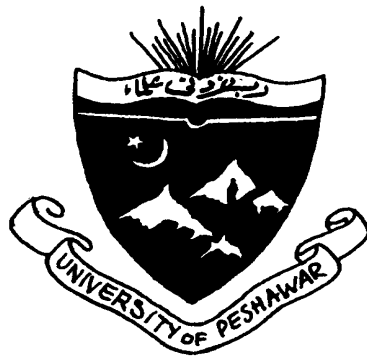


**EXPANSION OF BUILT UP AREA AND ITS IMPACT
ON URBAN AGRICULTURE: A CASE STUDY OF
PESHAWAR-PAKISTAN**



SAMIULLAH

**INSTITUTE OF GEOGRAPHY
URBAN AND REGIONAL PLANNING
UNIVERSITY OF PESHAWAR-PAKISTAN
(November, 2012)**

**DEDICATED TO
MY PARENTS WHOSE PRAYERS HAVE ALWAYS
BEEN A CONSTANT SOURCE OF INSPIRATION AND
ENCOURAGEMENT FOR**

Approval Sheet

This dissertation titled **“Expansion of built up area and its impact on urban agriculture: A case Study of Peshawar-Pakistan”** is submitted to the Institute of Geography, Urban and Regional Planning, University of Peshawar in partial fulfillment for Degree of Doctor of Philosophy in Geography is hereby approved.

External Examiner

Internal Examiner

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Samiullah

Abstract

This dissertation traces the spatial growth of Peshawar City District and its impact on urban agriculture. Peshawar is the capital of Khyber Pakhtunkhwa and one of the major cities of Pakistan. Data and information for the study was collected from historic maps, satellite images, documents, government offices (mostly from revenue record), private stake holders like real estate agents and farmers. The analysis shows that the city has been growing at a very rapid pace in recent years and in the absence of planning control has seen tremendous urban sprawl. The urban sprawl first set its foot in 1960s along the major roads radiating out of the city and cantonment. It then started expanding in a leapfrog fashion encroaching upon agricultural lands in the fringe with minimum of facilities and all the harmful environmental and social consequences. The haphazard growth often resulted in the development of slums or undesirable residential areas with lack of services and amenities, piecemeal commercial development, and intermix of conforming and non-conforming land uses.

The pattern of development of urban sprawl in Peshawar is typical of most Pakistani major cities, where ribbon sprawl is common along major roads, while leapfrog sprawl is prevalent in the city's fringes. The sprawl is consuming rich agricultural land and poses a threat to food security. The study highlights the causes of urban sprawl, analyzes land use dynamics and discusses some of the strategic and policy options that are available to control proliferation of sprawl and promote sustainable development of land use in the city.

The most alarming aspect of encroachment on farmland in Peshawar City District is the loss of prime agricultural land. Residential land use was the biggest consumer of farmland during 1991-2009 period. Some 8,748 hectares of farmland was lost for residential purposes. Brick kilns were the second largest consumer after residential land use. Conversely, gain in the farmland was achieved mainly by bringing cultivable waste area of around 26,600 hectares under plough. However, most of the area brought under cultivation did not belong to prime agricultural land and was mostly rain fed area in southern part of the city district. Moreover, further expansion of agricultural land has

stopped and therefore, any future assault on farming land will not be compensated even by inferior quality agricultural land.

In order to analyze land use and farming dynamics in peri-urban environment in this research, five sample mauzas were randomly selected for detailed study. The changes have been more drastic in those mauzas/villages located near the core city than those located away from it. Success of housing schemes on agricultural land has inspired individuals and groups of all types to join the race and buy land across Peshawar. There is a need to control this trend, which is continuing in the absence of land use or planning control.

Multiple government agencies and political interests influence land use development in Peshawar City District. There is a need to promote coordination between them and develop a flexible plan for the City District. It has to be realized by both the government as well as the general public that the encroachment of urban uses over farmland is cutting into national food basket and the present policy, or the lack of it, is ultimately bound to cause greater shortage of foodstuff and increased dependence on import. Therefore the present assault on urban farmland cannot be allowed to continue. However, the commercial pressure on farmlands has to be tackled through exploitation of available commercial opportunities. Farmers have the potential towards adjusting their enterprises to take advantage of new economic opportunities at the urban fringe. However, Government support is indispensable towards this end. The recognition of urban and peri-urban agriculture as urban land use, and its integration in land use plans and the creation of a favourable policy environment are critical basic steps towards this end.

TABLE OF CONTENTS

Acknowledgement.....	iv
Abstract.....	v
TABLE OF CONTENTS	vii
Chapter 1	1
INTRODUCTION.....	1
1.1 Introduction.....	1
1.2 Theoretical Framework.....	3
1.2.1 Conceptual framework	5
1.3 Research Problems.....	7
1.4 Significance of the study.....	7
1.5 Research Purpose	8
1.6 Research Questions.....	8
1.7 Hypotheses.....	8
1.8 Objectives	9
1.9 Research Methodology	9
1.9.1 Data Collection.....	9
1.9.2 Data Analysis.....	10
1.10 Sample Villages/Mauzas.....	10
1.11 Variables	11
Chapter 2	12
LITERATURE REVIEW	12
2.1 Introduction.....	12
2.2 City Growth and Evolution.....	12
2.3 Urban sprawl.....	13
2.4 Measurement of urban sprawl.....	16
2.5 Theories of city growth and Structure	17
2.5.1 Classical Theories of City Structure.....	17
2.5.2 Structure of Pakistani Cities	20
2.6 Encroachment of agricultural land.....	21

2.7	Urban farming.....	24
2.7.1	Urban Agriculture, Planning and Development	24
2.7.2	Integration of farming into urban planning	26
2.8	Urban policies in Pakistan	27
Chapter 3		29
ENVIRONMENTAL AND ECONOMIC SETTING.....		29
3.1	Introduction.....	29
3.2.1	Location and Extent.....	29
3.2.2	Historical background.....	29
3.3.1	Physical setting	32
3.3.2	Hydrology	35
3.3.3	Climate.....	39
3.3.4	Land capability	40
3.4	Socio-economic Profile.....	43
3.4.1	Economic Activities	43
3.4.2	Administration.....	46
3.4.3	Demographic profile.....	51
3.4.3.1	Spatial distribution of population.....	51
3.4.3.2	Migration.....	55
3.5	Conclusion	56
Chapter 4		57
DYNAMICS OF URBAN SPATIAL GROWTH AND PLANNING.....		57
4.1	Introduction.....	57
4.2	Spatial and Administrative Growth	57
4.2.1	Urban Expansion 1866-1947	58
4.2.2	Urban expansion 1947-1981.....	60
4.2.3	Urban Growth 1981-to date.....	61
4.3	Patterns of Urban Sprawl.....	63
4.4	Causes of Urban Growth and Sprawl:	68
4.4.1	Economic and Market Forces:.....	68
4.4.2	Demographic and Social:.....	68

4.4.3	Planning, Institutional and Legal:.....	69
4.5	Policy and Strategic Options:.....	70
4.5.1	Implementation of Urban Development Plans	71
4.5.2	Institutional Arrangements for Urban Planning and Management.....	73
4.5.3	Legislation and Regulation.....	73
4.5.4	Growth Monitoring and Smart Growth Audit	75
4.6	Conclusions.....	76
Chapter 5		79
LAND USE DYNAMICS		79
5.1	Introduction.....	79
5.2	Land Use and Urban Spatial Structure.....	79
5.2.1	Land Use	79
5.2.2	Urban Spatial Structure	82
5.2.3	Land use Gradient:	87
5.3	Land use Dynamics.....	90
5.3.2	Factors in Land Use Dynamics.....	92
5.3.2.1	Government Policy and Strategy	92
5.3.2.2	Economic and Market Forces	93
5.3.2.4	Demographic, Social and Technological Factors	99
5.4	Land Use Policies and Planning	100
5.5	Conclusion	101
CHAPTER 6.....		104
URBAN FARMING.....		104
6.1	Introduction.....	104
6.2	Farmland Distribution.....	104
6.3	Farm Land Dynamics.....	107
6.3.1	Pattern of Farmland Transformation	107
6.3.2	Causes of Farmland Transformation	113
6.4	Cropping on Farmland.....	114
6.4.1	Cropping Pattern.....	114
6.4.2	Crop Types	115

6.4.3	Spatial Distribution of Crops	118
6.5	Policies to Contain Farm Losses.....	121
6.6	Conclusion	123
Chapter 7		125
FARMLAND DYNAMICS IN PERI-URBAN ENVIRONMENT		125
7.1	Introduction.....	125
7.2	Profile of Selected Villages	125
7.3	Land use Dynamics in Sample Villages	127
7.4	Cropping Dynamics	134
7.5	Loss of farmland: Contributing Factors.....	144
7.5.1	Low Yields	144
7.5.2	Low access to Land	145
7.5.3	Farm Fragmentation	146
7.5.4	Farmers Perception.....	149
7.5.4.1	Water.....	150
7.5.4.2	Fertilizer, Seeds and Farm Machinery	150
7.5.5	Credit	151
7.5.6	Market.....	151
7.5.7	Land Market	151
7.6	Conclusion	152
Chapter 8		155
FINDINGS AND CONCLUSION		155
ANNEXURE		165
References		167

ILLUSTRATION

List of Figures

Figure 1.1 Peshawar City District, Towns	2
Figure 1.2 Factors Affecting Urban Land use	6
Figure 3.1 Peshawar City District, Location.....	31
Figure 3.2 Peshawar Vale, Physiography	32
Figure 3.3 Peshawar City District; Major Land forms	33
Figure 3.4 Peshawar City District, Hydrology.....	37
Figure 3.5 Peshawar City District; Water Table	38
Figure 3.6 Peshawar City District; Land Capability classes.....	41
Figure 3.6 Peshawar City District, Economic Activities	45
Figure 3.7 Town I	47
Figure 3.8 Town II	48
Figure 3.9 Town III.....	49
Figure 3.10 Town IV.....	50
Figure 3.11 Cantonment Area.....	51
Figure 3.12 Town-wise population percentage, 1998 (percentage).....	52
Figure 3.13 Town-wise population density, 1998 (persons/ km ²)	53
Figure 3.14 Peshawar City District; Population Density by Union Councils, 1998.....	54
Figure 4.1 Peshawar City District: Spatial Growth (a) Pre 1866 built up area (b) built up area 1866 (c) built up area 1947 (d) built up area 1981	59
Figure 4.2 Peshawar City District: Physical Expansion Limit as Identified in	
Master Plan 1965-85 & Structure plan, 1986-2001	61
Figure 4.3 Peshawar City District: Spatial Growth 1991-2009	
(a) Built up area 1991 (b) Built up area 2009	63
Figure 4.4 Peshawar City District: Urban Sprawl is characterized by (a) Ribbon Developments along Radial Roads, (b) New Unplanned Residential Extensions (1-4),.....	
As well as Engulfed Villages (5 and 6)	64
Figure 4.5 Shaheen Muslim Town: An Urban Residential Extension without Adequate	
Infrastructure is ‘A Recipe for Slum’	65
Figure 4.6 Old Village of Tehkal Payan Engulfed into the Peshawar during its Growth.	66

Figure 4.7 Location of Brick Kilns and Marble Factories in Peshawar City District, 2009	67
Figure 4.8 Hayatabad Township	70
Figure 4.9 Peshawar: (a) Growth Zones and	
(b) Local Development Areas Identified in 1986 Structure Plan	72
Figure 4.10 Peshawar City District, Towns	75
Figure 4.11 Basic Steps in Smart Growth Audit.....	76
Figure 5.1 Peshawar City District: Spatial Distribution of Land Use, 2009.....	81
Figure 5.2 Griffin Ford Model of Latin American Cities	83
Figure 5.3 A Generalized Model of Land Use in the Large South East Asian City	83
Figure 5.4 Peshawar City District: Spatial Structure Depicts Multiple Nuclei	84
Figure 5.5 Land use Gradient (a)	89
Figure 5.6 Land use gradient (b).....	90
Figure 5.7 Sample sites for land value data.	96
Figure 5.8 Peshawar city district. Land Values in open Market (a) 2000 (b) 2009	97
Figure 5.9 Peshawar City District: Land values gradient (2009).....	99
Figure 6.1 Peshawar City District; Farm Land distribution.....	105
Figure 6.2 Peshawar City District: Trends in Availability of Farm Land	106
Figure 6.3 Irrigated Vs Un-irrigated land (1991-2009)	107
Figure 6.4 Peshawar City District: Farmland Conversion, 1991-2009.....	109
Figure 6.5 Land capability classes and built up area in Peshawar city district.....	112
Figure 6.6 Land Value curve, indicating bid rent for different land use classes competing for the available land in Peshawar city district.	113
Figure 6.7 Peshawar city district, fluctuation of total cropped area (1986-2009)	115
Figure 6.8 Peshawar City District, Kharif cropping pattern (1988-2009)	116
Figure 6.9 Peshawar City District, Rabi cropping pattern (1988-2009).....	118
Figure 6.10 Peshawar city district: Spatial Distribution of Crops	119
Figure 6.11 Spatial Distribution of dominant crops, 2009.....	120
Figure 7.1 Peshawar City District, location of sample mauzas/villages.....	126
Figure 7.2 Type of Land use (percentages) in Selected Mauzas/Villages, 1991-2009...	128
Figure 7.3 Pakha Ghulam, Land use pattern (a) 1991 (b) 2009.....	131

Figure 7.4 Hargoni, Land use pattern (a) 1991 (b) 2009	132
Figure 7.5 Kochian, Land use pattern (a) 1991 (b) 2009	133
Figure 7.6 Maryamzai, Land use pattern (a) 1991 (b) 2009	133
Figure 7.7 Garhi Janu, Land use pattern (a) 1991 (b) 2009	134
Figure 7.8 Rabi Cropping Pattern by Mauzas/Villages, 1991-2009 (Percentage of Area)	135
Figure 7.9 Cropping Pattern, Kharif by Mauzas/Villages, 1991-2009 (Percentage of area)	136
Figure 7.10 Pakha Ghulam, Cropping Pattern	139
(a) Kharif, 1991 (b) Kharif, 2009 (c) Rabi, 1991 (d) Rabi, 2009	139
Figure 7.11 Hargoni, Cropping Pattern.....	
(a) Kharif, 1991 (b) Kharif, 2009 (c) Rabi, 1991 (d) Rabi, 2009	140
Figure 7.12 Kochian, Cropping Pattern	
(a) Kharif, 1991 (b) Kharif, 2009 (c) Rabi, 1991 (d) Rabi, 2009	141
Figure 7.13 Maryamzai, Cropping Pattern	
(a) Kharif, 1991 (b) Kharif, 2009 (c) Rabi, 1991 (d) Rabi, 2009	142
Figure 7.14 Garhi Janu, Cropping Pattern	
(a) Kharif, 1991 (b) Kharif, 2009 (c) Rabi, 1991 (d) Rabi, 2009	143
Figure 7.15 Percentage of farm ownership by size in sample mauzas/villages, 2009....	146
Figure 7.16 Fragmentation of farms, 2009: (a) Pakha Ghulam (b) Hargoni	147
Figure 7.17 Fragmentation of farms in Kochian, 2009.....	148
Figure 7.18 Fragmentation of farms, 2009: (a) Garhi Janu (b) Maryamzai	149

List of Tables

Table 3.1 Metrological Data for Peshawar	39
Table 3.2 Capital City District Peshawar; Population by Town, 1998.....	51
Table 3.3 Peshawar City District: Town-wise population density	52
Table 3.4 Peshawar City District	55
Migrants from other provinces/ within province, 1998. (Percentages)	55
Table 4.1 Peshawar: Expansion of Urban Area 1866-2009.....	60
Table 4.2 Peshawar City District Population Growth 1951-2012	69
Table 5.1 Peshawar City District: Land Use 2009.....	80
Table 5.2 Peshawar City District: Land Use Gradient.....	88
Table 5.3 Major land uses in Peshawar City District, 1991 & 2009	91
Table 5.4 Land value Gradient, 2009.....	98
Table 6.1 Conversion of farmland, 1991-2009 (Area in hectares)	106
Table 6.2 Irrigated vs Un-irrigated Land, 1991-2009 (Area in hectares)	107
Table 6.3 Loss of agricultural land in Peshawar city district.....	
by land capability classes.....	110
Table 6.4 Peshawar City District, Cropping pattern Kharif, 1988- 2009 (Area in hectares)	
.....	116
Table 6.5 Peshawar City District Cropping pattern Rabi, 1988- 2009 (area in hectares)	117
Table 6.6 Peshawar City District: Yield Gaps of Major Crops	122
Table 7.1 Profile of Mauzas/ Villages Selected for the Study	127
Table 7.2 Type of Land use in Selected Mauzas/ Villages, 1991 and 2009 (Area in	
Hectares)	128
Table 7.3 Rabi Cropping Pattern by Mauzas/Villages, 1991-2009 (Area in Ha)	134
Table 7.4 Cropping Pattern, Kharif by Mauzas/Villages, 1991-2009 (Area in Ha)	136
Table 7.5 Sample villages: Yield Gaps of Major Crops w.r.t Progressive Farmers yield, %	
.....	144
Table 7.6 Number of farm ownership by size in sample mauzas (mauzas), 2009	145
Table 7.7 Changes in cost of agricultural inputs, 1991-2009	150
Table 7.8 Land Values (per marla) in Sample Mauzas, 1991-2009	152

Chapter 1

INTRODUCTION

1.1 Introduction

Rapid urbanization results in multiplication of built up area particularly in metropolitan cities like Peshawar. This expansion is accompanied by changes in land use and in most cases result in the reduction of productive agricultural land within and around the cities (Bhatt, et al. 2005). This study focuses on the impact of expansion in built up area of Peshawar on land use in general and agriculture land use in particular. With increase in economic growth urban centres expand, land use changes are taking place in large cities in all developing countries (Lata, 2005) including Pakistan. It is important to detect and monitor these changes in land use over time to promote sustainable growth of urban areas. Identification of pattern and trends of expansion in built up area helps plan land use and infrastructure facilities in the city appropriately (Sudhira, 2004). Many issues arise when prime agricultural land in cities is converted into urban land uses. However, there is difference of opinion on how to control or guide the expansion of built up area to save productive agricultural land from its onslaught (Bryant et al., 1982; Ewing, 1997; Daniels, 1997).

The development of satellite remote sensing and access to better resolution data is helping to map land use changes. Application of GIS in this field is a great help not only in planning but also in decision making (Bhatt, et al. 2005). Overall, Geo-informatics provide very efficient tools to collect and analyze the information required for detection of changes in urban areas that conventional surveying technology are not able provide in a timely and cost effective manner (Imhoff, et al. 1997; Saleh, 2007). The physical expressions and patterns of urban sprawl on landscapes can now be detected, mapped, and analyzed using remote sensing (RS) and geographical information system (GIS) (Barnes et al., 2001). RS and GIS have been applied widely not only for detecting pattern of urban growth but also guiding it appropriately (Ehlers, 1990; Treitz et al 1992, Harris and Ventura 1995; Yeh and Li 1996).

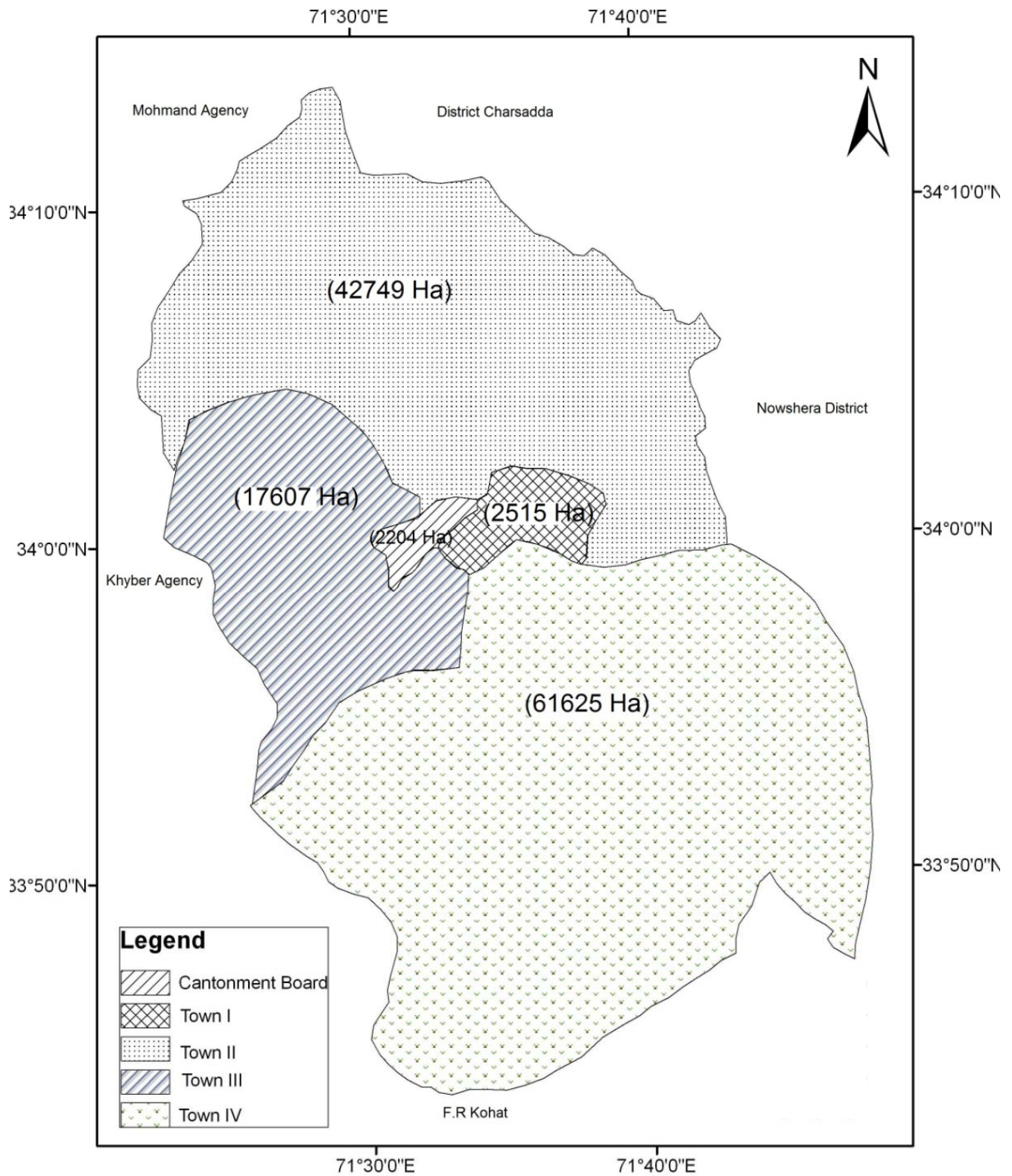


Figure 1.1 Peshawar City District: Towns

Peshawar is the fastest growing city of Khyber Pakhtunkhwa. Being the provincial capital it is the hub of the financial and administrative functions of the province. The population growth rate of the city during the 1972-81 inter censal period was 4.69% (GOP, 1983) which was higher than the average growth rate of 4.38% for Pakistan and 3.89% for the province. The growth rate between 1981 and 1998 was 3.30%, again higher than Pakistan (2.61%) and the province (2.75%) (GOP, 2000). After 1980 the migration of Afghan refugees resulted in an all time increase in the growth rate of the city and by 1998 the population had reached 2.01 million (excluding Afghan refugees) (GOP, 2000).

Since 2001 Peshawar has been designated as a City District, which now consists of four Towns and a cantonment (Fig. 1.1). Currently the development of residential area is very rapid towards north and east mostly in an unplanned manner over the agricultural land of Peshawar which is concentrated in these areas. The conversion of this land into built up area is harmful for agriculture and food security. To stop this trend Peshawar Development Authority (PDA) initiated Hayatabad Township in the western side of the city and also planned another township in the North West, called Regi Lalma Township. Despite these developments, however, encroachment of agricultural lands continues. In this research an effort has been made to detect the pattern and trend of growth in built up area of the Peshawar city district and their impact on agricultural land in Peshawar.

1.2 Theoretical Framework

Built-up portion of urban areas over the world had utilized about four hundred thousand km² of land area up to the year 2000, which accounted for 0.3 percent of the earth surface. This land utilized by cities was about 3 percent of cultivated land, which was estimated to be fourteen million km² in the same year (UN, 2005). With rapid increase in urbanization, it has been estimated that the area under cities will increase by about 2.5 times up to the year 2030, which will consume almost one million km² land accounting for about 1.1 percent of the total habitable land. In most cases large urban centers in the world are surrounded by very fertile agricultural land and Pakistan is no exception. There is strong competition between agriculture and urbanization in the country because both require flat land. Hence the process of encroachment of arable land by built up area is common in rich agricultural areas of Pakistan particularly so in and around large cities

like Lahore, Faisalabad and Peshawar. This is a dilemma for Pakistan where in the wake of growing population, the demand for both housing and food is enhancing.

Urban expansion takes place in different forms (Stephen, et al., 2005). It may take place at the present increased or lower density. The growth may be in the form of rebuilding in the same area through urban renewal at higher density or through infilling of vacant land in built up area, or development over the rich agricultural land at lower density (Greenfield development). The new Greenfield development can either be adjacent to or at the fringe of built up land or could take a “leapfrog” form. In many cases this type of development is unplanned and often results in lack of basic infrastructure and facilities (Drabkin, 1977).

Under the pressure from growing population and economic development built up area expansion or sprawl usually takes place along major roads springing from the city. This type of growth in the built up area is referred to as star shaped expansion. Such kind of growth can be planned or unplanned. In most cases particularly in developing countries it is disorderly. The new expansion may be legal, approved by the local planning authority based on zoning with specific land devoted to different uses or in some cases it may also result in mixed land uses while still conforming to zoning regulations. In some cases however, it is illegal whereby the new development may encroach upon the surrounding land with no legal entitlement. Thus it would neither be in accordance with building byelaws nor conform to zoning regulations. New development can also be in hazard prone areas like active flood plains with recurrent flood hazard.

The most common form of urban growth is accretion. Accretion is the type of urban expansion whereby all space is built inside the town, or where land is too expensive for housing, people build their houses as near the town as possible so that they can commute to the city. Expansion in this case depends to a great extent upon the facilities available and on the initiatives of the individual. For building purposes parcels of fields are bought thereby increasing their value enormously (Garnier, 1967). It is more common around the cities in developing countries. For example in African countries round the newly formed European quarters indigenous dwellings are to be found in great numbers. In Latin America such areas exist around Rio De Jenario, within a radius of 50 miles or more, where land has been

bought in anticipation of its future value. Landowners wait for their lots to become ripe for development and do not use them for agriculture (Drabkin, 1977).

The World Bank believes that by 2015, one half of the total population would be urban in Pakistan. By that time total urban population will be 85 million, of which 40 per cent will live in the two largest cities – Karachi and Lahore (Dawn, 2007) or other major cities including Peshawar. The overall impact will be expansion of built up area in most cases on agricultural land and open spaces. Over the course of time, these changes give rise to complex economic and ecological problems for future generations (Allen and Lu 2003; Imhoff, 2003). Therefore, better understanding of the processes of urban growth and their effects is essential for more effective urban planning and management through, establishment of a reliable and dynamic information database using modern technologies (Saleh, 2007). As stated earlier, remote Sensing and GIS techniques are very useful for this purpose. They help in constantly monitoring changes taking place in land use understanding the processes in operation and taking effective and corrective measures towards planned and healthy development of urban areas (Lata, et al, 2005).

