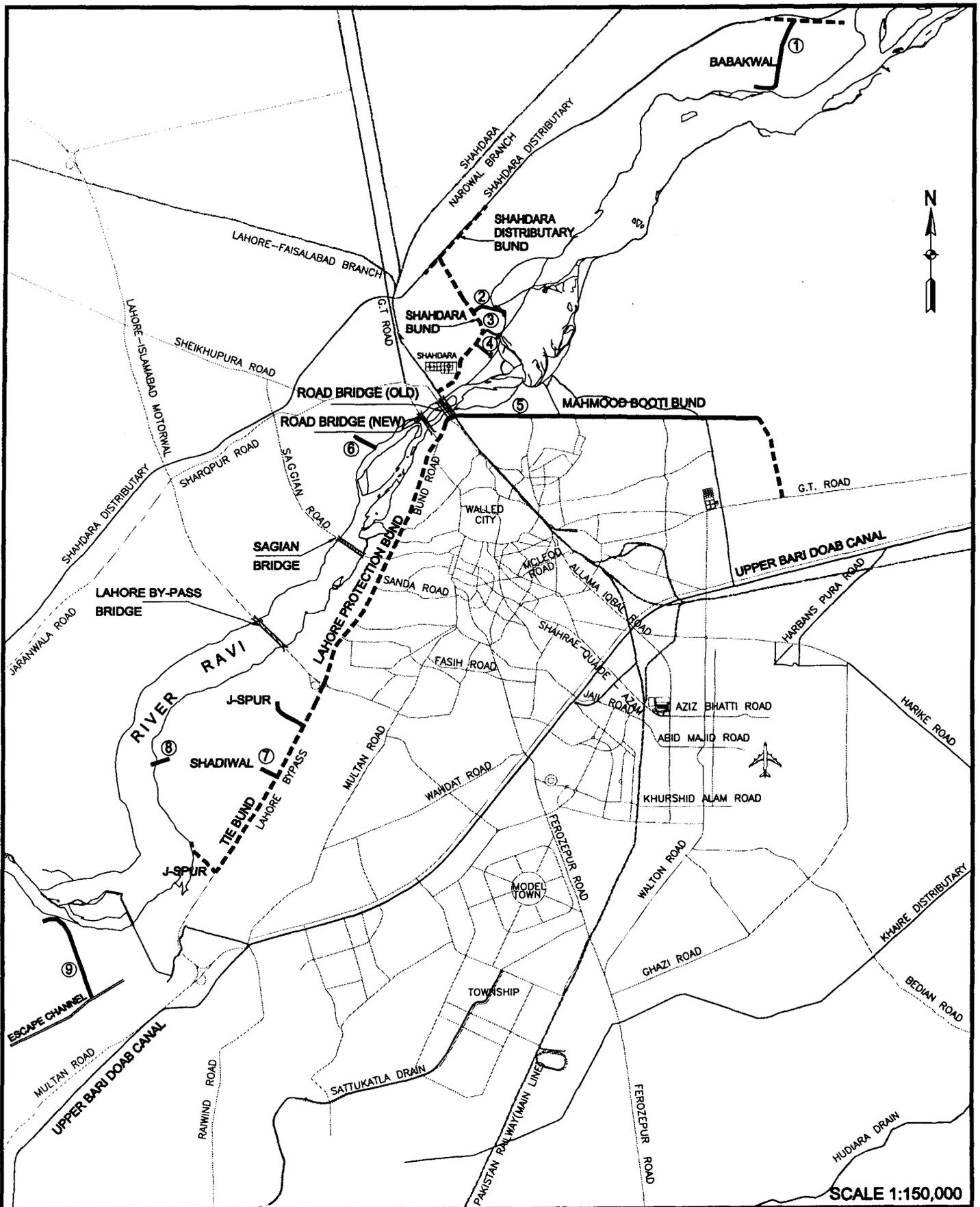
YEAR	WORKS REQUIRED AT	NATURE OF WORK	COST (Million Rs.)
1	- Babakwal Spur	Earth and Stone work for repairing J-Head and shank	8.5
	- Shahpur Kanjran Spur	Repair of stone pitching. earthen shank	7.6
	- L-Spur of Tie Bund	Earthwork	1.7
	- Dowl of Mahmood Booti Bund	Earthwork	1.2
Sub-Total			19.0
2	- Hockey/J-head Spur (610 metre =2,000 ft.) near Shadiwal Village	Earthwork/Stonework (new)	12.1
	- Hockey Spur of Shahdara Flood Protection Bund	Earthen Shank Portion requires repair	1.2
	- Sloping Stone Spur at Furrakhabad	Stonework	2.1
	- Spur No. 2 of Shahdara Flood Protection Bund	Stonework	1.2
	- Spur No. 4 of Shahdara Flood Protection Bund	Stonework	1.8
	- Flood Study	One year duration	10.0
	Sub-total		
GRAND TOTAL (Say)			48.0

25.2.2 Long Term Plans

It is high time that studies for the long term plans are initiated for flood management of River Ravi in the Lahore Region. Flood protection of the southward expanding urban settlements along left bank of River Ravi consists of extending the Lahore Protection Bund to a suitable point. This proposition is simpler as compared to providing protection to the right bank areas. Flood protection of the area along right bank of the river deserves special attention in view of its vulnerability to damage during the high floods.

With the urbanization and growth in industry around and beyond Shahdara Town, it would be extremely difficult in future to flood this area by frequent use of breaching section in the Shahdara Flood Protection Bund. (RD 137-163 of Shahdara Distributory), for releasing excess discharge in order to protect the main city of Lahore.

Alternatively, discharge capacity of the River Ravi stretch passing through Lahore will have to be increased to a reasonable limit, so that the need to operate the breaching section is seldom required.



LEGEND:-

- ① Babakwal Spur
- ② Hockey Spur of Shahdara Flood protection Bund
- ③ T-Head Spure No.4 of Shahdara Flood Protection Bund
- ④ T-Head Spure No.2 of Shahdara Flood Protection Bund
- ⑤ Dowel of Mahmood Booti Bund
- ⑥ Sloping Spur No.3 near Furrakhabad
- ⑦ L-Spur of Tie Bund
- ⑧ Hockey Spur Near Shadiwal Village
- ⑨ Shahpur Kanjran Spur

FLOOD PROTECTION WORKS
 EXISTING - - - - -
 TO BE REMODELLED —————

FLOOD PROTECTION MEASURES

Fig: 25.1

Detailed hydrological studies of the River Ravi in Pakistan have recently been carried out by NESPAK under the Flood Protection Sector Project. In addition, channel routing studies for flood peaks of different magnitude have also been made using computer-based mathematical models. This information is readily available and its advantageous use can be made for planning and design of the flood management works around the city of Lahore. A brief description of the related hydrological and hydraulic aspects follows.

25.2.2.1 Flood Routing

Record of peak discharges on River Ravi is available since 1922. Annual maximum historical flood discharge data of River Ravi, measured at Shahdara Bridge, has been collected from Punjab Irrigation Department for the period 1922 to 2000. The largest flood peaks recorded for which breaching section upstream of Shahdara was also operated are given in Table 25.2.

TABLE 25.2
LARGEST FLOOD PEAKS RECORDED SINCE 1922 FOR
WHICH BREACHING SECTION WAS OPERATED

YEAR	DISCHARGE IN CUSEC		
	At Bridge	Through Breach	Total
1955	259,000	283,000	542,000
1988	326,000	250,000	576,000

Recently, India has constructed Thein Dam on River Ravi located about 245 km (153 miles) upstream of Shahdara. It is designed to have a live storage of 1.90 million acre feet (MAF) for irrigation and power generation. According to reduction estimates¹ under post dam condition, the extreme floods in River Ravi are likely to be reduced by 20% at Shahdara. Consequently, any flood of intensity of 1955 or 1988 is expected to be reduced to around 400,000 cfs.

In view of above, the new works for effective flood control should be designed against peak flood value under existing condition with Thein Dam. As stated earlier, Sagian and Motorway bridges have also been constructed for a capacity of 400,000 cfs. It is, therefore, appropriate to adopt this discharge value for providing protective measures at Shahdara.

25.2.2.2 Alternative Flood Management Measures

Several alternative measures deserve consideration for facilitating the safe passage of Ravi flood peaks through Lahore Region. Major options available for achieving the desired objective are as follows.

¹ Report on National Flood Protection Plan, Phase-II, June 1987, NESPAK (Table 3.1)
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- i) Widening of waterways of the Railway and old Road Bridges by providing additional spaces (Figure 25.2).
- ii) Diverting excess flows upstream of Ravi Syphon. (Figure 25.3)
- iii) Constructing a protection bund on a convenient alignment in such a way that the escaping flow from the deliberate breach remains to the north of this bund and is guided back to Ravi at a safe location downstream. The area enclosed between the River Ravi right bank and the bund will thus be protected from inundation (Figure 25.4).
- iv) Constructing strong protective embankment all along the right bank at a distance that ensures trouble free propagation of the design flood peak (400,000 cfs). The existing bunds on the left bank may also require raising and strengthening for this alternative (Figure 25.5).
- v) Constructing ring bunds around selected areas on the right bank so that these remain free from inundation during the flooding from deliberate breach in Shahdara Bund. (Figure 25.6).

25.2.2.3 Comparison of Alternatives

As the alternatives are in the conceptual stage, only technical and social aspects can be compared. Major consideration regarding merits and demerits of various options are discussed in the following paragraphs:

Alternative V i.e. protecting selected areas by means of ring enclosure bunds has a major social drawback that the people residing in the left out areas would feel deprived. If larger areas are enclosed, this alternative approaches close to Alternative III. This alternative is therefore dropped on the grounds of social unacceptability.

Alternative IV (i.e. constructing flood protection bund along the right bank similar to the one existing on the left bank which should be strong and high enough to prevent inundation even during high peaks), involves acquisition of about 20 km long strip of land of about 100 m width along the right bank. Although technically possible, the protection embankments shall have to be extraordinarily large and would involve exorbitant cost. Another setback with this alternative is that the entire protection system of the left bank would also require raising. The raising of Mahmud Booti and Lahore Protection Bunds would mean widening of the bases too. This would, in turn, require acquisition of land which is already built up and covered by

residences, factories and public buildings etc. Accordingly, this alternative is not only expensive but would also involve social problems while acquiring land for its implementation.

Alternative III proposes construction of protective bund on the landward periphery of the area to be protected on the right bank. This alternative also involves acquisition of land in the built-up area which would create social problems. In addition, 300-400 acres of urban land would also be occupied by the embankment itself. Crossing of G.T. Road, Lahore - Sheikhpura Road and Lahore - Islamabad Motorway with the proposed bund would be problematic and expensive and cross-drainage structures would have to be constructed. All the above factors make this alternative un-attractive from the technical, social and economic view points.

Alternative II i.e. diversion of excessive flood flows in the upstream region can only partially meet the mitigation requirements. A few kilometres upstream of the Ravi Syphon there is a depression area along left bank of the river. This depression is presently separated by a low ridge of raised land patches from the river flood plain and can be transformed into temporary ponding sites for holding and attenuating the peak flood. Suitably sized cuts would have to be made in the ridge to allow spillage during high flood stages in the river. Proper study is required before embarking upon this alternative.

Alternative I i.e. widening of the constricting bridges at Shahdara, comprises remodeling of the Railway and Old Road Bridges for a discharge of 400,000 cfs. This alternative, though slightly cumbersome, presents the most practical solution to the problem. Once the waterway under these bridges is increased, the constriction will be removed and the afflux that presently threatens Mahmud Booti Bund will cease to build up. This alternative does not require excessive land acquisition and resettlement etc. and hence its social acceptability is ensured. Alternative I therefore appears to be the best option among those considered above.

25.2.2.4 The Recommended Plan

a) Remodeling Requirements

Comparison of various options has shown that Alternative I i.e. widening of the Railway and Old Road Bridges, which are presently the bottlenecks in flow regime, is the most desirable method of solving the problem.

In order to achieve the discharging capacity of 400,000 cfs, the Railway Bridge requires opening of 9 plugged bays. Similarly,

additional spans will have to be added to the old road bridge for increasing its abutment to abutment distance from the present about 384m (1260) ft to 625m (2050 ft).

About 305m (1000 ft) wide strip of land shall have to be acquired, mostly on the right bank, for the additional waterways and approaches etc. of the bridges to be remodeled.

Temporary bypass arrangements shall be required for remodeling of the Railway Bridge to keep the track in operation during the extension activities. Temporary diversion dykes, cofferdams etc. shall have to be constructed to keep the construction activity safe from the passing flood flows, if any.

b) Rough Cost Estimate

Design details of project components are to be prepared for arriving at a dependable cost estimate. At this stage only indicative rough cost can be worked out as under:

Description	Cost (in million Rs.)
i) Preparatory works, bypass, cofferdams etc	= 18.15
ii) Earthwork	= 12.00
iii) Extension of Railway Bridge	=133.10
iv) Extension of Road Bridge (old)	= 90.00
v) Training works	= 72.60
vi) Land Acquisition/Resettlement	= 54.45

Sub Total:	=380.30
Contingencies @ 10%	= 38.00
Engineering and Administrative @ 3%	= 11.41

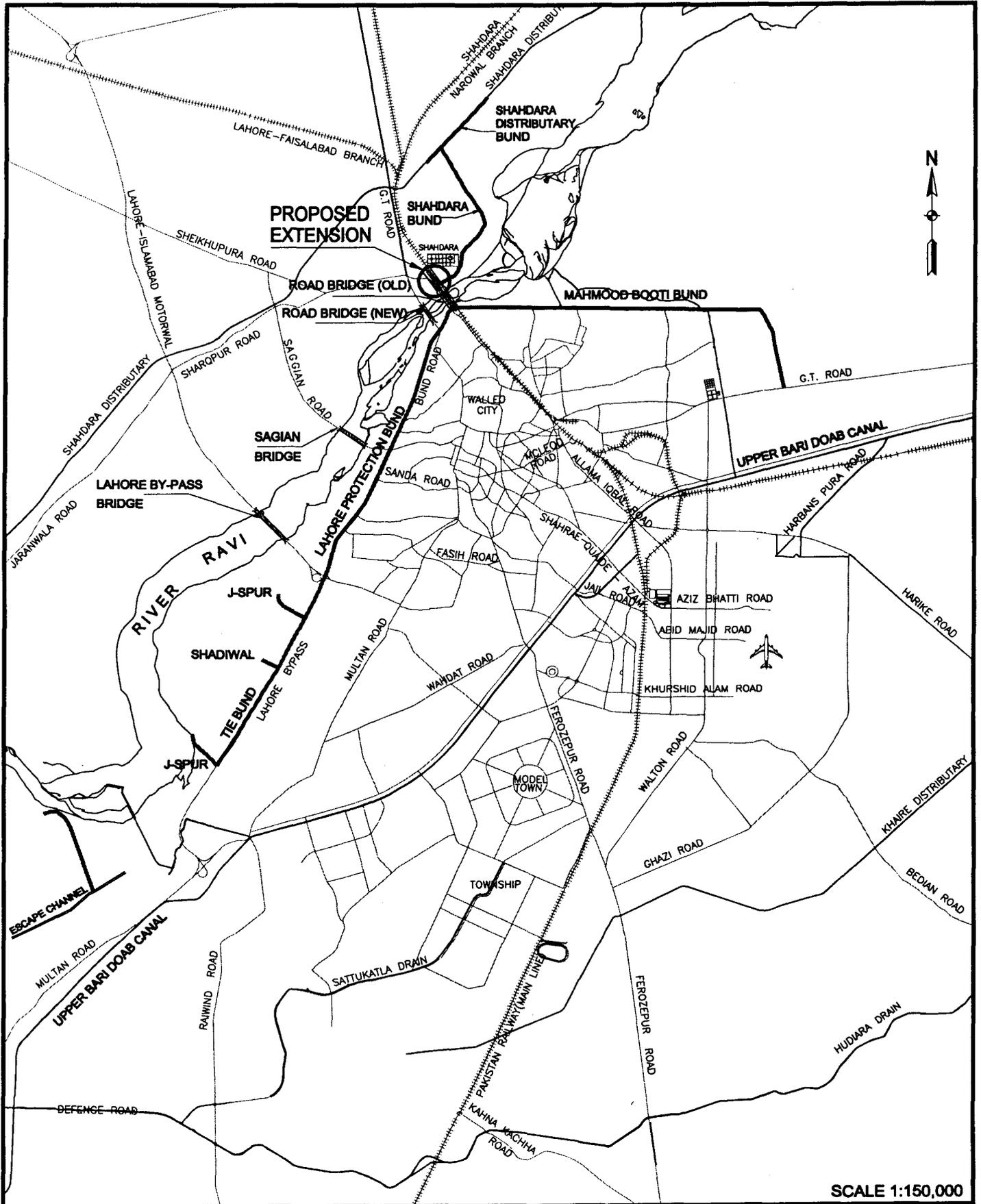
Total Cost	=429.71

	Say Rs. 430 million

25.2.2.5 Specific Recommendations for Project Implementation

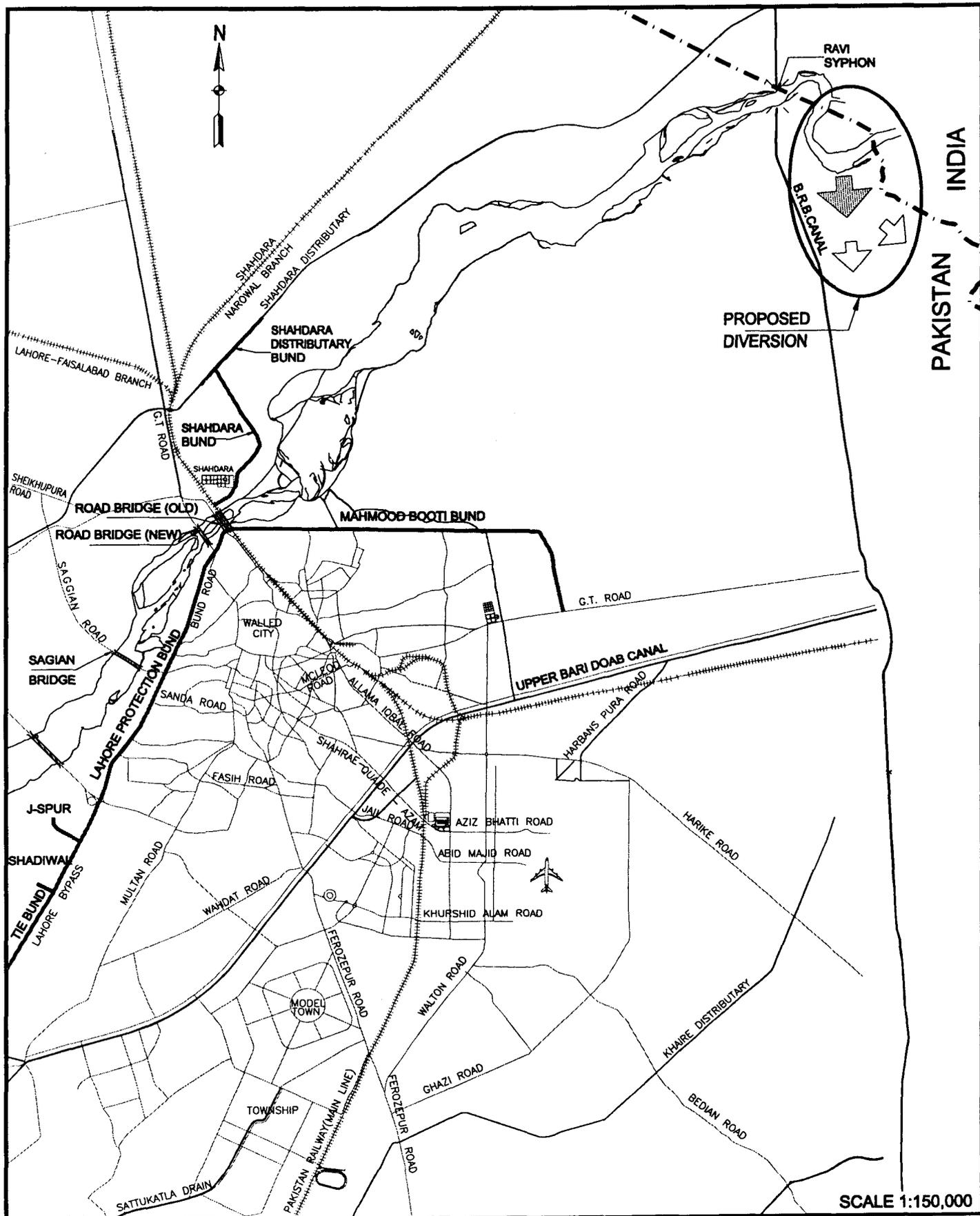
a) Keeping in view the involvement of various government departments/organisations, it is recommended that a committee comprising representatives from under mentioned agencies be formulated for coordinating the project activities.