1.2.1 Conceptual framework

Urban land use is affected by many factors both physical and human. Together they influence the use of land for different purposes like agricultural, commercial, industrial and residential. The usefulness of the land for a particular purpose may be assessed by its suitability, capability and value (FAO, 1976). Suitability refers to one tightly defined use or practice (McRae, 1981). Land capability refers to a range of uses for which land is suitable. The concept of value refers to cost of land that has monetary basis. The end product of these factors is the optimum land use (McRae, 1981). In the development of suitability and capability, technical data or classification is used. Socio-economic factors and processes also have a significant role to play in optimum use of land. Some political and economic factors are also extremely important in deciding the optimum purpose for which the land is used. These factors in turn decide the basis of existing land use (Fig. 1.2). This study would analyze the relevant factors that have affected the land use in the Peshawar City District in time and space.

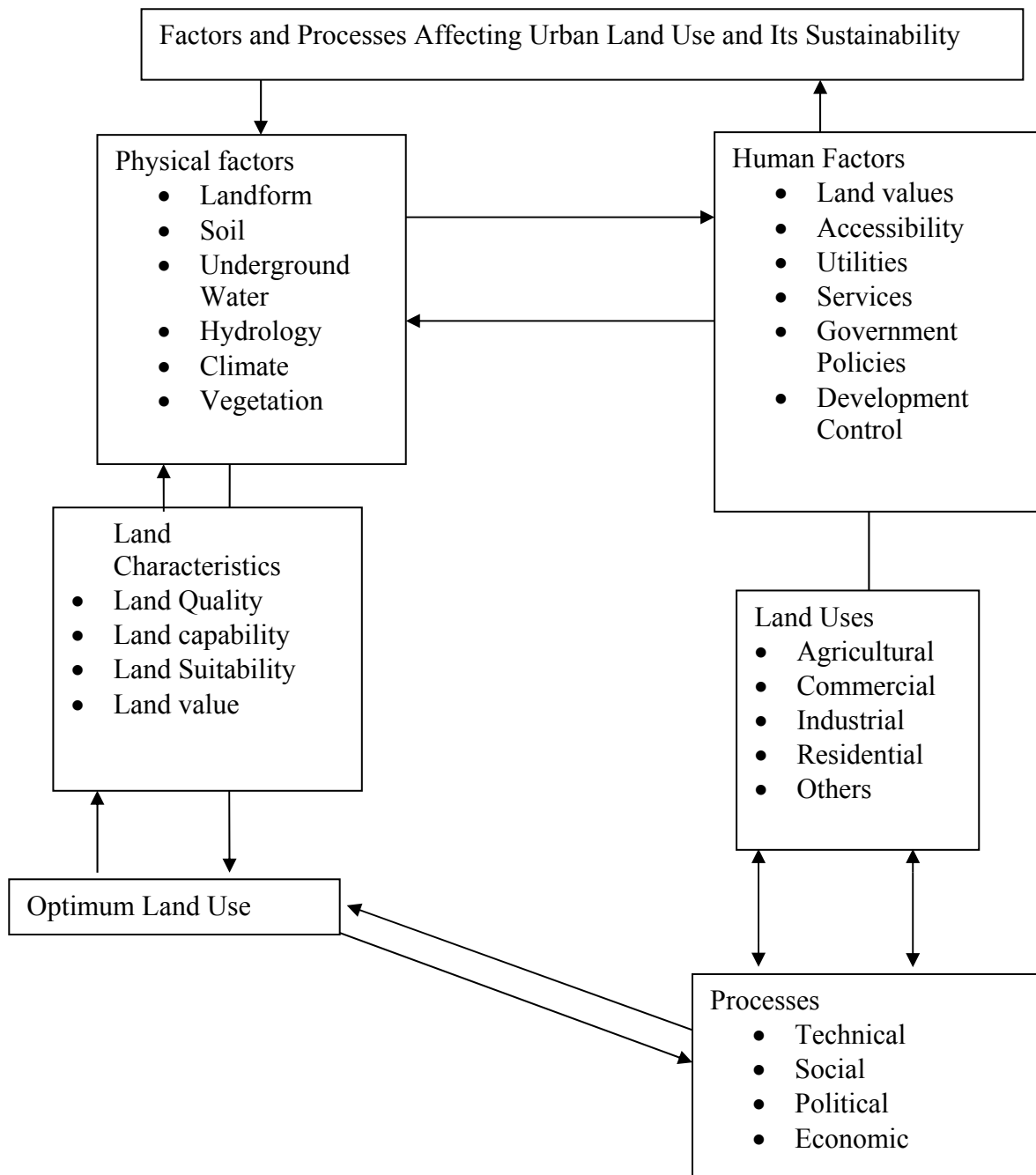


Figure 1.2 Factors Affecting Urban Land use

1.3 Research Problems

The city of Peshawar is expanding very rapidly both in terms of population size and spatial growth. As a result a number of problems and issues have emerged. In this context this research focuses on the following major problems:

1. Rapid growth of built up area has been resulting in urban sprawl, haphazard development and encroachment of the prime agricultural lands which has posed threat to food security.
2. The rapid urban expansion has lead to fast increase in land values in and around the city affecting the land use dynamics in the city district.

1.4 Significance of the study

The spatial and administrative growth of Peshawar has been extremely rapid since the decade of seventies. Historically, the total area of Peshawar municipality was only 20 km² in 1947. This area increased to 111 km² through five boundary extensions at different times. The first two of these (1954 and 1964) were limited in extent and added a total area of only 2.5 km² within the municipal limit. The third and fourth were the two major extensions (1972 and 1978). Together they resulted in the expansion of municipal area to 103 km² (GoNWFP, 2001). With the later expansion the status of Peshawar was changed from Municipality to Municipal Corporation. The next change in the boundary of the municipal corporation took place in 1981, when an area of 8 km² in the southeast of the city was annexed to increase the total corporate area to 111 km² (GoNWFP, 1987).

The fast growth of population together with rapid increase in the built up area created numerous problems for the city. In order to overcome these and guide the future growth in an orderly fashion the government passed a town planning act in 1975 and created a Metropolitan (Peshawar) Development Authority. However, in the absence of effective planning control unplanned urban expansion continued in the city along all radial roads moving out of the city, such as Charsadda road, Kohat road, Bara road, Warsak road, Delazak road, Phandu road, Hazar Khwani road and Grand Trunk (G.T) road. Gradually the areas between these roads have been filling up under pressure from increasing population.

The final expansion of Peshawar took place when the Municipal Corporation was redesigned as City District Government. The City District now comprises of 1,267 Sq Kilometers, with four Towns and 92 union councils.

With the expansion in the city, there is an increased pressure on natural environment particularly the land. This study will help in comprehending the patterns of urban expansion and analyzing problems resulting from rapid growth for solving them amicably

1.5 Research Purpose

The main purpose of the study was to trace the trend and pattern of urban growth in Peshawar City District to find possible ways and means for minimizing the haphazard urban expansion and particularly to examine the loss of fertile agricultural land to built environment and suggest how to promote environmentally sustainable land use in the study area.

1.6 Research Questions

1. What factors and processes are contributing to the growth of built up area and decrease in agriculture land in Peshawar City District?
2. What are the effects of rapid growth of built up area on land values and land use in Peshawar City District?
3. What policies and measures, if any, were adopted to guide the land use dynamics in Peshawar City district?
4. What possible measures can be adopted to control the haphazard growth in Peshawar City District?

1.7 Hypotheses

1. In the wake of population pressure the built up area is expanding rapidly resulting in land value speculations and undesirable land use dynamics in and around the city.
2. Growth of built up area in most cases is taking place on best agricultural land which is harmful for food security of the City District.
3. Lack of implementation of planning measures and investments lead to unplanned urban sprawl and undesirable land use growth and dynamics.

4. If expansion in future land use is in accordance with the land capability and planning standards, then the growth of the city will be sustainable.

1.8 Objectives

The study focuses on the following research objectives.

1. To find out the causes and effects of unplanned expansion of built up area in Peshawar City District.
2. To monitor the land use dynamics in Peshawar City District using modern technologies like GIS and Remote Sensing along with conventional surveys to monitor the changes in land use pattern and to find out the future direction of expansion of built up area in Peshawar.
3. To investigate if expanding land uses are according to the land capability and planning standards.
4. To evaluate the effectiveness of planning measures in monitoring and guiding the urban expansion in right direction.

1.9 Research Methodology

1.9.1 Data Collection

The data for this research was collected from both primary and secondary sources. Secondary data was obtained from;

- i. District Revenue Office, Peshawar.
- ii. Peshawar Development Authority (PDA)
- iii. Soil survey of Pakistan.
- iv. Population census organization.
- v. Literature from various sources like books, journals, periodicals, and thesis etc.
- vi. World Wide Web (www).

Primary data was obtained;

- i. By analyzing satellite images of Peshawar at various dates.

- ii. By digitizing and Georeferencing of sample villages/mauzas with a combination of revenue data and field survey.
- iii. Rapid appraisal for collection of data on land use, utilities and environmental services in the field through GPS.
- iv. Collection of land value and other relevant data through field survey/questionnaires/focused group discussions.

1.9.2 Data Analysis

Land use was categorized into macro land uses and micro land uses. Macro land use data was processed by using satellite data in GIS and also using revenue records, while micro land use data was collected through rapid appraisal in the field. Macro land use includes broad categories like built up area, agricultural, and waste land, while micro land use includes categories of land uses in built up area for example, commercial, residential and industrial etc.

Two types of growth was analyzed, growth of administrative boundaries and spatial growth or growth of built up area. For this purpose, historical maps, topographical maps and satellite images were used. Administrative boundaries were demarcated from the historical maps. Growth of administrative and built up area was divided into four phases i-e 1866-1947, 1947-1981, 1981-1991 and 1991 to 2009.

Remote sensing data collected through satellite images from SUPARCO was processed through geometric corrections, radiometric corrections and image enhancement techniques. For analysis of spatial and attribute data different GIS software like ERDAS IMAGINE, Arc GIS and MAPINFO were used. Satellite images of different years were then compared to find out the trend of expansion in built up area and land use changes that have occurred over time. Land use data collected from revenue office were also compared with it and analyzed using the above mentioned software. The analyzed data were then presented in the form of maps, diagrams and statistical tables and was duly analyzed.

1.10 Sample Villages/Mauzas

Peshawar district can be divided into three Agro-ecological zones i-e predominantly irrigated, predominantly *barani* or rain fed and predominantly range land. A number of

mauzas/villages were engulfed within the City District during its boundary extension. For the study of detailed land use and cropping pattern and dynamic processes operating in peri-urban areas, five mauza/villages were selected from these. They included Pakha Ghulam, Hargona Kochian—(three irrigated villages), Garhi Janu (rangeland) and Maryamzai (*barani* or rainfed land).

1.11 Variables

Dependent variable: Built up area

Independent variables: Land use, cropping pattern, Land values

Chapter 2

LITERATURE REVIEW

2.1 Introduction

The literature review in this chapter includes those aspects of urbanization, which are covered in the present study. The literature on city growth and evolution is covered in the first section. It also includes urban sprawl, which takes place through the process of scattered development of miscellaneous types of land use on locations in the fringe, followed by the gradual filling-in of the intervening spaces with similar uses. Land use is the main subject of review in the next section. While analyzing land use, the first thing that comes to one's mind is the theoretical framework of the structure of the city. This is the topic of the next section on land use that also reviews the literature on the land use gradient and the factors affecting it. Urban farming is the most dominant land use in the study area, the literature on which has been reviewed in the subsequent section. It is followed by the analysis of existing literature on land use and cropping dynamics in the linked urban, peri-urban and rural continuum.

2.2 City Growth and Evolution

The literature on historic growth and development of cities exist in numerous form including book, Journal articles, documents etc. A number of books provide material on the history of Peshawar individually or as a part of Gandhara Civilization. Hundreds of books and research articles have been written on various aspects of Gandhara Civilization (Peshawar was a primary city of this civilization), a comprehensive bibliography of which has recently been compiled by Baums and Glass (2012). A PhD thesis has also been written on Ancient Peshawar (Shah, 2005). Among historic books Wilson (1841) mentions of Peshawar as an important market town of very small population, an entrepot center at the entrance of Khyber Pass between India and central Asia. The Government Gazetteer of NWFP of 1831 also describes facts about Peshawar. Dani (1994) divided the growth of Peshawar into four stages in his most comprehensive book on the history of Peshawar. The formative stage dawned with the arrival of British to the end of nineteenth century, who were mainly concerned with the defense of frontiers with Afghanistan. The second stage

relates to the period from 1901 to the end of the First World War, when the new province of North-West Frontier Province (Present Khyber Pakhtunkhwa) was created. Peshawar became capital of the new province and it was the time when rapid expansion of the city started as migration to the city increased. The third stage lasted from 1919 to 1947, when constitutional struggle for independence ultimately lead to independence of Pakistan. The fourth stage from 1947 onwards started after independence of Pakistan in which very rapid changes took place in structure of Peshawar city. The size of population increased many times with corresponding changes in built up area.

A number of reports are also available that provide information on the growth of Peshawar, including the Master Plan of Peshawar (1965), Structure Plan (1986) (GoNWFP, 1987). The district census reports of various years also have very useful statistics on the population of Peshawar. A number of other government publications exist on other aspects including soil, water (Soil Survey of Pakistan), land use characteristics and agriculture (Revenue Record). Besides this, information is also available from historical maps, (Government Gazetteer), satellite images (SUPARCO), and topographic maps (Survey of Pakistan).

2.3 Urban sprawl

Writing about future cities, Le Cabusier (1967) in his book had visualized the concept of urban sprawl when he wrote, *The cities will be part of the country; I shall live 30 miles from my office in one direction, under a pine tree; my secretary will live 30 miles away from it too, in the other direction, under another pine tree. We shall both have our own car. We shall use up tires, wear out road surfaces and gears, consume oil and gasoline. All of which will necessitate a great deal of work ... enough for all* (Le Corbusier, 1967).

Duany, Plater-Zyberk, and Speck (2000) while identifying urban sprawl refer to two different models of city growth – the traditional neighbourhoods and the suburban sprawl. The traditional neighborhoods evolved organically and are represented by mixed-use, pedestrian-friendly communities, grouped into towns and cities- in response to human needs. Unlike the traditional neighborhood, urban sprawl develops at the fringe

with relatively low population densities, consumes land at an alarming rate, and is quite often unplanned. While producing insurmountable traffic problems and exacerbating social inequity and isolation sprawl is not regarded as healthy growth (GoP, 2011). Urban sprawl, and the economic and social systems which creates it, not only produce an inefficient and unpleasant environment on the urban fringe, but adversely affect the inner city and the rural areas as well (Bosselman, 1968; Newman, 1989; Ewing, 1997; Hillman, 1996; de Roo, 2000; Burton, 2000; Jenks et. al., 1996; Breheny, 1992; Elkin et. al., 1991).

Tracing the history of urban Sprawl, Black (1996) refers to Earle Draper, one of the pioneer urban planners in United States who used the word "sprawl". Other authors who have traced the history of urban sprawl include (Bruegmann, 2005; Hornstein, 2005; Angel et al, 2007; Today, 2001; Yeh, 2001; Axelrad, 1998; Barnes et al, 2001; Bhatta, 2009 and Mitchell, 2001). In addition to history scholars have worked on typology, causes of development of urban sprawl and their impacts. The literature on typology include the work of Peiser, 1989; Burgess, 1925; Alberto, 1969; Johnson, M. 2001; Garnier, 1967; Hart, 1976; Barnes et al, 2001; Glaeser, 2003 Brook, 2000; Brueckner and Johnson, 2001; and Ewing, 2008. There are different types of urban sprawl identified in literature. Garnier, 1967 and Hart, 1976 identified one type of urban sprawl called accretion. In accretion all space inside the town is built on, or land is too expensive for housing, people build as near to the town as possible in a continuous manner. Similarly, Cohen, 2004 and Brueckner, 2000 described another type of sprawl called star shaped accretion in which expansion is more like a star along the roads radiating from the city centre. The network of roads and railways become the dominating factor in expansion along which the built up areas expand. The roads represent the arms of the star, and the spaces between them get gradually filled in, but the principal arteries go longer and longer which, greatly affects the traffic flow along these roads such as along Charsadda road and Warsak road in Peshawar. Garnier, 1967 and Sinclair, 1967 identified another type of sprawl whereby the expanding cities reach out and engulf the existing peripheral villages. These villages keep their old way of life for a long time. Gradually the agricultural farms are converted to built environment; however, the former look of the

village does not always disappear. The same process is taking place in Peshawar where surrounding villages are being engulfed in the city but still most of them retain their original structure as traditional villages (GoNWFP, 1987). Another type of sprawl identified by scholars is the poly nuclear expansion in which expansion is not in a continuous manner but in form of different nuclei around the main city. The best example is placing a new town beside the old one (Garnier, 1967; Archer, 1973).

In contrast to unplanned sprawl, a different type of growth is planned expansion which involves deliberate expansion of the towns and cities involving the land use planning and regulations (Duncan, 1989; Rahman et al, 2008). In this case free expansion is not allowed in any direction. Thus in order to avoid the free expansion some Local Planning Authorities in Pakistan have taken some initiatives to develop planned township outside the existing city. The examples are Hayatabad Township in Peshawar and Iqbal Town in Lahore (GOP, 1997).

The literature on causes of urban sprawl is quite extensive. Among others it includes the work of Brueckner, 2000; Johnson, 2001; Barnes et al, 2001; Burchfield et al, 2006; Ewing, 2008; Glaeser, 2003; Nechyba, 2004; Squires, 2002; Johnson, 2001. In summary, they have identified the following main factors conducive to the development of urban sprawl:

- comparatively low price of land in the fringe
- accessibility of non-built farming land
- soaring rate of urban expansion
- availability of several public amenities in peripheral areas
- lack of development control on built up land because of its location outside the corporation boundary
- pressure of real estate agents on the farming land owners for selling land to developers
- rapid pace of urbanization
- mismatch between supply and demand of urban infrastructure and services

2.4 Measurement of urban sprawl

Many scholars have worked out different methods to measure the urban sprawl. Stephen, (2002) used the average density of population in the city as a method that could provide a ready and rigorous measure to show whether a city was more compact and less sprawling compared to another urban center. Lata et al, (2001) used entropy approach as a method to measure urban sprawl in Hyderabad, India. Sudhira et al, (2004) and Angel et al, (2007) used matrix analysis using GIS software to measure urban sprawl. Glaster et al (2001) recognized different theoretical magnitude of land-use patterns for measurement of urban sprawl. They included density, continuity, concentration, clustering, centrality, nuclearity, mixed uses, and proximity as criteria for measuring urban sprawl. Another metrics method, (Angel et al, 2007) used five metrics for measuring urban sprawl including:

Main urban core, The biggest adjacent group of built-up pixels in which at least 50% of the surrounding neighbourhood is built-up

Secondary urban core, Built-up pixels not belonging to the main urban core that have neighbourhoods that are at least 50% built-up

Urban fringe, Built-up pixels that have neighbourhoods that are 30–50% built-up

Ribbon development, Semi-contiguous strands of built-up pixels that are less than 100 m wide and have neighbourhoods that are less than 30% built-up

Scatter development, Built-up pixels that have neighbourhoods that are less than 30% built-up and not belonging to ribbon development (Angel et al, 2007).

Smart Growth America, an organization, used four indicators to measure urban sprawl including residential density, mixture of residence, employment and service facilities, vitalization of inner city; and accessibility of road network (Ewing et al, 2002).

Burchell, (1998) worked on US cities sprawl and concluded that average built up area density and land consumption per person were two most important measures of urban

sprawl, despite some shortcomings in measuring or describing urban expansion, in a purposeful manner. For example the leapfrogging form of urban expansion cannot be singled out up by these measures (Burchell et al, 1998; Ottensmann, 1977). Moreover, whether the built environment in the city are closely located in one single polygon or spread out thinly throughout the city, the average density in such a district study will be the same in both measures. Again, if the built up area of the city is packed together in a circle or a star-shaped figure having arms extending in numerous directions, the average built up area density of the urban district in the two measures will be the same.

2.5 Theories of City Growth and Structure

There is a dearth of literature about structure of cities in Pakistan. But a lot of work has been done on the various aspects of city structure in different parts of the world. Geographers have investigated the layout structure and land use in urban areas by constructing models and theories (Anas A., et al, 1998; Burgess, 1925; Hoyt. 1939 and Ullman and Harris, 1945) or by simply descriptive methods (Samiles, 1964). According to Ratcliff (1981, p. 93) “Models are used in town planning to understand the devices that determine the size and nature of urban areas and the location of land use therein” (Noor, 2004).

2.5.1 Classical Theories of City Structure

Three of the most quoted theories in the urban growth and structure were put forward by Burgess, 1925 “Concentric zone theory” Hoyt 1939 “Sector Theory” and Harris and Ullman, 1945 “Multiple Nuclei Theory”. They provide framework for studying the growth and structure of urban areas. Their significance is highlighted by Kivel (1993, p. 69) who states “these models have become so well established in the literature on urban structure that they are normally referred to as ‘The classical Models’”. Describing the importance of these models Fisher 1984 pointed that these classical models can be fairly helpful since they are simple and easily comprehensible. They are helpful in explaining how different land use classes of particular towns are arranged through specific approaches. However, no two cities or towns are alike. Therefore they may not display

the exact prototype of land use arrangement as displayed by either of these but it may be quite close to it classical models. In case of concentric zone theory, (Burgess 1925) growth is supposed to be at equal distance in all directions, and it is in the form of ring like structure. Fisher (1989, p. 103), states that “Burgess Idea is a sort of ‘ideal town’ or ‘Model’ against which any town can be compared”. The same may be true of Hoyt’s sector. Hoyt (1939) in his sector theory illustrated, the expansion of a city was supposed to be outward along the transportation routes. The aspect of direction and economic factors were added in addition to distance that was not considered by Burgess (Bradford and Kant, 1977, p. 195) in their research stated “Hoyt emphasized to a greater extent than Burgess economic factors like access to major transport route, he was also aware of the fact that high and low rent may repelled one another.”

The Concentric zone theory and the sector theory were developed based on the work done in the cities of USA. Many attempts have been made to apply/test these theories on the various cities of the world. (Rhind and Hudson, 1980). For instance Blumonfeed (1949) maintain that concentric land use pattern was present in Philadelphia, Jones (1960) has argued that the pattern of higher status residential areas in Belfast is consistent with the Hoyt’s model. Smith (1962) applied the sector theory on Calgary. Firstly he rejected it saying it to be over simplified, but latter on when he was analyzing the land value maps of the city he found that important sectoral variations did emerge. Five sectors were identified, one of which was high cost housing block. The crucial dynamics of Calgary’s growth is chiefly the outward succession of certain land use along radial lines of transportation, a marked resemblance to Hoyt’s model.

In another study, Robson (1969) has shown how the Northern parts of Sunderland exhibit the elements of concentric zone pattern while the southern part of the city shows equidistance of soccer pattern. According to Sedman and Wood (1965) Birmingham is an outstanding example of a city which has grown principally by the addition of successive zone around its original nucleus. Schnore (1965) has related the structure of Latin American cities to Burgess Model. He concluded that the urban areas display an inversion of the residential pattern of the concentric zone model, with high status groups in the center and other of lowest status on the fringe.

The work of Burgess and Hoyt has also been open to criticism and modification (Carter, 1976; Hallet, 1978; Hudson, 1980).

The Mann model (Mann, 1965) combines sector and concentric zone to produce a model applicable to medium size British town. Robson (1987) pointed out the structure of British cities are derived from the inter relationship of socio economic status: stages in the family cycle and housing tenure. In broad terms socio economic status is arranged sectorally and stages in the family life cycle concentrically. The influence of ethnicity as a factor influencing the urban structure was introduced by Rees (1970) while, the concept of urban zones in British and European cities were introduced by Hopkin (1985).

According to Multiple Nuclei Model (Harris and Ullman, 1945), the cities tend to grow around not only one but several discrete nuclei thus forming multiple Nuclei pattern. In the view of Tidswell (1978) this is more intricate than the others and therefore approaches closer to reality. It is also more flexible model and able to take into account peculiarities of site and the fashion of the history in particular the changing impulse of what comprise favoured residential location. Hudson (1970) suggested that multiple nuclei model is applicable to many colonial cities in Asia and Africa which have at least twin nuclei a European one and an indigenous.

None of the three models exactly or totally fit a city in reality, each of which has its own individual morphology. Nevertheless, they serve as guideline towards understanding the structure of particular towns, many of which represent the elements of each (Hudson, 1970). There are weakness and merits of each model and as the Rhind and Hudson (1980, p. 268) rightly said “Attempt has been made to modify these models by relaxing some of these assumptions and reintroducing variable originally omitted”. One of the problems of the theoretical morphological model is that they often do not take account of existing and persistent landscape feature built in various periods of urban design for example the Mann Model (Mann, 1965) is a useful descriptive tool but it throws little light on the process of urban growth, which work together to form the urban structure. In contrast, Lawton Model (Lawton, 1973), which is mostly derived from research into social and demographic conditions in Liverpool, examines the process of urban development in 19th

century. The model identifies a historic nucleus, with successive belt of housing enclosed around the older city, and with these, sectors of individuality derived from characteristics of the adjacent areas.

Urban Geographers since the early 1980s have argued that the ideas of Burgees and Hoyt regarding the city are obsolete. There are signs of emergence of new urban form despite the number of difference between individuals. They generally agree that the new cities are more fragmentary in their form, more disordered in structure and are generated by processes of urbanization which are different from those of earlier cities (Noor, 2004). The new urban form is usually named the “Galactic Metropolis” (Lewis, 1983; Knox, 1993) which illustrates a city that is not a single coherent entity; consist of a number of large spectacular residential and commercial developments with large environmentally and economically degraded space between them. The form is set to resemble a pattern of stars floating in space rather than the unitary metropolitan development growing gradually outward from a single center (Hall, 1998).

2.5.2 Structure of Pakistani Cities

Although a lot of work has been done on structure of cities in the developing countries of the world, but unfortunately, not much work has been done in Pakistani cities. The significant contribution in this regard was made by Qureshi (1959) in his study of Quetta. Elucidating the structure of Quetta, the provincial capital city of Baluchistan with regard to the layout of the roads, topography and height of the urban structure in relation to each other in terms of the stories, functional structure, congestion and occupancy rate. These seem were mostly related to composite of social, physical, economic and demographic processes. Mushtaq (1967) discussed the morphology of the city of Lahore in in terms of layout, intensity of the building, type of housing, open spaces and functional character. Bukhari (1970) traced the morphological patterns of Faialsalabad, the third largest city of Pakistan. Three phases were recognized by him during its evolution; the initial stage, the formative stage and modern stage. Hameed (1976) elaborated the various stages of growth in ‘urban Growth of Multan City’, which has been leading trade center for centuries. An evolutionary study of Lahore in geographical context was made by

Mushtaq (1977) in 'History and origin of Lahore City'. The study throws light on both temporal and spatial aspects of city's evolution. Similarly, Bukhari (1981) explained the evolution of urban region in Faisalabad, pointing out that in the old plan of the city, sectors were marked by various land use i.e. administration, residential, commercial, industrial, educational open spaces and recreational parks. Using the present general aspects of townscape, functional structure, morphology and demographic analysis, he demarcated the current urban regions of the city. These included commercial core, the administrative quarter, agricultural university campus, as well as the old sectors such as sub-urban area with industrial satellite and colonies and the fringe of the open country (Bukhari, 1981). In a study of urban encroachment of lands adjacent to cities Gulzar (2000) argued that the process is in operation for economic aims. The conversion of rural land to urban use particularly since 1970's which also increased the cost of land close to the urban margins compared to the peripheral land at a distance from the city (Gulzar, 2000).