- Pakistan Railways
- C&W Department
- Irrigation Department



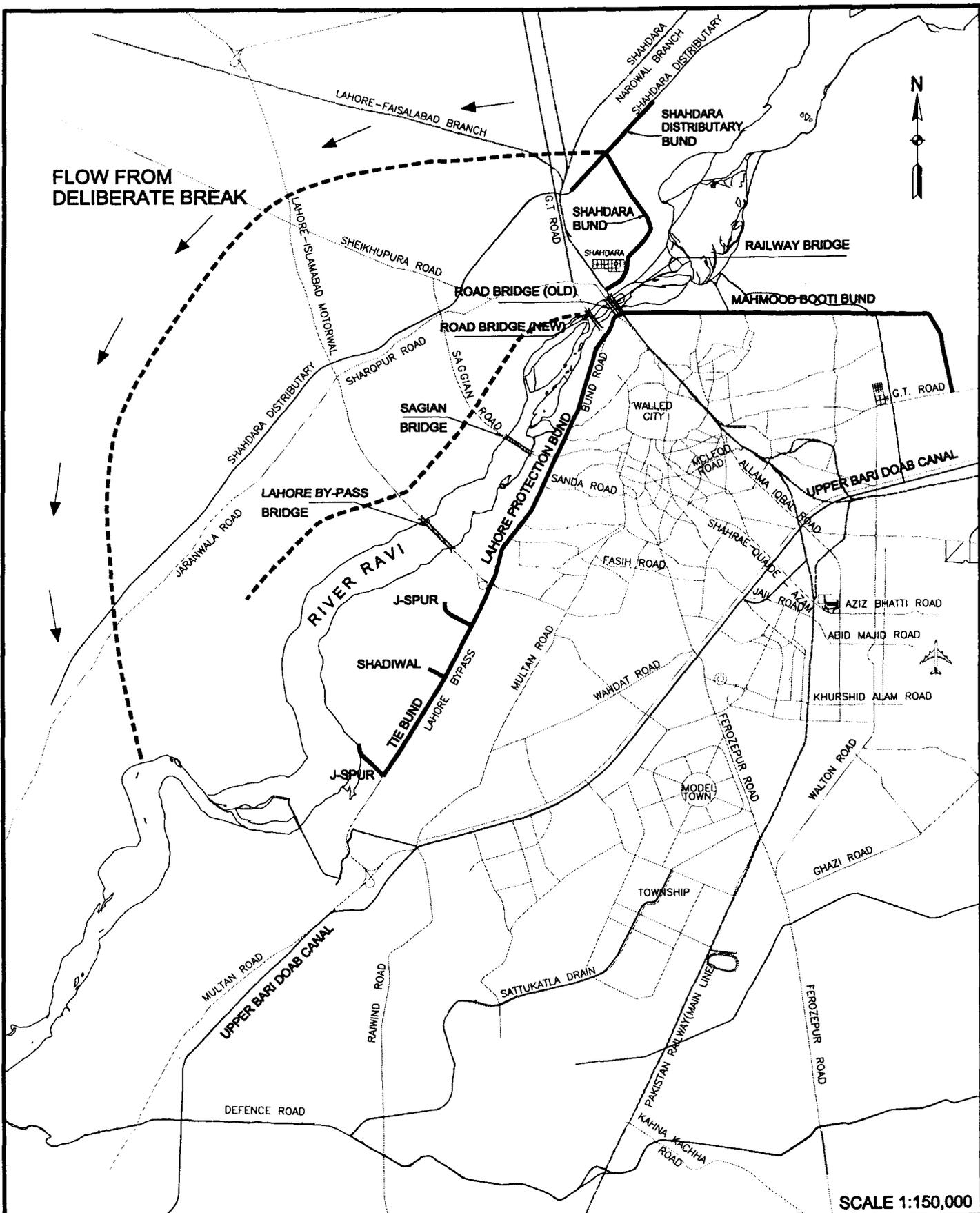
**EXTENSION OF RAILWAY
& OLD ROAD BRIDGES
(ALTERNATIVE-I)**

Fig: 25.2



**FLOOD DIVERSION
UPSTREAM OF RAVI SYPHON
(ALTERNATIVE-II)**

Fig: 25.3

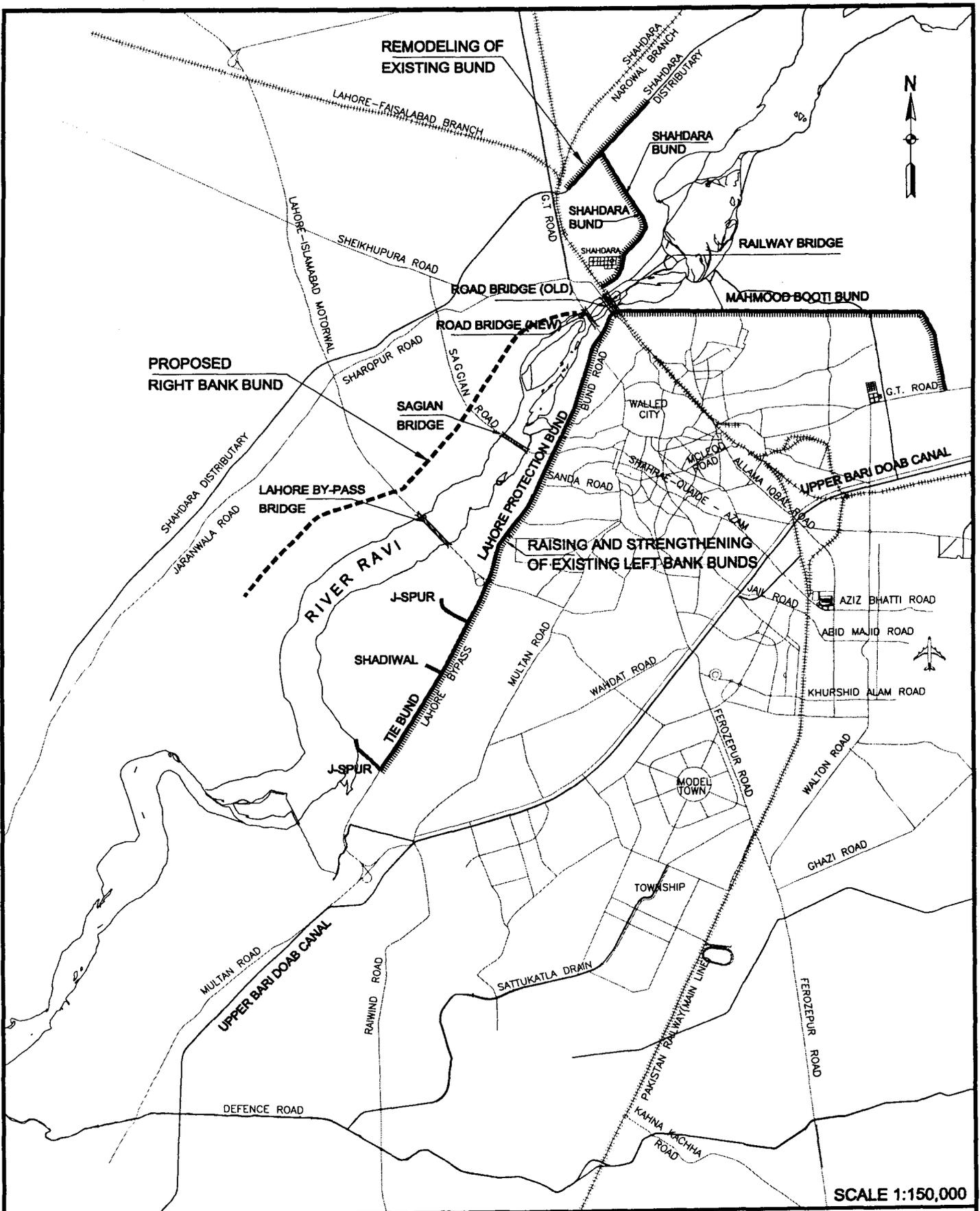


LEGEND:-

PROPOSED NEW BUND - - - - -

**PERIPHERAL
PROTECTION BUNDS
(ALTERNATIVE-III)**

Fig: 25.4

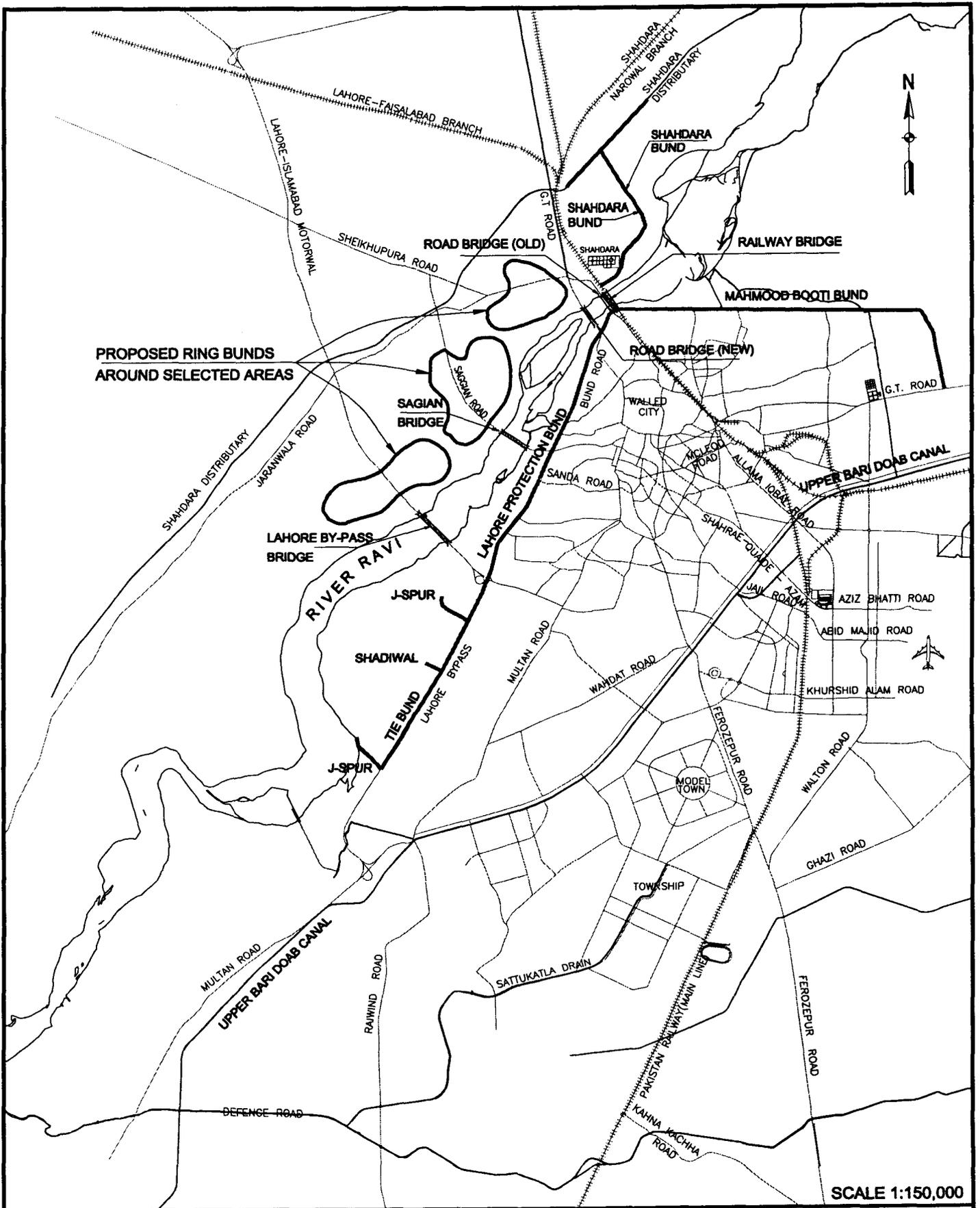


LEGEND:-

REMODELING OF EXISTING BUND
 PROPOSED NEW BUND -----

**RIGHT BANK PROTECTION BUNDS
 (ALTERNATIVE-IV)**

Fig: 25.5



**RING BUNDS AROUND
SELECTED AREAS
(ALTERNATIVE-V)**

Fig: 25.6

- Punjab Flood Commission
- Lahore Development Authority
- Ministry of Defence
- Lahore City District Government
- Planning and Development Department

The Irrigation Department, Government of the Punjab has already taken up the matter with the Pakistan Railways for widening/ remodeling of the old rail bridge to increase the flood discharge up to 400,000 cfs. (equivalent to the discharge of newly constructed bridges of Sagian and Lahore Bypass).

- b) Topographic survey of the latest field conditions be carried out immediately after expiry of the monsoon season. The survey should include details of land use, physical developments etc. in the project area.
- c) For convenient implementation, the project works may be grouped into suitably sized packages to be contracted according to availability of funds.
- d) Flood plain encroachments in River Ravi should be removed from the critical locations and appropriate compensation be paid to the affectees.
- e) Legislative reforms be made and enacted to prohibit encroachment of the river flood plain in future.
- f) In view of the sewage discharge in River Ravi which is polluting the water aquifer, there is strong need to make arrangements for storing river water on its upstream and flushing its bed more frequently to minimize pollution.

26.0 URBAN ENVIRONMENT

26.1 GENERAL

As discussed in Volume-I of this report, the prevailing environmental conditions in the City are deteriorating due to air and water pollution, increase in noise level, indiscriminate disposal of the untreated municipal and industrial wastewater into the surface water bodies and encroachments/unplanned growth in various parts of the city.

This section presents a short term plan (covering the first five years) for the environmental enhancement in the City of Lahore and recommendations and suggestions for long term environmental improvements. The Short Term Plan is centered around the following four aspects.

- (i) Air Quality Improvements
- (ii) Noise Prevention
- (iii) Water Quality Improvements
- (iv) Development of parks, playgrounds and landscaping

Short term plans for each of the above aspects are briefly described below, and the list of relevant projects is given in Volume-III of the report.

26.2 AIR QUALITY ACTION PLAN

A basic activity for the said plan would be to create a reliable data base as proposed in the Action Study on "Monitoring Programme for Air and Water Quality" which was prepared by NESPAK and submitted to LDA in 1998. Presently, the air quality monitoring data about the City of Lahore is based only on random surveys, which need to be supplemented by a continuous air monitoring exercise at all the busy traffic intersections as well as various industrial estates located in LMA.

Similarly, there is a need to extend the currently limited public bus transport system to serve whole of the city as already mentioned in Volume-I of this report (to reduce the number of private vehicles plying on the city roads) and construction of additional grade-separated facilities to reduce traffic congestion points.

There is also a need to check all vehicles to determine their suitability/fitness especially with regard to exhaust emissions at least once a year and framing of guidelines to keep dust and suspended particles under control during various construction activities. A phased programme for converting the public transport vehicles to CNG should now be undertaken. The imposition of a ban on burning of all types of solid waste in the City is also the need of the hour.

26.3 NOISE PREVENTION ACTION PLAN

Excessive noise has become a new pollution factor and nuisance in the life of the city residents. Various enforcement actions like strictly implementing the ban on

loudspeakers, and creation of silence zones near hospitals and educational institutions are urgently required.

There is also a need to discourage unnecessary blowing of horns through public education via electronic and print media, which almost always create a noise level above the acceptable International Standards i.e. 85 DBA.

26.4 WATER QUALITY ACTION PLAN

26.4.1 Ground Water and Drinking Water Quality

- Although some previous studies have been carried out by NESPAK and others, about ground water monitoring of Lahore, there is a need to continuously keep on updating this data. Therefore, monitoring of the water quality of selected tubewells as well as water distribution points as suggested in the Action Study on "Monitoring Programme for Air and Water Quality" is included in the plan. It is also desirable that positive pressure be maintained over night in the water distribution lines to minimize chances of pollution being sucked into the distribution lines during periods of tubewell switch off/closure.
- The regulation for keeping a minimum of 3m (10ft) spacing between water and sewerage lines needs to be strictly enforced otherwise suitable protective measures should be provided on ground.
- All water pipelines should be flushed from time to time and the overhead storage tanks be cleaned and disinfected at least once every six months. Both WASA and the private housing societies should be asked to ensure compliance with this requirement. The Punjab Health Department should play a pro-active role in this regard.
- Drinking water quality should be monitored on a continuous basis by both WASA and private housing societies. Checks on water quality should also be made by a third party at various locations.

26.4.2 Surface Water Quality

Regular monitoring of the water quality of River Ravi from Ravi / BRB Syphon up to Head Balloki, UBD Canal and Hudiara Drain as envisaged in the above-cited action study are included in the proposed plan.

This should be supplemented by construction of a sewerage system for localities disposing of their effluents into UBD Canal, carrying out feasibility studies and at least construction of the first phase of municipal and industrial waste water treatment plants, outlined in the Pak-NCS Project and various other studies.

Simultaneously work on the augmentation of the flow of River Ravi upstream of Ravi Bridge is very crucial due to the proposed construction of Thien Dam across the Border by India. This has adversely affected the already dwindled flow of River Ravi, with consequent environmental damage and probable negative effect on the recharging of Lahore aquifer.

26.5 DEVELOPMENT OF PARKS, PLAY GROUNDS AND LANDSCAPING

The City of Lahore is quite fortunate compared to many other major cities in the country to have a number of recreational parks and green areas. However with the growing environmental pollution, there is an ever-increasing need to protect this greenery and tree line of the City. In this connection, the development/proper maintenance of recreational spaces in Northern Lahore and around Walled City needs special emphasis.

Haphazard construction activity and development of housing schemes, shopping plazas and petrol pumps etc. tend to minimize the environmental beauty of the City as well as reduce the available open/green spaces. Construction of multi-storeyed plazas very close to the road shoulders without any setback from the main road should be avoided as it creates parking/traffic problems as well as presents an un-aesthetic look. Steps to mitigate these negative trends as well as a drive to include the public in a tree plantation initiative are the need of the hour.

26.6 RECOMMENDATIONS AND SUGGESTIONS FOR ENVIRONMENTAL IMPROVEMENTS

The following suggestions/recommendations are made to improve the overall environmental conditions in the City.

1. Lahore Master Plan needs to be implemented with strict landuse/ development control to ensure coordinated urban growth.
2. Encroachments on the rights of way of stormwater channels, roadways and the river banks should be discouraged and removed by resettlement of the occupiers to safer places. This can only be achieved through political will and a spirit to enforce the existing regulations on a continuous basis.
3. Lahore needs a proper stormwater drainage and solid waste management plan with strict implementation. Dumping of solid waste along the Motorway and near Saggian Bridge should be discontinued on a priority basis. This provides a very un-aesthetic look/impression of the city to the visitors from other cities/ areas. The City District Government should develop proper sanitary landfill sites, away from major roads/built up areas.
4. The tree line/greenery of Lahore must be protected by all means. Citizens should be involved in a drive to plant more trees in their houses/surrounding areas. There should be a target-oriented campaign each year to preserve and enhance the greenery of the City. If for any reason (road widening etc.) cutting of trees is unavoidable, the Environment Impact Assessment Study (EIA)

should ensure that at least an equal or preferably greater number of trees should be planted in the close vicinity of project area. A clean and green Lahore should be the goal of the campaign.

5. All major construction activities should be carried out with proper environmental considerations and be confined within false boundary walls to protect the environment from dust pollution and other hazards.
6. Housing schemes which do not have arrangements for proper disposal of their wastewater may not be issued necessary clearance. Similarly individual buildings/houses should also not be issued the NOC, if these do not provide for proper disposal system for sewage as well as runoff from driveways.
7. Greater co-ordination is needed between WASA, EPD Punjab, Health Department and PCSIR for the water quality monitoring of the City. It is recommended that joint teams of WASA and EPD may collect water samples from various areas of the City. This would increase inter-agency spirit of co-operation and also provide a chance of verification of the analytical lab results and coordinated action.
8. A plan for flushing the drinking water pipelines/overhead reservoirs on a regular basis by both WASA and private housing societies should be prepared and strictly implemented. Long term plans be prepared for replacement of corroded/ rusted water/sewerage pipelines.
9. New housing schemes developed by LDA like Allama Iqbal Town, Garden Town and Johar Town etc. have also shown signs of severe environmental degradation. The condition of private housing schemes located closer to such LDA approved schemes is even worse. LDA needs to develop an "Environmental Management Plan" for all new housing schemes and those recently developed, which should be strictly implemented. The operation and maintenance of relevant infrastructure by the private housing societies should also be included in the above plan and closely monitored.
10. For all efforts related to environmental preservation, community involvement is a critical factor which needs to be always kept in view. For instance, if six million people in a City are bent on spoiling the environment, the urban civic agencies will have very little chances of success in their efforts for environmental preservation. The need for public education and co-operation for all efforts related to environmental protection therefore needs no special emphasis. All public service/civic agencies therefore need to create "Community Liaison Units/ Cells" to achieve that goal, which should work in close contact with the citizens and involve them in various stages of policy formulation and implementation of decisions related to environmental preservation.
11. Extension of the presently limited public bus transport system for the whole city as already discussed should be carried out. A phased programme for conversion of the public transport vehicles to CNG, which is more economical

and pollution free, needs to be implemented. Comparative study of various means of mass transit as already highlighted in Volume-I of this report needs to be carried out.

12. The height of buildings and land sub-divisions should be allowed keeping in view their possible impact on the existing infrastructure (water supply, sewerage etc.) and the surrounding environment. The approval of building plans besides provision of adequate parking space should also ensure provision of proper safety arrangements like fire fighting equipment, elevators/stairs etc.
13. All major development projects, which are likely to cause an adverse environmental impact, should get their clearance from EPD, Punjab which is mandatory under Section 12 of Pakistan Environmental Protection Act, 1997.
14. All major roads particularly in newly developed areas must provide for green belts with tree plantation within their rights of way. Presently the non-functional fountains along Circular Road should be made functional.
15. No change of land use should be allowed except as per provisions of the Lahore Master Plan (e.g. establishment of industry in residential areas should be discouraged and prohibited). Existing industries and other non-conforming land uses posing environmental problems situated in the vicinity of residential areas should be shifted outside urban limits/built up areas (as discussed in the Chapter on Zoning Regulations).
16. Necessary steps should be taken to start construction of at least the first phase of the municipal and industrial wastewater treatment plants as outlined in the Pak NCS Project and as provided in the Pakistan Environmental Protection Act, 1997.
17. Until the completion of targets listed in Item 16 above is achieved, serious consideration should be given to the augmentation of flow of River Ravi upstream of Ravi Bridge for environmental mitigation.
18. Due to inadequate facilities in existing slaughter houses, Lahore requires a modern slaughter house to cater for the needs. An area of 717 kanals has been acquired near Shahpur Village along Multan Road. The proposed slaughter house must have a cattle market along with necessary arrangements for hygienic slaughtering, efficient utilization of by-products, adequate drainage and waste disposal system.

26.7 COSTING FOR SHORT TERM ENVIRONMENTAL IMPROVEMENTS

“Environment” is a very diversified field, which covers both air and water quality improvements, the issues of land development, parks and recreational spaces and development of flyovers/underpasses etc., which consequently improve the air quality in the City. The cost estimates of the actions proposed above are covered in Volume-III of this report.

However, costs and phasing of only the proposed monitoring studies/surveys and technical assistance which is conceived to be necessary in the short term (during the first five years) is indicated in Volume-III of this Report. Costs of certain actions which need to be taken up as a matter of policy, through legislative and/or administrative actions should be covered through routine provisions in the annual budgets of the concerned agencies. It is proposed that an annual budget proposed under the head "Environment" may be placed at the disposal of EPD, for carrying out miscellaneous environmental improvement works listed in the short-term plan either by the agency itself or through co-ordination with other agencies.

The costing for various surface, ground water and air quality monitoring studies is based on the Action Study on "Monitoring Programme for Air and Water Quality" mentioned above.

26.8 LONG TERM RECOMMENDATIONS

- Construction of municipal and industrial wastewater treatment plant(s) for the City of Lahore should be undertaken.
- Open sewage nullahs through the city be eliminated by construction of covered conduits.
- Marala Ravi Link Canal should be provided with some base flow in the dry weather (October through March) to augment the discharge of River Ravi, downstream of BRB Syphon/Ravi Bridge. This is essential to keep the River "alive", otherwise it would cause devastating environmental damage.
- By removal of unauthorized encroachments along Bund Road, create recreational areas along Bund Road as recommended in the Master Plan. This road may be renamed as "River View Drive". The entrance to a city should provide an aesthetic look to the visitors and not otherwise. The unauthorized settlements along Bund Road endanger safety of the Protective Bund as well as addition of pollution to the river's main flow. Also in case of sudden flooding, this population is always at risk of inundation, similar to the case of Lai Nullah in Rawalpindi. Hence a comprehensive Flood Management Study should be undertaken to save the city and its suburbs from devastations.
- Construction of a mass transit system through the city should be carried out to cater for the daily travel/commuter demand and to check the increasing use of private cars/vehicles.
- Community centres/children playgrounds should be developed in all new housing schemes, and wherever possible in the existing housing schemes.
- The City District Government should develop proper landfill sites located away from built up areas/major roads for solid waste management as proposed/identified in the Action Study on Solid Waste Management already submitted to LDA.

27.0 INSTITUTIONAL FRAMEWORK

27.1 INTRODUCTION

Rapid and uncontrolled urbanisation is creating multidimensional problems. Because of the market forces, the residential properties and vacant areas meant for residential uses are being rapidly converted into offices and/or commercial uses, particularly along major roads and streets. The trend is so heavy and rapid that the authorities found it difficult to cope with. The easier solution found was to 'regularise' commercialization activities throughout the city after charging a conversion fee. This step not only generated revenue for the concerned authorities but also made the life easier for the encroachers and for those who were responsible for illegal/unauthorized change of landuse. The 'pro-commercialization' policies of both LDA and ex-MCL as a source of revenue are evident from the fact that in both these organisations, senior planning officers along with support staff have been exclusively designated for commercialization purposes. The policy needs to be reviewed. The same is true about mushroom linear growth of industrial areas along the major corridors outside as well as inside the built-up areas of Lahore. These problems are aggravated if the institutional set-up is not responsive to the requirements.

Lahore has been and is growing rapidly. The City Authorities in the past, be it MCL or LDA, have been concentrating on planning approvals, building controls, planning and developing housing schemes and commercializing the non-commercial areas. The practical response to Lahore's problems has been inadequate. What is required is a live, dynamic and forward-looking institution which would continuously review, update, plan, monitor and when needed, implement programmes for guiding Lahore's growth and development. Under the Punjab Local Government Ordinance, 2001 (PLGO), Lahore has been declared a 'City District'. The set-up however, like in rest of the country, is in a transient stage and it may take a couple of years before it gets firmly rooted.

It needs to be stated here that planning approval and building control go hand in hand and are a down-stream function best carried out by the Town Administrations. In case of building regulations what is required is uniformity as well as de-centralisation of plan approvals. People should be able to get their building plans approved locally and should not have to run after officials sitting in the City District Administration. The prospective developers should follow the broad parameters/guidelines given in building regulations, regarding for example ventilation, light, cleanliness, disposal of waste etc. The Town Authorities must respond to the variety of applicants living within their jurisdiction as per specified regulations.

The composition, structure, functions and rules of business for all tiers of Local Government, including the City District, Town Municipal Administrations (TMAs) and Union Councils (UCs) have been laid down in the PLGO. To propose an implementation framework for Integrated Master Plan for Lahore

(IMPL), it is important to give a close look to the administrative set-ups of the above tiers of the Local Government. The relevant details about PLGO, 2001 have already been provided in Volume-I of this Report. The details from the point of view of Master Plan Implementation are discussed below:

27.2 THE CITY DISTRICT GOVERNMENT

Under the PLGO, since District Lahore has been declared as a City District, the District Nazim (being the Chief Executive), is responsible for the overall District Administration. The District Government comprises of district offices¹, including sub-offices of the government departments decentralized to the District Government and other offices set-up by the District Government and grouped under the Executive District Officers (EDOs) and coordinated by the District Coordination Officer (DCO). The DCO is the coordinating head of the District Administration with powers to review and assess the performance of the group of offices individually or collectively, and give directions for taking actions or measures for improving efficiency, service delivery and achievements of goals assigned in the approved plans of the District Government. Organization Chart is given in Volume-I of this Report.

Since its establishment in 2001, the City District Government (CDG) has accomplished various projects related to development of physical infrastructure, improving service delivery and promoting social sector etc. The CDG has the following vision of Lahore:

“Our vision of Lahore is a metropolis with international-standard policy and physical infrastructure that is friendly and safe for the citizens and the investors, and that also retains its traditional glory and magnificence. We are committed to attain excellence in all functional, developmental, and service delivery areas. We continue to work to implement this vision and Insha-Allah we will make Lahore not only a model district in Pakistan but a rival of Hong Kong, Dubai, Tokyo and Singapore at the international level. May God Bless Pakistan”.

27.3 THE TOWN MUNICIPAL ADMINISTRATIONS

Based on the contiguity of unions, the City District of Lahore has further been divided into six towns. For each of the six towns, there is a TMA which is a body corporate and consists of the Town Nazim, Town Municipal Officer, Town Officers, Chief Officers and other officials of the Local Council Service and officials of the offices entrusted to the TMA². At town level, there are four town officers working under the Town Municipal Officer (Organization Chart is given in Volume-I of this Report). These include:

¹ First Schedule, Part A (Decentralized Offices), Part B (Other Offices), Part C (Groups of Offices), of the PLGO.

² Section 50, Page 34 of the PLGO.

- Town Officer (Planning and Coordination)
- Town Officer (Infrastructure and Services)
- Town Officer (Regulations)
- Town Officer (Finance)

The TMAs describe their vision of Lahore as:

“Building an environmentally sustainable, functionally efficient, aesthetically pleasant, and livable town by maintaining its cultural heritage with focus on revitalization”.

27.4 THE UNION ADMINISTRATIONS

The six towns of the Lahore City District have in aggregate, 150 union councils. Though the urban-rural dichotomy exists no more, but going by the old terminology, there are 120 urban and 30 rural union councils in the City District. Ravi Town and Data Ganj Bukhsh Town have no rural union councils (refer Volume I of this Report).

The Union Nazim heads the Union Administration. The Naib Union Nazim deputizes the Union Nazim during his temporary absence. The Union Secretaries coordinate and facilitate in community development, functioning of the union committees and delivery of municipal services under the supervision of Union Nazim. Where there is more than one Secretary of the Union Administration, the distribution of work among the Union Secretaries is as under:

1. **Secretary (Union Committees):** responsible for facilitating and coordinating the functioning of union committees and any other function entrusted to him by the Union Nazim.
2. **Secretary (Municipal Services):** responsible for delivery of municipal services under the supervision of Union Nazim and for all other functions entrusted to him by the Union Nazim.
3. **Secretary (Community Development):** responsible for the community development works of the union administration and for all other functions entrusted to him by the Union Nazim.

The PLGO provides detailed job descriptions of the Union Council (UC) Secretaries. However, the functions given in the Ordinance are too ambitious as against the present qualifications and experience of the secretaries and the councillors. There is an urgent need for training of UC Secretaries as well as elected representatives so that they can properly carry out their designated responsibilities.

The 'Spatial Planning and Development' related functions of the District Government, Town Administrations and the Union Councils are summarized in Table-27.1.

TABLE 27.1
SUMMARY OF FUNCTIONS OF DIFFERENT TIERS OF LOCAL GOVERNMENT
RELATED TO SPATIAL PLANNING AS PER PLGO 2001.

Local Government Tier	Officer Responsible for Spatial Planning	Immediate Reporting Status	Planning Related Functions
District Government	District Officer (Spatial Planning and Development) DO (SP&D)	Executive District Officer (Works and Services) EDO (W&S)	<ul style="list-style-type: none"> • Approve master plans, zoning, land use plans, including classification and reclassification of land, environmental control, urban design, urban renewal and ecological balances; • Review implementation of rules and bylaws governing land use, housing, markets, zoning, environment, roads, traffic, tax, infrastructure and public utilities. • Approve development schemes for beautification of areas along rivers, beaches and sea sides.
Tehsil Government	Town Officer (Planning and Coordination) TO (P&C)	Town Municipal Officer TMO	<ul style="list-style-type: none"> • Spatial planning, execution and management of development plan. • Land use, building control, sub-division, and zoning. • Enforcement of municipal laws/ rules/ bylaws. • Compilation of information provided by union and village councils of prioritized projects. • Coordination of development plans and projects with Union Administrations.
Union Councils	Union Secretaries	Union Nazim	<ul style="list-style-type: none"> • Collecting and maintaining statistical information for socio-economic surveys; • Consolidating ward and neighbourhood development needs and prioritise these into union-wide development proposals. • To identify deficiencies in the delivery of services and make recommendations for improvement thereof to the concerned TMA

27.5 INSTITUTIONAL STRENGTHENING

The critical success factors for the current reforms process to succeed and be effective include human resource development, infrastructure development and the successful implementation of fiscal decentralisation policies. Any local government reform process must embrace social and capital investment

strategies as part of the reform agenda. City District Government, TMAs and other tiers of local government should have the capacity to manage the new responsibilities. Capacity needs to be defined in a comprehensive sense and go beyond trainings to include staffing, rules, procedures, tools, incentives, promotions and accountability. Capacity growth should also include enabling the local governments to enter into new institutional arrangements with private sector, NGOs and expand physical capital.

27.5.1 Orientation/Training

Historically, lack of capacity at the local level has been caused primarily by the highly centralised institutional system, which has recently been replaced by the institutions established under the Devolution Plan. However, while these institutions have now been entrusted with substantial autonomy and heavy responsibilities, they (particularly TMAs) lack necessary capacity to carry out the assigned tasks.

An important pre-requisite for strengthening institutions is to strengthen their understanding about a plan or project. It is therefore important that all concerned officials as well as elected representatives of different tiers are given a briefing/orientation about Lahore Master Plan. This will be done by senior planning officials of the City District Administration. The orientation will include an information package encompassing project background, objectives, master planning methodology and the implementation strategy. The target group would be the senior officials/personnel like EDOs who are most relevant for the Master Plan, planning officials of the City District Government, Town Nazims, Town Municipal Officers, Towns Officers (Planning and Coordination), Town Officers (Infrastructure and Services) and Elected Representatives. The objectives of orientation would be to involve the key players right at the start of the Master Plan implementation and to equip them with the overall concept of the Plan. The duration of one-day Orientation Sessions is suggested to be 2-3 hours and may be conducted in clusters (Elected Representatives/District Officials/Town Officials/Union Council Staff).

For the Town Planners of the City District and TMAs, provision of appropriate and intensive support to facilitate improved planning control, building control, zoning regulations and other tools for Master Planning implementation need to be considered.

27.5.2 Management Information System (MIS)

The proposed MIS is a computerized system to manage the planning data, such as socio-economic profile of various union councils, which as per the PLGO, the UCs are to collect and compile land record,

complete details about housing schemes and plots and other planning information. MIS is a set of people, hardware, software, databases, telecommunications, and procedures that should be configured to collect, manipulate, store and process data into information.

As regards the architecture of this system, a Local Area Network (LAN) initially consisting of one Server Machine and nine terminals should be established for the planning staff of the City District. The server machine may be placed in the MIS Room of the proposed EDO (Spatial Planning and Development)³ and nine terminals one each in the offices of all District Officers (DOs)/Deputy District Officers (DDOs). Initially this set up should be established at District level for information processing and sharing. Ultimately LANs may also be established at each of the six TMAs and should be connected to main server machine at City District Office to form a Wide Area Network (WAN). The MIS Section in the City District set up will be headed by a DDO (Planning-MIS) who will report directly to EDO (SP & D).

27.5.3 Reliance on Lower Tiers

Structures should be created which facilitate dialogue between different levels of government. This is already true in case of Union-Town and Union-City District relationship, as Naib Nazim of Union Council is member of the Town Council and Nazim of Union Council is member of the District Council. However, there appears to be a void between the Town Council and the District Council. For more effective service providing system, reliance on the Union Administrations should be increased. Technical/Professional staff should be hired/deployed in all positions requiring technical/professional expertise. The appointment of technical/professional staff should be based on performance.

27.5.4 Involvement of NGOs/Private Sector

The functions of different tiers of local government, as given in the PLGO are demanding in terms of skilled and motivated manpower, technical and administrative expertise and resources. Enabling TMAs to co-ordinate and develop communication mechanisms amongst various local organizations for community based integrated programmes and developing long term partnership and culture of collective action among local organizations, NGOs and the CBOs will enhance their organizational capacity for effective contribution towards planning services. Due to capacity constraints, initially therefore, for provision of public services, NGOs may be involved or a public/private mix may be introduced. But even for successful

³ Refer Section 27.6 for details.

externalisation of functions, management capacity and regulatory frameworks must be developed as a necessary precondition. New experimentation in the field of public/private mix must be implemented initially with pilot projects. These may for example include joint participation in planning, execution and management of development schemes.

27.5.5 Institutional Networking

Institutional networking through City District Administration, TMAs and Union Councils can provide a forum for exchange of experiences, ideas, knowledge and information. The network shall serve liaison and voice to articulate the perspectives and concerns of communities about various planning issues. Networking with relevant provincial line departments (which have not been devolved) is also very important. This for example, includes the Revenue Department which is responsible for registering the sale/purchase of land and has a vital role in controlling the illegal land sub-divisions. This Department should process registration of title documents only after obtaining the NOC from the concerned Town Planning Department. This will ensure adherence of these sub-divisions to the Master Plan, Town Planning Scheme or the Zoning Scheme, as the case may be.

27.5.6 Citizens' Participation

The entire planning process should be open and transparent and all relevant details should be made public and discussed before final decisions are taken. Public seminars, workshops and discussions using all forms of the media should be held to create public interest, awareness and involvement. There has to be accountability and transparency. Thus citizens must have access to relevant information such as policies, plans and all financial matters.

27.6 IMPLEMENTATION FRAMEWORK

The new institutional set-up for City District Lahore has begun to unfold. The ex-MCL of Lahore, ex-District Council Lahore and LDA with its agencies i.e. TEPA and WASA are now part of the Lahore City District Government.

27.6.1 Master Plan Implementation and Review Commission

A high level commission for implementation and review of Integrated Master Plan for Lahore is proposed with following composition:

1. District Nazim - Chairman
2. Secretary C&W Department
3. Secretary H & UD Department
4. Secretary LG and RD Department

5. Secretary Transport Department
6. Secretary Environment Protection Department
7. Secretary Finance Department
8. Director General, Lahore Development Authority (LDA)
9. District Coordination Officer
10. Managing Director, WASA, LDA
11. Chief Traffic Engineer, TEPA, LDA
12. Commander, 4 Coprs, Lahore Cantonment
13. Chief Metropolitan Planner, LDA ----- Secretary
14. Dy. Inspector General (Traffic Police)
15. Town Nazim, Allama Iqbal Town
16. Town Nazim, Aziz Bhatti Town
17. Town Nazim, Data Gunj Bakhsh Town
18. Town Nazim, Nishtar Town
19. Town Nazim, Ravi Town
20. Town Nazim, Shalimar Town

The commission should be formed to periodically review and update the plan, suggest changes, and oversee the master planning preparation and implementation process. The Commission should also provide long term planning vision for the metropolis.

27.6.2 Implementation at the City District Level

At the City District Level, following agencies need to coordinate for ensuring effective implementation of the Master Plan and for this matter the District Nazim may issue a directive to all the concerned agencies/ departments for strict compliance. These may include the following:

- Lahore Development Authority
- Traffic Engineering and Transport Planning Agency
- Water and Sanitation Agency
- EDO (District Coordination)
- EDO (Agriculture)
- EDO (Community Development)
- EDO (Education)
- EDO (Finance and Planning)
- EDO (Health)
- EDO (Information Technology)
- EDO (Revenue)
- EDO (Works and Services)
- Town Municipal Administrations of Six Towns
- Water and Power Development Authority
- Sui Northern Gas Pipelines Ltd.
- Pakistan Telecommunication Corporation Ltd.
- Other agencies concerned as and when required.

27.6.3 Preparation/ Revision of Master Plan

At present, LDA is looking after the housing and physical planning functions within whole of the LMA. At the City District Level, Spatial Planning and Development is a function of EDO (Works and Services). However, considering the complexity and enormity of planning issues in Lahore City District, it is imperative to have a separate EDO for Spatial Planning and Development. This EDO will be assisted by three District Officers namely District Officer (Landuse Planning), District Officer (Metropolitan Planning) and District Officer (Housing and Land Development) (see Figure 27.1).

It is proposed that currently the Metropolitan Planning/ Master Planning should continue to be the responsibility of LDA till such time that LDA is dissolved and totally merged with the City District Government. Afterwards this function will become the responsibility of the City District Government.

27.6.4 Town Municipal Administration (TMA)

The Town Governments are under-staffed with just 1-2 relatively junior town planners to carry out a fairly ambitious list of planning tasks as per the PLGO. It is important that TMAs are strengthened in terms of planning staff with at least three town planners. The existing post of Town Officer (Planning and Coordination)-TO(P&C) should be supported by two Additional Town Officers (P&C) (see Figure 27.2).

There is also need to strengthen the TMA with the technical staff related to building and landuse control, road construction, infrastructure development etc. TMAs also need to improve their record keeping skills, so that all types of records are properly maintained and are easily traceable.

27.6.5 Union Councils (UCs)

In most Union Councils, the Secretaries are not appropriately qualified for their jobs. The PLGO provides detailed job descriptions of the UC Secretaries. However, the functions given in the Ordinance are too ambitious as against their present qualifications and experience. The PLGO describes in detail the functions and roles of different units/ sections, but the local institutions have not yet prepared written job descriptions for the individual functionaries. There is an urgent need to do so.

Organizational Structure for Implementation of Lahore Master Plan

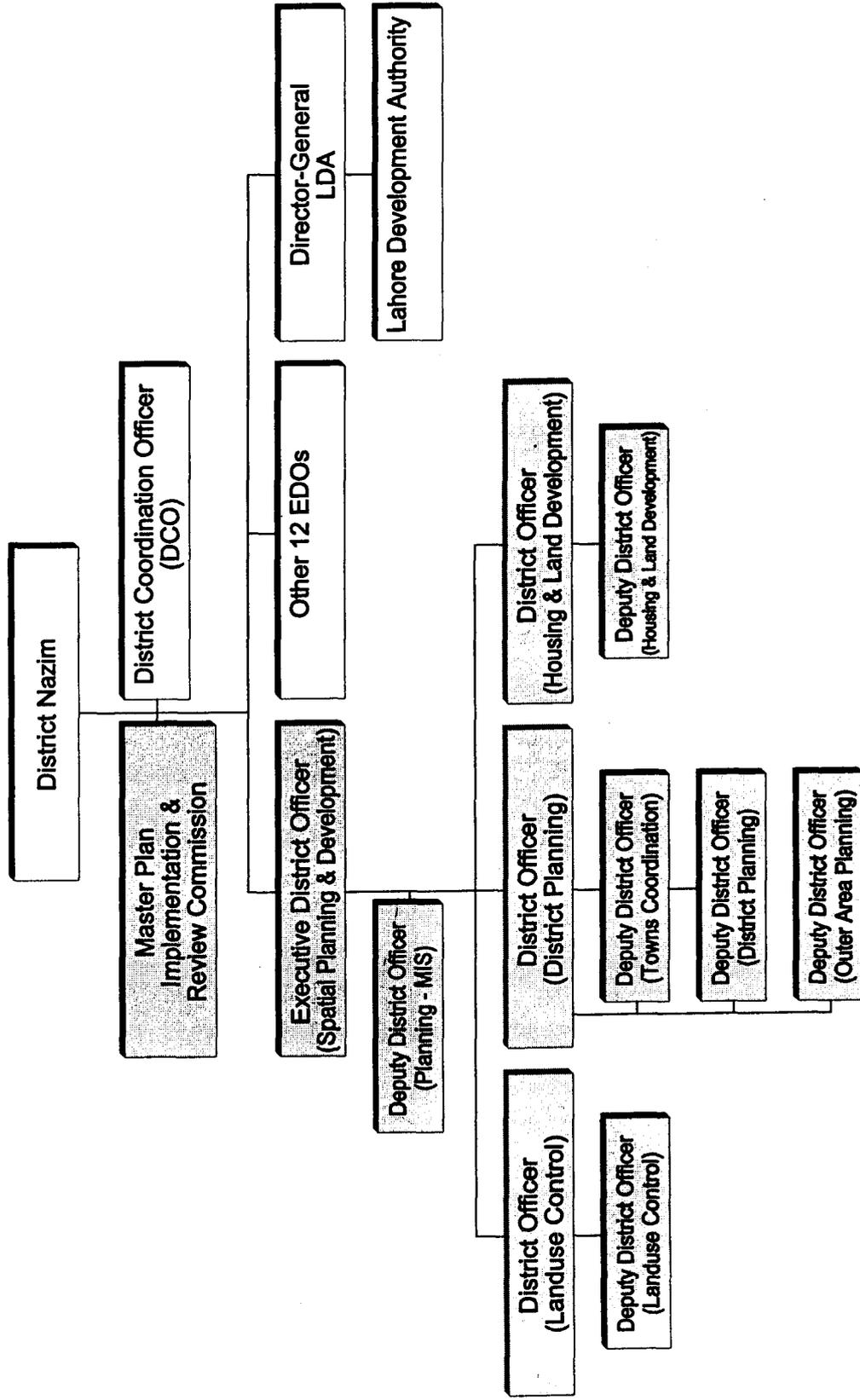


Fig: 27.1

Proposed Organization for a Typical Town Municipal Administration

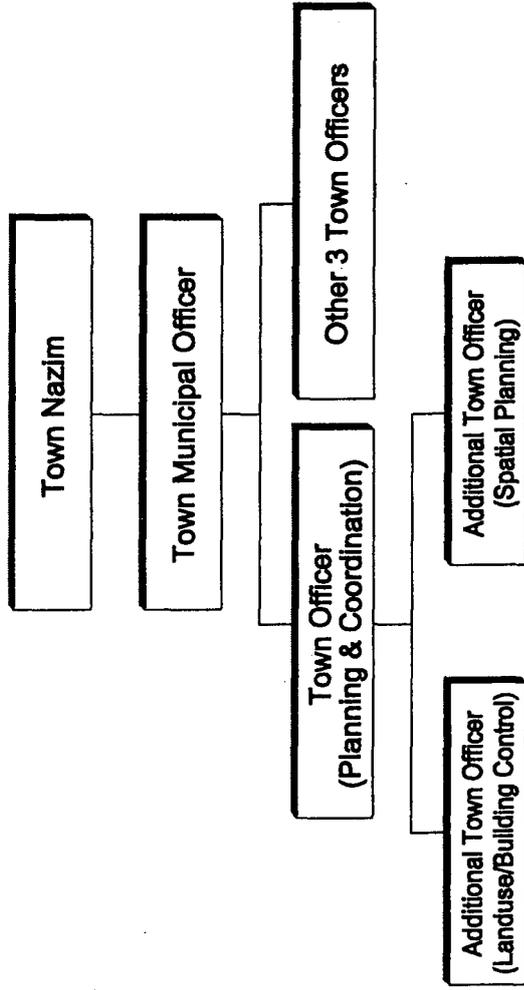


Fig: 27.2

28.0 FINANCING PROPOSALS AND OPTIONS

28.1 INTRODUCTION

The estimated funding requirement to execute the IMPL over the first five years (Short Term Plan) period is Rs. 58.03 billion, as reflected in Table 28.1. However, in recognition of the resource constraints likely to prevail during the implementation of the IMPL and the difficulties to be encountered in mobilizing financial resources of such magnitude, the Consultants have recommended a package of Rs. 20.543 billion (35.4% of total) for public sector and the balance development of Rs. 37.487 billion (64.6% of total) through private sector participation.

28.2 FINANCIAL REQUIREMENTS OF DEVELOPMENT PLAN BY PUBLIC SECTOR

The major involvement of the private sector effected in the total programme size are in respect of the following components:

- An investment of around Rs. 3.2 billion on the sewerage treatment plant unless the requisite funds become available earlier.
- During the 5 year plan period out of the four sites proposed only two sites are to be developed by the public sector for the solid waste management component.
- Investments in some projects relating to Lahore Ring Road, Ravi Road and development of bus terminals etc., totalling Rs. 17.84 billion, have been excluded from the public sector component on Transportation.
- The private sector investment in education¹ and health will comprise 30% and 60% of the gross investment requirement respectively estimated for these sub-sectors.
- Only 20% of the investment on the Recreation component will be financed by the public sector.

The rest of this section discusses availability of resources from existing sources and tax structures, the potential for new resource mobilization measures, instruments and financing options for funding the investments identified for the public sector.

¹ This is borne out by a study on demand for education of low and middle income households in the city of Lahore. The survey results suggest that more than 70% of the children from such households are enrolled in schools managed by the private sector --- Demand for Education Among Low and Middle Income Households in Lahore and 5 Districts of Punjab, System (Private) Limited, September, 1996.

TABLE 28.1
TOTAL DEVELOPMENT PACKAGE
FOR SHORT TERM PROJECTS
(SUMMARY OF COSTS IN MILLION RUPEES.)

S. No.	SECTOR	TOTAL	PUBLIC SECTOR	PRIVATE SECTOR
1.	Data Base	50	50	-
2.	Water Supply	1,700	1,700	-
3.	Sewerage System	4,683	1,537	3,146
4.	Drainage System	2,100	2,100	-
5.	Solid Waste Management	1,865	978	887
6.	Flood Protection	50	50	-
7.	Environment Protection	1,020	20	1,000
8.	Transportation	24,992	7,148	17,844
9.	Education	11,440	3,430	8,010
10.	Health	4,130	2,330	1,800
11.	Parks	6,000	1,200	4,800
	TOTAL	58,030	20,543	37,487

28.3 RESOURCE MOBILIZATION FROM EXISTING SOURCES²

Prior to the promulgation of Punjab Local Government Ordinance, 2001 (PLGO), the following institutions were responsible for the development and maintenance of physical infrastructure (other than the utility services of electricity, gas and telephone) in Lahore:

- Metropolitan Corporation Lahore (MCL)
- Lahore Development Authority (LDA)
- Water and Sanitation Agency (WASA)
- Traffic Engineering and Transport Planning Agency (TEPA)

Under the new setup MCL has been merged with City District Government, while the other three institutions still retain their individual identity. The development expenditure incurred by these organizations during the last three years is summarized in Table 28.2.

TABLE 28.2
INFRASTRUCTURE DEVELOPMENT IN LAHORE

	(Million Rs.)		
	1999-2000	2000-2001	2001-2002
Ex-MCL/CDGL	665.6	395.5	408.0
LDA	152.9	66.5	256.4
WASA	129.0	74.1	68.0
TEPA	-	-	6.0
Total	947.5	536.1	738.4

In addition to the above, the ex-District Councils of Lahore, Sheikhpura and Kasur and the LCB also undertook development and maintenance works in the

² Our attempts to estimate potential availability of resources for financing IMPL investments from existing sources were handicapped by the lack of historical data over a sufficiently long period on expenditures incurred on the development and maintenance of infrastructure by the public sector agencies mandated to carry out these functions in Lahore.

Metropolitan Lahore.* However, since these expenditures are relatively small, the activities of these agencies have not been taken into consideration in preparing estimates of resource availability.