Scholz (1983) explained the character of Pakistani cities by developing a model incorporating the process of spatial development. His work was based on the five large Pakistani towns of the Anglo Indian colonial character. The four processes he highlighted included:

1. The process of concentration and expansion with regard to the area and inhabitants.
2. The process of social segregation.
3. The process of concentration and expansion with regard to transport.
4. The process of concentration and expansion in the tertiary sector particularly, the retailing.

2.6 Encroachment of Agricultural Land

According to Lugo (1996) population growth and economic changes are two important factors affecting land use changes, distribution and amount of available agricultural lands. Researches in many countries of the world have indicated that one of the most

important implications of growth in built up area has been the loss of agricultural land (Burchell et al., 1998; Axelrad, 1998). The rapid loss of croplands was more rapid in countries that were densely populated before industrialization (Heimlich, 1989) such as Japan, South Korea and Taiwan. Brown (1995) showed that the position of these countries changed from grain exporters to importers. Japan's grain land declined 52% between 1955 and 1994. In South Korea, the cultivated area declined 46% between 1965 and 1994. Similarly, Taiwan lost 42% cropland between 1962 and 1994. In China, between 1990 and 1994 total grain area harvested dropped from 90.8 million ha to 85.7 million, which represented a decline of 5.6% in 4 years. This loss in productive cropland in China, combined with a population increase of 59 million people (4.9%), represented a 10.5% reduction in harvested grain area (Brown, 1995). Encroachment of built up area on farmland in China was discussed by Zeng (2005). According to him, characteristics of peri-urban areas were to be transformed into the urban system. The transformation process was to significantly decrease the cultivated area because of city sprawl (Zeng et al., 2005).

Potter (1993) found agricultural land in the Caribbean, one of the world's most densely populated regions was also under tremendous pressure from rapid population growth and a high rate of urbanization (Gajraj, 1981). For example the island of Puerto Rico human population density had increased more than threefold between 1900 and 1994. It is one of the highest densities in the world, with over 400 inhabitants per km² (Cruz-Baez, 1998). Over the past 60 years, Puerto Rico's economy has shifted from being mainly agricultural to industrial, with an emphasis on manufacturing and services (Morales-Carrion, 1983). In the 1930s, approximately 43% of the island's Gross National Product (GNP) came from agriculture, mainly sugarcane, coffee, and tobacco (Cruz-Baez, 1998). By 1996, the contribution of agriculture to Puerto Rico's GNP had decreased to 1.2%. Presently, coffee, poultry, and cattle production are the major components of the agricultural sector (Cruz-Baez, 1998). During the same period, the contribution of industry to GNP increased from 7% in 1934 to 41% in 1996 (Dietz, 1989). As agricultural production declined in Puerto Rico, forest cover increased, contrary to the trend of deforestation occurring throughout most of the tropics (Brown and Lugo, 1990). During the peak of

agricultural activity (1930 to 1950), forest cover on the island was reduced to approximately 6%, but by 1985 forests covered 34% of the island (Birdsey and Weaver, 1987). These economic changes have also led to an increase in urban areas, mainly on the coastal plains, areas which contain the most fertile agricultural lands on the island (Berrios-Saez, 1998).

The conversion of natural systems to agricultural production has been the primary basis for the successful growth of human populations for the last 9,000 years (Kates et al, 1990). The conflict between urban and agricultural land use, however, is only now becoming a subject of controversy. Conversion of productive farmland to urban uses under growing population in the present century has become a controversial aspect in debates over sustainable development and food security (Ehrlich, 1989; Daily and Ehrlich, 1992; Beasley, 1986). As more land is transformed to urban uses, the question arises as to whether this trend represents a systematic reduction in our ability to produce food by placing our infrastructure on the most productive soil resources. A disturbing consequence of this urbanization process is a growing dependence on ever-greater yields per unit area (on soils that remain) or a reliance on more distant soil resources for agricultural production (Beasley, 1986).

Given present demographic trends, it is important that issues of agricultural versus urban land use be resolved. An increasing number of regional populations may be at risk of food shortages in the future as a result of sociopolitical and economic instability (e.g., war, economic depression, social upheaval, etc.) with their consequent effects on global food supplies. While the reality of some agricultural land loss is accepted, both the magnitude and the potential effect are hotly debated (Lopez, et al. 1988). Central too much of the debate is the difficulty in acquiring accurate measurements of the agricultural area lost to urban use. Monitoring changes in urban land use, and assessing the impact of these changes on agricultural land area or production is therefore fundamental to rational, cost-beneficial analyses (Parsons 1977; Meyers, 1994).

2.7 Urban Farming

In spite of losses of farming land due to urbanization, many urban areas still have considerable agricultural land in their boundaries. Several studies have been carried out on urban agriculture both in developed and developing countries. (Anh et al, 2004; Sarkar, 2012; Armar, 2000; Boyd, 2001; Chaipa, 2001; Drecsher, 2000; Dubbling, 2005; Greenhow, 2002; Holmer, 2005; Smit et al, 1996; Cabannes, 2004; Kaufmann, 2000; Kitilla, 2003; Mugeot, 1991; Mposha, 2005; Robert et al, 2005). These studies have discussed different aspects of urban agriculture particularly in relation to food security and policy aspects. Anh, 2004 worked on opportunities for sustainable farming in Hanoi city. Sarkar, 2012 elucidated urban farming in India highlighting constraints and prospects of urban farming in Indian cities. Armar (2000) studied strategies for urban agriculture in Accra, Ghana one of the developing countries to supplement diets in urban areas. Boyd and Weise (2001) discussed urban agriculture supporting programme in Nepal. FAO (2000) portray successful cases of urban agriculture in various cities of the world including Montevideo (Uruguay), Curaca (Brazil), Quito (Ecuador), Bamako and Ouagadougou (West Africa), Texcoco (Mexico), Nairobi (Kenya) and Nerima Ward of Tokyo (Japan). However, no systematic work has been conducted in Pakistan on urban agriculture. Moreover farming has not been recognized as an urban activity in the cities although agriculture is practiced on the large chunk of land in most cities of Pakistan.

2.7.1 Urban Agriculture, Planning and Development

Urban farming has been gaining great importance in urban planning in both developed and developing countries. If accurately managed, it contributes considerably to the welfare of city dwellers. In the sprawling cities, there is a strong competition between the conventional urban land uses and farming (Chapin, 1979). At the regional level, the importance of agriculture is recognized as an important activity but in the cities, it has not gained much recognition from urban planners (Dresher, 2000; Roberts, 2005). Nevertheless, farming has the prospect to flourish in modern cities and reap benefits from urbanization (Kaufmann, 2000; Quon, 1999). For example, cities have large concentration of population that provides ready market for its products. Besides, cities

can provide easy access to form inputs such as natural manure and wastewater. Urban agricultural has always been part of the city since historic times; however its incorporation into the urban planning and policies has been lacking in many developing countries.

In most of the third world, city planning has been conducted through rigid master plans, which portray specific policies to be implemented in future time (Faludi A., 1973). In most cases, these plans are over enthusiastic containing such policies that cannot be implemented with available meager resources. The result is that most of the plans remain on shelves (Mposha, 2005; Foeken, 2006). Most town planners in developing countries do not have technical knowledge to handle urban agriculture and therefore they fail to incorporate it in the urban development policies and plans (Dubbling, 2005). Despite its gaining importance, many planners still consider it as a rural activity (Quon, 1999). Therefore, Wolfgang (2002) advocates that instead of having separate policy for urban agriculture, it should be included in the existing planning and development policies of the cities. Hence agriculture should be integrated into traditional land use classes and Geographic Information Systems (GIS) should be used for monitoring changes in land use pattern in cities. In fact many cities have already included urban agriculture in their planning systems. For example, Governador Valadares in Rosiario (Lovo et al., 2003) incorporated urban farming in city master plans. City of Gaborone in Botswana (Ministry of Agriculture, Botswana, 2006), Dar es Salaam (Kitilla and Mlambo, 2003) and Beijing (Greenhow, 2002) have also specified zones for urban agriculture in their plans.

Some government Policies, do not encourage urban agriculture, despite the increasing demand and wishes of the public. These are characterized by limiting space for urban agriculture and lack flexibility for its inclusion in future plans. In contrast, other policies and plans, like in Zimbabwe, have been prepared that assist, direct and guide inclusion of urban agriculture (Mushamba, 2004). Nevertheless, existing policies in most countries do not facilitate urban agriculture, but leave room for some flexibility. In Nakuru, Kenya for example policies tend to limit urban agriculture all levels, but the existing farming practice is allowed inside the city (Foeken, 2006). Usually the central governments make policies, which are implemented by local authorities. However, local authorities can put

pressure on state governments to legislate such policies in support of urban agriculture. Appropriate By-laws can then be prepared by local governments (Makonese, 2005).

2.7.2 Integration of Farming into Urban Planning

Worldwide, the planning tools range from long-term master plans to smallest level of neighbourhood plans (Quon, 1999; Chaipa, 2001; HARDD, 2002). They direct the use of private and public land for betterment of the society. Scholars have advocated that there should be compulsion for integration of urban farming as an important element of a development plan and specific area should be allocated for it in urban plans (Drescher, 2000; FAO, 2000; Greenhow, 2002). Many examples have been quoted from cities of different countries where urban agriculture has been included in municipal plans (FAO, 2001). Examples of these include Rosario and Cienfuegos in Latin America (Dubbeling, 2003), Dar es Salaam in Tanzania (Kitilla, 2003) and Cagayan de Oro in Phillipines (Holmer et al., 2005). These cities have shown how urban agriculture can be integrated into a city plan. Zoning policy has also been used to promote urban agriculture while also enhancing, human health and wellbeing. Zoning has been used to support urban agricultural in Gaborone, Botswana (Ministry of Agriculture, Botswana, 2006), and in Kathmandu, Nepal (Boyd and Weise, 2001). Various tools have also been used for mapping allocating and monitoring land under urban agriculture; GIS for example has been successfully been used in Dar es Salaam, Tanzania for growing vegetable on open spaces (Dongus, 2001).

The above discussion on planning and development indicate that there is ample reason to include urban agriculture land use into the planning systems of the cities. Urban planners should assist in its integration in the planning system appropriately. Nevertheless, urban planners are not decision makers. However as stated by Chaipa (2001) decision makers are usually the politicians and the task of planners is just to make them understand the problem.

2.8 Urban Policies in Pakistan

Urban policies of the government provide guidelines for framing the structure and internal arrangement of land use in cities to reduce the urban problems in a region (Gnaneshwar1995; Richardson, 1987). In Pakistan, the policy making for urban areas is the domain of central government by its Five-Year Plans, including its financing. After independence planning and development in Housing and Settlements sector at national level, framed part of the Five-Year Plans during 1950s. Afterward the name of the sector changed altered as ‘Physical Planning and Housing’. Planning Commission of Pakistan prepares the Five-Year Plans and is responsible for their execution. Under these five-year plans, ministries implement plans and programmes within their preview in specified period and resources.

It is important to note that public measures, affecting the people in urban areas, do not fully initiate from within the cities only. They include industrial development strategies, rural development projects as well as provision of education and health services have a direct impact on urban life. Mills calls these “non-urban policies as urban policies” (Mills, 1987). Pakistan is one of the pioneering countries that has started national policies for physical planning and housing in the Third World (TW). It had prepared a national Human Settlement policy which was however, neither approved nor implemented. Other urban policies are in housing and physical planning section of its Five-Year Plans and national budgets.

Looking through the history of five-year plans, it is clear that expenditure in physical planning and housing sector has increased more than 14 times in the last 50 years (Qadeer, 1996). The share of private enterprises has increased with time while the share of government expenditure has declined. The role of public agencies is to put down the basic structure for the private market to operate efficiently and fairly (GOP, 1988). Urban and housing programmes envisaged in National housing policy, are prepared under five core areas:

- Housing and Katchi Abadi upgrading;
- Provision of basic infrastructure in cities and rural areas;
- Organization structure for surveys, planning and development of cities;
- Public buildings and employee's housing;
- Special projects, mainly for tribal region.

Comparative proportions of plan allocations for each of these policy areas indicate that their share has been fluctuating over time. Most of the programmes are directed at development of land and buildings particularly in public sector (Qadeer, 1983). The share of housing has gradually dropped over time and more emphasis has been over provision of infrastructure. The importance of urban agriculture cannot be ignored any longer and needs to be recognized and included in urban policies and plans, particularly for largest cities (Foeken, 2006). Policies related to it indicate that no attention has been paid to urban planning or loss of agricultural land in the past. However, a recent report of Task Force for Urban Development constituted by planning commission does mention about the urban encroachment of agricultural land as a serious problem. It states that rapid sprawling of the cities and dramatic increase in their population have created problems of environmental degradation there is need for conservation of precious natural resources, including good quality farming land, etc. hopefully a follow up of the Task Force Report could lead to making urban agriculture an integral part of urban policies.

Chapter 3

ENVIRONMENTAL AND ECONOMIC SETTING

3.1 Introduction

This chapter gives general background and environmental setting of Peshawar City District. The chapter is divided into five sections. This brief introduction is followed by location extent and historical background of the city district. The third section deals with physical settings including the description of land capability classes, while economic and demographic profiles have been discussed in fourth section. The chapter is concluded in final section.

3.2.1 Location and Extent

The Peshawar City District is the capital of the Khyber Pakhtunkhwa province of Pakistan. It stretches from 33°44' to 34°15' north latitudes and 71°22' to 71°45' east longitudes, covering an area of about 1267 km². It is bounded in the north by Charsadda and in the east by Nowshera districts respectively. The Khyber Agency is on the west. Mohmand Agency is in the northwest, while Frontier Region of Kohat is in the south (Fig. 3.1).

3.2.2 Historical Background

Peshawar is one of the oldest existing cities of Asia. Its uninterrupted history goes back to several centuries, a fact confirmed by the ongoing deepest and widest excavation of the world at Gor Khatri within the walled city. Located at the mouth of Khyber Pass, the city has been the centre of trade between Central and South Asia and beyond to the Middle East.

Peshawar has long been known as frontier town. A mention of the city of Peshawar is found in the history written as far back as 400 A.D. (Dani. 1969). Different historians have called it by different names, which are in fact variations of its present name. The Chinese traveler Fa Hein who visited this area in about 400 A.D., gives the name of “Fu-Lu-Sha”.

The Chinese pilgrim, Hiuen Tsang visiting in the seventh century calls it Po-lu-sha. All these are variants of the same name, which, in one of the local dialects, is pronounced as Pekhawar. The old gazetteer records a Hindu tradition that the name Parashapur is after a Hindu King called “purrus” or “Purrush”, and hence the meaning is simply the seat of purus. However, there is no evidence of existence of such a hindu king (Dani, 1969). The oldest name has been traced back in Kharoshti record found near Attock, dated 119 A.D., where it is spelt as Poshapura, a Sanskrit name meaning the city of flower. The flowers of Peshawar were also mentioned in Mughal emperor Baber’s memoirs Tazk-e-Babari. Al-masudi and al-Beruni in the 10th and 11th A.D. mentioned its name as “Parshawar” in their travelogue and the city retained this name till the time of King Akbar who persianized it to Peshawar, a combination of the two Persian words “Pesh and Awar” meaning artisans, because of a number of artisans, who lived in this city (District Gazetteer 2001).

The British made the city headquarter of North West Frontier Province and mentioned it as the frontier town. Before British occupation, the city, for invaders coming from Kabul like Durrani and Mughals, was the first major locality they encountered after crossing Khyber Pass on their way to Hindustan (India). Hence to some the name is derived from the Persian Pesh awardan “that which comes first” (Dani, 1969). Mughal emperor Humayun regarded the holding of Peshawar as a real beginning to the conquest of India because it was the gateway holding the key for getting into the subcontinent. Historian Abul Fazl calls Peshawar by the name of Bagram or Bigram. He observes that, “The Tuman (chief) of Bigram is called as Parashawar” (Dani, 1969) from which the name of Peshawar originated.

Since its origin, Peshawar has seen the rise and fall of many civilizations. It was once the centre of Gandhara civilization and was subsequently ruled by Afghans, Hindus, Mughals, Durrani, Sikhs and Britishers up to the independence of Pakistan in 1947. The city came first to limelight in the first century A.D when Kushan Emperor Kanishka made it the capital of his vast Empire from the Caspian Sea to the mouths of the Ganges. The main city at that time existed on the 'Kassa', a high bank of the Bara River with its central area, where Qissa Khwani bazar is now located. After the glory of Gandhara period the city shrunk in size. The boundaries of the Hindu, Muslims and the Sikh periods can be identified within the walled city. The spatial limits of medieval Peshawar became well defined by the erection

of the city wall and gates in 1840. The structure and street patterns of this period can be identified even today. The city however has seen tremendous expansion outside its wall, and details of this form the subject of the next chapter.

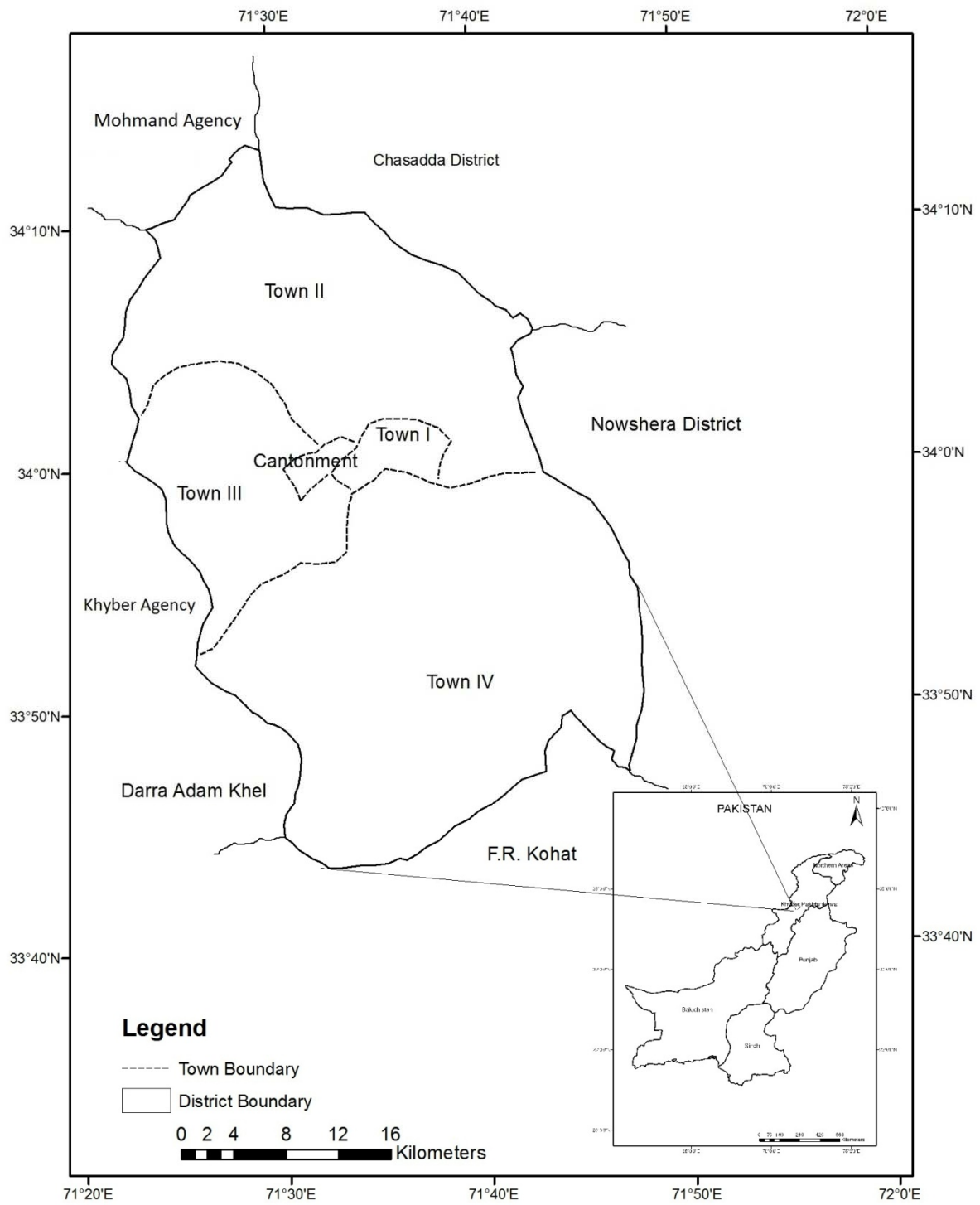


Figure 3.1 Peshawar City District: Location

3.3.1 Physical Setting

Study of physical settings of Peshawar City District is very important as it portrays the physical constraints and opportunities for spatial growth and development of the city. Physically, the City District is a part of Peshawar vale (Fig. 3.2), which constitutes the extreme northwestern tip of the Indo-Gangetic synclinorium, a depression filled with alluvial material. The alluvial fill is not as thick as in the Punjab, and rocks out-crop, related to faults in the bottom of geo-syncline are common in the area. During the middle and late Pleistocene period; river alluvium, piedmont alluvium, lake alluvium and loess were deposited in the depression. Parts of these materials have been removed by erosion. During the sub recent period, while the erosion of the older material continued, the river and piedmont alluvia were deposited,

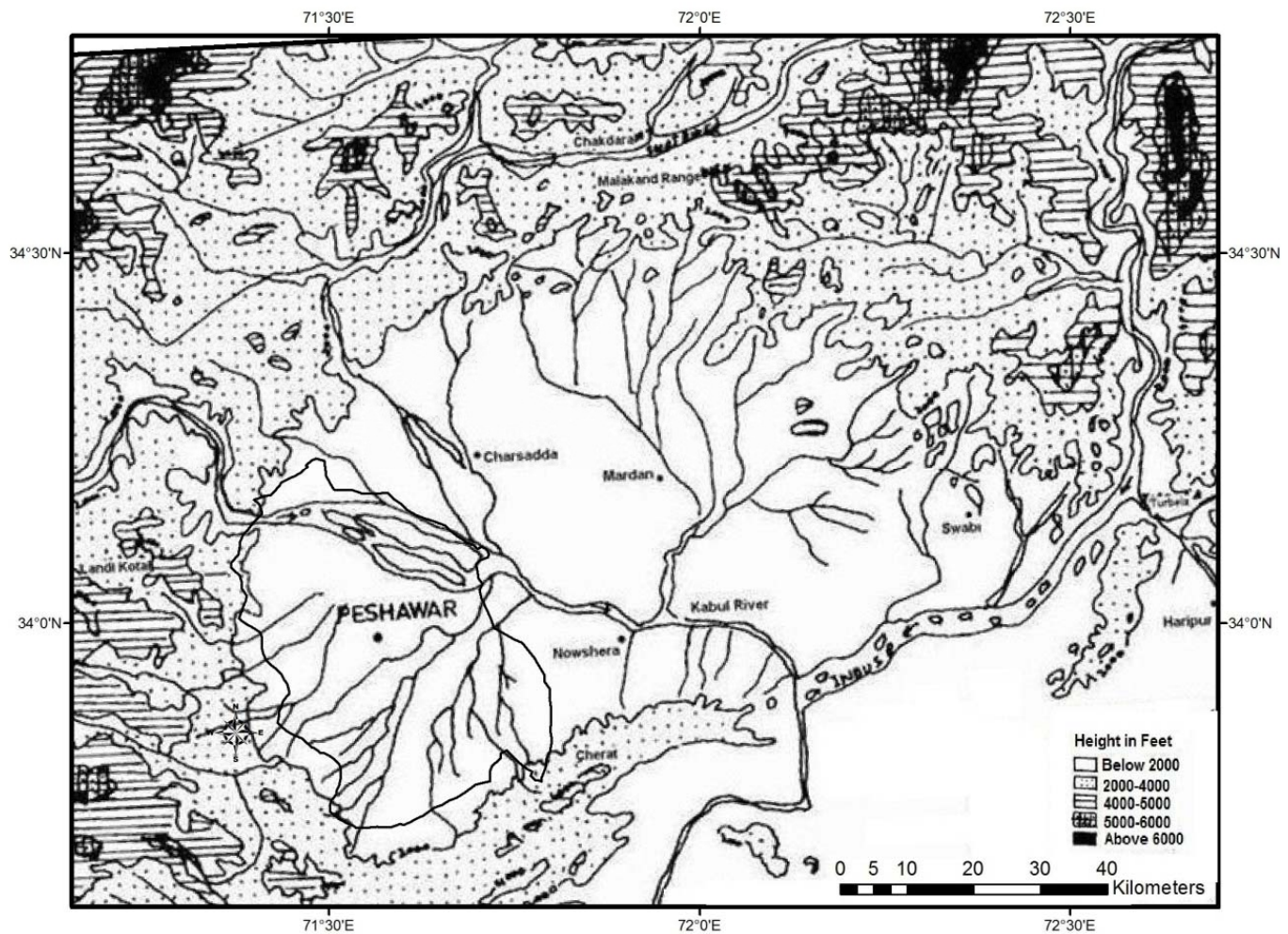


Figure 3.2 Peshawar Vale: Physiography

The present landscape and geomorphic configuration of the City District are given in Figure 3.3.