Table 28.2 reveals that the expenditure for infrastructure development in Lahore was Rs. 738.4 million during 2001-02. An additional sum of Rs. 570 million was allocated in the ADP for the year 2001-02 for different departments of the Government of Punjab (Education, Health, Housing, Urban Development, Public Health Engineering, etc.). This allocation was divided in the ratio of 91:09 between works dedicated to upgrading/improvement of existing infrastructure and development of new infrastructure. A year earlier, this ratio stood at 47:53.

The decrease from 53% to 9% to new infrastructural projects can be attributed to institutional changes underway due to the introduction of PLGO. The decline is therefore regarded as interim and in future new projects would get their due share.

28.3.1 City District Government Lahore (CDGL)

MCL created under the Punjab Local Government Ordinance, 1979 (VI) stands dissolved according to the PLGO. The CDGL has been created under a Provincial Government notification to handle the works and duties within the district.

The extensive mandate of the ex-MCL now transferred to CDGL makes it a key player in the provision, and subsequent operations and maintenance of infrastructure in the City District of Lahore. Of the components identified under the IMPL, CDGL is responsible for the construction and development of roads, street lights, solid waste disposal, construction of hospitals/ dispensaries, primary schools and sewage facilities and parks.

The defunct MCL's main sources of revenue in the past have been octroi, its share of property tax and a tax it charges on transfers of property. Octroi had been by far the largest and the most buoyant source up to the year 1998-99, contributing close to 60% of its revenues. After the abolishment of octroi, the Government of Punjab compensates this by providing octroi grant. For the year 2001-02 the revised grant received is to the tune of Rs. 845 million. Other levy's comprise a host of taxes and fees including the tax on transfers of property and property tax. The major components of the CDGL's revenue along with their percent share during the year 2001-02 are given in Table 28.3.

TABLE 28.3
CITY DISTRICT GOVERNMENT'S
SOURCES OF REVENUE (2001-2002)

SOURCES	REVENUE	%
Octroi Grant	845	55
LRRP*	248	16
Transfer of Property Tax	111	7
Property Tax	79	5
Bus Stand	86	6
Others	177	11
Total	1546	100

*Lahore Road Rehabilitation Project

A review of the data for the 5 year period up to 1997 shows that less than 15% of ex-MCL's expenditure was earmarked for development works. The primary reason for these nominal allocations for infrastructure development efforts is that whereas ex-MCL's total income grew at just around 9% per annum over the period 1992-97, its expenditure on personnel grew at an average rate of 10% per year. Over the years, the expenditure on salaries swallowed growing proportions of its income – whereas salaries absorbed 63% of its income in 1992, these took up almost 71% of ex-MCL's income in 1996-97. This restricted ex-MCL from performing an active role in the development of infrastructure in Lahore. For the year 2000-01 the allocation for development expenditure has marginally increased to 16% of the total expenditure.

Moreover, CDGL's ability to mobilize additional resources is constrained by legislative restrictions, which require local governments in Pakistan to finance operations and development expenditure entirely from self-generations. They are not allowed to incur debt in any form, other than funds advanced to them (as grants or loans) by the provincial government. In the case of CDGL, the Government of Punjab has neither extended any credit nor financed any infrastructure related expenditure in recent times; although it received grants from the Prime Minister's Big City Development Fund. Therefore, CDGL has been financing all its development expenditure from regular revenue sources, i.e., octroi, property tax, transfer of property tax, and other fees and taxes. Table 28.4 provides a breakdown of ex-MCL/CDGL expenditure on development projects during the period 1999-2002.

TABLE 28.4
EX-MCL/CDGL EXPENDITURE ON DEVELOPMENT

(Million Rs.)

YEAR	1999-00	2000-01	2001-02*	AVERAGE
Development Works	665.6	395.5	408	490

* Budget Estimates

Table 28.4 shows that the average allocation for developmental activities by ex-MCL/CDGL in the recent past has been around Rs. 490 million per annum.

Unless CDGL's revenues from existing instruments rise substantially, either as a result of a rationalization in tax rates, upward revisions in tax rates, or as a consequence of an increase in the number of transactions in property, annual projections of allocations on the basis of previous allocations for the development of the above mentioned components of infrastructure should revolve around Rs. 490 million.

28.3.2 Lahore Development Authority (LDA)

The main functions performed by LDA include the development of sites and services schemes, and the construction and maintenance of key roads mandated to it by the provincial government. It generates an average of Rs. 159 million per year as development receipts from its own sources, as reflected in Table 28.5.

TABLE 28.5
LDA FUNDS BY SOURCE

(Million Rs.)				
YEAR	1999-2000	2000-01	2001-02	AVERAGE
Own Sources Total	152.9	66.5	256.4	158.6
Other Sources Total (Loans etc.)	225.4	10.1	25.10	86.9
Total	378.3	76.6	281.5	245.5

In addition, it is also a recipient of funds from the Government of Punjab and the World Bank³. LDA spends the bulk of its own revenues, and the funds it receives from the World Bank on the development of housing schemes, whereas the funds transferred to it by the Punjab Government are used partly for land development and partly for financing the construction/ improvement of roads and bridges.

Based on expenditures incurred by LDA in recent years, it is estimated that it will be able to contribute approximately Rs. 150 million per annum to development projects from its own sources. The funds likely to be available to it from other sources have been discussed later below.

28.3.3 Water and Sanitation Agency (WASA)

The Water and Sanitation Agency (WASA) provides water supply and sewerage services in Lahore. The bulk of its receipts come from water tariffs followed by a user fee for sewerage (which is levied as a surcharge on the charges for providing water) and its share of the property tax. In recent years it has been able to cover its operating expenses from its share of the property tax and from the imposition of user charges for providing water and sewerage drainage services. However, after meeting its operating costs and settling its debt

³ Funds generated from deposit works have not been taken into account as these may lead to double counting. Moreover, these funds are subject to specific works, which may not be relevant for the IMPL

servicing obligations, WASA only has a modest amount left over for financing the development of infrastructure. Historically, therefore, infrastructure development has been funded from borrowings – both external and internal. Domestic borrowings have essentially taken the form of transfers from the provincial government in the shape of loans.

The two primary sources for financing WASA's infrastructure development have been the Punjab Government and the World Bank. The availability of funds to WASA during the years 1999-2000 to 2001-2002 from the three sources identified above are summarized in Table 28.6, giving an average availability of around Rs. 90 million per annum from its own sources for financing the projects identified in the IMPL.

TABLE 28.6
WASA'S DEVELOPMENT FUNDS BY SOURCE

(Million Rs)

YEAR	1999-2000	2000-2001	2001-2002	AVERAGE
WASA Own Source	88.0	74.1	68.0	76.7
Govt. of Punjab/Other	41.0	-	-	13.7
Own Source Total	129.0	74.1	68.0	90.4
Other Sources/Loans (World Bank + GOP)	380.2	160.7	124.0	221.6
Total	509.2	234.8	192.0	312.0

28.3.4 Traffic Engineering and Transport Planning Agency

The main sources for the TEPA are allocations by the provincial government under the ADP. Table 28.7 reflects the funds allocated to TEPA in recent years.

TABLE 28.7
TEPA's DEVELOPMENT FUNDS BY SOURCE

(Million Rs)

YEAR	1999-2000	2000-2001	2001-2002	AVERAGE
Own Sources	-	-	6.4	2.1
Other (PUDP Loans)	49.0	229.1	217.0	165.0
Total	49.0	229.1	223.4	167.1

Based on the information contained in Table 28.7, it is being assumed that TEPA will be able to mobilize resources of up to Rs. 170 million per annum to undertake development works during the currency of the IMPL.

28.3.5 Annual Development Expenditure by Government of the Punjab

In 2001-02 the Rs. 691 million ADP allocation by the Government of Punjab for Lahore financed approximately half of the total expenditure on infrastructure development, with the bulk expended on the upgrading/improvement of roads. LDA and WASA collectively received the share, 18%, of this allocation, while the provincial line departments of health, transportation and education were other recipients of the balance of Rs. 570 million.

ADP allocations for LDA and WASA have already been discussed in Sections 28.3.2 and 28.3.3 respectively. Of the funds allocated to the other sectors, approximately 91% (Rs. 519 million) have been earmarked for the improvement/upgrading of existing facilities, while the balance of Rs. 51 million was set aside for the development of new infrastructure. It is assumed that the Government of Punjab will be able to make allocations of higher magnitude in the future also for new development projects.

28.3.6 Additional Resource Mobilization from Existing Sources and Mechanisms

Different institutional arrangements for levying and collection of taxes under the existing tax structure could improve tax recovery (e.g., privatization of tax collection – see further details in Section 28.5.3), thereby generating additional funds for improving maintenance of infrastructure.

The institutional responsibilities for maintaining developing infrastructure are characterized by overlap of functional mandates⁴. These overlaps have led to duplication of effort, over-staffing, competition for some projects or joint abandonment of others, and near impossibility to allocate resources based on commonly conceived priorities. By reducing such functional duplication, additional resources can be released for infrastructure development.

Savings can also come from efficiency improvements. Personnel efficiency can be enhanced through appropriate incentive schemes, introduced simultaneously with the, politically difficult, downsizing of public sector agencies.

However, existing sources of revenue, the structures and levels of local and provincial taxes and user charges would not be able to release adequate funds for financing the development programme under the IMPL on a sustainable basis, although they have the potential to generate resources to finance future O&M obligations of the developed infrastructure at present quality standards. It, therefore, appears that substantial efforts will have to be undertaken to mobilize additional resources for the development programme built into the IMPL.

⁴ Some of instances of functional duplication that occur include the following:

- a) LDA and CDGL are both responsible for road development, construction and maintenance.
- b) The jurisdiction over roads and traffic is exercised by several agencies: CDGL, TEPA, National Highways Authority (NHA) and LDA.
- c) LDA and CDGL each has its own civil magistrates to prosecute encroachers.
- d) LDA and CDGL each has its own police contingents deputized from the Provincial Police Department to execute eviction orders, demolish unauthorized construction, etc.
- e) LDA and CDGL have both been responsible for the development and maintenance of parks.
- f) WASA and CDGL are both responsible for the construction of sewerage drains

28.3.7 Summary of Projected Revenues from Existing Sources

In the light of the discussion above and considering the likelihood of continued constraints on resource availability, it is estimated that funds of around Rs. 1.2 billion per annum are likely to be accessible for financing investments identified in the IMPL.

Our projections of the resources likely to be available from CDGL, LDA, WASA, TEPA and the Punjab Government of Rs. 6 billion for the implementation of the IMPL over the five year plan period are summarized in Table 28.8. Any additionality in resources flowing from improved institutional arrangements for recovery of taxes and user charges and expenditure curtailment through better inter-agency coordination and reduction in functional overlaps would improve the situation but has not been considered in these estimates.

TABLE 28.8
ESTIMATED FUND CONTRIBUTIONS BY LOCAL
AGENCIES TOWARDS IMPL

(Million Rs.)

Year	1	2	3	4	5	Total
CDGL	490	490	490	490	490	2,450
LDA	150	150	150	150	150	750
WASA	90	90	90	90	90	450
TEPA	170	170	170	170	170	850
Punjab Government	300	300	300	300	300	1,500
Total:	1,200	1,200	1,200	1,200	1,200	6,000

28.4 ADDITIONAL REVENUE GENERATION BY IMPROVEMENTS IN FISCAL MEASURES

It is estimated that contributions from existing resources would, at best, only be able to finance 29% (Rs. 1,200 million) of the annual public sector requirement of Rs. 4,110 million arrived at in Section 28.2. The remaining need for Rs. 2,910 million per annum to implement the Public Sector Plan will either have to be through seeking loans/grants from international lenders/agencies or it has to be generated from other sources, including revenue enhancements from rationalization of taxes and changes in rates of existing taxes. Some of these sources for generating revenues are discussed in detail in this section.

28.4.1 Reforming of Property Tax

The property tax structure had been characterized by liberal exemptions, lacks buoyancy and elasticity. Frequent additions in the list of exemptions had contributed to the erosion of property tax revenues. The structure was also inequitable in its incidence and taxes self-occupied residential and commercial properties lightly, although they have the same level of access to services as rented out properties.

The new property tax assessment formula approved by the provincial government covers the recommendations made in March, 1996 by Mr.

Shahid Kardar⁵ in his proposals for the revision of Tax in Punjab. It stressed using indicators easy to quantify, e.g., plot size, covered area, independent house or flat, corner plot, age of building. The proposal argues that some of the benefits accruing to the property owners in the shape of higher property values owing to the provision of infrastructure and social services should also accrue to the government that provides these services. In other words, land should be taxed according to capacity to produce revenue - regardless of whether the owner has developed the land to full capacity.

The new system is based on unconstructed land and covered area of the property. For this purpose, the new system divides the whole Province into five categories from A to E and each of these is divided into those located on main road and off road. For properties which are 20 years old, a 10% discount has been provided. The new assessment formula does not leave a room for maneuvering for the departmental staff. Every assessee can now calculate his property tax quite easily.

The receipts from property tax for the year 2000-01 are reported as Rs. 212 million. Assuming an increase of 50% in the tax, additional revenues are estimated as Rs. 100 million.

28.4.2 Transport Cess on Fuel

A proposal that was under consideration for several years, and was included in the budgetary proposals submitted by LDA and TEPA few years ago, argued for the imposition of a transport cess or surcharge on gasoline consumed within Lahore. Such a charge, which is common in other cities like Bangkok, can not only serve as a proxy for a user charge on road transport but also assist in limiting congestion. In addition, it would be progressive in incidence, given the highly concentrated pattern of automobile ownership and the pattern of transport expenditure. Furthermore, since the tax base is wide, even a small surcharge can fetch substantial revenues. For administrative simplicity, the collection of such a surcharge should be left to gas stations or oil distribution companies within the city, from whom this can be collected at source.

The current level of gasoline consumption in Lahore is estimated at around 3.16 million litres per day. A surcharge of 1% on current prices would generate about Rs. 400 million per year. A 1% increase would be equivalent to 35 paises per litre. For the purposes of this analysis and taking into account some reduction in consumption of petroleum due to a price revision, the additional increase in revenue of about Rs. 300 million per annum has been assumed from such a levy.

28.4.3 Taxes on Transfer of Immovable Property

Actual receipts through transfer fee of immovable property during the year 2001-02 is estimated as Rs. 111 million.

⁵ Proposals from the Revision of Property Tax in Punjab, Shahid Kardar (March 1996)

Till a few years earlier taxes on property transfers were high (almost 17% of the value of the property as notified in the DC's valuation list) covering disincentive to register property related transactions. Buyers preferred to obtain powers of attorney and take possession of the property. Lowering of tax rates on property transfers in the recent past is expected to encourage registration of transactions. It is expected that these would further increase about 25% resulting in additional revenue of Rs. 30 million per annum.

28.4.4 Traffic Fines and Parking Fees

Traffic fines are collected by the police. It is recommended that 50% of the income from such fines should be transferred to the civic agencies responsible for developing and maintaining transportation related infrastructure. This measure would make available an estimated Rs.5 million per annum as additional revenue for new projects/schemes. Similarly, parking fees can be extended to more areas in the city.

28.4.5 Share in Toll Taxes on Ravi Bridge

Currently, toll tax is charged on bridges over River Ravi by the Punjab Highway Department. It is recommended that a part of the toll tax collected should be utilized for financing infrastructure development and maintenance activities. Such a proposal has been under consideration for several years and has formed part of the resource mobilization measures submitted in the past by both LDA and TEPA. They have also been advocating an increase in the toll tax and its extension to other inter-city routes.

LDA estimates that one third of the toll taxes collected from these bridges would generate an additional Rs. 75 million per annum.

28.4.6 Entertainment Tax

Although entertainment tax is a local tax, it is collected and retained by the Provincial Government. The estimated collection for 2000-01 from this tax was Rs. 190 million in the province. If CDGL is allowed to collect this tax, an estimated Rs. 50 million (25% of total) per annum can become available to it as additional revenue.

28.4.7 Motor Vehicle Tax (MVT)

The Provincial Government charges an annual road tax (called "Token Tax") which is recoverable from every vehicle registered in the province. The revenue collected is retained by the Provincial Government and not shared with the local agencies like CDGL, LDA and TEPA, who are in turn responsible for maintaining intra-city roads. Ex-MCL, LDA and TEPA have pleaded in the past that a part of these collections should be transferred to them, thereby augmenting

their resources to undertake the development and maintenance of the road network. The case for sharing of MVT revenues is strong.

28.4.8 Estimates of Additional Revenues

The expected additional revenues which would become available by implementing the above measures are estimated at Rs. 560 million per year and are summarized in Table 28.9.

TABLE 28.9
ESTIMATE OF ANNUAL ADDITIONAL REVENUE
GENERATION

(Million Rs.)

Source	Revenues Generated
Revision of Property Tax	100
Transport Cess on Fuel	300
Revision of Property Transfer Taxes	30
Share of Traffic Fines	5
Share of Tolls on Ravi Bridges	75
Entertainment Tax	50
Total	560

The additional resources likely to be mobilized from these measures would be around Rs. 2800 million for the five year leaving a large gap if the whole package is to be implemented over the proposed period. This shortfall will have to be met largely either by capital inflows from external sources or by mobilizing/encouraging private sector. Some potential sources of assistance that can be tapped in the foreseeable future are discussed in the following section.

28.5 FINANCING FROM NEW SOURCES

New sources for financing the IMPL include the private sector participation and access to local and international capital markets. The scope and potential of some of the alternative sources and mechanisms described below would have been affected by recent economic and political developments in the country and may not represent serious options in the near future.

28.5.1 Private Sector Participation

Government policy and commitment can enhance the participation of the private sector in commercially viable projects, while targeting its own resources to projects unlikely to attract private sector investment. Consequently, a clear identification is required of the areas to be opened to the private sector.

Some of the components of the IMPL that could attract the private sector are the following:

- (i) The private sector could be contracted as an agent for collecting revenue, thereby generating additional funds through better management and improved collection efficiency. Such a

mechanism could include collection of property tax, recovery of water supply bills, etc., depending upon the capability of the private sector, thereby augmenting revenues from the same instrument. For instance, since 85% of the property tax collected by the Provincial Excise and Taxation Department is transferred to local governments, there is little incentive for the provincial governments to enhance the efficiency and reach of this instrument to raise revenues. By transferring the responsibility of levying and collection of property taxes to CDGL, or by contracting out collection of property tax to the private sector, additional revenues could be raised from the existing tax structure.

- (ii) Through a carefully drafted regulatory framework some civic functions could be privatized. The assets created by the government could either be given on lease or their ownership could be transferred to the private sector. The privatization of the operations of some utility agencies would save personnel costs, and improve the efficiency and cost effectiveness of service delivery; cost savings will, however, be nominal if only assets are leased out for operations. Privatization of utility services could help finance some of the IMPL related investments. For instance, if WASA is privatized in the next three years, the responsibility of financing some investments during the final two years of the IMPL could be transferred to new private operators to whom WASA's assets are transferred.
- (iii) The private sector could be induced to invest in infrastructure projects for which funds would otherwise have to be mobilized by the civic agencies. For example, the construction of intra-city transportation system could be contracted out to the private sector.

The probability of the private sector financing urban infrastructure would depend primarily on the commercial viability of a service, which, in turn, would hinge on the degree of excludability and competitiveness in the consumption of the service. Excludability in the provision of a service is present when it is possible to prevent a user from consuming a service, while competition/rivalness refers to the event when the consumption by one user reduces the supply available to others.

Based on these characteristics, the components of the IMPL can be classified into four groups:

Pure public goods: Such services are non-excludable and non-competitive. The provision of such goods cannot be left to the private sector as the lack of excludability pre-empts the possibility of collecting user charges from the consumers of such goods and services. Of the components included in the IMPL the services which can be categorized as pure public goods are intra-urban transportation

with the exception of public transportation and intra-urban highways, environmental protection, flood protection and drainage systems.

Pure private goods: Such services are both excludable and rival. This makes them commercially viable since user charges can be collected for the provision of these goods and services. Components of the IMPL that can be categorized as purely private in nature are land development, water supply, sewerage, education, health and electricity. Such goods can be provided both publicly and/or privately. At present, the private sector is involved in all five areas, although its involvement in electricity is limited only to power generation, and does not extend to power transmission and distribution.

Club goods: The consumption of such goods is excludable but is non-rival in nature up to a point when congestion sets in. As such goods are excludable, the public or the private sector can provide them. However, the provision of both these goods requires large amounts of initial investment and may not be commercially viable for the private sector in the short run. IMPL components that fall in this category are intra-urban highways and parks.

Common property: The consumption of such goods is non-excludable but non-rival in nature only up to a point when congestion sets in. Solid waste management is the component of the IMPL that can be classified as common property. Solid waste management has been privatized by the co-operative housing societies of Lahore Cantonment and Model Town. In addition, there are two private sector firms, the Lahore Sanitation Programme (LSP) and Nisaar Jaan and Company, who are attempting to establish themselves in the solid waste management industry.

Based on the discussion above, domestic private sector participation in Lahore is likely in development of land and housing schemes, water supply, education, health, electricity, sewerage, and solid waste management. Currently, the private sector has some involvement in the provision of all the above mentioned utilities/services. Whereas the provision of private sector education and health facilities is quite extensive, the coverage of water supply, sewerage and solid waste management by the private sector is largely limited to the affluent areas of Lahore. A synopsis of private sector participation in each of these fields will reveal the ability of the private sector to participate in the IMPL.

Water Supply, Sewerage and the Private Sector

Private sector participation in the provision of water supply and sewerage service is limited to the services provided by various co-operative housing societies. Any replacement or rehabilitation work is financed from the revenues generated from user charges and/or fiscal devices, such as a charge for transferring property collected by the co-operative housing societies.

In our view, private sector participation in the water supply and sewerage components of the IMPL is likely to be limited over the plan period. However, a long term strategy may be developed by decentralizing the water supply and sewerage system of Lahore on a locality or zone basis, whereby private run housing societies can be made responsible for the provision of water supply, sewerage services and some other municipal functions such as road maintenance, street lighting and solid waste management.

Solid Waste Management and the Private Sector

Presently, two local private sector organizations are providing services connected with solid waste disposal. They are the Lahore Sanitation Programme (LSP), better known as Waste Busters, and Nisaar Jaan and Company. Currently, however, their scope of operations is restricted and focused on high income localities; e.g., the LSP is only catering to 5,000 households of which 80% are high income households. Therefore, their ability to participate effectively in the solid waste management component of the IMPL is limited at present.

28.5.2 Borrowing from Domestic and International Capital Markets

Access to the local capital market is yet another option available to CDGL, LDA or WASA to generate funds for infrastructure development. The modalities of access to the local capital market can range from loan acquisition from commercial banks and/or development financial institutions (DFIs), to issuing bonds. The ability of the local development agencies to obtain loans or issue bonds would depend on three factors: the risk the investors will have to take, the return the investors will earn, and the liquidity of the instruments.

The characteristics of risk and return on an investment are strongly inter-linked. The risk that an investor takes depends on the ability of the borrower to service the debt and the quality of collateral offered. The ease with which a borrower can make the debt repayments depends on his income stream. The more assets a borrower has to provide as collateral against a certain level of debt, and the larger a consistent income stream relative to the debt servicing requirement, the lower the risk for an investor. Moreover, the lower the risk, the greater the willingness of the lender to accept a lower return on his investment.

Liquidity considerations are also critical. It is this characteristic that makes an instrument like a bond more attractive than a loan. Bonds, compared with borrowing money from banks, would be a better option if a secondary market for bonds can evolve over time, as opposed to a loan that cannot be transferred, especially if such a loan is not backed by the guarantee of the Government of Pakistan (GoP). Furthermore, whereas bonds can generate funds of varying amounts according to need, loans have to be acquired in lump sums.

The only utility company in the country that has financed its medium to long term requirements from bonds is WAPDA. In the past WAPDA was able to raise large sums as local currency debt through bonds, essentially because of guarantees provided by GoP that it would settle outstanding liabilities in the event of a default by WAPDA. Despite WAPDA's monopoly position in providing a utility service, its ability to tap the domestic capital market has been substantially reduced following the withdrawal of government guarantees.