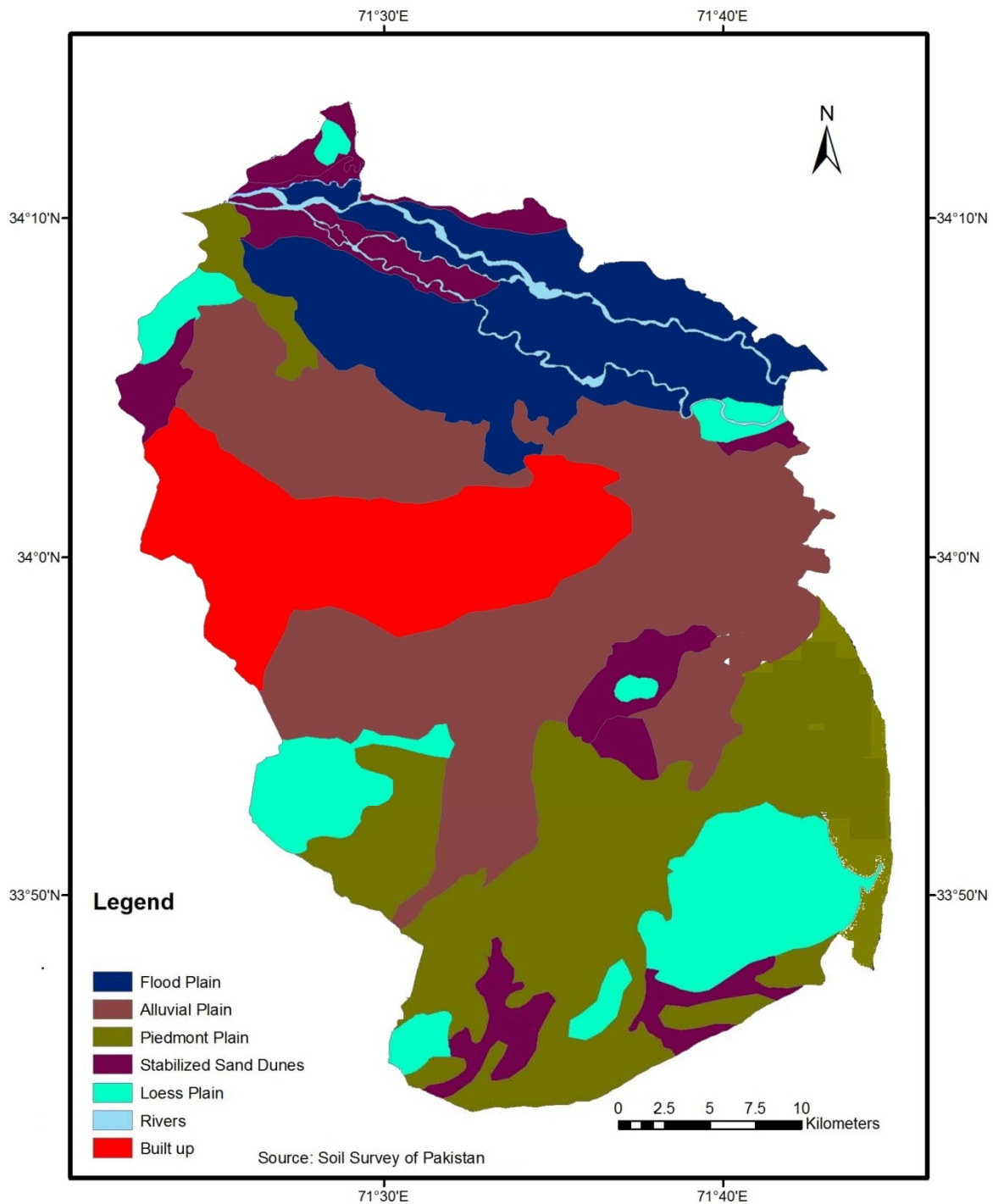


Figure 3.3 Peshawar City District: Major Land forms

Four major geomorphic units can be identified based on topography, relief and geological formation: alluvial plains, piedmont plains, loess and stabilized sand dunes. Their details are as given below.

1. **Alluvial plains:** Active and recent flood plains represent the lower parts of the area stretching along the Kabul River. Most of this area is subjected to occasional flooding by the river during high floods. The soils occurring on this landform in the levee and point bar position are mainly stratified with occasional bands of silt loam or very fine sands or sandy soils, moderately deep/deep and shallow over gravels or sands. Sub recent level to nearly level flood plain at relatively higher position. The soils of this landform are very deep, well drained, calcareous, silt loam with olive gray colour.
2. **Piedmont plains:** The piedmont plain is in the south, the older part of which has nearly level to gently sloping gradient. The soils of this landform are very deep, well-drained, calcareous, silty clay loam and brown/dark to brown in colour. The Sub recent part of the piedmont plain has been dissected by torrent water from mountains in the west. The soils of this landform are moderately deep to deep, loamy, well drained, reddish brown and calcareous.
3. **Loess Plains:** Two main landforms can be recognized in the loess plains. The original loess plain has been dissected and has nearly level to slopping position with very deep, brown/dark brown, silt loam soil, weakly structured, strongly calcareous with a kanker zone at 25-45 cm depth. Re-deposited loess plains consist of level to nearly level relatively higher areas and level to nearly level basin/channel infills. The soils occurring in the higher positions are deep loams, well-drained and calcareous, while soils in the basin or infills are very deep, moderately well drained and silty clay loam in texture. These soils do not have zone of lime accumulation within five feet depth. They are found mainly in the southern parts of the district.
4. **Stabilized sand dunes** The Stabilized sand-dunes landscape occurs in the southeastern part of the City District. Here old Pleistocene sands exposed in a bluff, has been blown by wind. The comparatively fine materials i.e. silt and fine sand has been eroded and deposited at the foot of these sand dunes. These soils developed in

the nearly level to gently sloping positions are deep, massive, excessively drained and have loamy sand texture.

Looking at the physical setting, the potential land for urban growth mainly lies in the southeast and southwest. Because in the northeast of the city there is a flat land partly with high water table which is not fit for building construction. The rest of the area is the best agricultural area as shown in the land capability map of Peshawar (Fig. 3.5). Another potential area lies to the north of Hayatabad. This is a barren land with no agriculture; Regi Township has been designed on this land. The area is too high to be irrigated from the existing gravity canals and the land there comparatively is very poor from agricultural point of view. Therefore this is the good potential area from physical point of view urban growth.

3.3.2 Hydrology

Hydrology of the City District is shown in the accompanying map (Fig. 3.4). Kabul is the main river of Peshawar district, which enters in the Northwest. The river starts rising in the February and reaches the highest discharge level in July when water is supplemented by monsoon rains. After entering the district, it divides into three channels – Shah Alam, Naguman and Sardaryab. Sardaryab, the northern most channel forms the boundary between Peshawar and Charsadda districts. South of Kabul River is Budni Nala, which receives drainage from many seasonal streams or Khwars. The area between Sardaryab Channel of Kabul River and Budni River forms the flood plain. The meander flood plain extends from Warsak in the Northwest towards Southeast in the upper Northern half of the district. The Bara River enters the District South of the main built up area and flows to the Northeast. It is joined by a number of Khwars including Zandai Khwar, Chilla Khwar, Chinkar and Jani Khwar on its way to Kabul River.

Kabul River is the main source of irrigation system in Peshawar. It is snow-fed and its flow increases in spring because of snowmelt. Two different canal irrigation systems are functioning in the area; Regular Canal Irrigation system and Civil Canal Irrigation System. The Irrigation Department of the provincial government administers the Regular Canal Irrigation System. Several canals have been taken off from the Warsak Dam. The

Warsak High Level Gravity Flow Canal irrigates the western as well as the southeastern parts of the district while the Warsak Lift Canal irrigates southern and southwestern parts. The small canals taken off directly from the Kabul River through simple diversion by the local communities called “National Irrigation System” irrigate the northwestern, central and eastern parts of Peshawar City District. Because of concentration of rivers as well as unlined canals and distributaries water table is comparatively high in northern parts of the City District. Over large area of the flood plain water table is 10 to 30 feet but it is quite deep in the southern parts of the city district (Fig. 3.5).

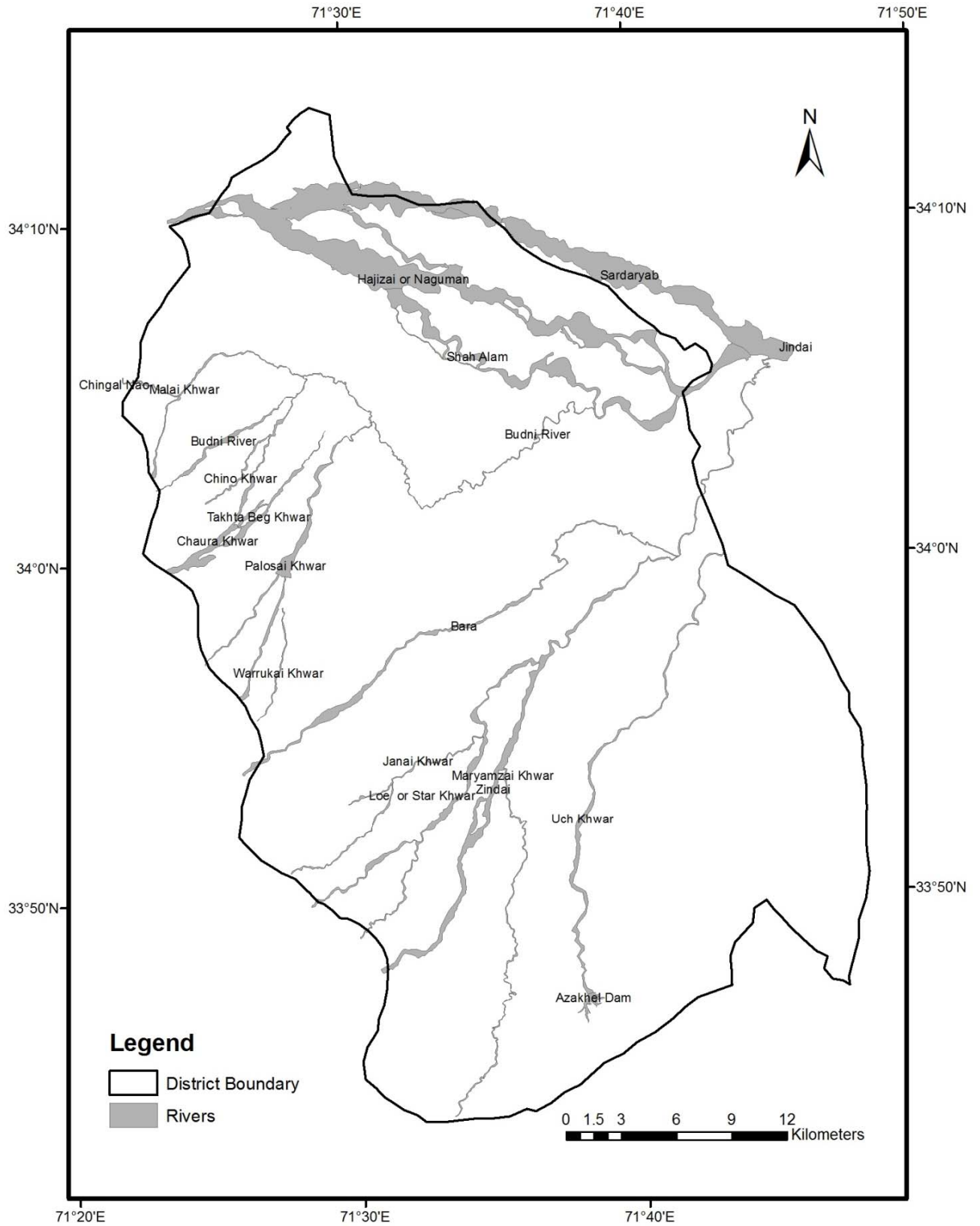


Figure 3.4 Peshawar City District: Hydrology

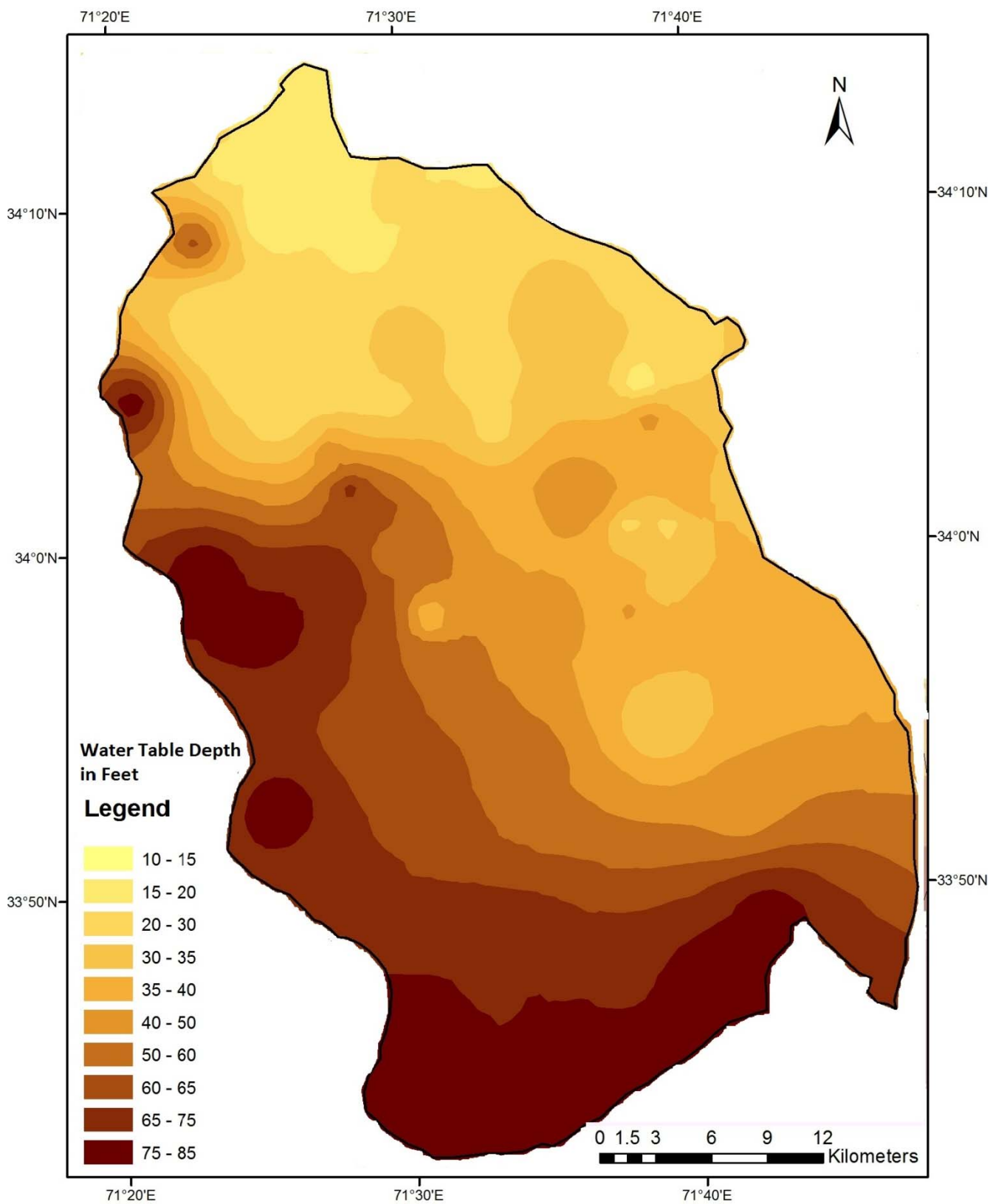


Figure 3.5 Peshawar City District: Water Table

3.3.3 Climate

Peshawar city district has semi-arid climate. The area has a warm summer followed by a cool winter. The mean monthly temperature ranges from 11.3°C to 33°C with mean annual temperature 22.9°C. June and July are the hottest months with mean maximum temperatures usually ranges between 40.2°C and 37.7°C and extreme maximum of 50°C. December and January are the coldest months with mean minimum temperatures of about 5.3°C to 4.1°C. The lowest minimum recorded temperature is –1.6°C (Table 3.1). Mean relative humidity ranges from 29.1% to 55.8% with an average value of 44.5%.

Table 3.1 Metrological Data for Peshawar

Months	Mean amount of precipitation (mm)	Mean Temp. (°C)	Mean Max. Temp. (°C)	Mean Min. Temp. (°C)	Highest Max. Temp. (°C)	Lowest Min. Temp. (°C)	Mean Relative humidity at 1200 UTC (%)	Wind speed at 1200 UTC (Knots)
1	2	3	4	5	6	7	8	9
January	29.5	11.3	18.5	4.1	26.5	-1.6	47.6	1.5
February	46.0	13.2	20.0	6.5	30.0	-1.0	40.9	3.1
March	84.0	17.2	23.8	11.1	36.0	3.0	42.2	3.9
April	46.6	23.6	30.6	16.7	41.5	7.0	38.3	4.6
May	23.0	29.3	36.9	21.7	47.2	12.0	29.2	5.7
June	14.5	33.0	40.2	25.4	50.0	17.0	29.1	6.3
July	46.6	32.1	37.7	26.6	46.6	18.0	47.9	6.3
August	74.0	30.9	35.9	25.8	46.0	20.0	55.8	5.6
September	21.7	29.0	35.2	22.7	42.0	12.0	49.7	- -
October	18.8	23.8	31.5	16.0	38.0	10.0	46.2	- -
November	12.1	17.9	26.1	9.6	35.0	1.5	52.2	0.8
December	16.6	13.0	20.7	5.3	29.0	-1.3	54.7	0.7
Annual	433.2	22.9	29.8	16.0	50.0	-1.6	44.5	- -

Average of 30 years (1973-2002)

Source: Pakistan Metrological Department, Karachi 2002.

Frost occurs usually during the months of December, January and February in the north and northeast of the area and causes great damage to crops. The frost effect is less severe in the south and southwestern part of the area.

The rainfall occurs due to monsoon as well as western depressions. The winter rains are brought by western cyclones with cold fronts moving from the Hindu Kush ranges while the summer rains result from the monsoon of the Indian Ocean. Peshawar receives more of its rainfall from western depressions than monsoon. The marked winter rainfall come as gentle showers of long duration and is more effective than the summer rains. The monsoon rains are usually accompanied by thunderstorms. The average rainfall varies from 300 mm to 450 mm. The rains are erratic and insufficient for crop growth.

3.3.4 Land Capability

Land capability classification is a method of appraisal and grouping the soils of an area to show their relative suitability for different land uses in particular for sustained production of common agricultural crops, grazing or forestry. The classification outlined here is similar in basic structure to that of the U.S. Soil Conservation Service System (Klingebiel and Montgomery, 1961), but the definitions of the classes have been modified and the number of subclasses extended to suit the local conditions (Ashraf et al, 1970). In particular, assumption of irrigation or absence of irrigation has been made explicit.

Based on the above criteria, eight classes have been recognized as given in figure 3.6. Soils placed in the highest or best class (I) have the least limitations for agricultural use and relatively little effort is required to produce high yields of a wide range of crops. In the next two lower classes (II and III) there are some limitations for agricultural use, relatively greater effort is required to produce high crop yields and the choice of crops may be narrower. These problems are extremely severe in soils of class IV, which, though capable of producing a few marginal crops, have little possibility for improvement. Soils in the lowest class (V to VIII) have major limitations for arable farming. The soils placed in classes V to VII can however, be used as range or for forestry. Their suitability for these uses gradually diminishes from well suited in the case of class V to poorly suitable in the

case of class VII land. Soils placed in class VIII are agriculturally or vegetation wise unproductive. In other words, soils below class IV can be utilized for urban uses too.

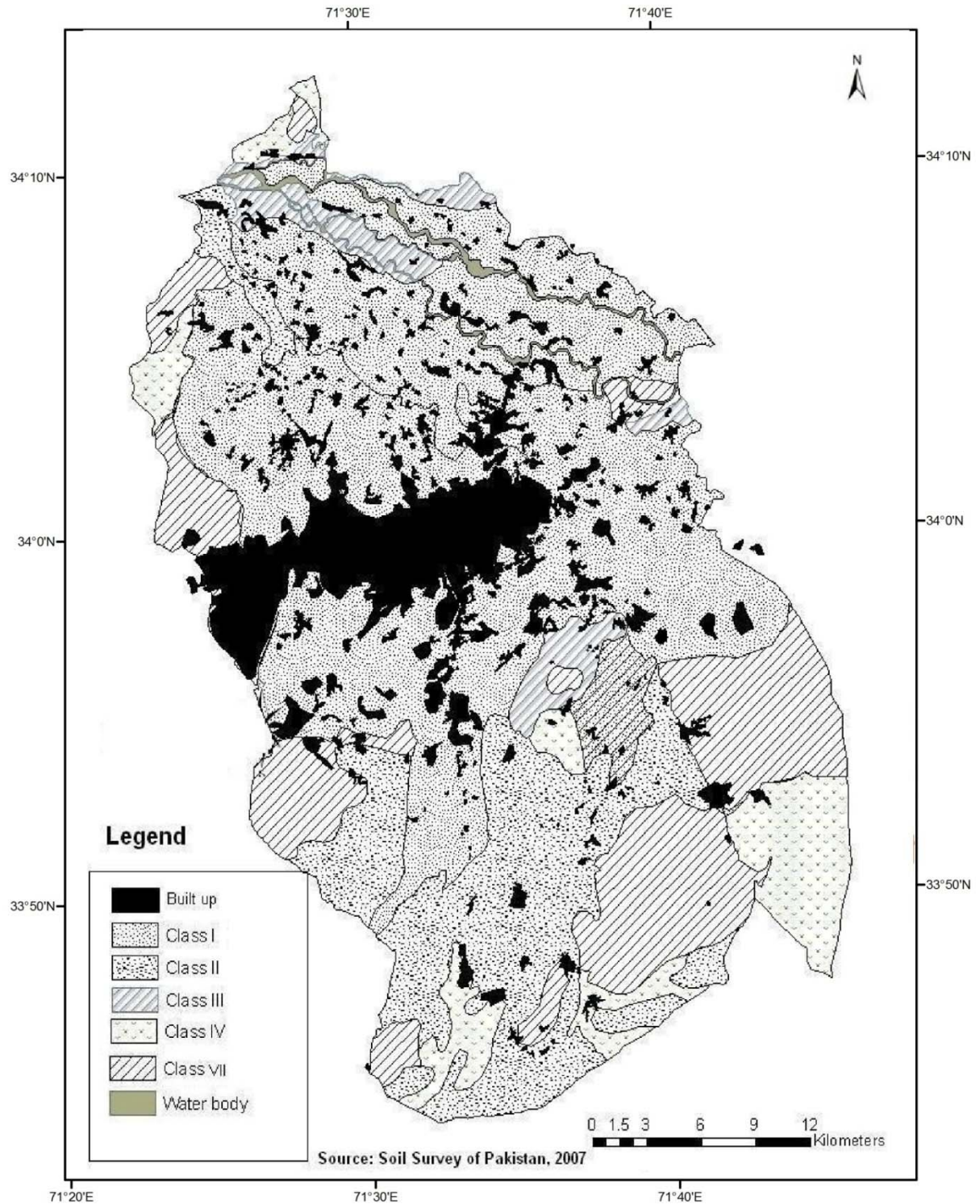


Figure 3.6 Peshawar City District: Land Capability Classes

The details of various land capability classes for Peshawar are given below:

Class I. Very good irrigated land:

Located all along built up area (Fig. 3.6), much of land in this class have no or only slight limitations for crop production throughout the year and have the widest range of agricultural use. They are level to nearly level, deep, well-drained, medium textured, non-saline/ non-sodic and moderately to moderately slowly permeable and have good water holding capacity. The source of irrigation in the study area, are canals as well as tube-wells. Under traditional management and with sufficient irrigation water, these soils are at least moderately productive. However, they are capable of giving very high yields of a wide range of crops under modern management.

Class II. Good arable land:

Land in this class occur in southern part under and have minor limitations for crop production throughout the year, though a comparatively narrower range of suitable crops than in class I. Remedial measures are easy to apply or management adapted to the limitations is easy to practice. Only two subclasses have been recognized. Under traditional management and with irrigation most of these soils are used for maize in summer and clover or wheat in winter. Under modern management including provision of drainage, extra care in seed bed preparation and balanced use of fertilizer, total productivity could be very high with crop choice limited to maize, wheat and clovers.

Class III. Moderately good arable land.

Land in this class occurs in patches (Fig. 3.6) in the city district and has moderate limitations for crop production throughout the year, or a limited range of suitable crops. Part of the limitations can be removed at some cost, but other part of the limitations cannot be removed and require special management or selection of suitable crops for high productivity. Moderately coarse texture, high water-table and moderate erosion are major problems of the soils in this class. Under traditional management and with sufficient irrigation water, the crop yield of the subclass is moderate. However, they are capable of good yields of wide range of crops under modern management.

Class IV. Poor (marginal) land.

This class also occurs in small patches in Peshawar. Land in this category has severe limitations for crop production and may have a very narrow range for agricultural use. Improvement to a high level of productivity may not be technically feasible but would entail prohibitively high expenditures for development or maintenance. Due to its coarse texture and rapid permeability these soils cause great wastage of water, which has created high water table at places in this class. Parts of this land occur along the rivers in recent or active flood plains, and are under flooding risk during monsoon season. Considerable portions of this land also exist in southern fringe of the city district, where it is non-arable and supports poor grazing. A small portion of this land is irrigated by canals.

Class VII. Poor grazing land

There is no land in Peshawar under categories V and VI. The only other category of soil in Peshawar is Class VII. It does not have potential for crop production due to lack of water coupled with one or more severe limitations. However, they provide inferior grazing for part of the year. There is some potential for irrigated agriculture but at present no irrigation is there due to lack of water.

3.4 Socio-economic Profile

3.4.1 Economic Activities

Peshawar City District has diverse economic activities. Historically it has been an important market town located on silk route from Central Asia to India. It has several markets and bazaars, both traditional such as the ones that exist in the walled city as well as the modern shopping malls such as Deans Plaza and a number of new shopping malls in Cantonment and on the Khyber Road as well as Karkhano Market north of Hayatabad, where shops sell a variety of foreign goods and attract shoppers from all over Pakistan.

The city has seen considerable industrial development (Fig. 3.7). Numerous industries exist in Hayatabad Industrial Estate and Kohat Road Industrial Estate, which are manufacturing hosiery, small arms, leather and foot wear, garments, ghee, soap, etc.

Match factories, flourmills and steel re-rolling units are also operating in the district. In addition it has Khazana Sugar Mill on Charsadda Road. A number of brick kilns and marble factories are also there.

The City District offers numerous services too. It is the main educational centre of the Province with numerous universities and colleges, both government and private, where students from all over the province are enrolled. It also has specialized health facilities in its hospitals such as Khyber Teaching Hospital, Lady Reading Hospital, Hayatabad Medical Complex and numerous other private hospitals and clinics. It also has provincial headquarters of numerous banks, insurance and other companies.

Peshawar is the main transportation hub of the province with an international airport (Bacha Khan International Airport), two railway stations and several bus terminals. The district is well connected to rest of the country through air, train and bus services.

The location of the district is well suited for disposing off all kind of agricultural products quite easily. Marketing facilities are available throughout the area for easy disposal of sugarcane, fruit, vegetables, maize and wheat. Farm to market roads are also available for easy transportation of farm products. Being the provincial capital, Peshawar City District has most of the administrative functions located here. Headquarters for most of the institutions are located here. That is why people from all over the province are attracted towards Peshawar. It is also a very important dry port particularly for Afghanistan. The same dry port can be used for central Asia if the law and order situation improves.