In view of the discussion above and the present financial plight of public sector utility organisations, the current environment for any bonds, floated by public enterprises even those providing utility services, is inauspicious. WAPDA has not been able to generate the desired amount of revenues through its last flotation of bonds even though it was offering an interest rate of 19%. It, therefore, appears highly unlikely that CDGL, LDA, or WASA would be able to mobilize substantial funds from both the domestic and international capital markets. Not only would these have to offer a rate higher than 19%, since they would be considered more risky investments compared with WAPDA, they may also be called upon to furnish the guarantee of the Government of Pakistan. Moreover, there would be serious doubts about the ability of these agencies to generate rates of return in excess of 19% on their investments to be able to service such a debt.

Although revenue bonds repayments could also be considered by linking them to revenues from specific projects, inelasticities of revenues owing to weak revenue recovery efforts are likely to also render project specific bonds an infeasible alternative. Therefore, mobilization of additional resources through bonds does not appear to be a serious option for these agencies in the foreseeable future.

The weak financial position of the CDGL and LDA is not the only constraint on the ability of these institutions to access the local capital market through bond issues, the instability of the macro-economic environment and the general short term nature of the deposit base in Pakistan also serves as serious limiting factors. It is highly unlikely that under present conditions foreign investors would be willing to invest in such bonds floated, even if they are backed by government guarantees. Furthermore, the fact that bank deposits in Pakistan are largely short term in nature reflects the public reluctance to invest in long term ventures.

28.6 CONCLUSIONS

The estimated annual investment requirement by the public sector is Rs. 4,110 million. We estimate that existing sources and revenue enhancing measures along with private sector involvement would be able to contribute the maximum, for which the appropriate legal and regulatory framework would also have to be evolved prior to implementation. The balance amount would have to be met from borrowings – both - local and international (Table 28.10).

TABLE 28.10
SUMMARY OF FINANCING PROPOSALS FOR
PUBLIC SECTOR FUNDING

(Million Rs.)

S. NO.	SOURCE	TOTAL
1	Total Requirements	20,543
2	CDGL	2,450
3	LDA	750
4	WASA	450
5	TEPA	850
6	Punjab Government	1,500
7	Sub-Total:	6,000
8	Additional revenue generation by improvements in fiscal measures	2,800
9	Total financing available from the local source (7+8)	8,800
10	Total financial requirement from new sources (1-9)	11,743
11	Loans from International Lenders	11,743

29.0 ZONING REGULATIONS

29.1 PURPOSE

Rapid growth coupled with the absence of coordinated institutional set up and lack of enforcement of whatever meagre regulatory measures available to the civic bodies has led to the creation of a highly undefined land use pattern in the city. Excepting few areas characterizing more or less defined land uses, intermixture of compatible and incompatible establishments is a common phenomenon adversely affecting the quality of urban life in Lahore. In the civilized and developed countries of the world the enforcement of zoning regulations is considered necessary to promote public safety, health, convenience and general welfare of the community. These regulations generally aim at:

- i. Zoning of all the land, vacant and built up with a view to enhance their value through land use control.
- ii. Protection of residential, business and industrial areas and uses alike from encroachment by incompatible and harmful uses.
- iii. Developing sound relationship and interaction between various land uses to co-exist in harmony.
- iv. Regulating height and bulk of buildings and spaces around the buildings in the specified use zones.
- v. Gradual shifting or elimination of existing non-conforming uses as may be specified in the regulations though such uses may have been lawfully established before the promulgation of the regulations.

Zoning regulations being a prospective planning device normally refer to individual substandard structures and as such these can not provide an immediate remedy for correcting existing bad conditions all at one time. The application and enforcement of nuisance abatement laws for the correction of particular set of bad conditions is therefore very important. Equally important is the realization of the need to use available devices in a coordinated manner with a view to accomplish plans for the betterment of community at large.

It has been observed that nuisance abatement laws are acted upon very occasionally and that too after the actual occurrence of emergencies such as fire accidents, explosions, heavy rains, etc. etc. For what ever reasons the pre-emptive use of legitimate planning and legal devices for correction of extremely bad conditions is sparingly done. The general public has thus continued to suffer from poor safety and health standards, increasing pollution and overall degradation of living environment.

29.2 LAND USE ZONES

The LMA has been divided into six distinct land use zones i.e. residential, commercial, institutional, industrial, recreational, agricultural and farming described here under along with the uses which may be permissible in each one of them. Listing of uses in various zones had been very carefully done in the 1966 Master Plan for Greater Lahore. As such the changes or alteration in the said listing have been suggested only where the occurrence of certain uses ordinarily not permissible in various zones has been frequent over the past thirty five years.

29.2.1 Residential

Based on the criteria of gross density the three main residential zones and seven sub-residential zones have been identified as detailed in Table 29.1:

**TABLE 29.1
MAIN RESIDENTIAL AND SUB-RESIDENTIAL ZONES**

Residential Zone	Sub-Residential Zone	Density (Persons /ha)	Minimum plot size for Housing Layouts in sq.m (Marlas)	
Low Density Zone (LDZ)	RL1	Up to 100	420	(20)
	RL2	101 to 150	250	(12)
Medium Density Zone (MDZ)	RM1	151 to 200	210	(10)
	RM2	201 to 250	160	(7.5)
	RM3	251 to 350	105	(5)
High Density Zone (HDZ)	RH1	351 to 450	84	(4)
	RH2	451 to 600	63	(3)

29.2.1.1 Low Density Residential Zone LDZ (RL1 and RL2)

Uses Permitted - Detached or semi-detached dwellings subject to the density limitations; Primary and Secondary level educational institutions; Clinics and Dispensaries; Social and Cultural Institutions; Retail Shops when located in local shopping centres and offices of professional people with adequate parking facilities; Parks and play grounds; Non commercial vegetable gardens and nurseries; Neighbourhood recreational uses like Clubs; Mosques; Ancillary uses clearly incidental to residential uses which must be free from nuisance and hazard.

Uses Permissible on Appeal if allowed by the Authority on merits - Commercial offices and service shops of local character when located in local shopping centre or in concentrated localities or as shown in the site development schemes; Raising of poultry for non-commercial purposes provided the birds are properly segregated from the habitable parts of the dwelling unit.

29.2.1.2 Medium Density Residential Zone MDZ (RM1, RM2 and RM3)

Uses Permitted - Multi-family dwellings, apartment buildings; Colleges and research institutions, hostels, boarding houses and tourist homes; Local Municipal and Government offices in addition to all uses permitted in residential use zone LDZ subject to density limitation specified for various sub-residential zones:

Uses Permissible on Appeal if allowed by the Authority on merits - All uses permissible on appeal in residential use zone LDZ; Cinemas; Restaurants, hotels and motels; Hospitals not treating contagious diseases and mental patients; Petrol and gas filling stations on sites located along roads having at least 30 m right of way and 100 metres away from a crossing of two primary roads or a roundabout.

29.2.1.3 High Density Residential Zone HDZ (RH1 and RH2)

Uses Permitted-All uses permitted in MDZ; Public utilities and buildings; Public and semi public recreational uses; Taxi and Rickshaw stands.

Uses Permissible on Appeal if allowed by the Authority on merits - All uses permitted on appeal in MDZ.

29.2.1.4 Prohibitions

Uses not specifically provided in a particular residential use zone are prohibited uses and shall not be permitted under any circumstances.

29.2.2 Commercial

The Commercial Zoning would consist of four use zones namely:

- i) Special Commercial Zone (C1)
- ii) Retail Commercial Zone (C2)
- iii) General Commercial Zone (C3)
- iv) Central Area Uses Zone (C4)

29.2.2.1 Special Commercial Zone (C1)

Uses Permitted-Business, financial and professional offices; Cultural institutions (like theatre halls, cinemas etc), Restaurants and entertainment places; Residences and social welfare institutions provided these are located on first or higher floors; Public and semi-public recreational uses; Public utilities and buildings; Residential hotels, motels, show rooms, boutiques; approved parking provisions.

Uses Permissible on Appeal if allowed by the Authority on merits
- Petrol and gas filling stations; Hospitals not treating contagious diseases or mental patients; Approved parking provisions.

29.2.2.2 Retail Commercial Zone (C2)

Uses Permitted - All uses permitted in C1 use zone; Retail shops; service uses like barbers, tailors, launderers and dry cleaners' shops etc; Meat, fish and fruit retail markets; Service industries without nuisance or hazard and not employing more than 5 persons with or without power, provided the goods manufactured are sold on the premises in retail; Approved parking provisions.

Uses Permissible on Appeal if allowed by the Authority on merits
- All uses permissible on Appeal in C1 use zone; Coal, wood or timber yards; Service industries without nuisance and hazard and employing not more than 10 persons with or without power, provided the goods manufactured are sold on the premises in retail; Taxi and scooter stands; Bus sub-terminals; Approved parking provisions.

29.2.2.3 General Commercial Zone (C3)

Uses Permitted - All uses permitted in C2 use zone; Vocational training schools; Service garages; Covered storage; Service industries without nuisance or hazard and not employing more than 10 persons with or without power; Wholesale markets; Transportation terminals; Approved parking provisions.

Uses Permissible on Appeal if allowed by the Authority on merits
- All uses permissible on Appeal in C2 use zone; News-papers and printing presses; Service industries without nuisance or hazard and not employing more than 15 persons with or without power; Approved parking provisions.

29.2.2.4 Central Area Uses Zone (C4)

Uses Permitted - All uses permitted in C3 use zone; Printing presses and newspapers; Warehouses and godowns for whole-sale storage except when specifically prohibited; Light manufacturing and service industries without nuisance or hazard and not employing more than 15 employees with or without power; second hand goods markets;

Uses Permissible on Appeal if allowed by the Authority on merits
- All uses permissible on appeal in C3 use zone; Service industries which would not cause excessive, injurious or obnoxious noise, vibration, smoke, gas, fumes, odour, dust effluent or other objectionable conditions and employing not more than 25 workers with or without power; Covered storage for industry; Junk yards;

Railway passenger and freight terminals; Petrol and gas filling stations; Taxi and rickshaw stands; Approval parking; Loading and unloading requirements for all uses.

29.2.2.5 Prohibition

Uses not specifically provided in a particular commercial use zone are prohibited and shall not be permitted under any circumstances.

✓ 29.2.3 Institutional

Uses Permitted - Educational and research institutions; Offices of social and cultural organizations; Diplomatic missions; Religious institutions; Park memorials and monuments; All public and semi public recreational uses; Public utilities and buildings; Community facilities; Art councils and auditoriums; Local and Zonal Municipal and Government offices; Taxi stands; Bus halts; Residences and other uses incidental to main permitted uses which are in no way causing any nuisance or hazard; Approved parking provisions.

Uses Permissible on Appeal if allowed by the Authority on merits - Large residential hotels, restaurants and clubs; Offices of commercial and financial institutions; Commercial recreational uses like theatre halls, cinemas; Petrol and gas filling stations; Limited retail shopping; Approved parking provisions.

29.2.3.1 Prohibition

Uses not specifically permitted herein are prohibited.

29.2.4 Industrial

The Industrial Zoning shall consist of two sub-zones meant for the establishment of Light and medium and Medium heavy industries.

29.2.4.1 Light and Medium Industries (LMI) Zone

Uses Permitted - Light and medium industries which would not cause injurious or obnoxious vibration, smoke, gas, odour, effluent or other objectionable conditions and employing not more than 100 workers with or without power; Warehouses and storage; Public utilities and buildings; Canteens; Agriculture in existing agricultural and farm area until the area is required for development; Approved parking, Loading and unloading provisions.

Uses Permissible on Appeal if allowed by the Authority on merits - Industries which in the opinion of the competent authority will

constitute medium industry by performance standards even though it employs more than 100 persons with or without power; Bus and truck terminals; Railway passenger and freight terminals; Petrol and gas filling stations; Taxi stands; Junk yards; Dwellings for labour and watch and ward staff; Recreational facilities for employees; Farm houses in the existing agricultural land.

29.2.4.2 Medium Heavy Industries (MHI) Zone

Uses Permitted All categories permitted in LMI use zone; medium heavy industries employing 500 and more workers with or without power; Warehousing and storage depots of non-perishable and non-inflammable commodities and incidental uses; Approved parking, Loading and unloading provisions.

Uses Permissible on Appeal if allowed by the Authority on merits - All categories permissible on special appeal in LMI use zone; Warehousing of perishable and inflammable commodities, Dwellings for Labour and watch and ward staff.

29.2.4.3 Prohibition

All uses not specifically permitted in a particular use zone are prohibited uses and shall not be allowed.

29.2.5 Recreational

Uses Permitted - All public recreational uses including parks, play grounds, play lands and parkways; Special educational and recreational areas; Youth hostels and clubs; Taxi and rickshaw stands; Bus halts and car parking areas.

Uses Permissible on Appeal if allowed by the Authority on merits - Outdoor theatres and drive-in cinemas; Restaurants and establishments selling eatables; Public utilities and municipal facilities; Uses clearly incidental to recreational use which will not create nuisance or hazard; Graveyards; Dwellings for labour and watch and ward staff; Adequate parking provisions.

29.2.5.1 Prohibition

Uses not specifically mentioned herein are prohibited.

29.2.6 Agricultural and Farming

Uses Permitted - Agriculture; Horticulture; Dairy and poultry farming; Milk chilling and pasteurization centres; Farm houses within the farm boundaries provided that the minimum area of the farm is not below one acre; Existing village settlements; Community facilities

and public utilities; Houses adjacent and incidental to the rural settlements; Brick kilns and removal of clay up to 8 ft. depth beyond a distance of 5 km from the limits proposed for urbanisation by 2021.

Uses Permissible on Appeal if allowed by the Authority on merits

- Parks and other public and semi-public recreational uses; Storage, processing and sale of farm products on the property where produced; Servicing and repair of farm equipment and machinery; Sale of agricultural supplies; Industry using the farm produce as raw material and not causing nuisance; Scientific and agricultural research institutions and laboratories used for purely research purposes; Area needed for defence purposes; Retail shopping and services uses; Cottage industries and special uses which need segregated locations such as hospitals for infectious diseases etc.

29.2.6.1 Prohibition

All uses not specifically permitted herein are prohibited.

29.3 NON-CONFORMING USES

The 1966 Master Plan for Greater Lahore rightly recommended the gradual shifting for non-conforming uses on the principle of amortization so as to cause minimum amount of hardship to the owners of non-conforming uses. The obnoxious industries were to be assigned a higher priority for shifting with amortization period of 5 years as against 10 and 20 years for nuisance and non-nuisance industries respectively. Nothing concrete has been done within last three and half decades and non-conforming and incompatible uses continue to exist side by side either with the connivance of the municipal staff or under the cover of not a very well defined licensing system provided in the local Government laws. For these very reasons the safety and quality of urban life has remained at stake. It is high time, that stringent steps are taken to adopt a clear cut policy based on identification and gradual elimination of non-conforming uses located in various use zones.

The obnoxious uses, trades and industries have been categorised and listed below with the recommended action plan for the elimination and shifting of dangerous and highly offensive non-conforming uses on one hand and managing relatively less dangerous and less obnoxious non-conforming activities on the other.

29.3.1 USES RATED AS OBNOXIOUS, DANGEROUS OR HIGHLY OFFENSIVE

- Storing, packing, pursing, cleaning, preparing or manufacturing, blasting powder, ammunition, fire works, gun powder, sulphur, mercury, gases, salt-peter, nitro-compounds, nitro-mixtures, phosphorous or dynamite;

- Storing explosives, petrol, oil, lubricants and other inflammable materials including timber, firewood and coal etc. Dealing in chemicals, liquid or otherwise cleaning, dying, preparing or manufacturing of cloth or yarn in indigo and other colours;
- Storing, processing, cleaning, crushing, melting, preparing or manufacturing or dealing in bones, tallow, offal, fat blood, soap, raw or dry hides and skins; Washing or drying wool or hair;
- Casting of heavy metals; Preparation of aerated water; Electroplating; Welding; Marble cutting and polishing; Manufacturing of cement and hume pipes; Burning or grinding of lime or metal stone; Keeping animals likely to create nuisance; Operating and running tin factories and power loomes; Manufacture of safes and boxes; Operating and running bake houses; Any other use which may be declared by the District Government to be dangerous or likely to cause nuisance to public health and life.

29.3.2 Recommended Action Plan

- i. Highly offensive and dangerous non-conforming uses posing threat to human life must be given highest priority. Such uses should either cease to operate or be shifted and relocated in the conforming use zone within a maximum period of one year from service of a notice by the City District Government.
- ii. A cut off date may be fixed, which may range from three to five years depending upon the extent of nuisance and obnoxiousness associated with a non-conforming use for the owners to shift such uses to the conforming use zones.
- iii. During the period specified in (i) and (ii) above a non-conforming use tax must be imposed. The amount of tax to be substantially increased, if a non-conforming use is allowed to stay and that too only once with permission from the competent authority for an additional period of maximum six months and two years for highly offensive and relatively less offensive or non-nuisance uses respectively.
- iv. No addition and alteration in the structure for supplementation and extension of facilities in the premises being used for non-conforming uses will be allowed.
- v. Areas extensively affected by non-conforming uses should be taken up for urban renewal and redevelopment of the locality.

29.4 RECOMMENDED HEIGHT, BULK AND SET BACK REQUIREMENTS FOR VARIOUS USE ZONES

29.4.1 Residential Use Zone

29.4.1.1 General

Layout plans for portion of a particular density area should be approved in keeping with the proposed overall density for the area. The community facilities should be planned on the basis of actual gross density achieved or that prescribed for the area, whichever is higher.

For calculating gross density¹, the area earmarked for community facilities and services of the level of mohallah and below which comprise primary schools, local open spaces, shops, mosque and residential streets, with a right of way up to 25 metres (80 feet) will be included in the area for which the density figures are being worked out. In cases where the given area is bounded by roads of 25 metres (80 feet) width, or less only one half width of the peripheral roads to be taken and all other higher order community facilities and services needing a threshold of more than 6,000 persons should be excluded from density calculations.

29.4.1.2 Floor Area Ratio² and Plot Coverage

The 1966 Master Plan recommended FAR ranging from 0.5 to 1.25 for residential houses and from 1.75 to 2.5 for multi-storeyed apartment buildings. In view of the gradual increase in the average household size i.e. from 5.8 in 1961 to 7.1 in 1998 coupled with the extensive and scarce urban land, the upper limit of FAR for smaller plot is recommended to be raised to 1.5 with a view to provide for more habitable space in individual residential houses. Similarly, the maximum permissible FAR for apartment buildings having six storeys or more need to be drastically increased thereby allowing for the construction of more dwelling units on a given site. Subject to the density provisions and the type of development provided in the IMPL the site coverage and corresponding Floor Area Ratios shall be as given in Table 29.2:

¹ Densities shall be calculated at a flat rate of 7.1 persons per dwelling unit.

² 'Floor Area Ratio' (FAR) is the ratio of the total areas of all floors in the building to the area of the plot on which it is placed. 'Floor Area' is taken to include not only room areas, but also halls, closets, stairway and wall thickness. The basement area meant and used for parking of vehicles may be excluded from the Floor Area for calculating the FAR.

**TABLE 29.2
RECOMMENDED FLOOR AREA RATIOS**

S. NO	DESCRIPTION	MAXIMUM SITE COVERAGE	MAXIMUM FAR
1.	Residential plots of 5 marla (105 sqm) and below	75%	1:1.5
2.	Residential plots of 7 ½ marla (160 sqm) up to 10 marla (210 sqm)	70%	1:1.4
3.	Residential plots of 12 marla (250 sqm) to 1 Kanal (420 sqm)	65%	1:1.3
4.	Residential plots falling in the zone of 2 kanal and above	55%	1:1.25
5.	Apartment buildings having four to five storeys ³	35%	1:2
6.	Apartment buildings having six to twelve storeys	30%	1:3
7.	Apartment buildings having more than twelve and up to twenty storeys	25%	1:4

29.4.1.3 Height of Buildings

Height of residential buildings will be subject to the specific provisions of various development schemes. However, as a matter of general rule, the height of buildings shall not exceed 1.5 times the width of the street plus the width of set back if any, subject to a maximum height of 200 ft.

In approved schemes, apartment buildings shall be permissible in areas specially earmarked for this purpose. However, in the existing residential areas, apartment buildings will be permissible on plots of 4 kanals or more and the overall height of an apartment building measured from top of the plinth to the top of the parapet wall shall not exceed 45 ft.

29.4.1.4 Number of Storeys

In individual residential plots, normally, only three storeyed buildings may be allowed. This should particularly be done in case of plots lying in the areas to be developed and covered by development scheme where the community facilities and roads are provided at the prescribed standards. In the already built-up areas the number of storeys should be restricted to two with a barsati (attic) at the top.

In case of sites meant for apartment buildings in an approved scheme⁴ the number of storeys may range up to twenty depending on the

³ Apartment houses having more than four storeys should be provided with lifts and provisions should be made for the underground reservoirs and installation of booster pumps and over head tanks to ensure the supply of water in the higher storeys.

density provisions. However, in the existing built up areas the maximum number of storeys permissible for an apartment building excluding basement is four with minimum effective height of each floor as 2.9 m (9.5 ft).

29.4.1.5 Frontage of Plots

Each individual plot should provide a minimum frontage of 20 feet on the access road. The ratio of depth to frontage should normally range between 1:2 to 1:2.5.

29.4.1.6 Set Back Lines

Front and rear set backs should be provided as determined by the by-laws of Local Authorities subject to height restriction to allow sufficient light and air circulation. For detached houses, side set backs from plot line to each side of constructed area should not be less than 10 feet. For semi-detached plots it should not be less than 5 feet on the detached side. For row houses, corner plots should be provided suitable set back from the road right-of-way, of the road according to the traffic requirements.

29.4.1.7 Exception

In case of comprehensive housing projects there may be no need to sub-divide the land with a view to create plots and provide plot lines from which set backs and other dimensional features could be measured. Adherence to the over all density standards, provision of community facilities and services, height limitations and setbacks along the boundaries of the project site must however, be ensured along with adequate provision for parking, and servicing within the project site.

29.4.2 Commercial Use Zone

29.4.2.1 Central Areas and District Commercial Centres

Wherever a redevelopment scheme or any new construction is proposed for any commercial area located in the Central Areas and District Commercial Centres, the standards given in Table 29.3 shall regulate the construction activity.

⁴ Approved scheme means a project duly approved for urban development, redevelopment or renewal including areas specified and notified for specific use, housing schemes, zoning schemes and Larger Areas Plans.

**TABLE 29.3
STANDARDS FOR CONSTRUCTION OF COMMERCIAL AREAS**

DETAILS	STANDARDS
F.A.R.	1:8
Maximum site coverage for commercial sites including covered parking and arcade if any	7/8th of the plot area on ground floor and 3/4th on subsequent floors
Maximum height of buildings	1.5 times the width of road right of way plus set back, if any, subject to maximum of 200 ft.

Basement, covering not more than the ground floor coverage will be allowed for parking, servicing and storage. Set backs should be provided in accordance with the following standards:

- i. Maximum 20 ft set back for all sites measuring 840 sq.m (2 kanals and above).
- ii. Minimum 10 ft. set back in all other cases including built-up commercial areas of Walled City.

Wherever provision of an arcade may be prescribed under an approved scheme, the restriction of set backs may not apply.

Service lanes where provided should have a minimum right of way of 30 feet.

29.4.2.2 Other Commercial Areas

For other Commercial areas including service industry the provisions are recommended in Table 29.4. The basement and storage space is included in the covered area. The total area of the basement shall not exceed the total coverable area on the ground floor.

29.4.2.3 Areas and Roads Approved for Change in Land Use under Commercialization Policy

As a result of the original zoning provided in the approved housing schemes and the concurrent subdivision policy of the government, it is not very uncommon to see plots of different sizes and dimensions located side by side along the same street. The variation in size ranges from 12 Kanals to one Kanal in the case of Main Boulevard in Gulberg to 2 Kanals to 3 Marlas in Allama Iqbal Town and some other localities. In view of this anomalous zoning pattern being created, it is necessary to lay down standards separately for different plots in terms of permissible height and coverage of sites, if such plots are allowed to be commercialized under the change in Land Use (Commercialization) Policy.