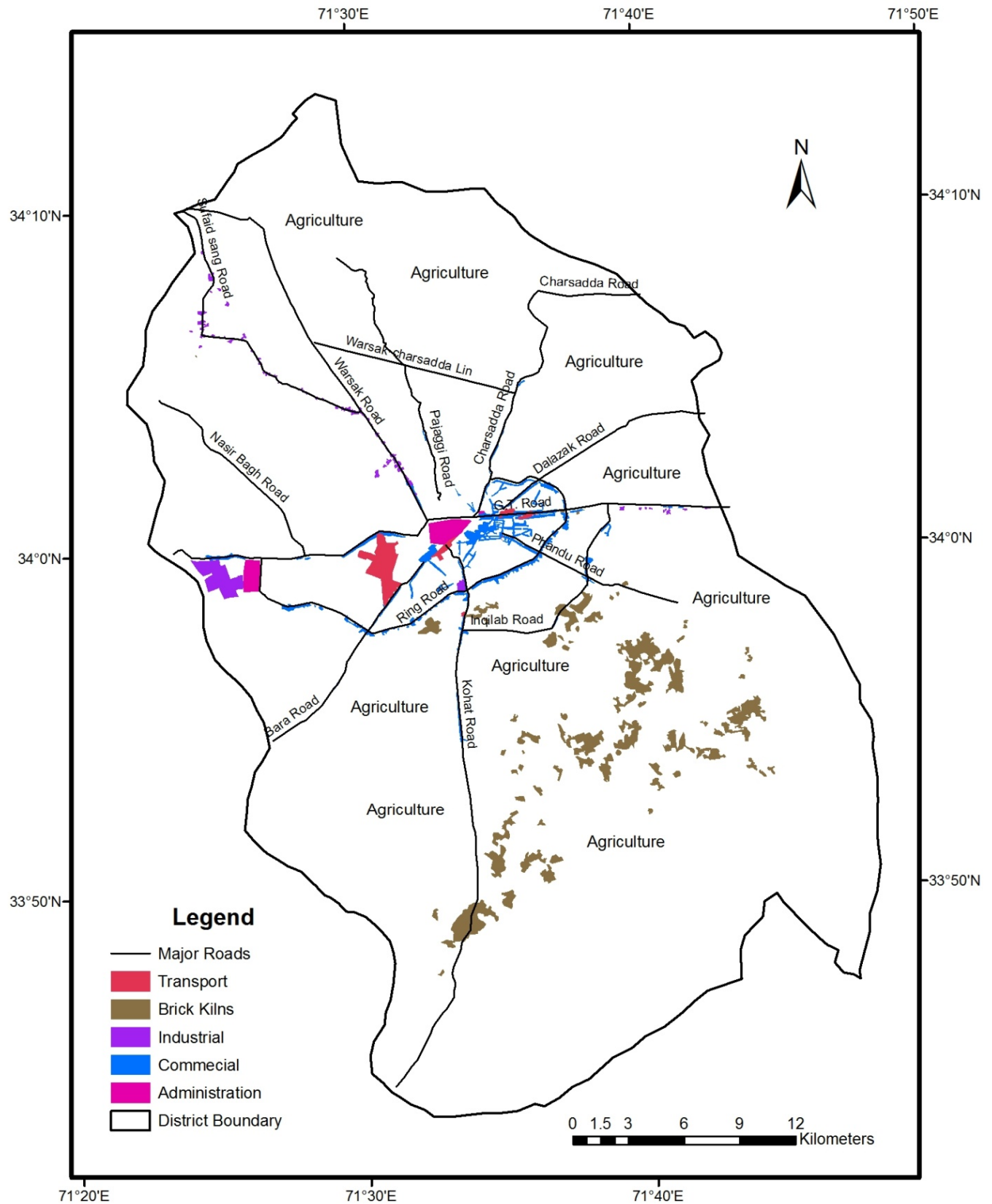


Figure 3.7 Peshawar City District: Economic Activities

A big chunk of land in Peshawar City District is flat and irrigated by canals as well as tube wells. Tube-wells are used for irrigation purposes in the northwest and southern part of the area. In the northwest, the canal irrigation is relatively expensive due to uneven topography of the area. In the south canal irrigation is supplemented by the tube-well to fulfill the water requirements of the crops especially at the tail end.

The City District is famous for producing both food and cash crops. The main food crops are wheat, maize and barley. The main cash crop is sugarcane. An important institution in the field of agriculture in the district is the Agriculture Research Institute, Tarnab located along the Grand Trunk Road about 16 Km from Peshawar city centre towards Nowshera (DCR Peshawar, 1998). The principal fruits are plum, peach, pear, apricot, watermelon, muskmelon, apple, guava, mango, persimmon and loquat. The principal vegetables grown in the district are turnip, carrot, spinach, tomato, cauliflower, cabbage, peas, radish and ladyfinger. (DCR Peshawar, 1998)

3.4.2 Administration

Since 2001, Peshawar district has been designated as City District, which consists of four towns and a cantonment. There are 92 union councils in the District. Political head of City District Government is Zilla Nazim and the District Coordination Officer (DCO) heads district administration.

Each Town has a Town Municipal Administration (TMA). It consists of a Town Nazim, Town Municipal Officer, and Town Officers with a team of other officers to assist the Town Municipal Administration. Functions of Town Municipal Administration include spatial planning (land use planning and zoning), provision and supervision of municipal services (sanitation, water, solid waste, traffic engineering, street lights, fire fighting, roads and streets, graveyards, maintenance of open spaces and parks) development control (building control and site development) in all four towns.

Town I forming heart of the city consist of old walled city and early nineteenth century expansion areas and new residential colonies developed around the old city (Fig. 3.7). It has very small agricultural land along its eastern side. It includes commercial hub of the

city like Chokyadgar and Qissa Khwani bazaar, Khyber Bazar, Shoba bazaar, as well as city railway station and new large bus stands. Important recreational facilities like Shahi Bagh, Arbab Niaz cricket stadium, Jinnah Park and Wazir Bagh are also located there. The largest hospital of the province, Lady Reading Hospital and important residential areas like Gulbahar, Sheikh Abad, Shaheen Muslim Town (Shah Dhand) Afghan Colony, Zaryab Colony, Nauthia Payan, Kotla Muhsin Khan, Kakshal and Wazir Bagh etc. also form part of this town as do some government colonies like Civil Colony, Dabgari Garden Colony and Civil Quarters. Town I is second largest in terms of population spread over 25 union councils, but smallest in terms of area.

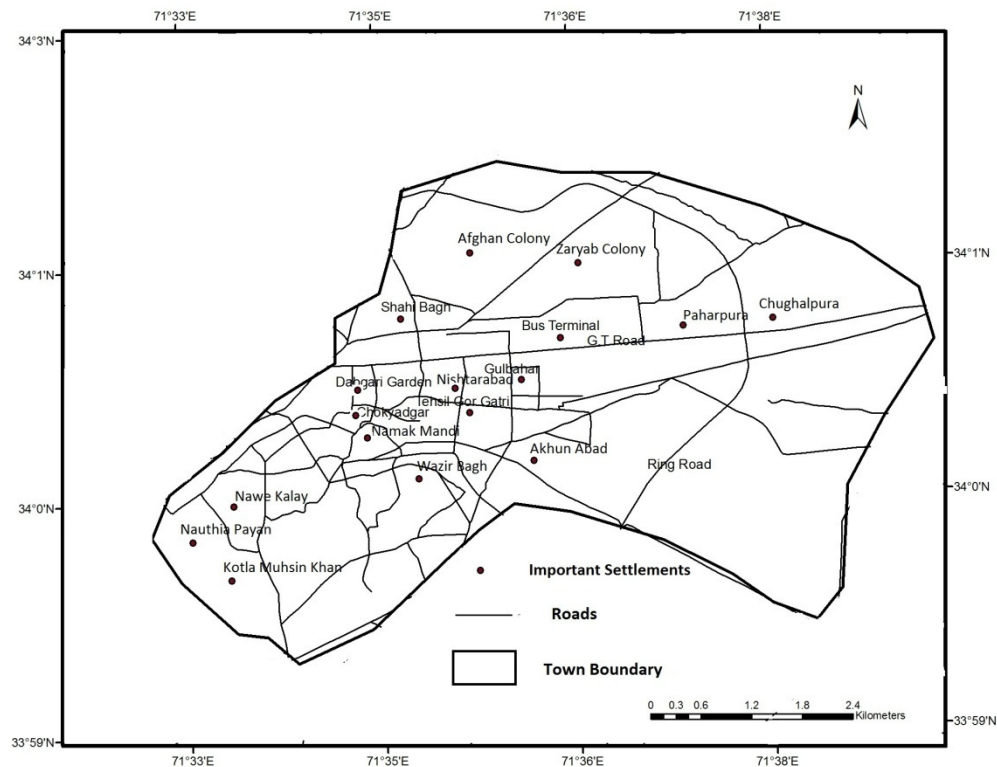


Figure 3.8 Town I

Town II is located in northern part of the City District, and accommodates many of the former rural localities of the district. It also has a major share of prime agricultural land of the City District. However, some industrial establishments such as marble factories are also located there. Besides, it also accommodates urban sprawl in the form of new housing developments. Important settlements of this town are given in figure 3.8.

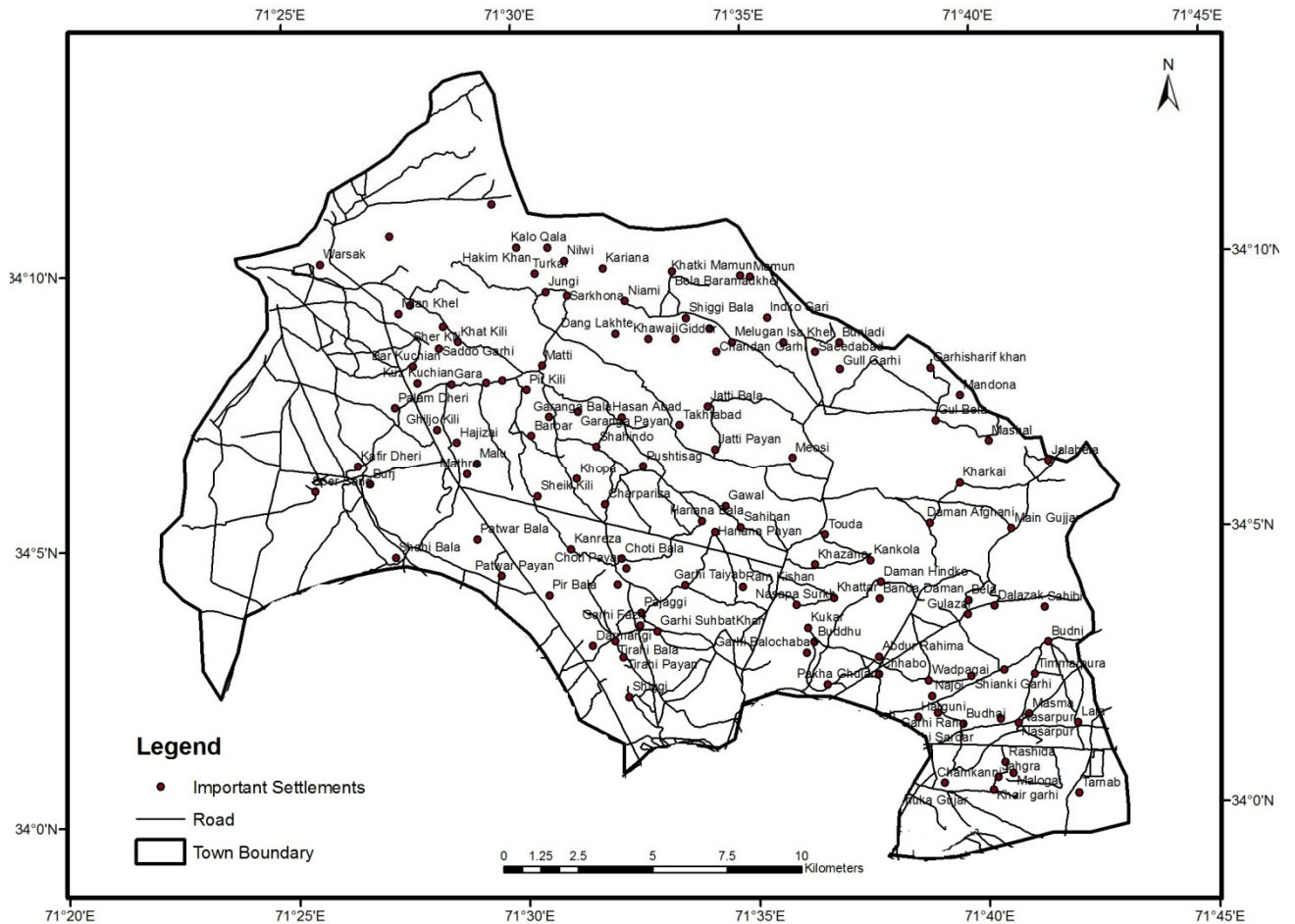


Figure 3.9 Town II

Town III is located in the western side of the City District. It has 21 union councils and contains important areas like Hayatabad, Regi Township, University Town, University Campus (largest educational complex of the province), engulfed old villages such as Tehkal Bala, Tehkal Payan, Achini Payan, Achini Bala, Pushtakhara, Naudeh Bala, Palosi and Mullazai. Largest industrial estate of the City District, Hayatabad Industrial Estate is also located in this town as do Karkhano Market. Agriculturally this town is less important compared to Town II as bulk of western part of it is barren land. The two planned townships of Peshawar were developed on this land.

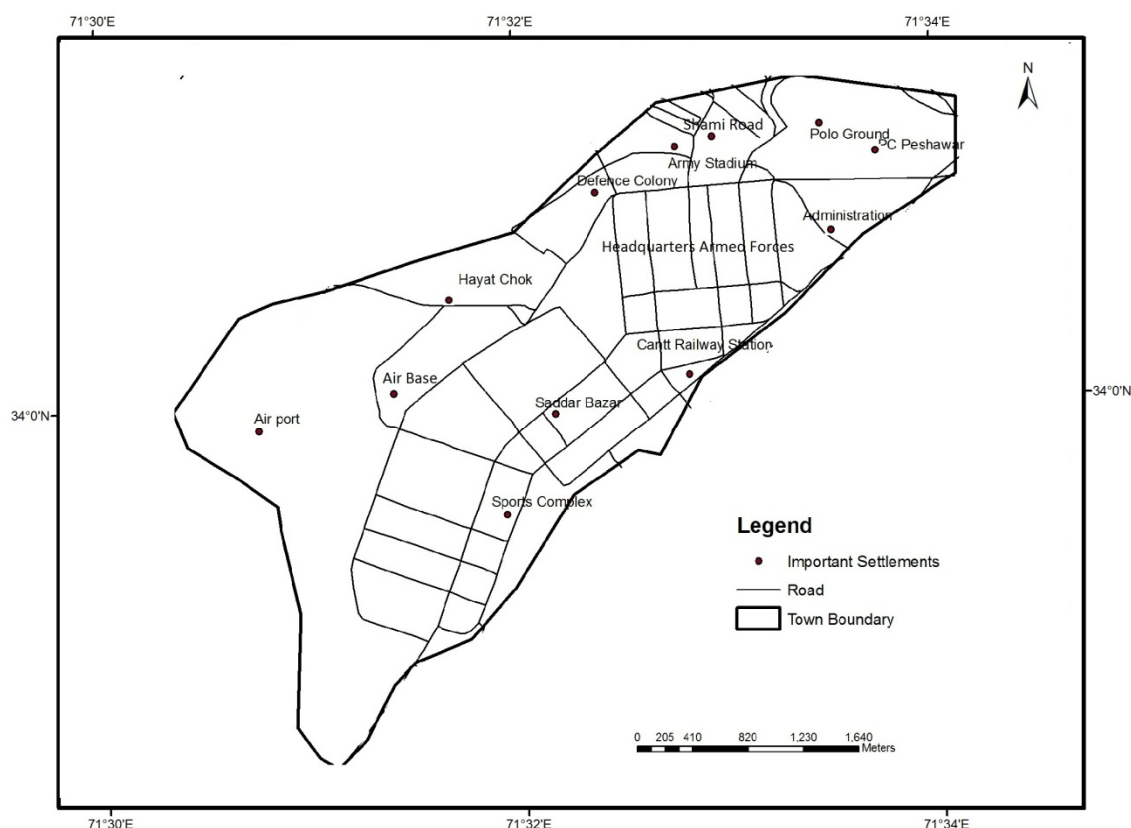


Figure 3.12 Cantonment Area

3.4.3 Demographic Profile

Peshawar City District is the largest urban centre in the province. Its population was over two million in 1998. Estimated population for 2010 was 3.05 million.

3.4.3.1 Spatial Distribution of Population

Town-wise population is given in the table 3.2 & Fig. 3.12

Table 3.2: Peshawar City District: Population by Town, 1998

Town I	Town II	Town III	Town IV	Cantonment Board	Total Population
508,090	537,138	475,558	435,540	68,740	2,025,066

Source: Election Commission of Pakistan, 2001.

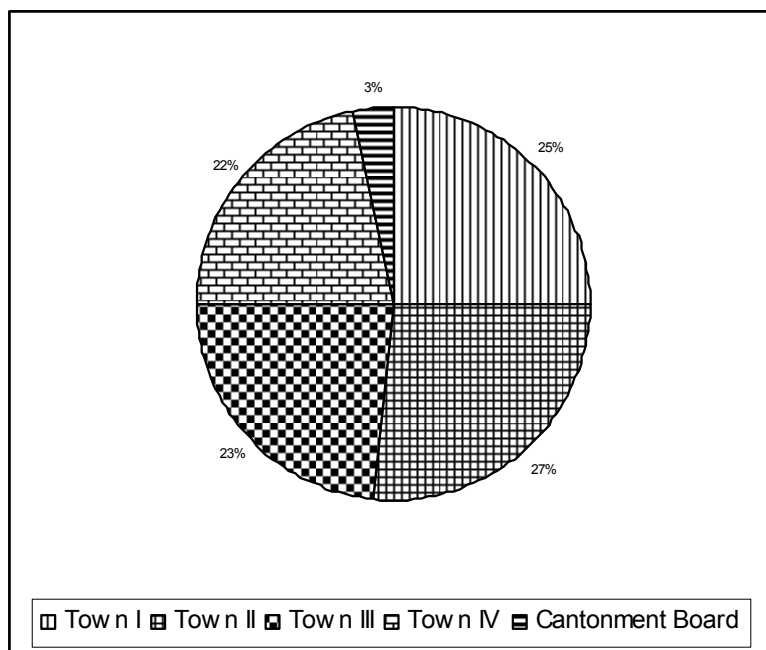


Figure 3.12 Town-wise Population, 1998 (percentage)

Town II is the most populous with a population of 537,138 in 1998. Town I follow it with more than half a million people. Together, Town I and II accounted for a population of more than one million.

Population density wise, Peshawar City District is the most thickly populated district of the province. However, the density is not even. It varies from more than 20,000 to less than 1,000 persons per square Kilometer in different parts of the city. Average density of population in Peshawar was 1,606 persons per square kilometer in 1998. Density of population is given in table. 3.3 & Fig. 3.13

Table 3.3 Peshawar City District: Town-wise Population Density

Population Density	Town I	Town II	Town III	Town IV	Cantonment Board
Persons/Km ²	20,210	1,257	2,702	707	5,468

Source: Election Commission of Pakistan, 2001.

It can be seen that town I is the most densely populated with only 2 percent area of the district but accommodating a quarter of the population. Average population density in town I was over 20,210 persons/ Km². Cantonment is the second most densely populated geographical part of the city with a population density of 5,468 persons/ km². Town II comes third in population density.

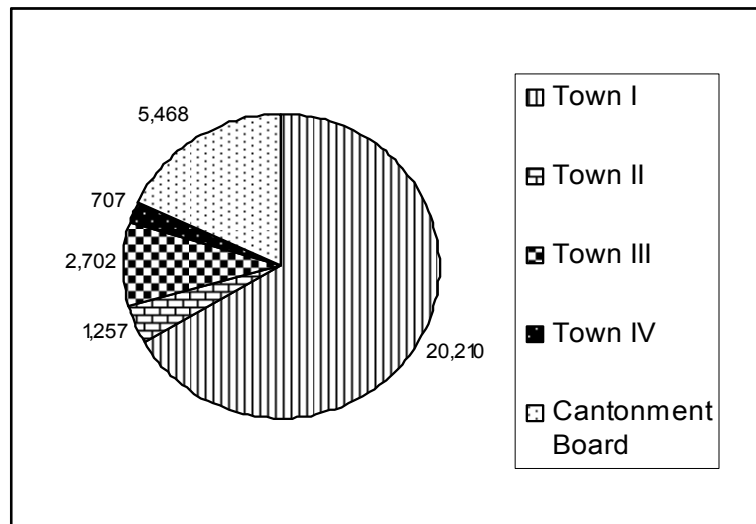


Figure 3.13 Town-wise Population Density, 1998 (persons/ km²)

Town IV is the most sparsely populated town. It covers 49 percent area of the city district but contains only 22 percent of population with an average density of only 707 persons per square kilometer. Union council-wise density of population is shown in Fig. 3.14. In southern parts of the district over large area, population density is less than 500 persons per km². Generally, union councils of town IV have much lower density than union councils of the other towns.

In extreme northern parts of the City District population density is also low although not as low as in town IV. Only in one union council i.e. Sufaid Sang the density is less than 500 persons per km². Majority of the union councils have population density between 501 to 1500 persons per km². As one moves towards city centre, population density increases reaching over 20,000 persons per km² in town I located in the centre.

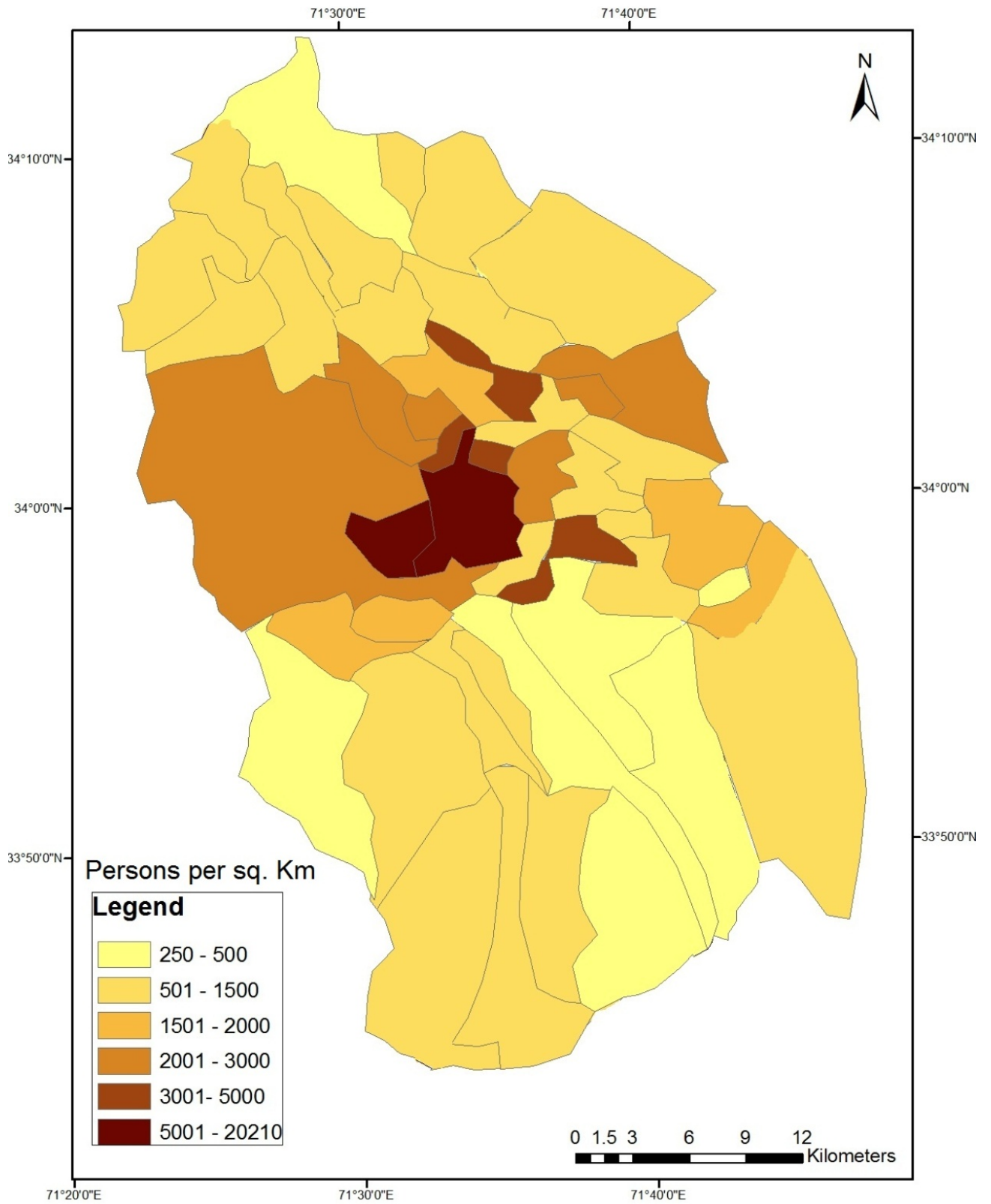


Figure 3.14 Peshawar City District; Population Density by Union Councils, 1998

3.4.3.2 Migration

Migration data suggest that Peshawar has always been the most attractive city for the migrants particularly from within the province. Out of the all reported migration data more than 50 percent in-migrants into the city were from within the province. It is followed by migration from the Federally Administered Tribal Area (FATA), which was over 12 percent (Table 3.4).

**Table 3.4 Peshawar City District:
Migrants from other provinces/ within province, 1998. (Percentages)**

Place of previous residence	Town II & IV	Town I & III
All areas	100	100
Sindh	0.03	2.23
Within province	46.55	51.14
Punjab	2.20	4.64
Balochistan	0.25	0.15
Islamabad	0.00	1.33
FATA	42.97	7.14
AJK	0.00	0.47
NA	0.00	0.29
Other countries	4.11	6.59
Not reported	3.88	26.03

Source: District Census Report, 1998.

Most of the migrants settled in the town III and I. However, migrants from FATA were mostly settled in town II and IV where they bought their own land to build houses and practice agriculture.

The above migration statistics do not show the number of Afghan refugees living in Peshawar. Since 1980 more than 500,000 Afghan refugees have also settled in Peshawar, which numbered more than the migrants who moved into the city from within the country. Impacts of such large-scale migration to the city district were enormous. A large number of these migrants settled on permanent basis, which increased demand for

housing in the city district with subsequent increase in the rents. It also put extra pressure on already overcrowded infrastructure. However, it also increased the labour force in all sectors particularly in brick kiln industries.

3.5 Conclusion

A study of environmental profile of Peshawar City District shows that there are no major physical constraints to the expansion of built environment, which is currently limited to a smaller part in the core. However, administratively the city cannot grow on the western side where much of the barren flat land exists because it is located in the tribal area. In the north and east of present built up area is prime agricultural land where encroachment is undesirable. The city has scope of expansion in the south but it is still an unattractive area because availability of infrastructure is comparatively low.

Peshawar City District is the largest metropolis of the province with varied population density which is very high in the core but reduces outward. Like any provincial metropolis Peshawar is a multifunctional city as an administrative, market, industrial, and transport centre. However, a large part of the city in the fringe is rural in character, with a large chunk of agricultural land. It is therefore important to study the changing character of urban agriculture along with other urban functions.

Chapter 4

DYNAMICS OF URBAN SPATIAL GROWTH AND PLANNING

4.1 Introduction

This chapter examines spatial growth dynamics of Peshawar City District since 1866, when the wall around the old city was consolidated. It is divided into six sections. After this brief introductory part, the next section highlights the expansion of administrative limits and built up area of Peshawar from 1866 onward with a major focus on recent expansion that took place after 1991. Much of this expansion was unplanned with the exception of two new planned townships of Hayatabad and Regi Lalma. Overall, the planning efforts were rather ineffective in controlling the urban sprawl that is the characteristic of the city today. The third section of this chapter, analyses the pattern of urban sprawl, as it evolved over time. The next section traces the causes of urban sprawl while its following section is devoted to policy and strategic options for improving the future urban development in Peshawar in the light of challenges faced by the City District. The findings of the paper have been summarized in the concluding section.

4.2 Spatial and Administrative Growth

The historic growth of Peshawar can be traced in four phases. The first phase lasted from early growth discussed in the previous chapter to the establishment of walled city. The second phase dawned with the emergence of Peshawar's twin city 'the cantonment' that was developed to accommodate the British Colonial Rulers, who captured Peshawar in 1848. It lasted till the independence of the country in 1947. The third phase beginning with independence continued up to the Soviet invasion of Afghanistan in 1979, which triggered a large-scale migration from that country to Peshawar. The tempo of refugee movement together with internal rural urban migration considerably enhanced the growth of Peshawar after 1981 that marks the most recent or fourth phase of massive developments in the city district.

4.2.1 Urban Expansion 1866-1947

Prior to coming of British in 1848, the city of Peshawar consisted of a walled city (Fig. 4.1a) with adjacent Bala Hisar fort. This area was inhabited from the Kushan times since 1st AD (Dani, 1995). The British colonial rulers did not add much to the indigenous city. The only exception was widening of some roads. The old city within wall covered 193 hectares of land, had a very dense population a radial pattern of road system. The city wall with 16 gates had an oval shape extending from northeast to southwest.

The colonial rulers added a military cantonment in 1866 to the west of the walled city (Fig 4.1b), where they maintained a large garrison to control the region. With the addition of cantonment, the administrative limits of Peshawar increased many fold (Table 4.1). It was the first major expansion in Peshawar Urban Area. The Cantonment had a gridiron pattern of roads and was the first planned expansion outside the walled city. The only major new addition to Peshawar after the development of cantonment during the second phase was the establishment of Islamia College in the early years of the twentieth century (Fig. 4.1c), which later became the nucleus of the present University Campus and a major growth point that pulled the growth of the city to the west. There was expansion in rural areas surrounding the city too (Fig. 4.1b).

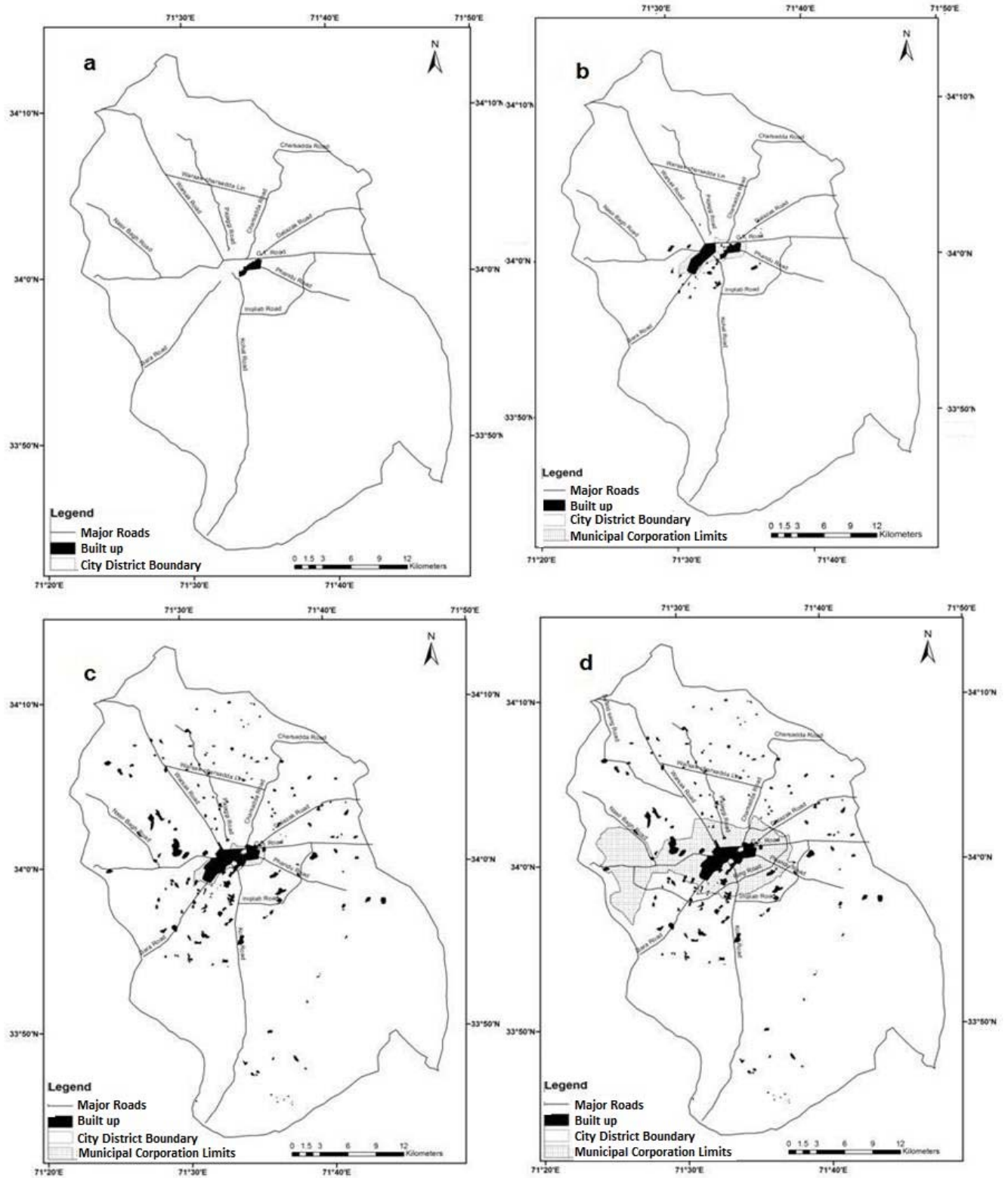


Figure 4.1 Peshawar City District: Spatial Growth (a) Pre 1866 built up area (b) built up area 1866 (c) built up area 1947 (d) built up area 1981

4.2.2 Urban Expansion 1947-1981

After independence from the British rule in 1947, Peshawar became the capital of the then North West Frontier Province (now Khyber Pakhtunkhwa). This resulted in an increase in the City's administrative and financial functions and promoted a relatively faster growth in built up area, which increased from about 2,853 hectares in 1947 (Fig. 4.1c) to 4635 hectares in 1981 (Fig 4.1d). During this period, (1947-81) expansion in built up area was at the rate of 52.6 hectares per year, which was more than double over the previous period. The expansion in built up area was also accompanied by a major boundary extension in 1981 (Fig. 4.1d), which resulted in expansion of urban administrative area of Peshawar to 11,100 hectares (Table 4.1).

Table 4.1 Peshawar: Expansion of Urban Area 1866-2009

Year	Area within Administrative Boundaries (ha)	As % of Present City District Area	Size of Built up Area within City District
Pre 1866	193	0.15	193
1866	919	0.72	919
1947	1,678	1.33	2853
1981	11,100	8.83	4,635
1991	11,100	8.83	7,182
2009	126,710	100	16,986

**Source: SPOT Image, 2009; GoNWFP, 2001; LANDSAT Image, 1991;
Toposheets of various dates**

Several new nuclei of development were initiated during this phase. Among these were University Campus, University Town, Hayatabad Township and two industrial estates at Kohat and Jamrud Roads. A number of peripheral villages such as Tehkal Bala, Tahkal Payan, Hazar Khwani, Nauthia, Landi Arbab Chughalpura, Sardar Garhi, Babu Garhi, Pahari Pura, Deh Bahadur, Malakander and Pakha Ghulam were also engulfed into expanding city. Residential expansion also started around the wall city and cantonment. Among the new residential areas were Nishtar Abad, Gul Bahar Colony, Sheikh Abad,

Zeryab Colony, and Faqir Abad in the East and Gulberg, Danish Abad, and Shaheen Town, Nauthia Jadeed etc. in the west.

A Master Plan was developed for Peshawar in 1965, covering the period 1965-85 to streamline the growth of the city. Among others, the Plan indicated the new potential growth boundary of the city (Fig. 4.2), as did the Structure Plan of 1986. Unfortunately, neither of these plans were approved or implemented and unplanned growth of the city continued particularly along the radial roads leading out of the city.

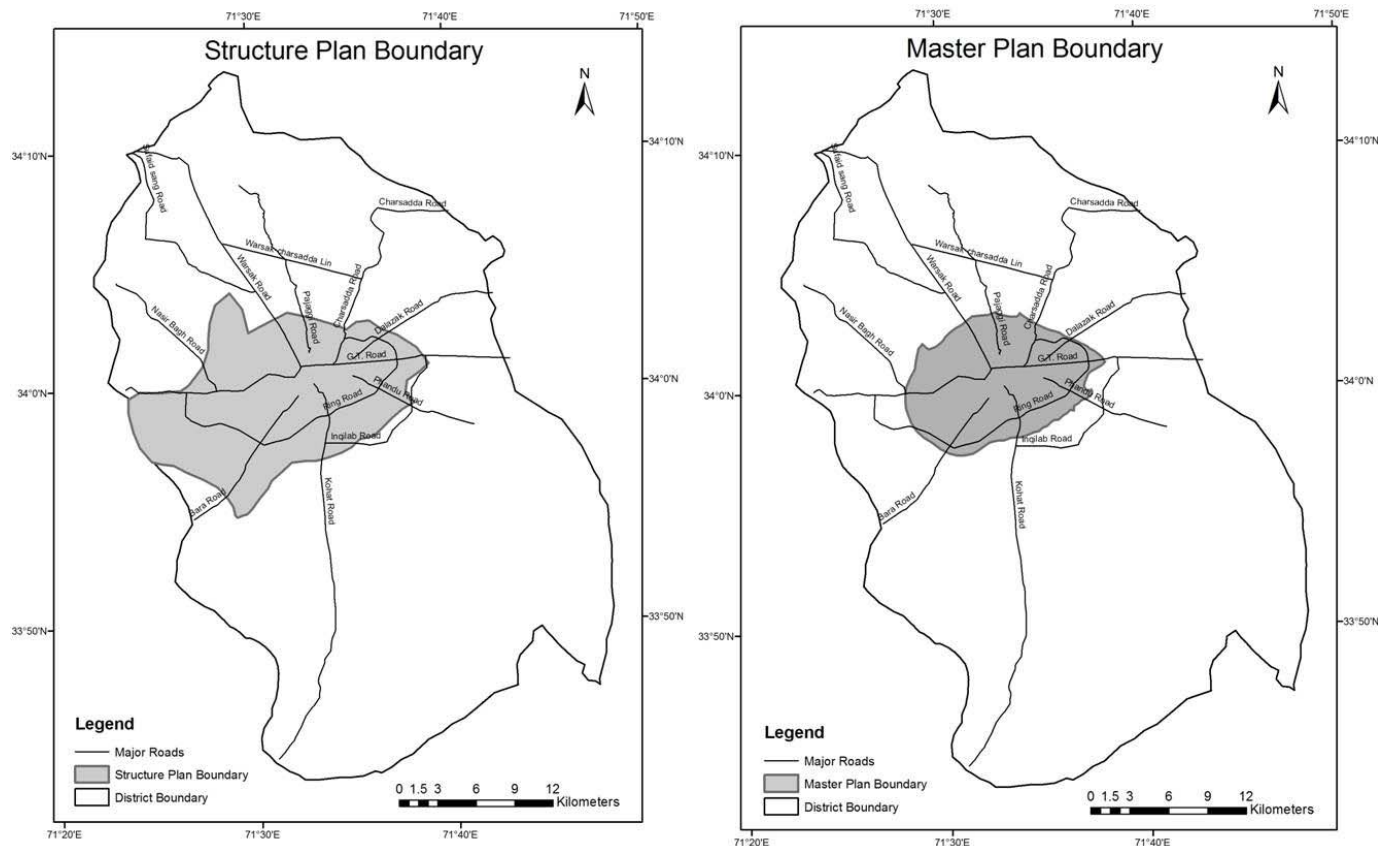


Figure 4.2 Peshawar City District: Physical Expansion Limit as Identified in Master Plan 1965-85 & Structure plan, 1986-2001

4.2.3 Urban Growth 1981-to date

The physical growth of Peshawar was quite high during the current phase (Fig. 4.3 a & b) compared to previous periods. Huge influx of Afghan refugees was the main contributor. The refugees settled not only within the main city but also in the fringe areas of

Peshawar. The result was that the built up area increased to more than one and a half time in just 10 years between 1981 and 1991 from 4,635 hectares to 7,182 (Table 4.1) accounting for an addition of 255 hectares of built environment every year. With the exception of Hayatabad, most of this expansion was unplanned. It not only continued along radial roads but also started rapid encroachment on prime agricultural land between radial roads in the east and north of the city.

The fastest growth in built environment of Peshawar (Table 4.1 and Fig. 4.3a & b), took place in the last twenty years compared to the previous decade, whereby it doubled, increasing at the rate of 545 hectares per year. The urban sprawl during this period also spread along new Ring Road built in this phase that attracted considerable development along its sides. The linear urban sprawl along the roads resulted in massive increase of traffic and enhanced congestion and pollution to an alarming level. The encroachment of prime agriculture land by urban sprawl also continued with its ramification for the food security.

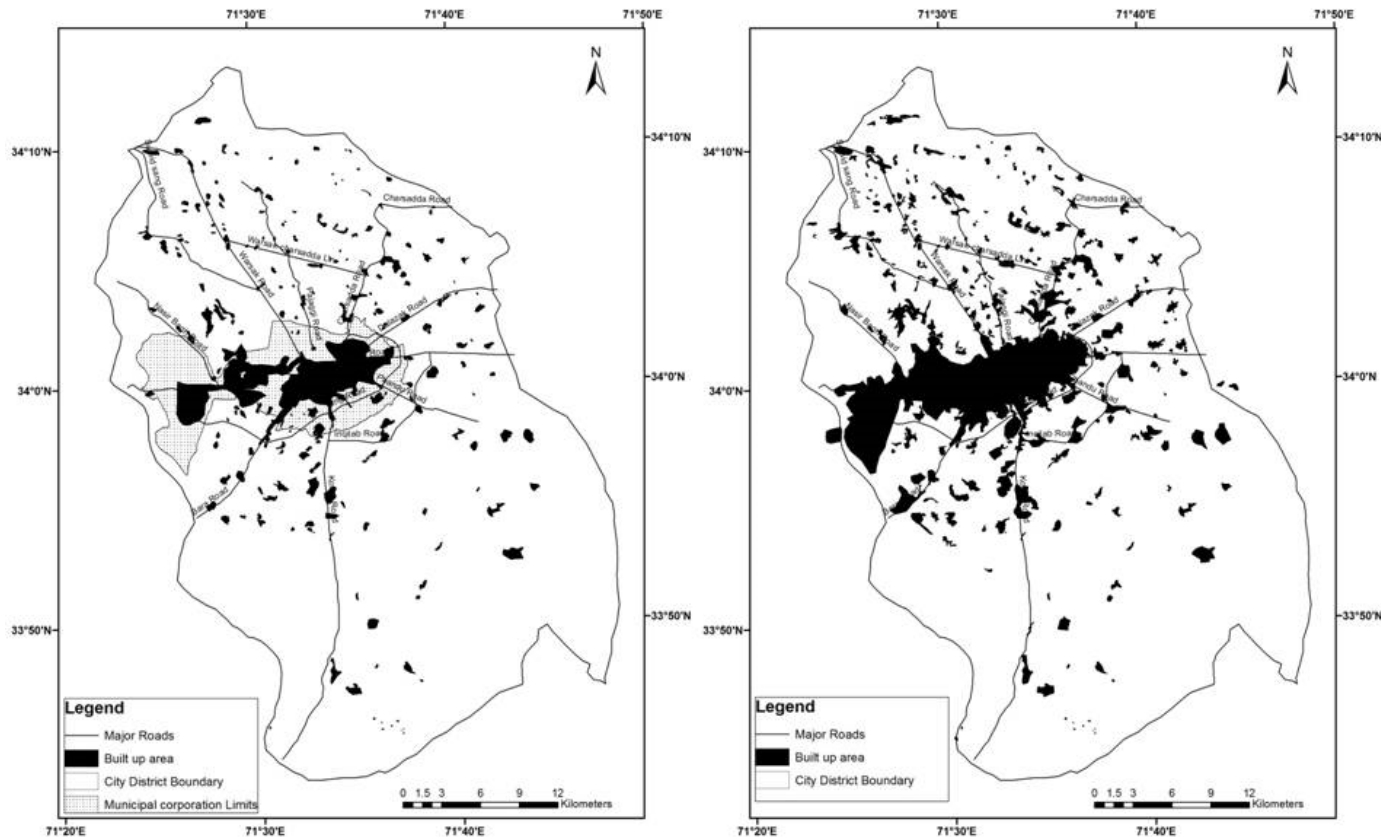


Figure 4.3 Peshawar City District: Spatial Growth 1991-2009

(a) Built up area 1991 (b) Built up area 2009

4.3 Patterns of Urban Sprawl

Urban expansion takes place either under objective planning, guided and regulated by development control or through spontaneous growth with unplanned isolated constructions, especially along the roadsides and in the city fringes. The later appears to be true for Peshawar, where urban sprawl has occurred due to scattered development of various types. Initially the growth in population of Peshawar was absorbed within the boundaries of the walled city or Cantonment area. Urban sprawl started gaining ground in 1960s with the development of ribbon sprawl or developments along the major roads radiating outwards from the city such as Grand Trunk Road, Kohat Road, Bara Road, Pajagi Road, Warsak Road, Delazak Road and Phandu Road. Rural agricultural land in the fringe was expected to check this elongated pattern of urban sprawl. However, inefficient planning and urban management not only failed to achieve this but encouraged speculators to encroach upon prime agricultural land. It also resulted in the development

of residential developments in the fringe areas in leap-frog fashion with minimum of facilities and all the harmful environmental and social consequences.

An important consequence in this regard was the development of varied land use association side by side whereby new disorganized residential extensions (except a few planned ones such as Hayatabad and Defense Colony), old villages, industry and commerce, city services and farming are not neatly sorted out into homogenous areas but intermingled in a random fashion (Fig. 4.4). The haphazard growth often resulted in the development of slums or undesirable residential areas with lack of services and amenities, piecemeal commercial development, and intermixes of conforming and non-conforming land uses.



Figure 4.4 Peshawar City District: Urban Sprawl is characterized by (a) Ribbon Developments along Radial Roads, (b) New Unplanned Residential Extensions (1-4), As well as Engulfed Villages (5 and 6)

An example of residential extension that has become a slum is Shaheen Muslim town (Shah Dhand). Located just outside the walled city in the east, it was built on low-lying dissected land that provided clay to former brick kilns. Construction of drainage system in this low level land was extremely difficult, as a result the neighborhood developed without proper drainage system. With expansion in the population of the area numerous problems emerged, the most important being stagnant water. Roads and streets in the area are also narrow, irregularly laid out without any geometric pattern (Fig. 4.5). The area

also lacks in urban services. Creating such urban extensions/places without adequate urban infrastructure is a “recipe for slums.”

There are two main reasons for the development of such urban extensions. The first and foremost is the non-availability of good low-cost land for housing. As a result people are forced to occupy lands that are relatively less safe such as abandoned brick kilns with lands in depressions created by kilns, where sanitation development is very expensive. The second being the lack of access to affordable financing by the poor that can enable them improve their housing. Like Shah Dhand or Shaheen Muslim Town, there are some other areas on Kohat Road that have also been developed on abandoned brick kilns.



Figure 4.5 Shaheen Muslim Town: An Urban Residential Extension without Adequate Infrastructure is ‘A Recipe for Slum’

A number of old villages have also been engulfed in the growing urban sprawl. These villages, which were once surrounded by agricultural lands, have lost most of them (Fig. 4.6). Structure of these villages is an example of unplanned growth. Usually the streets and roads do not have a geometric shape and are often unpaved. Many houses in these villages are katcha with poor infrastructure facilities and lack proper sanitation and waste disposal. After the designation of City District, many fringe villages have also become part of Peshawar. These villages are surrounded by agricultural land, which need protection from the onslaught of urbanization.



Figure 4.6 Old Village of Tehkal Payan Engulfed into the Peshawar during its Growth

Major examples of industries that have intermingled into urban sprawl are brick kilns and marble factories. In view of rising demand of bricks for construction, their number increased from 400 in 1991 to over 1000 at present while their area enhanced (Fig. 4.7) from 850 hectares to about 2400 hectares over the same period. They are primarily located in the southern part of the City District because of availability of clay in the area. Marble industry has also flourished with construction boom. The area under it increased from 85 hectares in 1991 to 132 hectares at present. They are concentrated in the northern parts of the city district along Warsak and Sufaid Sang roads (Fig. 4.7), because of availability of raw marble in nearby area.

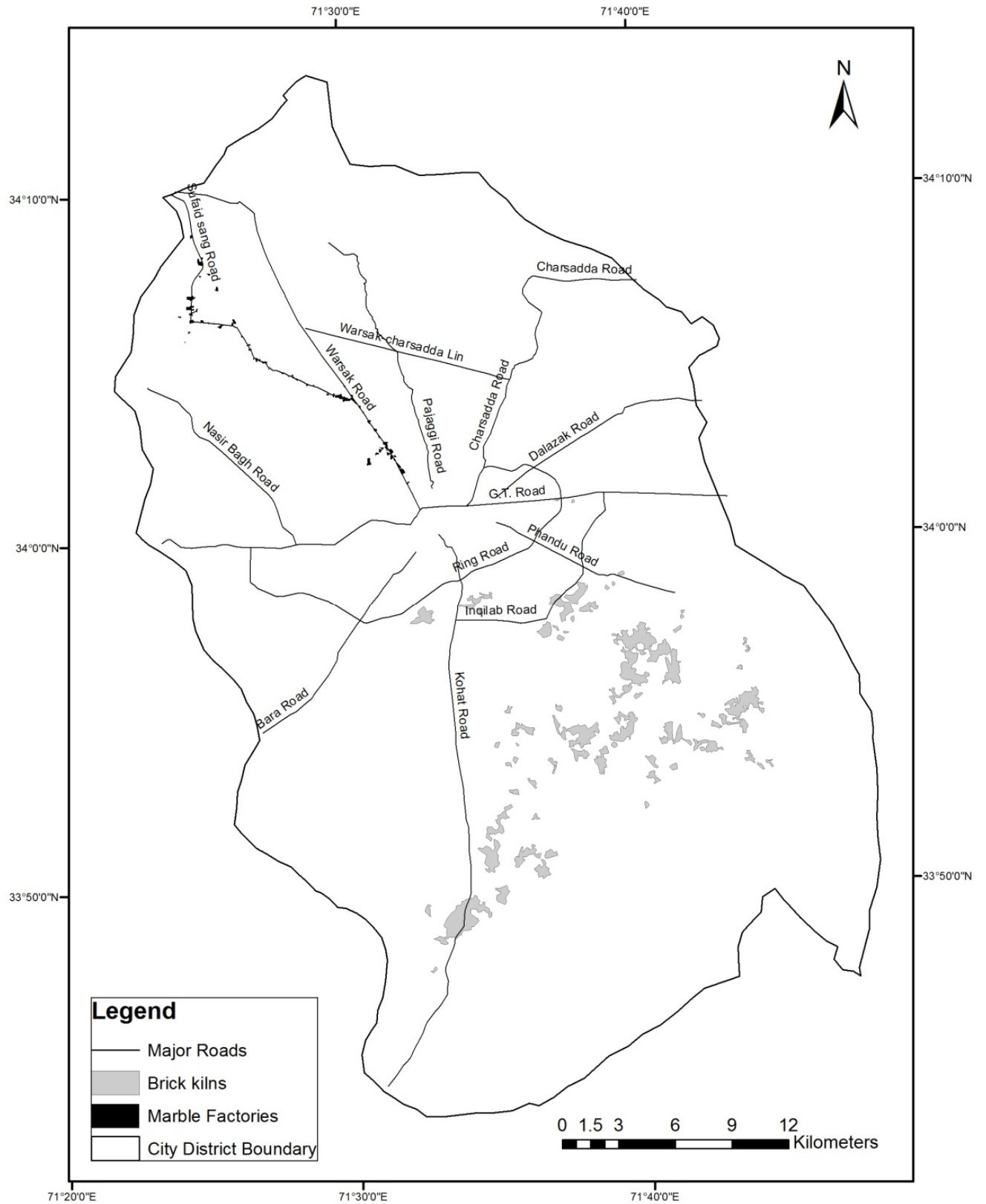


Figure 4.7 Location of Brick Kilns and Marble Factories in Peshawar City District, 2009

4.4 Causes of Urban Growth and Sprawl:

The comprehension of growth dynamics of urban sprawl demands an analysis of their causes. Several scholars have discussed the general causes and catalysts of urban growth and sprawl (Barnes et al, 2001; Brueckner et al, 2000; Burchfield et al. 2006; Ewing et al, 2008; Rahman et al, 2008; Squires 2002,). The main causes of urban sprawl in case of Peshawar can be broadly grouped into three categories - economic and market; demographic and social; and planning, institutional and legal.

4.4.1 Economic and Market Forces:

Economic growth enhances urban sprawl because it leads to rising per capita income that increases the demand for new housing as well as more housing space (Black, 1996; Bhatta, 2009; Giuliano, 1989). In Peshawar, this encouraged developers to speedy construction of new housing units and other infrastructure without proper planning and coordination among developers, governments and individuals. Another serious outcome of this scenario of rapid construction was speculation, manipulation of real estate and fast increase in the price of land. The real estate business has been dominating the economic scene during the last three decades in Peshawar city district. With lax development control, the developers have been channelizing the growth pattern of the city according to their will. One result of this is ribbon sprawl for commercial expansion along all major roads leading out of the city. It has also encouraged some estate agents and property-owners to hold back parcels of lands from the market resulting in discontinuous and fragmented urban sprawl.

4.4.2 Demographic and Social:

Demographic factor is one of the principal causes of urban sprawl in Peshawar. Official statistics show growth rate at over 3 percent (Table 4.2) and this excludes Afghan Refugees, which means that the growth rate is even higher in recent years. Such high growth rate obviously puts heavy pressure on demand for housing and encourages urban sprawl.

Table 4.2 Peshawar City District: Population Growth 1951-2012

Years	Population size (000)	Intercensal increase (%)	Cumulative increase (%)	Annual growth rate
1951	391	-	-	-
1961	529	35.29	35.29	3.08
1972	807	52.55	106.39	3.70
1981	1113	37.92	184.65	3.89
1998	2019	81.40	416.37	3.56
2012 (Estimated)	3051	51.11	680.3	3.56

Source: Population Census Organization

Lack of affordable housing (those, which can be purchased by the median income group) has also been one of the most important causes of urban sprawl in Peshawar. Non-availability of space inside the walled city and cantonment compelled citizens to construct their residences in the periphery of the city. The housing units are also very small in the heart of the city or near it. Therefore, inhabitants have moved towards urban fringe for extra living space. Since the land values outside the city are low, therefore, people have been able to purchase more land and build relatively larger houses in the urban sprawl.

4.4.3 Planning, Institutional and Legal:

Lack of consistent policies and planning has also caused urban sprawl in Peshawar. In the absence of implementation of master or local plan, the stakeholders both public and private particularly real estate developers have taken their own decisions about the future growth of the city. This freedom eventually resulted in the development of uncontrolled and spontaneous urban growth and sprawl. Further, the Public regulation have not strictly controlled and regulated the fringe areas of Peshawar as strictly as the walled city, cantonment and Hayatabad. Therefore, many developers and individuals have taken the opportunity to construct housing units and colonies to suit their own need contributing to urban sprawl.