**TABLE 29.4
FLOOR AREA RATIOS AND HEIGHTS RECOMMENDED FOR
COMMERCIAL AREAS**

PLOT SITE	MAXIMUM SITE COVERAGE		FAR	MAXIMUM HEIGHT
	Both Ground & First Floors including Arcades	Subsequent Floors		
420 sq.m (1 Kanal) and above	75%	66%	1:4	18.25 m (60 ft)
Less than 420 sq.m (1 Kanal) up to 210 sq.m (10 marlas)	75%	66%	1:3	12.2 m (40 ft)
Less than 210 sq.m (10 marlas) but not less than 63 sq.m (3 marlas)	80%	75%	1:2.25	9.2 m (30 ft)
Less than 63 sq.m (3 marlas) but not less than 21 sq.m (1 marla)	90%	75%	1:1.5	8 m (26.25 ft)
Individual Mohallah shops below 21 sq.m (1 marla)	100%	-	1:1	4 m (13 ft)
Wholesale markets and covered markets	60%	60%	1:1.5	12.2m (40 ft)

**TABLE 29.5
RECOMMENDED HEIGHTS, NO. OF STOREYS, SITE COVERAGE AND
FLOOR AREA RATIO FOR PLOTS SUBJECTED TO CHANGE OF USE UNDER
COMMERCIALIZATION POLICY**

PLOT AREA	MAXIMUM ⁵ HEIGHT INCLUSIVE OF THE ORIGINALLY PERMISSIBLE HEIGHT OF 38 FT.	NO. OF STOREYS ABOVE GROUND LEVEL	MAXIMUM SITE COVERAGE		MAXIMUM FAR
			Ground & First Floors	Upper Floors	
3360 Sq.m (8 Kanals) and above	130 ft	12	65% of each floor	50% on each floor	1:6
From 2520 Sq.m (6 Kanals) to less than 3360 Sq.m (8 Kanals)	110 ft	10	-do-	-do-	1:5
From 1680 Sq.m (4 Kanals) to less than 2520 Sq.m (6 Kanals)	90 ft	8	-do-	-do-	1:4
From 840 Sq.m (2 Kanals) to less than 1680 Sq.m (4 Kanals)	70 ft	6	-do-	-do-	1:3
From 420 Sq.m (1 Kanal) to less than 840 Sq.m (2 Kanals)	45 ft	4	70%	-do-	1:2.4
Below 420 Sq.m (1 Kanal)	38 ft	3	75%	55%	1:2

Table 29.5 shows provisions that are being recommended to regulate the height and the mass of buildings with a view to achieve a heterogeneous skyline along the roads and the areas, duly approved for commercialization. The competent authority may charge fee for

⁵ Building heights above the specified limit of 38 ft may be allowed by the competent authority on individual merits of the case subject to the condition that FAR remains within the limits indicated in the table and the siting of the building and the disposition of the sections of the building exceeding the permissible height do not disturb the privacy of the adjoining residential houses

allowing height more than the maximum permissible height of 38 ft laid down for residential developments.

29.4.3 Institutional Use Zone

F.A.R. for buildings for institutional uses will vary between 1.5 to 3 and may be determined in individual cases depending upon the location and nature of use. The maximum area permissible for coverage including covered parking shall not exceed 50%. A basement not exceeding in size the area of the ground floor will be allowed for parking, servicing and storage.

29.4.4 Industrial Use Zone

29.4.4.1 Light and Medium including Cottage Industries

- Minimum Plot Area 250 sq.m (12 Marlas)
- Maximum Plot Area 1 acre
- F.A.R. 1:1.0
- Maximum coverage 50%

A basement not exceeding ground floor coverage is allowed. Set backs to be provided in accordance with the requirements of the scheme or the bye-laws of the local authorities.

29.4.4.2 Extensive and Medium Heavy Industries

- Minimum plot area 1 acre
- Maximum plot area 10 acres
- Maximum plot coverage 50%
- F.A.R. 1:0.5

Basement and set backs allowed as in service and light industries.

29.4.4.3 Warehousing and Storage Depots

- F.A.R. 1:1.8
- Minimum site coverage 60%

Basement and set backs allowed as in light and medium industries.

29.4.5 Farm and Agricultural Use Zone

It is very necessary that the agricultural and farming zone all around the urban areas is preserved in a manner that its character as a green belt is protected to maximum possible extent and yet the rural activities in so far as growth of village settlements and allied activities are concerned do not suffocate due to enforcement of some

restrictions essentially required to maintain the predominant character of the area with its *flora and fauna* and above all largely pollution free environments.

Restrictions on the covered area and permissible height for farm houses in Farm and Agricultural Use Zone are as suggested in Table 29.6.

**TABLE 29.6
COVERED AREA AND HEIGHT RESTRICTIONS FOR FARM HOUSES**

SIZE OF FARM	MAXIMUM COVERAGE ON GROUND FLOOR	MAXIMUM HEIGHT
Above 3 acres	150 sq.m	Double storey with maximum height of 8 metres
2 to 3 acres	125 sq.m	-do-
From 1 to less than 2 acres	100 sq.m	-do-
Below 1 acre	Construction of farm house not permissible	

Construction of buildings for other uses permitted in the Farm and Agricultural Use Zone shall conform to the standards individually recommended for respective uses.

It is however pointed out that the proposals given on Zoning Regulations in this Chapter need to be thoroughly reviewed by a Technical Committee before their implementation. This committee may comprise of town planners, architects, engineers, developers, legal experts, administrators etc.

30.0 SUB DIVISION REGULATIONS

30.1 OBJECTIVES

The sub-division regulations lay down yardsticks for prospective developers and land sub-dividers to operate within the framework of zoning proposals and as such aim at checking haphazard and sub-standard development of residential areas. These regulations tend to provide a leveled ground for all concerned and are equally beneficial to sub-dividers, house owners and the civic authorities. The genuine developers of land are better acknowledged by the public as against the seasonal sub-dividers who by defying the sub-division standards try to earn maximum profits by providing inadequate level of community facilities and services. The sub-division regulations discourage land speculation and thus create stability in property values. Community facilities and services provided by the genuine sub-dividers in accordance with the laid down standards would be much economical to maintain than to correct and upgrade the substandard services latter on which may often require doing the works all over again.

30.2 CHARACTERISTICS

The sub-division regulations usually consist of three important elements namely:

- i. Procedure to be followed and the list of documents to be submitted to the competent authority for seeking approval of site development scheme and land sub-division proposals.
- ii. Details of specific information to be shown on the drawings.
- iii. The design standards to be followed by land sub-dividers, developers, housing societies and public sector organizations for the preparation and execution of housing layouts plans and sub-division plans.

30.3 PART –I: GENERAL ADMINISTRATIVE MATTERS AND PROCEDURES

30.3.1 Section –I: Definitions

Unless otherwise expressly stated, the following terms shall, for the purposes of these regulations have the meanings indicated here under. Where the terms are not defined these shall have their ordinarily accepted meaning or, such as the contract may apply.

Acre: means a size of land equal to 9.68 kanals or 43,560 sq.ft (4046.86 sq. metre).

Apartment Building: means a multi-storey building containing more than two apartments sharing common stair case, lifts or access spaces.

Approved Scheme: means a project duly approved for urban development, re-development or renewal including Master Plan, Structure Plan, Larger

Area Plan, areas specified and notified for specific use, traffic control plans, housing and zoning schemes.

Area Standards: mean area requirements and restrictions laid down under these regulations for undertaking sub-division or land development, operations including provision, of zoning regulations as have been, or may hereafter be adopted by or on behalf of the Competent Authority.

Cardinal Points: means geographic directions of North, South, East and West.

Competent Authority: means the authority competent to approve the land sub-division and land development plans and to control the building and land use activities.

Developer: means a person or body of persons engaged in Real Estate activity and not engaged in construction as masons or such other artisans.

Government: means the Government of Punjab.

Kanal: means a size of land equal to 20 marlas (420 sq.m)

Land: includes the earth, water and air, above, below or on the surface and any thing attached to the earth and has the meaning assigned to it under Clause (a) of Section 3 of the Land Acquisition Act, 1894.

Land Development or Development of Land: means the dividing of land into plots, the amalgamation of plots, the carrying out of any building, and engineering operations including provision of public utilities in, on, over or under land, making of any material change in the use or appearance of any land, and the creation or termination of rights of access and shall include all other developments customarily associated with it unless otherwise specified.

Land Use or Use of Land: means the development existing on land.

Layout Plan: means a land use plan which may include planning standards or other provisions relating to:

- a) the precise location and characteristics of roads, other rights of way, and utilities;
- b) the dimensions and grading of plots and the dimensions and siting of structures;
- c) the precise location and characteristics of permissible types of development ; and
- d) any other planning matters which contribute to the development and use of the area as a whole.

Major Sub-division: mean any sub-division including, but not limited to, sub-division of land measuring 2 or more hectares or any size sub-division requiring any new road, or the extension or addition of substantial new public facilities.

Minor Sub-division: means sub-division of land measuring less than 2 hectares fronting on an existing road, not involving any new road or the extension or addition of substantial new public facilities.

Marla: means a size of land equal to 225 sq.ft (20.90 sq.m)

Master Plan: means the Integrated Master Plan for Lahore (2001-2021)

Person: means any individual, company or association or body or individuals, whether incorporated or not, or any public agency.

Planning Standards: means those Zoning Regulations or other land development requirements or restrictions and area allocation for various land uses as provided in the Master Plan or may hereafter be adopted.

Plot: means any size of land capable of being described with such definiteness that its location and boundaries may be established, which is designated by its owner or developer as land to be used or developed as a unit, or which has been used or developed as unit.

Public Building: means and includes religious buildings, health and social welfare buildings, educational buildings, post office, police station and other community buildings.

Registered Town Planner: means a person duly registered/ enlisted as Town Planner with the Pakistan Council of Architects and Town Planners (PCATP) and the said registration is valid and renewed up to date.

Road: includes any public or private road, highway, street, alley as indicated by its context.

Structure Plan: means the plan prepared as part of Lahore Urban Development and Traffic Study, 1980.

Sub-division: means the division of land into two or more plots, and "sub-division plan" means a layout plan prepared in connection with the sub-division.

Zone: means an area/ areas earmarked or specified for a particular use or character in the Master Plan including an area in which sizes of plots may have been preserved.

30.3.2 Section – II: Application of Sub-Division Regulations

1. No person including the Federal and Provincial Governments Autonomous, Semi-Autonomous and Local Bodies and Provincial and Federal Government Agencies shall sub-divide this land, carryout land development or permit land development within the boundary of the area of Lahore City District except in compliance with the requirements, restrictions or conditions of:
 - a) these Sub-Division Regulations
 - b) Zoning Regulations
 - c) approved schemes and
 - d) approved Government Policy governing Sub-Division of residential plots.

2. The following activities or uses shall be taken for the purposes of these Regulations to involve land development as defined:
 - a) a change in type of use of land or if these regulations divide uses into classes, a change from one designated class of use to a use in another designated class.
 - b) division of land into plots or material change in the external appearance of land:
 - c) a material increase in the intensity of use of land.
 - d) commencement of mining or excavation of land
 - e) deposit of refuse, solid or liquid waste or fill on a plot of land.
 - f) the installation of underground or overhead public service facilities;

3. The following operations or uses do not constitute land development for the purposes of these Regulations:
 - a) the maintenance or improvement of a public road, highway, street or railroad track, sewers, drains, cables, power lines, telephone lines, or similar facilities, if the work is carried out on land within the boundaries of the right-of-way;
 - b) the use of any land for agricultural purposes, including excavations, in the course of agricultural operations, except to the extent of the making of wells which may be specifically controlled by any other law concerned with water preservations;
 - c) a change in the form of ownership of any land not involving the division of land into plots;

- d) the creation or termination of easements, or covenants or other rights in the land.
- 4. No person shall advertise for the purposes of disposing, selling transferring or undertaking sale promotion in any sub-division/land development project, through any information media including printing or fixing of posters, banners, hoardings, and pamphlets, unless such a sub-division/ land development is duly approved under these Regulations.

30.3.3 Section III: Submission of Applications and Plans

- 5. All applications shall be made on land sub-division application form as may be prescribed by the competent authority.
- 6.
 - a) Every prospective sub-divider intending to carryout sub-division or land development whether new or involving modification shall employ a Registered Town Planner to prepare, design and supervise the sub-division and land development operations/ works.
 - b) Where the Registered Town Planner so employed ceases to be incharge of such sub-division and land development operation/ works before the same are completed, further operations/ works shall forth with be suspended until a fresh appointment is made as required under Regulation 6(a) above.
- 7. Every prospective sub-divider or developer who intends to carryout land sub-division or land development shall submit to the competent authority an application in writing for permission and the Registered Town Planner so employed shall submit the following:
 - a) A plan drawn to a scale of 2000 ft to an inch (1:25000) or other suitable scale to show the site in the context of important existing urban features, unless its address is a number in a regular sequence of numbers in an approved scheme.
 - b) A survey plan of the site including some adjacent area drawn to a scale of not less than 200 ft to an inch (1:2,500) showing there in:
 - i. the area and all the dimensions of the site
 - ii. the cardinal points
 - iii. existing physical features, land use and accessibility nodes.
 - iv. on-site and off-site existing infrastructure, both overhead and underground with necessary technical data.
 - v. contours drawn at ½ ft interval and natural drainage pattern
 - vi. spot heights on 100 ft grid
 - c) Information on water table and quality of ground water

- d) Sub-division and a detailed layout plan drawn on a scale of not less than 200 ft to an inch (1:2,500) with Khasra Nos. duly superimposed on it and shall:
- i. delineate the number, shape, sizes and extent of plot for residential use, recreational facilities, open spaces and parks, educational and health facilities, circulation, system, spaces earmarked for vehicular as well as pedestrians, parking, religious and other community activities, commercial and industrial uses, utilities, strictly according to the standards prescribed in the Master Plan and these Regulations and other infrastructural facilities. The layout plan shall ensure that the spaces are allocated and located in a manner that these are functional and complementary to one another, economically efficient, aesthetically pleasing and above all safe in operations.
 - ii. take into consideration environmental factors such as climate, orientation; noise impact, vegetation etc.
 - iii. earmark spaces for various uses in accordance with the planning standards.
8. Every prospective sub-divider, developer who intends to make any addition or alteration in an approved sub-division or layout plan as a result of which the original area of the site will increase / decrease or where the changes are such as to alter the original use of spaces earmarked, shall submit an application to the Competent Authority along with all information and documents as required under these Regulations.
9. Every prospective sub-divider who intends to carry out land sub-division or land development under Regulation 7 and 8 shall, if required, produce all documents of title of land showing his right to carryout such sub-division or land development.
10. a) Every person, who under Regulation 8 and 9 is required to provide to the Competent Authority any plan or document shall furnish four copies of every such plan, one of which shall be mounted or drawn on linen.
- b) Every plan submitted under Regulation 7 and 8 shall, in token of its having been prepared by a Registered Town Planner or under his supervision shall bear his stamp, signatures, registration and current registration renewal number.
11. a) After the receipt of an application for permission to carry out a major or a minor land sub-division/ land development, the Competent Authority, within 60 days in the case of major and 45 days in the case of minor sub-division/land development shall conduct technical

scrutiny of the layout plan and in doing so shall take into account, as may be pertinent:

- i. the provisions of the Master Plan, and of any approved scheme and Zoning Regulations as may be applicable to the area in which the proposed sub-division/ land development is located.
 - ii. the implications, if any, for the development of a larger area of which the proposed sub-division constitutes a part.
 - iii. any approved development programme of a public agency, or if its own which might be adversely affected by the proposed sub-division/development.
 - iv. the need, if any, to protect existing resources, objects of architectural or historical importance, installations or investments of the Federal Government, Provincial Government or any public agency.
 - v. needs of the adjoining neighbourhoods and communities relating to sanitation, road and street networks, traffic and transportation facilities, the existence or absence of municipal services in the area, programmes for future provisions of such services, public amenities, industrial commercial activities and facilities, air and water quality, other attributes of physical environment, and significant social and economic characteristics of the inhabitants.
- b) On completion of technical scrutiny, conducted under Regulation 11(a) the Competent Authority may:
- i. invite public objections to the proposed development, if the layout is found to be in accordance with these Regulations; or
 - ii. in case of serious defects and violations of these Regulations refuse the permission, or
 - iii. require further details of the plans, documents, specifications and any other particulars to be submitted to it.
12. a) Before an application of sub-division/ land development is technically approved the Competent Authority shall accord an opportunity to all interested persons for being heard, or to file objections to the proposed development by causing a notice to be published in one English and one Urdu Daily Newspapers having wide circulation.
- b) The notice under Regulation 12(a) shall state the detailed particulars of the land involved, place at which, and the officers with whom or before whom objections may be filed or interested persons may be

heard, which shall not be less than 10 or more than 30 days from the date of publication of notice.

- c) It should not be obligatory for the Competent Authority to entertain any objection filed after the expiry of the period given in the notice published under Regulation 12(a).
- 13.
- a) Within 15 days of the expiration date of the notice published under Regulation 12(a), the officer so designated shall prepare and send to the applicant a statement of all suggestions or objections filed, testimony given and issues if raised during personal hearings granted to the interested persons;
 - b) The applicant shall respond and submit, within 15 days of the receipt of the information under Regulation 13(a), a reply to all the suggestions or objections filed against the proposed development.
- 14.
- a) Within 30 days from the receipt of reply from the applicant, or if no reply has been received, within 15 days from the expiry of period prescribed under Regulation 13(b), the officer so designated shall consider the entire matter in the light of reply from the applicant and suggestions or objections filed or testimony given and submit a report to the Competent Authority for passing orders for granting or refusing technical approval of the layout plan who in case of refusal shall record reasons and specify the provisions of the Regulations violated.
 - b) Appeal against refusal of application may be filed with the higher Competent Authority within 30 days of receipt of rejection order.
- 15.
- a) The applicant shall indicate on the layout plan at least 30% of the total saleable area and execute at his own cost a Mortgage Deed in respect of the said area with the Competent Authority as a partial security for provision of the utility services by him or if he may so desire, submit a Bank Guarantee equal to the estimated Cost of development in lieu of mortgaging of plots from a Scheduled Bank.
 - b) The applicant shall transfer to the Competent Authority, free of cost, all the area earmarked in the layout plan for roads, parks and open spaces, graveyards, and public buildings as defined and for doing so, shall execute and get registered a Transfer Deed under the law.
- 16.
- Until and unless so permitted by the Competent Authority, the applicant shall bound himself not to sell, dispose, auction, allot, commit or alineate in any manner, this land or plot mortgaged with, or transferred to the Competent Authority under Regulation 15 (a) and (b).
- 17.
- a) Before technical approval of the layout is officially communicated to the applicant the Competent Authority shall cause a notice, to be

published at the cost of the applicant in one English and one Urdu daily Newspaper having wide circulation.

- b) The notice under Regulation 17 (a) shall state the details of the plots mortgaged with and the areas transferred to the Competent Authority under Regulation 15 (a) and (b) respectively.
18. The letter containing the approval granted under Regulation 14 (a) may be issued by an officer duly authorized by the Competent Authority and it shall contain all the information relating to the plots mortgaged and the areas transferred by the applicant under Regulation 15 (a) and (b) in addition to the salient features of the layout plan so approved.
 19. Within 90 days of the issuance of technical approval of a major sub-division, the applicant shall submit engineering designs of the infrastructure i.e. water supply system, sewerage system, drainage system, external electrification system including street light, roads and communication system and landscaping of parks and open spaces to the concerned agencies under intimation to the Competent Authority.
 20. The applicant shall provide and complete at site all the infrastructure services specified in Regulation 19 in accordance with the engineering designs approved by the concerned agencies within a period of three and a half (3½) years from the receipt of the letter of approval issued under Regulation 18.

30.3.4 Section IV: Fees and Penalties

21.
 - a) The Competent Authority and the concerned agencies may, together or individually charge for the scrutiny of sub-division / land development, plans and engineering designs to be submitted under these regulations and other matters arising during the processing and disposal of layout plans and engineering designs or in course of construction of infrastructure services, a fee to be known as scrutiny fee at rates and in such manner as may be fixed by it from time to time.
 - b) The Competent Authority may exempt from payment of scrutiny fee a minor sub-division/ land development proposal, which in the opinion of the Competent Authority will be meant and used wholly for religious, charitable or educational purposes.
 - c) The Competent Authority may regularize and impose penalties for violation of the provisions of these Regulations at such rates and in such manner as may be specified by it from time to time.

30.3.5 Section-V: Procedure, Notice, Inspection and Certificates during Construction

1. Every prospective sub-divider/land developer who carries out Development Works shall use sound construction materials which shall be of good quality and execute the Development Works accordingly to the acceptable standards of engineering practice.

23. The Competent Authority may, through its authorised officers, at any time:
 - a) before approval of an application received under Regulations 7 and 8;
 - b) during execution of Development Works; and
 - c) before and after the receipt of notice of completion of Development Works or any part thereof;inspect the site, without giving previous notice to the sub-divider/developer.

24. If on making any inspection under Regulation 23, the Competent Authority finds that the Development Works:
 - a) Contravene any of the provisions of these Regulations, any officer duly authorized by it may by written notice require the person carrying out Development Works within a period to be specified in such notice, either to make such alteration, as shall be specified in such notice, with the object of bringing the work in conformity with the sub-division/land development plans or provisions of these Regulations or to get amended sub-division/ land development or engineering designs approved after complying with the requirements of these Regulations.
 - b) In the event of non-compliance with the requisition as made under Regulation 24(a), any officer authorized by the Competent Authority shall be able to order in writing cessation of work or order demolition of such construction which may contravene any of the provision of these Regulations and the expenses thereof shall be paid by the sub-divider/ land developer.

25. Every prospective sub-divider/ land developer who carries out and completes all the Development Works or a part thereof as approved under these Regulations shall deliver to the concerned agency and the Competent Authority a notice in writing together with a certificate duly signed by the Engineer in-charge of works and the Registered Town Planner employed under Regulation 6 for the redemption of area mortgaged or release of Bank Guarantee Proportionate to the Development Works carried out and completed at site.

26. Within 15 days of the receipt of notice under Regulation 25, the Competent Authority, or the concerned agencies shall through officers, duly authorized, inspect the Development Works and after such inspection either approve or disapprove the Development Works and make such further orders as it may decide.
27. If the Development Works already carried out and completed are approved under Regulation 26, the Competent Authority shall, as the case may be, proceed forthwith for the redemption of area mortgaged or release the Bank Guarantee either as a whole or, if the Development Works are intended to be completed in phases, in four installments in a manner described hereunder:
- On completion of 25% of all the Development Works 1/5th portion of the total area mortgaged or that of Bank Guarantee may be redeemed at this stage inclusive of redemption already made
 - On completion of 50% of all the Development Works. 2/5th portion of the total area mortgaged or that of Bank Guarantee shall be redeemed at this stage inclusive of redemption already made
 - On completion of 75% of all the Development Works 3/5 th portion of the total area mortgaged or that of Bank Guarantee may be redeemed at this stage
 - On completion of all the Development Works All the balance portion of the area mortgaged or that of Bank Guarantee shall be redeemed
28. The applicant shall, at his own cost, enter into and get executed a Redemption Deed for the release of any area mortgaged with or the Bank Guarantee submitted to the Competent Authority under Regulation 15 (a).
29. a) In case the applicant fails to provide and complete all or any of the infrastructure services specified in Regulation 19 within the period stated in Regulation 20 or on expiry of any extension of time which may be granted for reasons to be clearly recorded, the Competent Authority shall proceed with the sale by auction of the area / plots mortgaged and public building sites taken over or encashment of Bank Guarantee to collect funds required for provision of utility services left incomplete by the applicant;
- b) If the funds so collected may fall short of the estimated cost of the unfinished and incomplete works, the Competent Authority shall complete the Development Works and may recover the difference of cost proportionately from the beneficiaries as a Betterment Charge.

30. Every developer shall look after the utility services and Development Works provided by him in an approved sub-division / land development project so long as the said services are not handed over to the Competent Authority or a local body or a concerned agency as the case may be.