The satellite towns of Hayatabad and Regi Lalma were planned to absorb overspill population of the city and curtail urban sprawl. Only Hayatabad was developed among the two, but it proved to be a drop in ocean in the wake of massive growth in population and demand for land for residential and other purposes. Hayatabad Township was designed and planned by Peshawar Development Authority (PDA). After British cantonment, it was the first major planned expansion of the city. The Township developed in grid iron pattern and consisted of seven phases (Fig. 4.8).

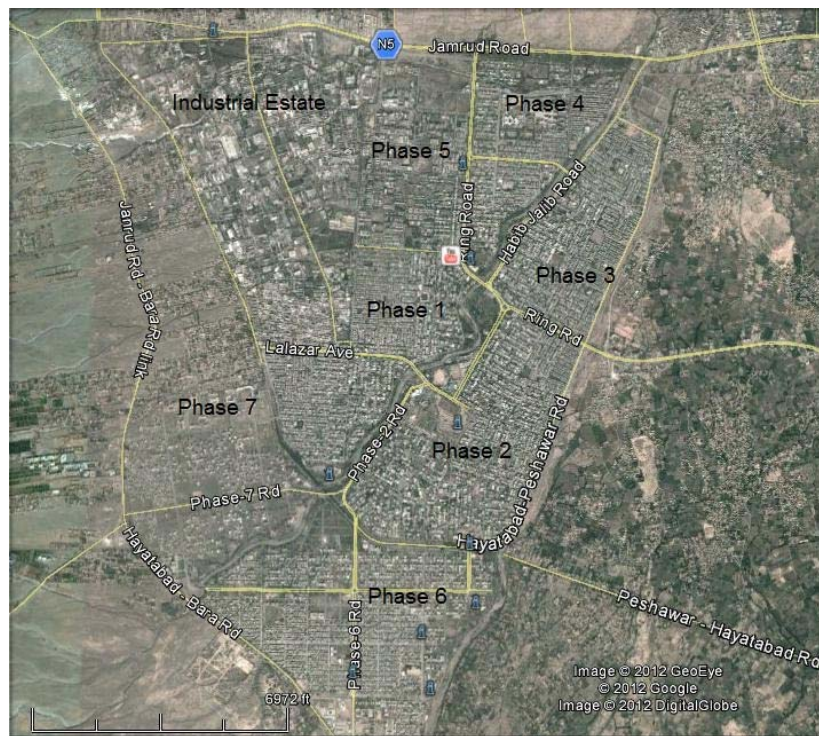


Figure 4.8 Hayatabad Township

Legal disputes over land tenure problem have delayed implementation of Regi Lalma project resulting in outgrowth of built up area leaving the undeveloped land inside the city. The tenure system of the area was so complex that it took over 10 years to settle the disputes.

4.5 Policy and Strategic Options:

The past planning practice in Peshawar, as discussed above has failed to achieve the objectives of appropriate urban development. The resulting urban sprawl is a serious

threat to the sustainable development of the city, as once unplanned built up areas are proliferated, irreversible changes take place. Sprawl also has serious implications in economic, social as well as environmental terms. Economically, it is leading to inefficiency in energy use and causing inflated infrastructure costs. Socially, the deficit in urban infrastructure and services is eroding livability, productivity and efficiency of the city. Environmentally, degrading urban ecology is apparent in the encroachment of agricultural land, development of substandard housing, slums and shantytowns, deteriorating air and water quality and inadequate management of waste.

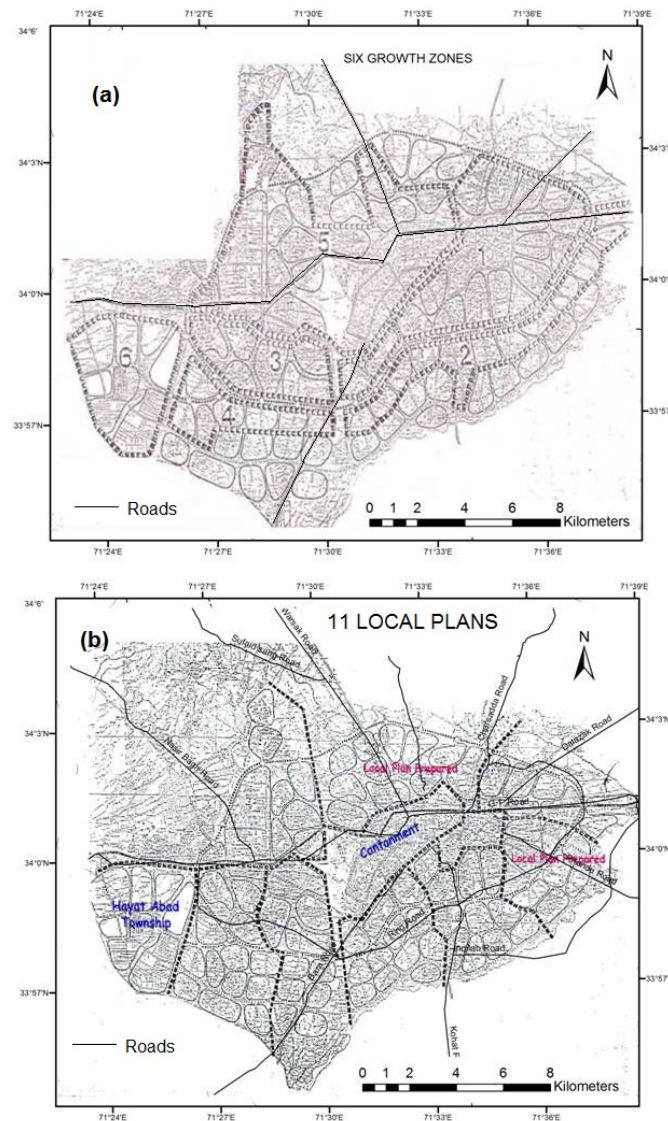
The key factors responsible for failure of planning relate to lack of political will and institutional and policy failures. These have led to excessive delays in plan preparation and approval process, poor institutional set up, lack of coordination among government agencies, failure to generate adequate funds and legal and regulatory shortcomings.

4.5.1 Implementation of Urban Development Plans

Effective spatial development plans help guide appropriate expansion of cities and implement wise land-use policies. Two spatial development plans were prepared for Peshawar - a Master Plan (GoNWFP, 1965) and a Structure Plan (GoNWFP, 1986) for the proper development of the city. They were not effective because none of them were approved. The first plan instead of suggesting measures to stop harmful urban sprawl, concentrated on speedy provision of necessary infrastructures and services. Hence the unauthorized urban sprawl continued throughout the plan period 1965-85.

The Structure plan prepared in 1986 for the period 1986-2001 attempted to abate many shortcomings of the previous 1965-86 Master plan for the city. It pointed out, “there is no significant program of development of any scale, which could provide housing for lower income families.” As a result, much of the urban growth of Peshawar had been piecemeal and of poor construction, and also occurred in a haphazard and uncontrolled manner. Provision of necessary infrastructure in these areas was becoming significantly difficult and expensive (GoNWFP, 1986; P. 12). The plan designated 6 growth zones and 11 local planning units in Peshawar urban area (Figs. 4.9 a & b) and proposed the development of

local plans urgently for critical districts, where rapid growth was taking place. It also identified the problems of the private land development control particularly in terms of layout of the plots and building densities. The Plan emphasized the locational influence of public services provision rather than on detailed controls. It stressed on ensuring potential flexibility, ease of implementation and costs as well as benefits.



**Figure 4.9 Peshawar: (a) Growth Zones and
(b) Local Development Areas Identified in 1986 Structure Plan**

The implementing agency of the Plan did not succeed in getting its approval. Hence many good proposals for the development of the city could not be implemented and the city continued to expand in its own fashion towards its peripheries in the absence of

planning control. While, it is imperative to investigate the reasons for non-implementation of these plans; it is also necessary to prepare and implement a new spatial development plan in order to control urban sprawl, promote the best land use, have judicious distribution of urban infrastructure and services and their smooth management.

4.5.2 Institutional Arrangements for Urban Planning and Management

The City District Government, Town Management Administrations (TMAs), Peshawar Development Authority, Cantonment Board and Defense Housing Authority are the institutions that are responsible to make urban development plan and schemes for urban service delivery in their own jurisdiction. This compartmentalized institutional system has resulted not only in fragmented planning and development and wastage of resources, but also failed to check urban sprawl. Lack of coordination among these planning and development agencies in Peshawar is just the tip of the iceberg. The problems become more acute at micro level when it comes to land use management, housing development, service delivery, slum formation and control of urban sprawl.

This problem of fragmented management can be removed through placing development departments under one agency. This agency could be City District Government (CDG) or a new autonomous authority. Whether CDG or a new autonomous authority, if created, should have a separate unit to look after the affairs of the urban fringe so that constant monitoring and feedback is ensured and unauthorized developments are checked. An effective system of coordination in development is essential whether for success in checking urban sprawl or streamlining overall urban growth.

4.5.3 Legislation and Regulation

Legislation and regulation are important tools and instruments for planning of urban areas and to regulate their growth and associated sprawl (Saxena, 2008). It is evident from the case of Peshawar that implementation of a development plan without effective legislation is very difficult if not impossible. The preparation of first Master Plan of Peshawar was carried out under the Municipal Administration Ordinance (MAO) 1960 (GoWP, 1960). However, this Ordinance was silent about plan sanctioning and implementing authorities

as well as plan revision. The MAO 1960 was replaced by the Provincial Local Government Ordinance (PLGO) 1979 which had similar provision for the development of a master plan but did not made it mandatory for local government to develop or implement it.

The Local Government Ordinance (LGO) 2001 (GoNWFP, 2001) superseded the PLGO 1979. Under the new Ordinance, Peshawar City District was created and divided into four towns, with a City District Government (CDG) at district and Town Management Administration (TMA) at town level (Fig. 4.10). The towns were further subdivided into Union Councils (UCs). All the TMAs were required to prepare a master plan for the area within their jurisdiction and get it approved from their respective Councils. However, provisions for master planning also existed as one of the function in the Act of Peshawar Development Authority (PDA). Initially under the LGO 2001, PDA was made part of the District Government but as a separate entity. The LGO 2001 dissolved in 2010. However, the institutions of CDG, TMAs and UCs are still functioning. It is now generally believed that after the 18th Amendment in the Constitution, urban development would now be the responsibility of local/city governments. Therefore, it is essential to give greater administrative and financial autonomy to the local government at Peshawar for playing an effective role in city development.

Moreover, as recommended in Planning Commission's Task Force Report on Urban Development (GoP, 2011), a thorough review of the existing laws and procedures would be needed for suitable amendments, where necessary. Evaluating the efficacy of planning and zoning regulations, development standards, land registration/transfer procedures, rent control laws, property taxation, etc. would be important. It has been noticed that the flaws in the regulatory framework have severely constrained land supply and abnormally raised its prices given the strong demand for businesses and residences (GoP, 2011) in urban sprawl.

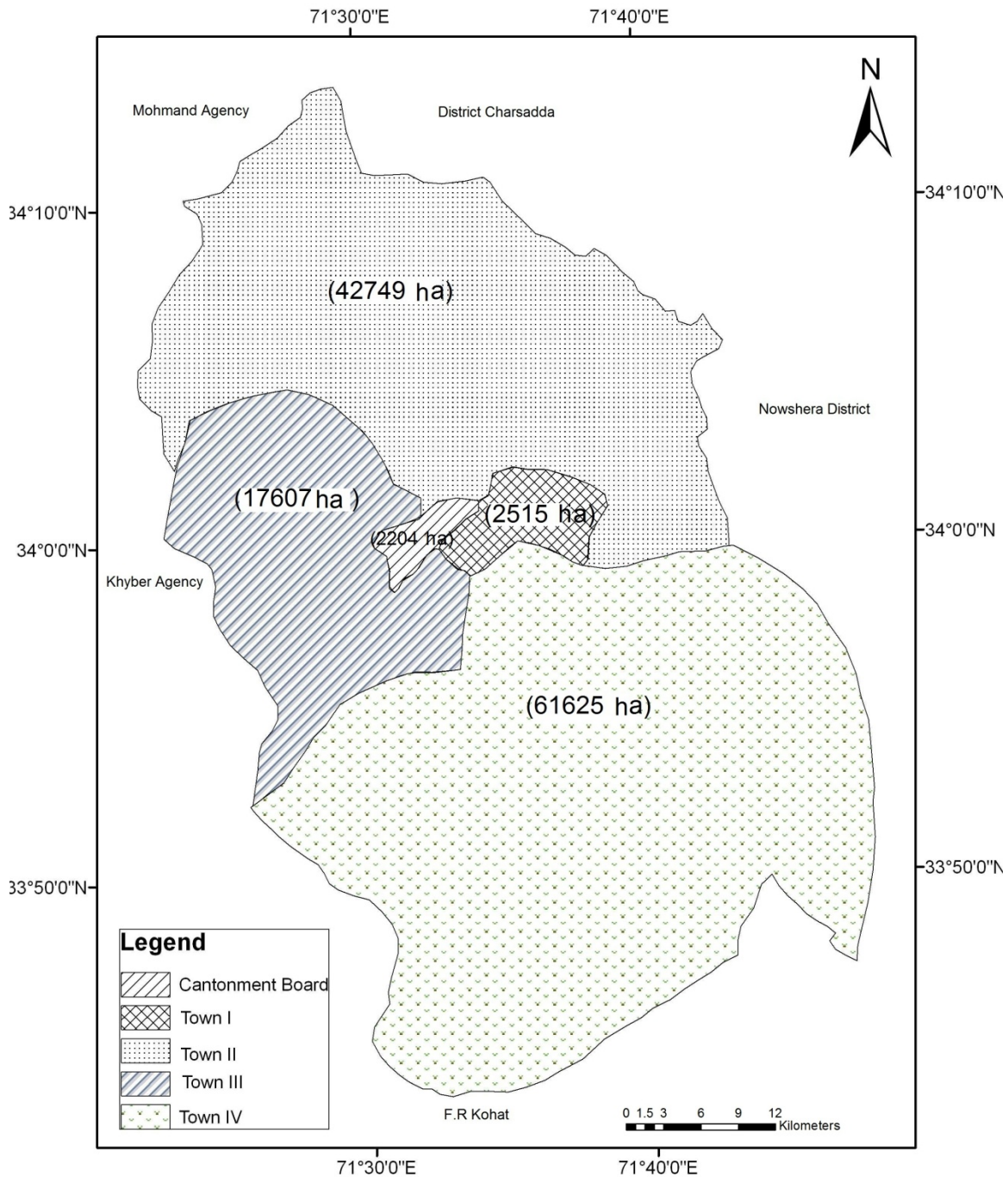


Figure 4.10 Peshawar City District, Towns

4.5.4 Growth Monitoring and Smart Growth Audit

Growth monitoring through remote sensing and GIS provide important tools that can provide information to the planners and the decision-makers on the state of development and the nature of change in the urban milieu (Nigam, 2008; Angel et al, 2007; Sudhira et

al, 2004; Lata et al, 2001). This can enable the planners to effectively regulate, manage and guide the urban development process.

Smart Growth Audit is a technique by which a community, city, or region can evaluate how well its existing policies and planning practices meet a set of defined "smart growth principles or standards." These may include neighborhood livability; better access, less traffic; thriving cities, suburbs, and towns; shared benefits; lower costs, lower taxes; preserving open space etc. (Guilbeau, 2008). Five basic steps are followed in Smart Growth Audit as given in Figure. 4.11

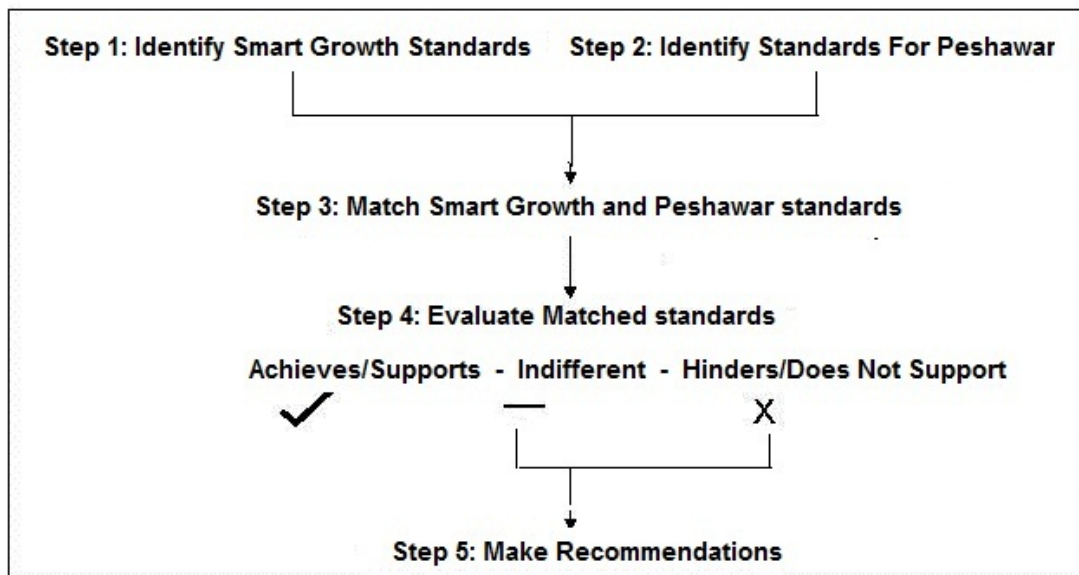


Figure 4.11 Basic Steps in Smart Growth Audit

Finally, government intervention would be needed at higher level (Federal/ Provincial) towards enhancing institutional capacity of local government, regulating urban property market and prices of urban real estate; imposing restrictions on premature conversion of agricultural land and taxes on land transfer to check speculation.

4.6 Conclusions

Prior to the British rule, Peshawar was a comparatively small walled city. The first major and planned expansion took place when the British added cantonment to the west of the walled city. With the passage of time, development of built up area also started outside

the walled city and Cantonment. After independence Peshawar became provincial capital, which gave impetus to urban growth in the city. The urban expansion became rapid with the influx of Afghan refugees in the city after Soviet invasion of Afghanistan in 1979. Annual expansion of built up area increased by more than three times from just 52.4 hectares per year during 1947-1981 period to more than 250 hectares per year between 1981 and 1991. This expansion rate further increased to 545 hectares per year after 1991.

Urban expansion in Peshawar resulted from spontaneous growth with unplanned isolated constructions, especially along the roadsides and in the city fringes. The urban sprawl first set its foot in 1960s along the major roads radiating out of the city and cantonment. It then started expanding in a leapfrog fashion encroaching upon agricultural lands in the fringe with minimum of facilities and all the harmful environmental and social consequences. It led to the emergence of varied land use association whereby new residential extensions (except a few planned ones such as Hayatabad and Defense Colony), old villages, industry and commerce, city services and farming intermingled in a random fashion. The haphazard growth often resulted in the development of slums or undesirable residential areas with lack of services and amenities, piecemeal commercial development, and intermixes of conforming and non-conforming land uses.

The main factors responsible for the development of urban sprawl in Peshawar can be grouped into three categories - economic and market; demographic and social and planning, institutional and legal. Economically the growth in income enhanced housing demand and encouraged developers to undertake fast construction of new housing units and other infrastructure without proper planning. A serious outcome of this scenario of rapid construction was speculation, manipulation of real estate and fast increase in the price of land. High demographic growth rate at over three percent also put heavy pressure on demand for housing and encouraged urban sprawl. In the absence of implementation of master or local plan, the stakeholders both public and private particularly real estate developers took their own decisions and contributed to urban sprawl.

The key factors responsible for failure of planning relate to lack of political will and institutional and policy failures. Poor institutional set up, lack of coordination among

government agencies, inadequate funds and legal and regulatory shortcomings were other constraints in the way of plan preparation, approval and implementation. Sustainable growth of Peshawar and success of future planning endeavors including control of urban sprawl in the city will hinge upon alleviation of these problems.

Chapter 5

LAND USE DYNAMICS

5.1 Introduction

Peshawar City District, as seen in the previous chapter saw unprecedented change in its built up area during 1991- 2009 period resulting in urban sprawl and an increasingly dispersed pattern of urban-generated residential development within peri-urban areas. This chapter analyses the spatial and temporal aspects of land use in Peshawar city district and their socioeconomic and environmental consequences. The chapter has been divided into five sections. After this brief introduction, the next section discusses the present land use and urban spatial Pattern or morphology of the city district. The third section examines the dynamics of land use change between 1991 and 2009. The fourth section discusses the factors that are responsible for the land use change and their policy implications. Finally, the findings of the chapter are summarized in the concluding section.

5.2 Land Use and Urban Spatial Structure

5.2.1 Land Use

The spatial distribution of land use is a reflection of underlying human processes and influences the ecology of urban environment (Redman, 1999). Humans modify their environment, with often increasing the fragmentation and creating smaller patches of landscape through land use changes particularly in the urban fringe. In order to check this and promote systematic growth of Peshawar, spatial planning policies have sought to achieve a ‘physical consolidation’ of the urban Peshawar with its rural fringe through extension of the boundary of the city district in 2001. However, no land use plan has emerged as yet in order to give a practical shape to this effort of physical consolidation. The current size of land use types in the Peshawar city district are given in Table 5.1 while their spatial distribution is shown in Figure 5.1.

Table 5.1 Peshawar City District: Land Use, 2009

Type of Land use	Area (Hectares)	Percentage
Residential	15,991	12.62
Industrial	426	0.33
Brick Kilns	2,360	1.86
Commercial	970	0.76
Transport	465	0.37
Open Space	784	0.62
Graveyards	1,070	0.84
Farming	72,712	57.4
Rangeland	23,208	18.3
Barren land	3,664	2.90
Water Bodies	5,060	4.0
Total	126,710	100

Source: SPOT Image, 2009

It can be seen from the table that three fourth areas under the boundary of city district consist of farm or range land. In the built up area, as expected, the residential land use dominates, followed by industrial use (inclusive of brick kilns). The commercial area comes next. The spatial distribution, as expected, shows a concentration of built up area in the centre. Irrigated farming is primarily on the outskirts in the north and east, while dry or rain fed farming is dominant in the south. All the rangelands are located in the southern part of the city district. A pattern of urban sprawl is apparent from patches of residential areas or brick kilns dispersed throughout the farmland.

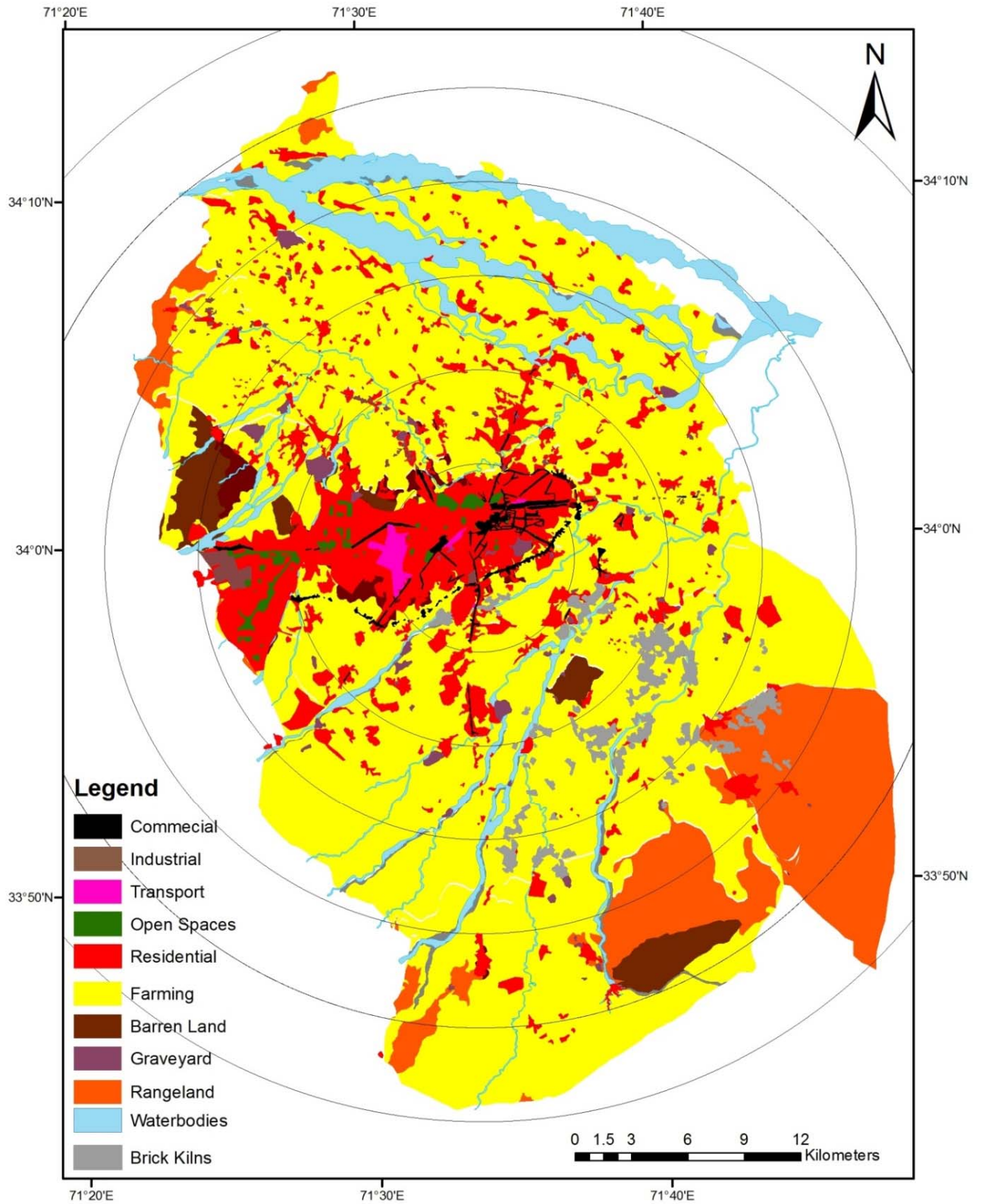


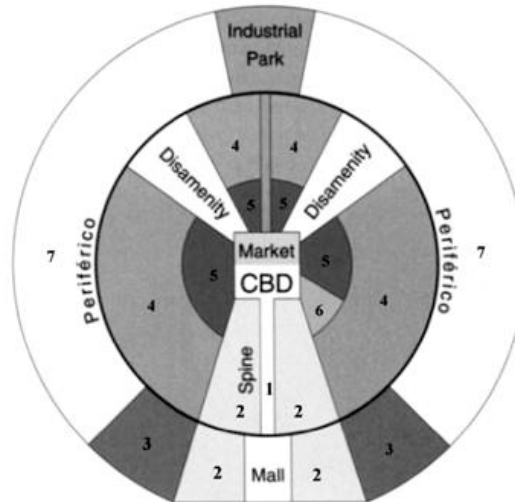
Figure 5.1 Peshawar City District: Spatial Distribution of Land Use, 2009.
 (The circles have been drawn at 5 kilometers interval from the city centre)

5.2.2 Urban Spatial Structure

Basic data on land use helps in understanding the city structure. Scholars have strived to describe urban spatial structure and its change over time using such data. For example the concentric zone theory of Burgess (1925) explains urban spatial pattern as concentric rings of different land uses with a central business district at the core. The sector theory of Hoyt (1939) perceives concentric zone pattern modified by transportation networks into segments or wedges of residential clusters radiating from the centre. The multiple nuclei theory (Harris and Ullman, 1945) describes urban pattern formed by multiple centres of specialized land use activities.