30.4 PART-II: PLANNING CONTROL REQUIREMENTS, DESIGN PARAMETERS, AREA ALLOCATION AND LOCATION STANDARDS

30.4.1 Section -I: Sub-Division Proposals

30.4.1.1 General Sub-Division Proposals

31. No land shall be sub-divided and used in a manner inconsistent with the use and density standards prescribed in any Approved Scheme, Zoning Regulations and the provisions of the Master Plan.
32. Excluding sites meant for construction of Apartment Buildings, the size of residential plots shall not exceed 2 kanals (840 sq.m.) in a privately sponsored sub-division/land development proposal and 1 kanal (420 sq.m.) in the case of proposals, sponsored by Government Departments or any public sector agency. In both the cases the minimum size of residential plot shall not be less than 3 marlas (63 sq.m.)
33. Two or more sites may be allowed to be combined for the purpose of constructing one building. The cumulative area of plots, if meant to be joined for construction of one house shall not exceed 2 kanals (840 sq.m.).
34. Except as permissible under Regulation 32, no land shall be sub-divided or developed into large plots for construction of individual houses including farm houses.

Nothing contained in this Regulation shall however, prevent the construction of farm houses in the Farm and Agricultural Use Zone in the manner and subject to such other conditions as specified in the Zoning Regulations.

30.4.1.2 Sub-Division Proposals for schemes having area less than 100 kanals

Parcel of land having area less than 100 kanals will be sub-divided into plots in the following manner:

- i Minimum street width will be 20 feet.
- ii The resultant plots will not be less than 4.5 marlas if residential, and 150 sq. feet if commercial.
- iii The minimum plot width will be 22.5 feet in residential areas and 10 feet in commercial areas.
- iv The ratio between width and length of the plots will not exceed 1:2.

- v The minimum space allocated for public facilities in the sub-divided plots will be as follows:

Size of sub-divided plot	Space required for public facilities
Up to 4 Kanals	400 Square feet
Above 4 Kanals	3% of the plot area.

- vi Fee will be charged according to schedule of Local Authority.

30.4.2 Section -II: Standards

35. Land Use Distribution

- a) The proportions of land under various uses would vary according to the nature and size of a sub-division / land development project. Obviously, the area can be predominantly earmarked for residential use in a Minor Sub-division as against a Major Sub-division when it would certainly decrease due to the demand for providing additional facilities to satisfy the needs of a comparatively larger community. Also the applicable Zoning Regulations and density provisions have a direct bearing and in certain cases, these may result in an altogether different pattern of land use distribution. Generally speaking the sub-division / land development project meant for low rise housing may contain the following range of land use distribution:

S. No.	Use	Area Allocation (%)
i.	Residential	50 to 57
ii.	Commercial	Between 2 & 3
iii.	Educational, Health, Religious and other Community Facilities inclusive of Parking Spaces as per approved standards.	5 to 7
iv.	Roads/ Streets and Parking Spaces	25 to 30
v.	Parks and Open Spaces	Not less than 7
vi.	Sewerage Disposal Station and Water Works	Not less than 1
vii.	Graveyards	Not less than 2

- b) An area equivalent to 30% of the area reserved for commercial use shall also be provided, preferably at its front, for parking of vehicles.

36. **Roads and Streets**

- a) (The minimum right of way for primary and secondary roads shall be as prescribed in the Master Plan and any other approved scheme including the Structure Plan.)
- b) For roads other than those mentioned at (a), the right of way shall be:
 - i. as prescribed in the Approved Schemes
 - ii. as established at site subject to a minimum of 20 ft (6 m) in the existing built up areas
 - iii. not less than 30 ft (9 m) in all other cases.

37. **Design Guidelines for Water Supply, Sewerage, Drainage and Solid Waste:**

a)	Water Supply	Guidelines
i.	Per capita water supply	363 litres / capita / day (80 gpcd)
ii.	Terminal Pressure	20 psi (minimum) 60 psi (maximum) (one psi = 2.31 ft of water length)
iii.	Minimum size of water supply distribution line	75 mm (3")
iv.	Overhead Tank height	18 to 21 metres (60-70 ft)
v.	Area reservation for supply mains	1 to 2 metres
vi.	Public Stand Posts	
-	Maximum population served per tap	100 persons
-	Maximum Spacing	180 metres
-	Minimum Pressure head	6 metres
b)	Sewerage and Drainage and Solid Waste	
i.	Quantity of waste water to be taken for sewerage design	- Residential 80 % of water supply - Commercial 90% of water supply
ii.	Slope / Self-cleansing velocity	Minimum 0.76 metres /Second (2.5 ft/Second)
iii.	Minimum size of sewer line	225 mm (9")
iv.	Minimum depth of cover	0.75 metre

v. Manhole Spacing

Manholes shall be provided at every intersection and at every change in grade, level, diameter or direction. Additionally manholes shall be spaced so that each plot can discharge its sewage in a manhole either directly or through cross connections.

vi. Area Reservation along the Shoulder of Road

- Sewerage Lines (225mm – 675 mm dia) 2 metres
- Lateral drains 0.60 metres on both sides of the road
- Collection drains 0.75 to 1 metre
- Transmission drains 1 to 1.25 metres

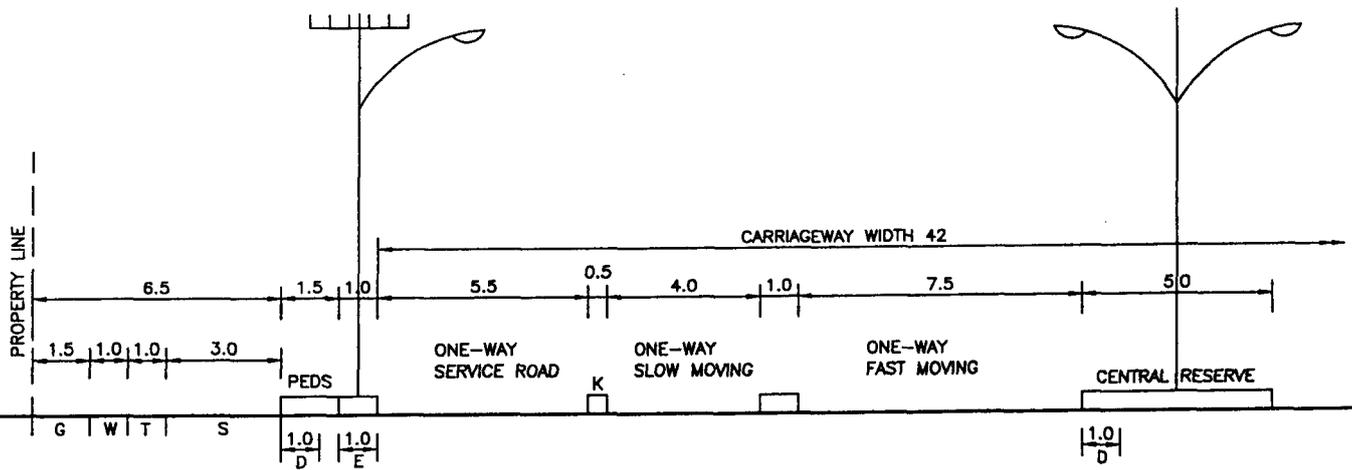
vii Solid Waste 0.55 kg/capita /day

38. Placement of Services in Road Cross-Sections

- a) The placement of services shall not be done under the carriageways except where width of road may be limited and enough space for berms is not available.
- b) To avoid frequent road digging for maintenance and repairs, the services shall be placed in the space reserved for berms as shown in various road cross-sections for primary, secondary and local roads (Fig.30.1, 30.2 and 30.3).

30.5 PART-III: ISSUES RELATED TO APPROVAL OF PRIVATE HOUSING SCHEMES

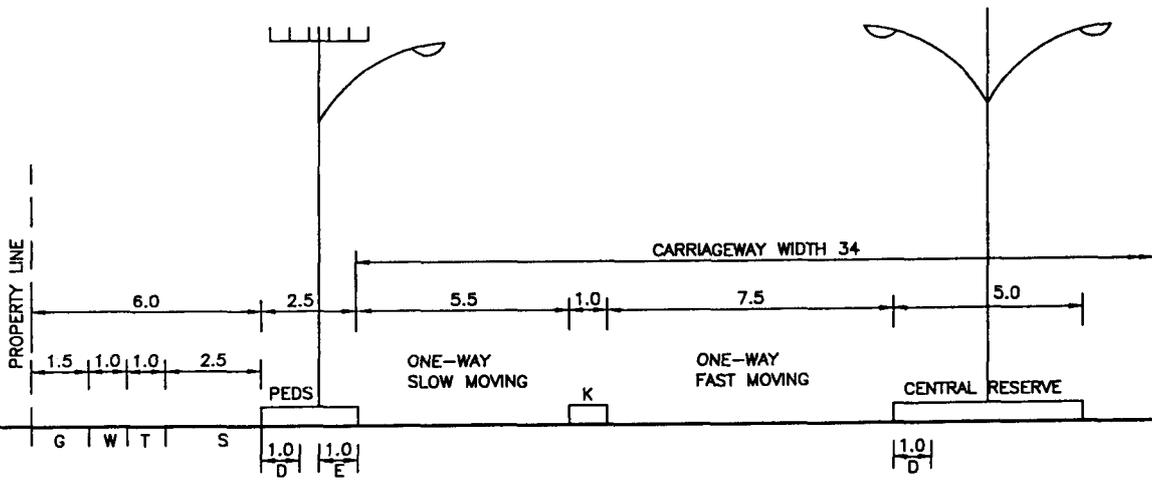
39. The current procedure adopted by LDA for approving the Private Housing Schemes having an area of more than 100 kanals is in order. It is however suggested that in view of excessive pressure on commercial developments in the city, the percentage land use distribution for commercial use may be increased from the current 2% to 3% of the total scheme areas.



CROSS SECTION 1(a)

ROAD WIDTH 60 (MINIMUM 55)

180 to 197



CROSS SECTION 1(b)

ROAD WIDTH 50 (MINIMUM 45)

148 to 165

LENGEND:-

- SEWERAGE S
- WATER SUPPLY W
- DRAIN D
- GAS G
- TELEPHONE T
- ELECTRICITY E
- KERB K
- PEDESTRIAN PEDS

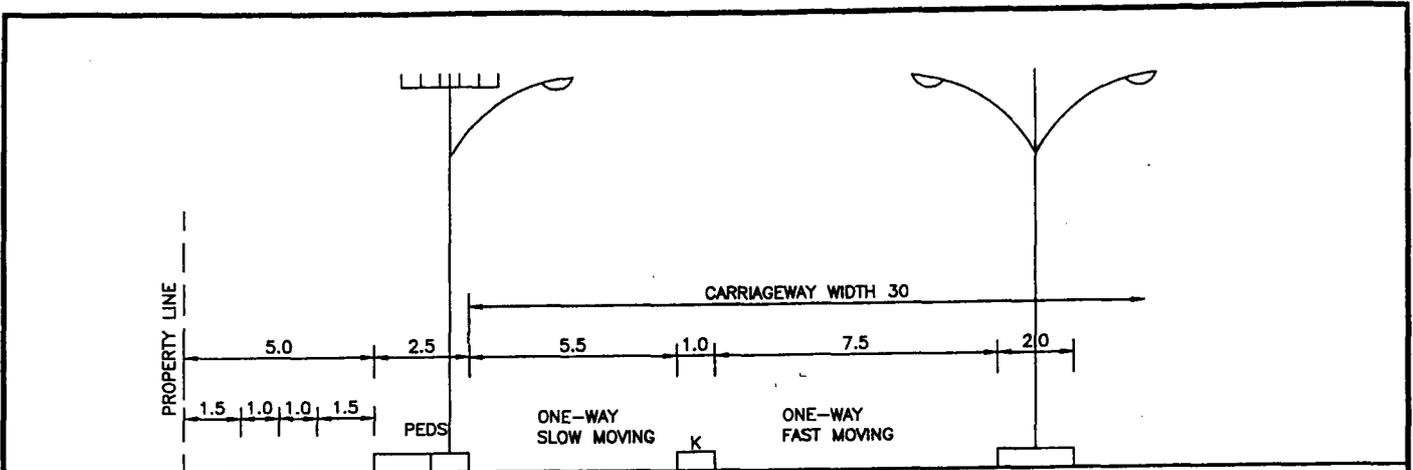
NOTE:-

(ALL DIMENSIONS ARE IN METRES)

SCALE 1:500

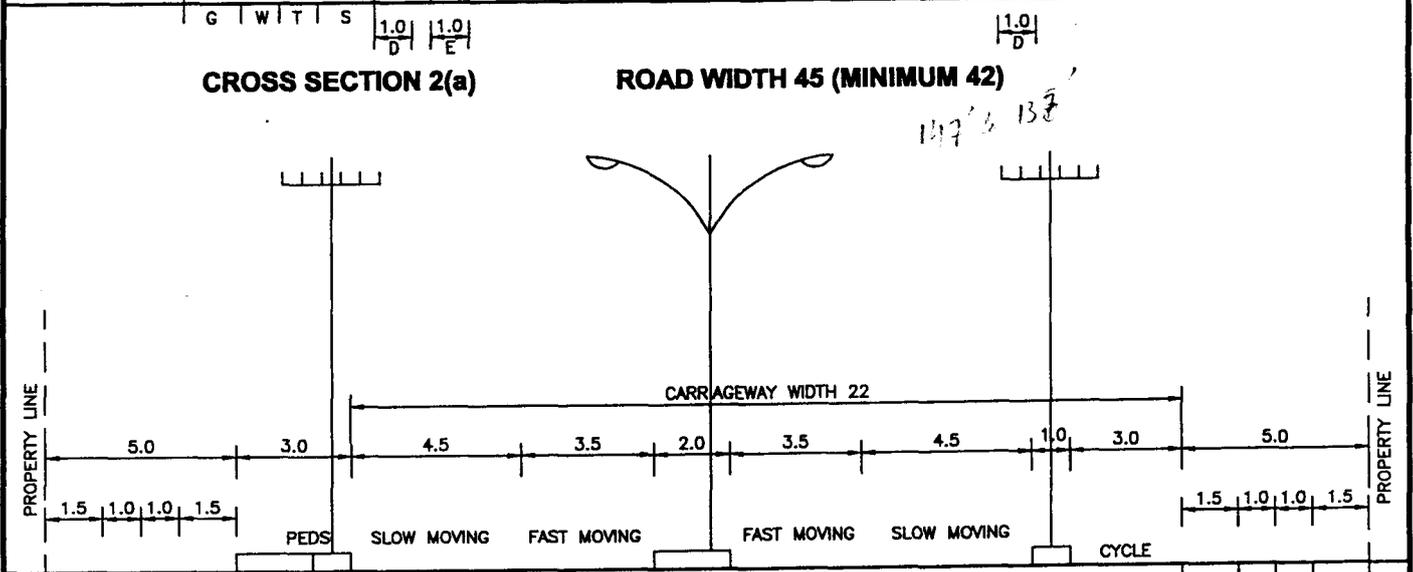
**PLACEMENT OF SERVICES
ALONG PRIMARY ROADS**

Fig: 30.1



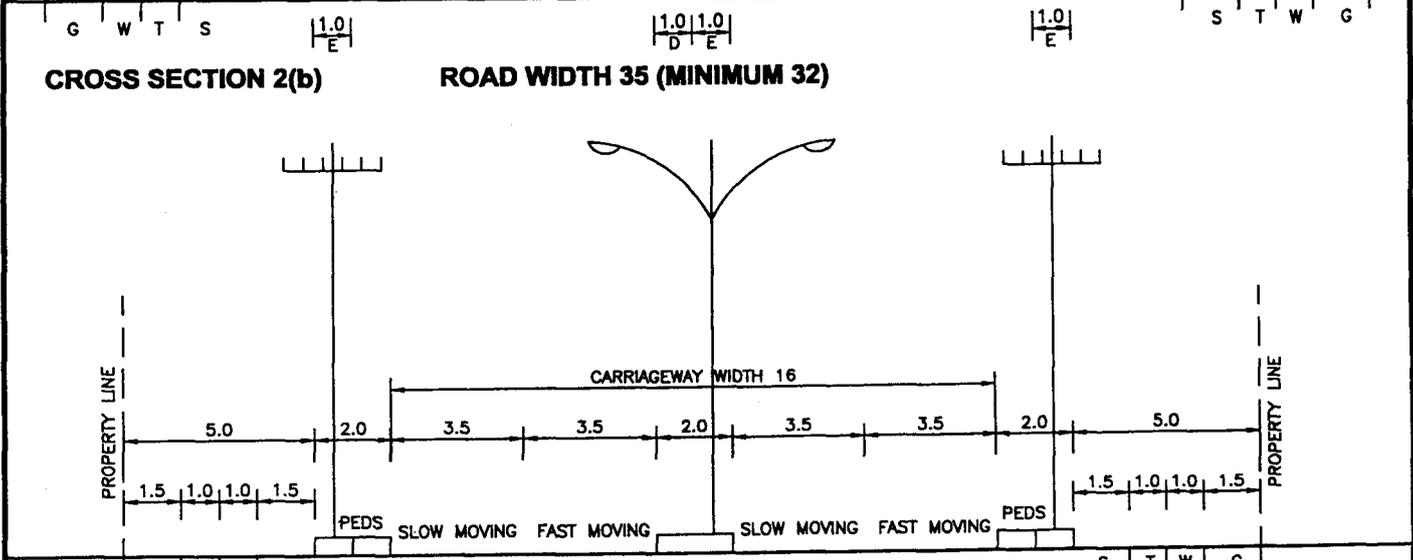
CROSS SECTION 2(a)

ROAD WIDTH 45 (MINIMUM 42)



CROSS SECTION 2(b)

ROAD WIDTH 35 (MINIMUM 32)



CROSS SECTION 2(c)

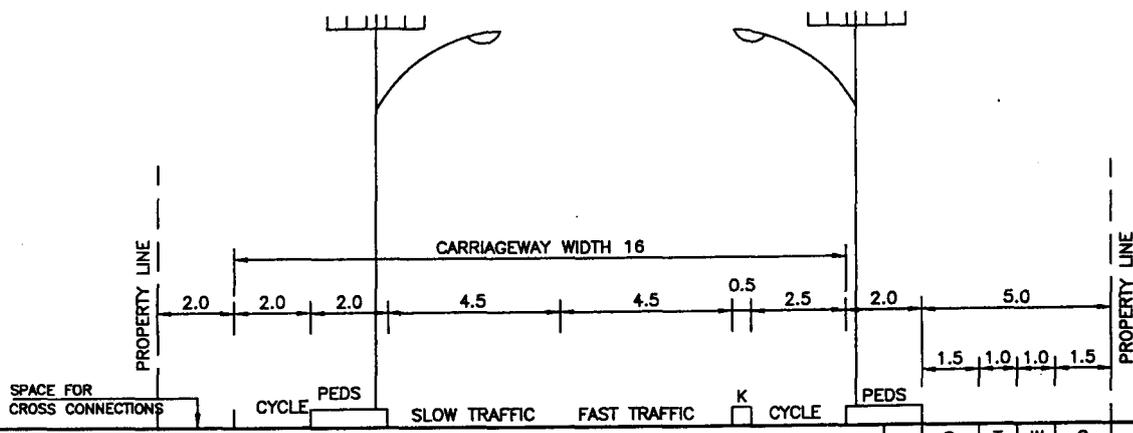
ROAD WIDTH 30

NOTE:-
(ALL DIMENSIONS ARE IN METRES)

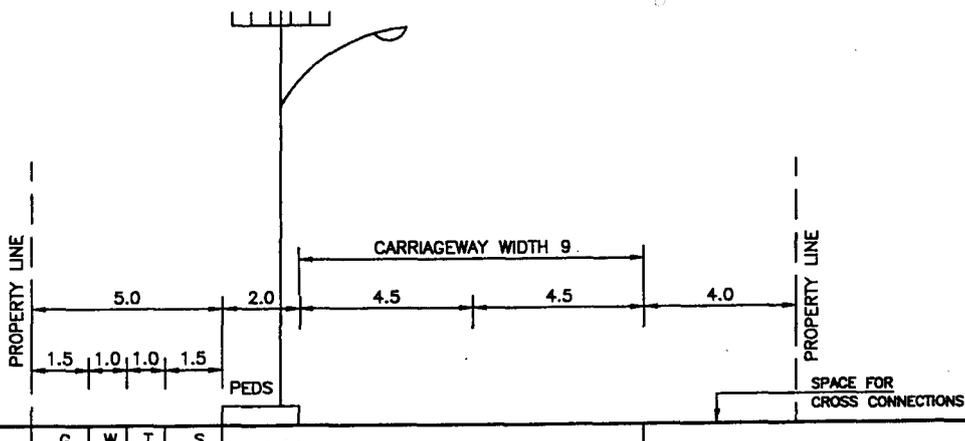
SCALE 1:500

PLACEMENT OF SERVICES ALONG SECONDARY ROADS

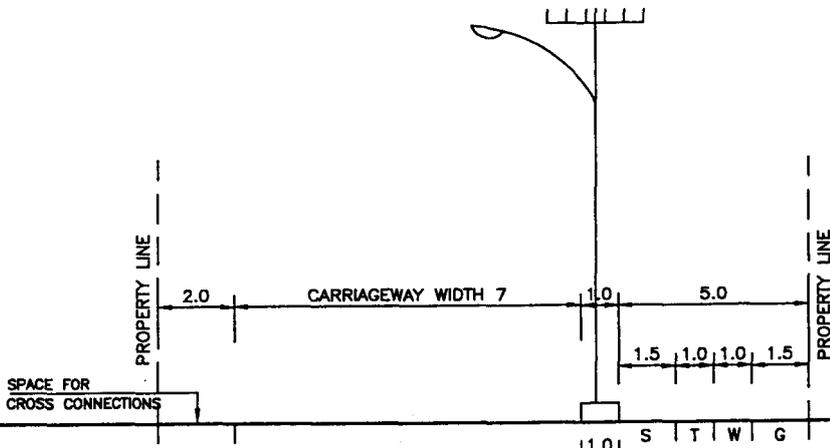
Fig: 30.2



CROSS SECTION 3(a) ROAD WIDTH 25



CROSS SECTION 3(b) ROAD WIDTH 20



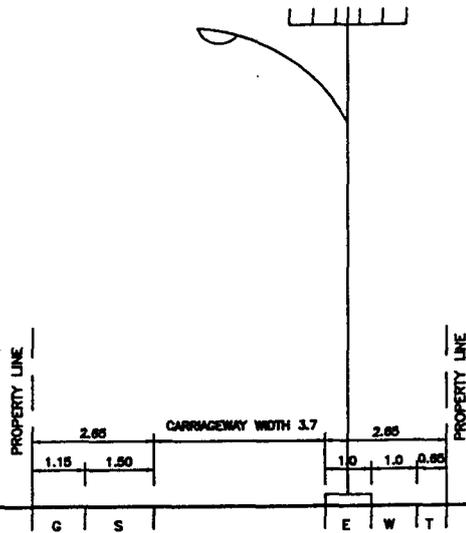
CROSS SECTION 3(c) ROAD WIDTH 15

NOTE:-
(ALL DIMENSIONS ARE IN METRES)

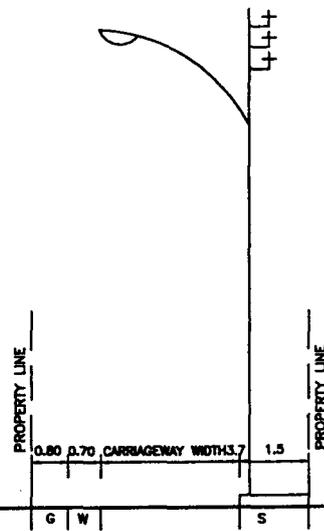
SCALE 1:500

**PLACEMENT OF SERVICES
ALONG LOCAL ROADS
(CONTINUED)**

Fig: 30.3



CROSS SECTION 3(d) ROAD WIDTH 9



CROSS SECTION 3(e) ROAD WIDTH 6

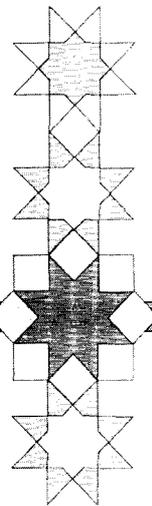
NOTE:-
(ALL DIMENSIONS ARE IN METRES)

SCALE 1:600

PLACEMENT OF SERVICES ALONG LOCAL ROADS

Fig: 30.3

ANNEXURES TO VOLUME II



ROADS PROPOSED FOR INDUSTRIAL & COMMERCIAL USES

ROADS FOR INDUSTRIAL USE

I. ALLAMA IQBAL TOWN

1. Sundar Road (Multan Road to Raiwind Road)
2. Defence Road to Manga Road
3. Jaliana Road Defence Road to Bhalai Gul
4. Defence Road to Ferozepur Road
5. Multan Road River side from Thokar to Manga Town
6. Manowal Road
7. Baghdadi Road (from Multan Road to Manowal)

II. NISHTAR TOWN

1. Azam Chowk to Main Hudiana Drain
2. Along Hudiana Drain (Multan Road to Railway Line)
3. Lahore Park (Raiwind Road) to Coca Cola Factory (north side of road)
4. Sem Nullah (before Rajian Chowk)
5. Rohi Nullah (before Raiwind Morh) Raiwind Road to Sundar Road and east side of Raiwind Road.
6. Inam Road, Glaxo Town
7. Panju Road
8. Halloki Road near Railway Line

III. RAVI TOWN

1. Southern side of Bund Road
2. PECO Road, Badami Bagh
3. Noor Road, Badami Bagh
4. Abdul Sattar Road, Badami Bagh

ROADS FOR MIXED COMMERCIAL/ INDUSTRIAL USES

I. ALLAMA IQBAL TOWN

1. Shahpur Road (Multan Road to Shahpur Village)
2. Katar Bund Road upto Motorway
3. Chowk Yatim Khana upto Bund Road (Motorway)
4. Raiwind Road (Thokar Niaz Beg) to Raiwind Town
5. Defence Road to Ferozepur Road
6. Multan Road River side from Thokar to Manga
7. Manowal Road
8. Baghdadi Road (from Multan Road to Manowal)
9. Niaz Beg Village Road
10. Muzammil Town, Multan Road
11. Ijtima Road (Pajian Chowk to Manga Road)

II. NISHTAR TOWN

1. Bank Stop to area within jurisdiction of Nishtar Town (NT)
2. Old Kamahan Road Bank Stop to Azam Chowk
3. Kacha Defence Road (from Kahna Nau to jurisdiction of NT)
4. Raiwind – Lahore Road (from jurisdiction of Nishtar Town to Raiwind Morh)
5. Sundar Road
6. Jia Bagga Road (from Raiwind Road Arrian to Railway Line)
7. Suwa Asal Raiwind Road

ROADS FOR COMMERCIAL USE

I. ALLAMA IQBAL TOWN

1. Ichhra Road (Ichhra Morh to Pakistani Chowk and adjacent Bazar up to Arain Mosque).
2. Pir Ghazi Road (Shama Morh to Baba Azam Chowk)
3. Zaildar Road (Chowk Baba Azam to Ichhra Morh)
4. Ahmed Munir Shaheed Road (Chowk Rehman to Chowk Rahmanpura)
5. Sultan Ahmed Khan Road (Water tank to Nasha Stop)
6. Fazal Elahi Road (Ferozepur Road to Rahmanpura Chowk)
7. Gunj Bukhsh Road (Chowk Abdul Wahid to Avian Chowk)
8. Chah Jamuwala Bazar, Ichhra.
9. Shah Kamal Road (Avian Chowk to Chowk Ashiqabad to Mian Maqbool Road, Azam Chowk)
10. Nadeem Shaheed Road (Shahab Chowk to Neelum Block and adjacent bazar)
11. Millat Road (Pacci Thathi to Chowk Arif to Petrol Pump Khawaja Riaz)
12. Al-Mumtaz Road (Chowk Yateem Khana to Chowk Pacci Thathi Bus Stop)
13. Budhan Shah Road (Thana Nawan Kot) to Ex-MCL Primary School
14. Jhuggian Road (Shezan Factory to Sabzazar G. Block)
15. Lakhshmi Chowk to Bund Road and Kot Kamboh to Jhuggian Nagra
16. Link Shah Farid Road Darbar to Kot Kamboh
17. Shama Cinema, Ferozepur Road to Pakistani Chowk to Usman Bazar
18. Wahdat Road (Muslim Town Morh to Multan Chungi, Multan Road)
19. Maulana Hasrat Mohani Road (Wahdat Road to Multan Road)
20. Multan Road (Chowk Chauburji to Thokar Niaz Beg)
21. Defence Road, Multan Road to Bhuptian Chowk to Ferozepur Road
22. Chung Main Bazar
23. Mohlanwal Road
24. Niazbeg Road (up to the Village)
25. Samsani Road (Hanjarwal to Canal)
26. Ittefaq Road
27. PECO Road (up to PECO Town)
28. Kharhak Main Bazar
29. Rasul Park Main Bazar
30. Link Road (Rasul Park to Kharhak)

31. Fateh Sher Road (Ganda Nalla to Chaudhry Colony)
32. Mahmood Road (First roundabout Samanabad to Kubra Mosque)
33. Shakir Road (Chowk Patwarian to Kubra Mosque to Hassan Market)
34. Shamke Bhattian, Main Bazar.
35. Manowal Road
36. Chowk Yateem Khana to Motorway Chowk
37. Manga Main Bazar.

II. DATA GANJ BAKHSH TOWN

- | | |
|-----------------------------|--|
| 1. Ravi Road | |
| 2. Bund Road | Niazi Chowk to Yateem Khana Chowk |
| 3. Sanda Road | MAO College to Bund Road |
| 4. Allama Iqbal Road | Taj Cinema Chowk to Railway line |
| 5. Ferozepur Road | Canal to Railway line |
| 6. Khuda Bukhsh Road | Main Gulshane-Ravi Road to Bund Road |
| 7. New Shalimar Road | Multan Road to Ganda Nala Chowk 60' Road |
| 8. 60' Road | Ganda Nala Chowk to Al-Khaiyam Road |
| 9. Shamnagar Road | Chauburji to Gulshan-e-Ravi Scheme |
| 10. Main Road Gulshane Ravi | Multan Road to Main Market Gulshane-Ravi |
| 11. Out Fall Road | Veterinary University Chowk to Bund Road |
| 12. Abdali Road | Bus Stop No.1 to Sant Nagar Chowk |
| 13. Jail Road | Shadman Chowk to Zafar Ali Road |
| 14. Ansari Road | Islampura Bazar to Naseeruddin Road |
| 15. Main Bazar, Islampura | |
| 16. Haider Road Islampura | |
| 17. Umer Road Islampura | |

III. NISHTAR TOWN

1. Main Ferozepur Road from Railway Overhead Bridge to Chungi Amer Sadhu to Bank Stop
2. Railway Road, Raiwind
3. Manga Road
4. Kasur Road
5. Main Kainchi Bazar
6. Makhdum Abad Bazar near General Hospital
7. Kamahan Road From Chungi Amer Sadhu to jurisdiction of NT along Canal (South side)
8. Awan Market Bazar
9. PECO Road From Kot Lakhpat Bridge to PECO Morh (West Side)
10. PECO Morh to Model Town Link Road (North Side)
11. Bagarian Road both sides (Commercial)
12. Karmanwala Bazar, Akbar Shaheed Road, Najaf Bazar, Main Bazar Liaqutabad, Madina Bazar, Main Bazar Pindi Rajputan
13. Ismaeel Nazar Bazar

14. Shahzada Road
15. Shami Park, Haji Park (Chungi Amer Sadhu)
16. Chandrai Road (Gujjar Colony)
17. Bhatti Road near Green Town
18. Katcha Jail Road (Peco Factory Railway level crossing)

IV. RAVI TOWN

1. Ravi Road
2. Maulana Ahmed Ali Road
3. Khokhar Road
4. Rahim Road
5. China Scheme Road (from Singhpura to Bund Road)
6. Ghoray Shah Road
7. Amar Road, Shad Bagh
8. Sheikhpura Road
9. Wandala Road, Shahdara
10. Main Bazar Imamia Colony
11. G.T.Road
12. Main Road Shahdara Town
13. Circular Road
14. Lajpat Road, Shahdara
15. Main Bazar Jia Musa (Shahdara)
16. Jaranwala Road (Chowk Begum Road to Sagian Chowk)
17. Ravi Link Road
18. Timber Market Road
19. Main Market Tauheed Abad
20. Aziz Road (Misri Shah)
21. Tezab Ahata Road
22. Umer Din Road (Wassanpura)
23. Sher Shah Road (Badami Bagh)
24. Main Bazar, Data Nagar (Badami Bagh)
25. Chah Miran Road
26. Tajpura Road
27. Bazar Siddiqui Colony (Badami Bagh)
28. Kot Khwaja Saeed Road
29. Pindi Das Road, Shahdara
30. Baran Dari Road, Shahdara
31. Shafi Muhammad Road, Chaman Colony, Shahdara
32. Main Begum Kot Road, Shahdara
33. Main Bazar, Chaman Colony
34. Main Bazar, Yousuf Park, Shahdara
35. Kala Khatai Road, Shahdara
36. Sultan Pura Road, Misri Shah
37. Kachhu Pura Road, Misri Shah
38. Masoom Shah Road, Badami Bagh
39. Drain Road, Badami Bagh

V. **SHALIMAR TOWN**

A. **G.T.Road**

(Between Singhpura and Jallo Morh) along with the following allied roads:

1. Haq Nawaz Road, Baghbanpura
2. Pakistani Bazar
3. Ram Bazar
4. Abdul Ghani Road
5. Sultan Mahmud Road
6. Lakhodehr Road
7. Singhpura Main Road (from Singhpura Morh to Bhagatpura Morh, Bund Road)
8. Naqshbandi Road
9. Salamatpura Road
10. Riaz Ahmad Road
11. Naseerabad Road
12. Rashidpura Road
13. Kotli Pir Abdul Rahman Road

B. **Shalimar Link Road**

(Between Shalimar Chowk and Mughalpura Chowk) along with the following allied roads:

1. Mujahidabad Ramgarh Bazar
2. Sahowari Main Road
3. Ganj Bazar
4. Sehar Road
5. Soekarno Bazar

C. **Canal Bank Road**

(Both sides between Mughalpura Chowk and Sozo Water Park) along with the following allied roads:

1. Lal Pul-Nabipura Bazar (Siddique Akbar Road)
2. Gulshan Park Main Road
3. Maskeenpura Bazar
4. Fatehgarh Road
5. Harbanspura Road
6. Katcha Salamatpura Road
7. Muhammadpura/ Tajpura Road
8. Qalanderpura Road
9. Muslimabad Road
10. Defence Road (Gawala Colony Road)

D. **Bund Road**

(from Daroghawala Chowk to Bhagatpura Chowk)

AFFORDABILITY ANALYSIS BASED ON VARYING FINANCIAL TERMS

TABLE-1
HOUSING AFFORDABILITY BASED ON 15% INTEREST RATES AND 3 TO 25 YEARS REPAYMENT PERIOD

% of HHs	Cumulative % of Households	Average Annual Household Income in Lahore	Annual Capacity To pay @15% of Annual Income)	Financial Terms (CRF): 15% over:(No. of Years)										
				3	5	7	10	15	20	25				
0.47	0.47	12,210	1,832	0.437977	0.298316	0.240360	0.199252	0.171017	0.159761	0.154699				
1.26	1.73	20,333	3,050	6,984	6,141	7,622	9,194	10,712	11,467	11,842				
3.19	4.92	28,462	4,269	9,747	14,310	17,761	21,425	24,962	26,721	27,596				
5.74	10.66	36,592	5,489	12,533	18,400	22,837	27,548	32,096	34,358	35,482				
6.18	16.84	44,722	6,708	15,316	22,486	27,908	33,666	39,224	41,988	43,362				
7.68	24.52	52,852	7,928	18,101	26,576	32,984	39,789	46,358	49,624	51,248				
7.8	32.32	60,982	9,147	20,885	30,662	38,055	45,907	53,486	57,254	59,128				
15.24	47.56	73,176	10,976	25,061	36,793	45,665	55,086	64,181	68,703	70,951				
12.17	59.73	89,436	13,415	30,629	44,969	55,812	67,327	78,442	83,969	86,717				
8.48	68.21	105,696	15,854	36,198	53,145	65,959	79,568	92,704	99,236	102,483				
31.79	100	170,716	25,607	58,471	85,845	106,544	128,526	149,745	160,296	165,541				

TABLE-2
HOUSING AFFORDABILITY BASED ON 10% INTEREST RATES AND 3 TO 25 YEARS REPAYMENT PERIOD

% of HHs	Cumulative % of HHs	Average Annual Household Income in Lahore	Annual Capacity to Pay (@15% of Annual Income)	Financial Terms (CRF): 10% over:(No. of Years)										
				3	5	7	10	15	20	25				
0.47	0.47	12,210	1,832	0.402115	0.263797	0.205405	0.162745	0.124059	0.117460	0.110168				
1.26	1.73	20,333	3,050	4,556	6,945	8,919	11,257	14,767	15,597	16,629				
3.19	4.92	28,462	4,269	7,585	11,562	14,849	18,741	24,585	25,966	27,685				
5.74	10.66	36,592	5,489	10,616	16,183	20,783	26,231	34,411	36,344	38,750				
6.18	16.84	44,722	6,708	13,650	20,808	26,723	33,728	44,245	46,731	49,824				
7.68	24.52	52,852	7,928	16,682	25,429	32,657	41,218	54,071	57,109	60,889				
7.8	32.32	60,982	9,147	19,716	30,053	38,597	48,714	63,905	67,495	71,963				
15.24	47.56	73,176	10,976	22,747	34,674	44,532	56,204	73,731	77,873	83,028				
12.17	59.73	89,436	13,415	27,296	41,608	53,436	67,443	88,474	93,445	99,630				
8.48	68.21	105,696	15,854	33,361	50,853	65,310	82,430	108,134	114,209	121,769				
31.79	100	170,716	25,607	39,427	60,099	77,184	97,416	127,794	134,974	143,907				
				63,686	97,078	124,676	157,357	206,426	218,023	232,454				

TABLE-3
HOUSING AFFORDABILITY BASED ON 7% INTEREST RATES AND 3 TO 25 YEARS REPAYMENT PERIOD

% of HHs	Cumulative % of HHs	Average Annual Household Income in Lahore	Annual Capacity to Pay (@15% of Annual Income)	Financial Terms (CRF): 7% over:(No. of Years)										
				3	5	7	10	15	20	25				
0.47	0.47	12,210	1,832	4,808	0.243891	9,873	0.185553	0.142378	12,867	0.109795	19,408	0.094393	21,349	0.085811
1.26	1.73	20,333	3,050	8,004	12,506	16,437	21,422	27,779	32,312	35,543				
3.19	4.92	28,462	4,269	11,203	17,504	23,007	29,984	38,882	45,226	49,749				
5.74	10.66	36,592	5,489	14,405	22,506	29,582	38,552	49,993	58,150	63,966				
6.18	16.84	44,722	6,708	17,604	27,504	36,151	47,114	61,096	71,065	78,172				
7.68	24.52	52,852	7,928	20,806	32,506	42,726	55,683	72,207	83,989	92,389				
7.8	32.32	60,982	9,147	24,005	37,504	49,296	64,244	83,310	96,903	106,595				
15.24	47.56	73,176	10,976	28,804	45,004	59,153	77,091	99,968	116,280	127,909				
12.17	59.73	89,436	13,415	35,205	55,004	72,297	94,221	122,182	142,119	156,332				
8.48	68.21	105,696	15,854	41,606	65,004	85,442	111,351	144,396	167,957	184,755				
31.79	100	170,716	25,607	67,206	105,002	138,014	179,866	233,244	271,302	298,435				

THE PARAMETERS FOR COST ESTIMATES

For estimating costs, quantities have been derived from a layout specifically designed for the purpose. The following guidelines were used while planning the layout:

A low-income housing scheme has to be of high density. For high residential densities, the NRM¹ suggests a range of 264-690 persons per hectare. An average round figure of 500 persons per hectare has been adopted. The layout designed for this density is a 'mohalla' or cluster of dwellings along with commercial and institutional facilities for day to day living. The population equivalence of a 'mohalla' is 6000-8000 persons², its characteristic services being a primary school and a local mosque.

Thus for a mohalla of 8000 persons with a density of 500 pph, the area required is $8000/500=16$ hectares. The proposed internal roads/streets have a right-of-way of 8 m, with a carriageway of 5m. The landuse and plot distribution in the proposed layout are presented in Tables 1 and 2. According to Housing Census 1998, the average household size of Lahore is 7.1. Since the number of residential plots is 1214, the population of the proposed module is $1214 \times 7.1 = 8,620$.

TABLE 1
LAND USE DISTRIBUTION FOR A TYPICAL LOW-INCOME HOUSING SCHEME

Landuses	Hectares	%
Residential	9.914	59.78
Roads	5.759	34.73
Open Spaces	0.555	3.34
Primary School	0.214	1.29
Mosque	0.107	0.64
Shops	0.036	0.22
Total	16.585	100.00

TABLE 2
PLOT SIZE DISTRIBUTION

PLOT SIZES		No. OF PLOTS	%
m ²	Marlas		
72	3.43	882	72.65
90	4.28	236	19.44
150	7.14	96	7.91
Total		1214	100.00

¹ National Reference Manual on Planning and Infrastructure Standards

² Op. Cit, Page-61

**ENGINEER'S COST ESTIMATE
LOW INCOME HOUSING SCHEME**

Annex C to Chapter-20

Sr. No.	Description	Total Qty	Unit	Schedule Rate (Rs.)	Amount (Rs.)
ROADS					
1.	Providing and laying dry brick soling for pavement of streets, roads etc.	937	%Cft	2,461.15	2,306,098
2.	Earthwork for shoulders.	86.814	%Cft	2,834.30	246,057
3.	Compaction of earth.	86.814	%Cft	95.10	8,256
				Total	2,560,410
WATER SUPPLY					
1	Excavation of trenches for water supply pipeline.	115.2	%Cft	549.35	63,285
2	Rehandling of earthwork	115.2	%Cft	181.85	20,949
3	Providing, laying, cutting, jointing, and disinfecting asbestos cement pipeline of BSS in trenches with cement joint and rubber ring, complete in all respects (3" i/d)	14,400	Rft	58.10	#VALUE!
4	Providing & fixing cast iron special	150	Kg	9.80	1,470
5	Providing & fixing S.V of B.S.S quality (3" i/d)	17	No.	1,254.00	21,318
6	Providing & fixing of fire hydrant	2	No.	1,584.00	3,168
7	R.C.C for 1:2:4 thrust block	1	%Cft	5,622.70	5,623
8	Valve assembly with surface box	17	No.	533.70	9,073
9	Providing & fixing of stand posts	100	No.	3,500.00	350,000
10	Construction of tube well complete in all respect	Job	Job	1,700,000.00	1,700,000
11	Construction of overhead reservoir (25,000 gallons) complete in all respect	Job	Job	1,450,000	1,450,000
12	House connection 20% of total houses.	261	No.	750.00	195,750
				Total	4,657,276
SEWERAGE SYSTEM					
1	Earthwork excavation in open cutting for sewer	226.80	%Cft	676.95	153,532
2	Rehandling of earthwork	226.80	%Cft	181.85	41,244
3	Providing and laying of brick ballast for sewer.	124.74	%Cft	1,003.85	125,220

**ENGINEER'S COST ESTIMATE
LOW INCOME HOUSING SCHEME**

Annex C to Chapter-20

Sr. No.	Description	Total Qty	Unit	Schedule Rate (Rs.)	Amount (Rs.)
4	Providing laying of sewer as per specification (9" I/d)	16,800	Rft	68.25	1,146,600
5	Construction of manholes as per drawing specification complete in all respect	326	Nos.	9,000.00	2,934,000
6	Construction of septic tank & soak pits complete in all respect	2	Nos.	300,000	600,000
7	House Connection (4 Houses + Chamber)	326	Nos.	12,000.00	3,912,000
8	Construction of septic tank	2	Nos.	900,000.00	1,800,000
TOTAL					10,112,596
STORM WATER DRAIN					
1	Construction of Punjab Standard Drain Type-1	14000	%Rft	25.60	358,400
2	Construction of Punjab Standard Drain Type-V	5300	%Rft	110.80	587,240
TOTAL					945,640
EXTERNAL ELECTRIFICATION					
		Job	Job	5,868,000.00	5,868,000
GRAND TOTAL					24,143,922

Annex to Chapter-22

BEDS IN SPECIALIST/TEACHING HOSPITALS

- No. of beds required in 2021 (Table 22.10, Chapter 22)=13,500
- No. of beds in existing Teaching/Specialist Hospitals (refer Table 1 below) =9,117
- No. of additional beds required till 2021=4,383

**TABLE 1
DETAILS OF BEDS IN EXISTING/PROPOSED HOSPITALS TILL 2021**

S.NO.	HOSPITAL	EXISTING BEDS	ADDITIONAL BEDS PROPOSED	TOTAL BEDS IN 2021
1	Shalimar	200	550	750
2	Nawaz Sharif	150	600	750
3	Mayo	1799	0	1799
4	Services	1050	0	1050
5	Ganga Ram	534	0	534
6	General	612	0	612
7	Lady Willingdon	235	220	455
8	Gulab Devi	1300	0	1300
9	Mental	1400	0	1400
10	Punjab Cardiology	284	216	500
11	Jinnah	1100	0	1100
12	Sheikh Zaid	453	172	625
13	2 new hospitals in the South Corridor ('@875 beds/hosp.)	0	1750	1750
14	1 new hospital south of Sabzazar. ('@875 beds/hosp.)	0	875	875
Total		9117	4383	13500

BEDS IN GENERAL HOSPITALS

Total Requirements of Hospital Beds (2021)	=	9,500
Hospital Beds in the Existing 30 General Hospitals	=	2,411

Additional Beds required till 2021	=	7,089

PROPOSALS

	No. of Beds
a) Provision of 21 New Hospitals ¹ (Ave. No. of Beds/ Hospital = 300)	= 6,300
b) Provision of Additional Beds in the	

¹ Includes two hospitals replacing those proposed to be upgraded.

Existing Hospitals

= 789

TABLE-2
NUMBER OF BEDS TO BE ADDED IN THE EXISTING
GENERAL HOSPITALS

S.No.	NAME OF HOSPITAL	NO. OF BEDS (EXISTING)	BEDS TO BE ADDED	TOTAL BEDS
1.	Lady Aitchison Hospital	100	60	160
2.	Dental Hospital	8	-	8
3.	Government Model Town Hospital	8	-	8
4.	Government Wahdat Colony Hospital	8	-	8
5.	Government Hospital Kot Khawaja Saeed	125	60	185
6.	Government Mozang Hospital	25	25	50
7.	Government Mian M. Munshi Hospital	125	60	185
8.	Anjuman Hussainia (Al-Khomini) Hospital	12	-	12
9.	Data Darbar Hospital	70	80	150
10.	Eye Hospital (MCL)	44	36	80
11.	Fatima Memorial Hospital	330	20	350
12.	Ishaq Haroon Waqf Hospital	18	14	32
13.	Government Khaira Hospital	-	-	-
14.	Malik Jalal Din Hospital	70	30	100
15.	MCL Infectious Diseases Hospital	170	30	200
16.	Mumtaz Bakhtawar Hospital	100	25	125
17.	Nawaz Sharif Hospital	150	50	200
18.	Police Hospital, Qila Gujjar Singh	64	40	104
19.	Police Hospital, Qurban Lines	18	-	18
20.	Said Mitha Hospital	50	25	75
21.	Shalimar Hospital ²	-	-	-
22.	Sutluj Rangers Hospital	50	25	75
23.	United Christian Hospital	216	24	240
24.	Maternity Hospital, Pathi Ground	20	30	50
25.	Maternity Hospital, Chohan Road	20	30	50
26.	Railways Hospital	200	25	225
27.	WAPDA Hospital	100	25	125
28.	Children's Hospital	250	60	310
29.	Social Security Hospital Multan Road ²	-	-	-
30.	Janki Devi Hospital	60	15	75
Total:		2,411	789	3,200

² Proposed to be upgraded to Specialist Hospital