Some models of cities in developing world have also been advanced (Armstrong et al, 2007; Waugh and Bushell, 2001; Lowder, 1986; Ford and Griffin, 1980). They highlight a central concentration of commercial activity along with a number of residential neighborhoods and a close association of the indigenous elite with the commercial area. The educated and professional elites, on the other hand, just like Western privileged class of the society have been shown to have moved out to neighborhoods in the peri- urban areas (Lowder, 1986). The migrants and poor unlike their Western counterpart do not occupy the areas near the core of the city, but appear to form shantytowns either in the outer fringes (Ford and Griffin, 1980, Fig. 5.2) or in hazard prone areas, lacking city services (Lowder, 1986). The morphological model of Asian port cities shows a multiple nuclei pattern (Fig. 5.3), with a core, which may be an original village or a traditional commercial area or a modern commercial area.

In South Asia, a morphological analysis based on land use in Calcutta showed pattern of concentric zones, while literacy and ethnic patterns depicted a sectoral form (Ananthakrishnan, 1998). Similarly the Griffin Ford Model for cities in Latin America showed a centralized pattern. The centre of the city was the CBD or Market with the wealthy living in the inner city and in a sector extending along a commercial spine (Fig. 5.2). Poorer people, on the other hand occupied the squatter zone at the periphery of the city.



1. Commercial
2. Elite Residential Sector
3. Middle Class Residential
4. Zone of in situ Accretion
5. Zone of Maturity
6. Gentrification
7. Zone of Peripheral Squatter Settlements

Figure 5.2 Griffin Ford Model of Latin American Cities
(Source: Ford and Griffin, 1980)

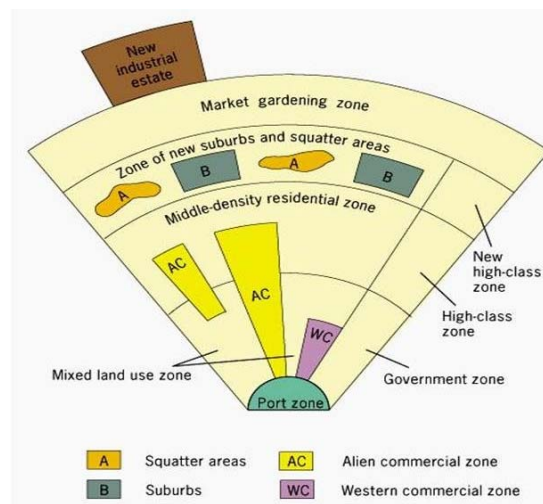


Figure 5.3 A Generalized Model of Land Use in the Large South East Asian City
Source: McGee (1969)

The urban spatial pattern for contiguous built up part of Peshawar city district unlike its many counterpart cities does not show a concentric or sector pattern. It is more a multiple nuclei city due to many historical, physical and social factors. In terms of historical evolution, the city evolved from a number of nuclei such as the walled city, the cantonment, university campus and town, Hayatabad Township etc. In physical terms it showed a tendency to extend westward where the land was flat but less suitable for agriculture. However, westward extension is reaching its limit because of the city's boundary with tribal area in that direction. The following map (Fig. 5.4) shows the urban spatial structure of Peshawar.

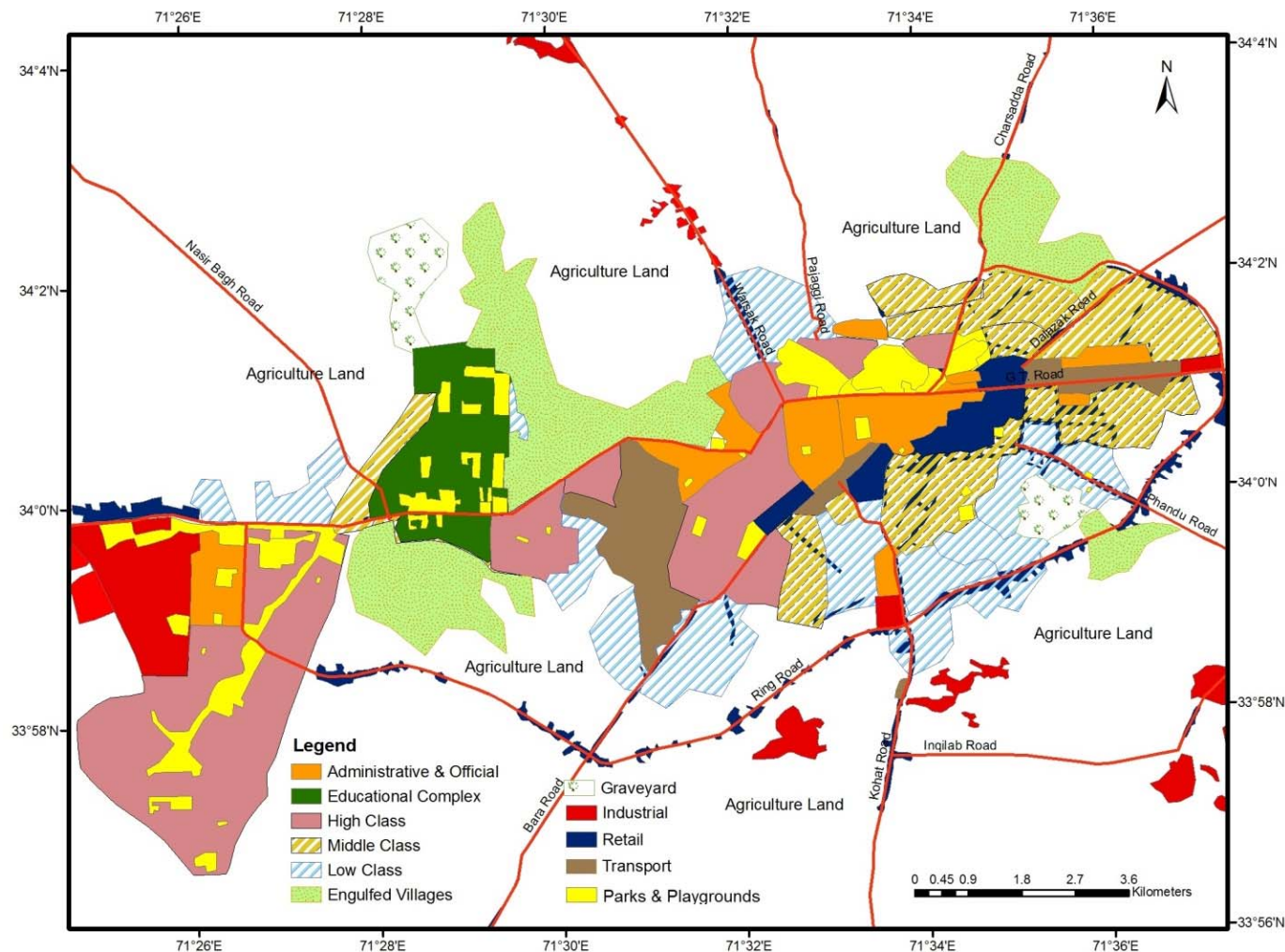


Figure 5.4 Peshawar City District: Spatial Structure Depicts Multiple Nuclei

The City District has the following major nuclei

1. Main commercial hub of the city is located in the old city, which serves as Central Business District (CBD) for Peshawar. In the central part of the city there is a concentration of commercial land use in the core. However, along the streets radiating from this core the ground floor is used for commercial purposes and top floors for residential. Another commercial hub originated in the cantonment, which became rival CBD. The structure of this dual character CBD is interesting. The old city central market is characterized by specialized traditional bazaars and markets as their very name depict i.e. Bazaar masgran (copper ware market), Bazaar-e-Bazazan (cloth market), Mochi Lara (shoe market), Meena Bazaar (Ladies market for embroidered dresses and accessories), Bazaar e Batairan (birds bazaar), Bazaar Zargaran in Andersher (goldsmith and silversmith market), Namak Mandi (salt market) etc.
2. The CBD of Cantonment serves the elites and has modern shops and offices (Fig. 5.4) including Deans Plaza, which houses as many as 500 shops, offices, a hotel and a marriage hall. The Cantonment CBD is a small retail centre compared to the old city CBD it has gained greater importance over its rival for two reasons. Firstly because its retail outlets cater for elites and secondly because of better traffic situation and parking facilities. In addition to the dual character CBD, new retail facilities and modern shopping plazas are emerging rapidly on the Khyber Road connecting cantonment to the University and beyond to Hayatabad.
3. Karkhano market is another commercial nucleus which serves as outlying business centre of Peshawar city district where most of the imported items are marketed. People from Peshawar as well as other parts of Pakistan come here for shopping.
4. High class residential areas (Fig. 5.4) are located inside the cantonment and fringes of the city. Hayatabad is located at the western fringe. The cantonment houses official high class residential area of ruling elites. Defense colonies at its fringe also house elite's private residences. Similarly, Shami road and University

- town are high class residential areas of the city district. Residences in the University town, however, are transforming rapidly into offices and commercial Guest houses.
5. Industries are located at different places in the city. They are mainly concentrated in three areas of the city i.e. Hayatabad industrial estate, Kohat road small industrial estate and along Warsak road.
 6. Middle class residential areas are concentrated mainly in and around the walled city i.e. Gulbahar, Nishthar Abad and to the north i.e. Zaryab Colony, Faqeer Abad and Afghan Colony. Most of them were developed with the improvement in security after independence. Although not planned to optimum they have comparatively wide roads with fair living conditions.
 7. Low class residential areas are located at the periphery of the city in low lying areas or depressions formed due to extraction of clay for brick kilns that have now been abandoned. Shaheen Muslim Town (*Shah Dhand*), Akhunabad and Bahadur Kalay are examples of such areas. They were developed and occupied by the poor segment of the society because the land values here were very low. Living conditions are pathetic due to insanitary conditions, congestion and very narrow and winding roads. The occupants of these areas are daily wagers or very small vendors selling fruits, vegetables etc.
 8. Transport terminals form other nuclei of the city district. They include bus terminals located at the periphery of the city i.e. new bus stand along GT road in the east and Kohat bus stand on Kohat road in the south. Another small transport terminal is located on Charsadda Road. The airport is located at the western fringe of the cantonment. Besides, there are two railway stations one located in the city and another in the cantonment with a huge dry port which meets the requirements of the province as well as neighbouring Afghanistan.
 9. Engulfed villages form other nuclei in the city. Originating as independent entities, they have merged into the city during its expansion. Some of them are large villages like Tehkal Payan, Tehkal Bala, Hazarkhani, Palosi etc. They

- accommodate substantial population of the city. Although experiencing change, most of them still maintain their typical village structure till today.
10. Official administrative institutions exist in several clusters in the city district. The largest one is in the cantonment (Fig. 5.4), which houses the secretariat of the provincial Government, provincial assembly, high court and Supreme Court, Governor house, chief Minister House etc. Another nucleus of government institutions is located in Hayatabad, where one full phase i.e. phase V has been allocated to government and private institutions.
 11. University campus on the west serves as a huge educational complex hosting a number of educational institutions like University of Peshawar, Engineering University, Islamia College University, Khyber Medical College, Agricultural University and Pakistan Forest Institute.

5.2.3 Land use Gradient:

The urban spatial pattern of a city, no matter how it is formed, is bound to affect physical, ecological, and socioeconomic processes within its boundaries and beyond. Understanding the relationship between the spatial pattern of urbanization and processes affecting it therefore demands further analysis of city's structural characteristics. Hence, in this study, integrated gradient analysis has been carried out to quantitatively characterize the urbanization pattern in the Peshawar City District and relate the urban morphology to ecological and socioeconomic processes.

Concentric circles at 5-kilometer intervals were drawn for this purpose from the city centre to assess the changes in land use pattern as one move outward to the fringe. Thus, percentages of different land uses in each of the identified five zones from A to E (Fig. 5.1) were calculated and are shown in table 5.2.

Table 5.2 Peshawar City District: Land Use Gradient
(Figures indicate percentages)

Land use	Zones of 5- Kilometer Width from the Centre to Periphery									
	A		B		C		D		E	
	1991	2009	1991	2009	1991	2009	1991	2009	1991	2009
Residential	35	65	18	28	16	20	4	5	2	3
Industrial	1	1	1	1	1	2	1	2	1	1
Brick Kilns	0	0	1	2	4	6	2	3	<1	< 1
Commercial	9	11	3	4	1	1	1	1	<1	<1
Transport	4	5	1	1	1	1	<1	< 1	<1	< 1
Open Spaces	6	6	2	2	1	1	<1	< 1	<1	< 1
Graveyards	1	1	1	1	1	1	1	1	1	1
Farming	42	9	67	55	60	64	45	65	30	35
Rangeland	0	0	<1	<1	9	<1	33	11	47	41
Barren land	<1	<1	2	2	2	2	5	3	10	10
Water Bodies	2	2	4	4	2	2	9	9	9	9
Total	100	100	100	100	100	100	100	100	100	100

Source: SPOT Image 2009 & Field Survey

Table 5.2 indicates that most of the built up area is located in the inner circle or zone A. However, as one moves progressively outward from the city centre percentage of farm and rangeland increases while the proportion of built up area is reduced. Thus in the innermost zone A, over 80 percent area is built environment while only 9 percent is farmland. Conversely, over 75 percent area in the outer zone is farm or rangeland while only about 5 percent area is under built environment. A comparison of situation for 1991 and 2009 indicates that in the inner zones, the built up area is rapidly encroaching upon agricultural land. For example the farmland covered as much as 42 percent area of zone A in 1991, but by 2009, it had reduced to 9 percent. Conversely, the built up area in zone A has enhanced from 49 to 82 percent. In zone B again the farmland has reduced from 67 to 55 percent, while the built environment enhanced from 24 to 36 percent. In zones C, D and E, while the farmland is being lost to built environment, new areas are also being brought under farms as can be seen in table 5.2.

A further analysis of land use gradient for built up area in terms of residential, commercial and industrial and transport uses along with parks and playgrounds is presented in Fig. 5.5.

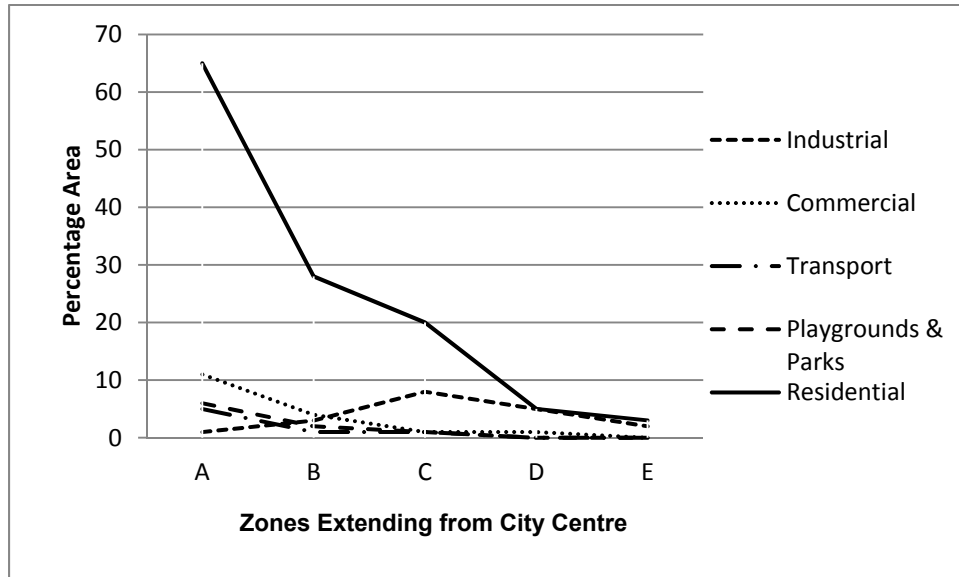


Figure 5.5 Land Use Gradient (a)

Commercial activities in Peshawar are spread over many places. Most of them are located in the inner city region with main commercial hub in the old city and a twin commercial centre in the cantonment area. Industries and Brick kilns are mostly located in the third and fourth rings (Zones C & D). Brick kilns are concentrated in zones B, C and D (Fig. 5.5). Parks and playgrounds decrease as one move out of the city centre.

The distribution of farm and rangeland as described earlier gradually increases with increasing distance from the city (Fig. 5.6). At a distance of about 25 kilometers from the centre the most dominant land use is farmland or rangeland.

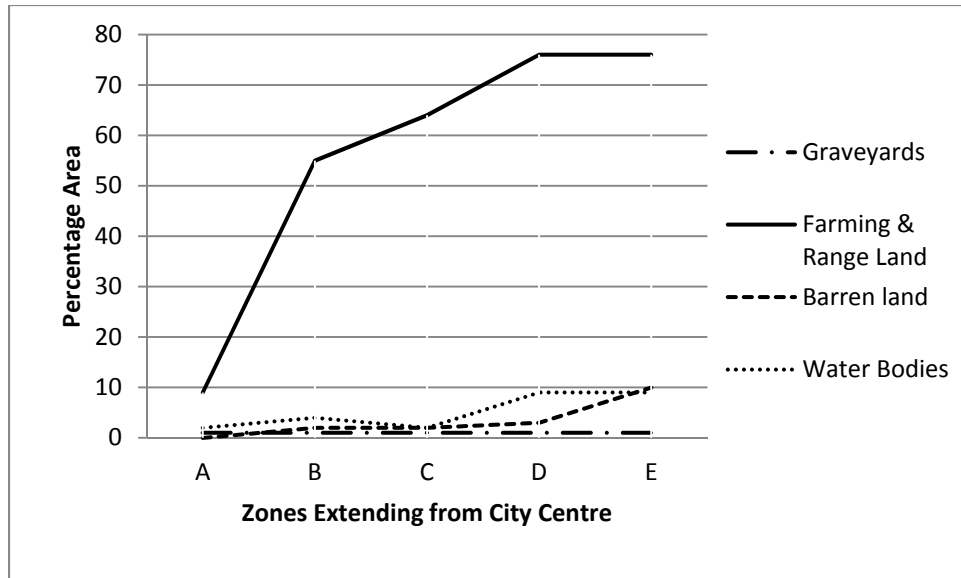


Figure 5.6 Land Use Gradient (b)

Similarly, as the distance increases the percentage of range and barren land also rise. This pattern of land use pattern partially follows the classical model of Von Thunen. Barren land and rangeland is mostly concentrated in the southern and western parts of the city, where due to lack of irrigation and unsuitable topography, farming is not possible. Most of the water bodies (primarily rivers) are located in the north of the city at some 15-25 kilometers distance from the centre.

5.3 Land Use Dynamics

This section deals with change in land use pattern over time and causes of these changes in Peshawar city district. Quantitative changes in land use over 1991- 2009 period are indicated in table 5.3.

Within built up area residential use increased from 6,138 hectares in 1991 to 15,991 hectares in 2009, an increase of more than two and a half times. Residential land use constituted 92 percent of the built up area in 2009. Residential area is most compact in town I, where land is extremely expensive. Here double and triple storey residential buildings are found. The roads and streets are very narrow causing congestion and traffic jams especially during the peak hours.

Table 5.3 Major land uses in Peshawar City District, 1991 & 2009

Land use	1991		2009		Change1991-2009	
	Area (ha)	Percent Share	Area (ha)	Percent Share	Area (ha)	Increase (%)
Residential	6,138	4.8	15,991	12.6	9853	61.6
Industrial	366	0.3	426	0.3	60	14
Brick Kilns	970	0.8	2,360	1.9	1,390	58.9
Commercial	628	0.5	970	0.8	342	35.2
Transport	465	0.4	470	0.4	Negligible	1
Green Space	680	0.5	784	0.6	104	13.3
Graveyards	1,070	0.8	1,070	0.8	-	-
Farming	51,957	41	72,712	57.4	20,755	28.5
Rangeland	39,654	31.3	23,208	18.3	-16,446	-41.7
Barren Land	19,722	15.6	3,664	2.9	-16,058	-81.4
Water Bodies	5,060	4	5,055	4	Negligible	-
Total	126,710	100	126,710	100		

Source: LANDSAT, 1991, SPOT image 2009 & Land Revenue Record, 1991-2009

Industrial land use has also seen substantial increase particularly because of enhancement of brick kilns, which have not been clubbed with industries and presented separately in table 5.3. It can be seen that the area under brick kilns has more than doubled. Brick kilns are located on the most fertile soil. It is another threat to farming land in Peshawar city district. With increasing population and betterment of economic conditions the housing construction has enhanced and the demand for baked bricks has increased.

Commercial land use including both retail and offices such as banks, insurance companies etc. are also multiplying resulting in enhancement of commercial area by about 35 percent between 1991 and 2009.

Farmland has also increased in size by about 28 % because of conversion of a large part of range and barren lands into cultivated land. In past much of the western and southern part of the district was barren. With extension of irrigation water through gravity canals, much of this land has been brought under cultivation. Barren land located in the western side of the city, on the other hand has been used for the development of two very

important townships, Hayatabad and Regi townships. Very small area of barren land now remains in the west and south of the city district accounting for only 3% of the total area compared to 16% in 1991. Despite substantial reduction in size over 1991-2009 period, rangeland still constitutes the second largest land use in Peshawar City District, although some of it is being brought under cultivation. The water bodies (mostly rivers both perennial and non-perennial) account for some 4 percent area of the city district. The non-perennial ones get inundated every year and carry high water discharge during summer season.

5.3.2 Factors in Land Use Dynamics

Land use dynamics are influenced by various groups of factors including government policy and strategy, economic and market conditions, and demographic change, social attitudes and values.

5.3.2.1 Government Policy and Strategy

Government Policy and strategy is a very important factor in land use dynamics. In urban areas land use distribution is regulated through development control exercised by zoning and subdivision as well as building control regulations. In the absence of development or structure plan there is no zoning plan for the Peshawar City District. The city also has not developed subdivision regulations as yet for private developers like the ones developed by Islamabad, Rawalpindi, and other big cities of Pakistan whereby the private entrepreneurs developing housing estates are required to follow the prescribed land subdivision regulations. Under these they have to follow ratios assigned for residential buildings, green space, roads and streets, commercial uses etc in a housing estate. The only measure available for development control in Peshawar is building regulation through which the party constructing the house seeks the approval of house plans from local authorities. Even this control is exercised strictly only within the former municipal limits. Consequently, areas located outside the old municipal limits do not follow any land use control.

The inefficient use of land by government itself in its development schemes or due to

lack of existing land use regulations and density standards together with informal processes in operation has resulted in shortage as well as extremely high price of land for housing. It has also made investment in land more lucrative than any other type of capital investment (GoP, 2011). The Planning Commission's Task Force on Urban Development on this issue pointed out, "In large towns, land is a hotly contested commodity and is planned and disposed off through powerful, and often compromising, planning agencies and through political and economic pressure of powerful interest groups. These interest groups develop land for sale and lease it to the urban elite middle classes and overlook, often entirely, the needs and demands of the majority. The result is low-density elite middle-income colonies creating an uncontrolled and automobile-dependent urban sprawl. Meanwhile, ecologically unsafe wastelands are informally converted into increasingly smaller lots for low-income groups" (GoP, 2011).

Thus in Hayatabad and Regi Lalma townships, where the Government has taken the initiative, mostly low-density developments have taken place, primarily catering for high and middle income group. Private developments, as depicted in the previous chapter are also resulting in low-density residential areas such as WAPDA colony, University Town etc. Failure of local authorities to meet the land and housing shortages for poor has led to land encroachments and development of slums in low lying unserved areas such as Shah Dhand, Gharibabad and along Kohat Road etc.

In terms of urban infrastructure, the problems are inequitable coverage (where principal sufferers again are poor and low-income groups), defective infrastructure leading particularly to transmission losses, poor quality of service delivery and low level of cost recovery. It is important to shift the present focus on expanding urban infrastructure to increasing efficiency and improving management as well as maintenance by adopting innovative techniques.

5.3.2.2 Economic and Market Forces

A very important factor in land use distribution and change is location or space, where market forces become crucial in terms of value or cost of a parcel of land. Many scholars (McMillan, 1996; Jones, 1999; Johnson, 2001) have recognized the importance of

location in establishing the price of land, which in turn affects the choice and dynamics of land use. Some land uses with high turnover per unit of land, such as shopping, business and commercial can afford high price of land, whereas other requiring large tracts of land such as industries and airport tend to locate at cheaper locations. Land values vary in space in an urban area. The empirical evidence shows that the city centre usually have the highest land value, which tend to decrease outward in cities which conform to concentric zone theory. In Peshawar, the land values are highest in Central Commercial area/CBD that reduces with distance from it as one move towards the periphery. However, there are exceptions as the land values also show their peak along arterial roads leading out of the city where new commercial centres and Plazas are emerging (Fig. 5.8).

a. Land Value

One of the most important factors affecting land use in a city is land value, which has its own dynamics varying in both space and time basically depending on supply and demand in the market. Because total supply of land is fixed or constant, its value or price is primarily determined by demand (Drabkin, H. 1977). In terms of space or location, plots or lots of land located at or near the core of city or near the lines of communication particularly major roads often have very high values (Berry and Garrison, 1958). Land use that have high turnover such as business and commerce, can afford such high price of land (Ratcliff, 1949). While other land uses requiring big chunk of land at relatively cheaper rate such as industrial uses prefer locations with the lowest price in the market. The price rent is what has to be paid by a particular use to prevent the site going to some other use that can secure the given site by outbidding all other uses. Hence commercial land uses have the highest advantage for more accessible locations that is why the CBD or core of the city always has retail outlets. As the distance from the CBD increases other uses like, residential, manufacturing etc. dominate. However, development of outlying shopping centres and high-class residential areas are also emerging at the fringe of built up area and making some changes in this general pattern.

In Peshawar as in the rest of Pakistan, two different types of land values prevail, one determined by the Local Government for calculating the rate able values, while the other

is the actual market price at which the land is bought or sold in the market. The District Revenue Office of the Government decides about the rate able value of land depending upon its location in the city district, and size of land available for sale. If the lot is less than four *kanals* (A kanal is a local unit of measurement equivalent to 505.857 square metres or one eighth of an acre) and located on the main or access road it is declared as commercial. If it is more than four *kanals* but less than 16 *kanals*, it is considered as residential. While a lot of more than 16 *kanals* is regarded as agricultural land irrespective of its location. The rate able values are generally determined for charges payable to the District Government on transfer deed to the title of land (*Intiqal*). Since this is an arbitrary method, therefore this data alone is not enough to determine the market value or price of the land. Therefore this study collected data on land values based on a survey of diverse group of people concerned with land prices including property dealers, Patwaris (Land Revenue Officials) as well as other relevant persons involved in deals concerning buying and selling of land conducted in different parts of the city district. Altogether land value data was collected for about 200 sample locations spread over the whole city district (Fig 5.7). This data was put in GIS format in Arc Map software using the kriging method as spatial analysis tool (Fig 5.8).

Alonso in his land value model of city suggested that land values decrease away from the city centre. This decrease is very sharp from commercial to residential and agricultural use. Generally, this is true for Peshawar City District. As one moves from center to periphery, the land values decline (Fig. 5.8). However, the decline is not uniform in all directions. This decline is steepest in the south. Northward where rich agricultural land exists and land speculation has started for residential plots the decline is comparatively less steep. The decline is least steep along the eastern and western sides occupied by the built up area and through which main arteries of transportation the Khyber and Ring Roads pass.

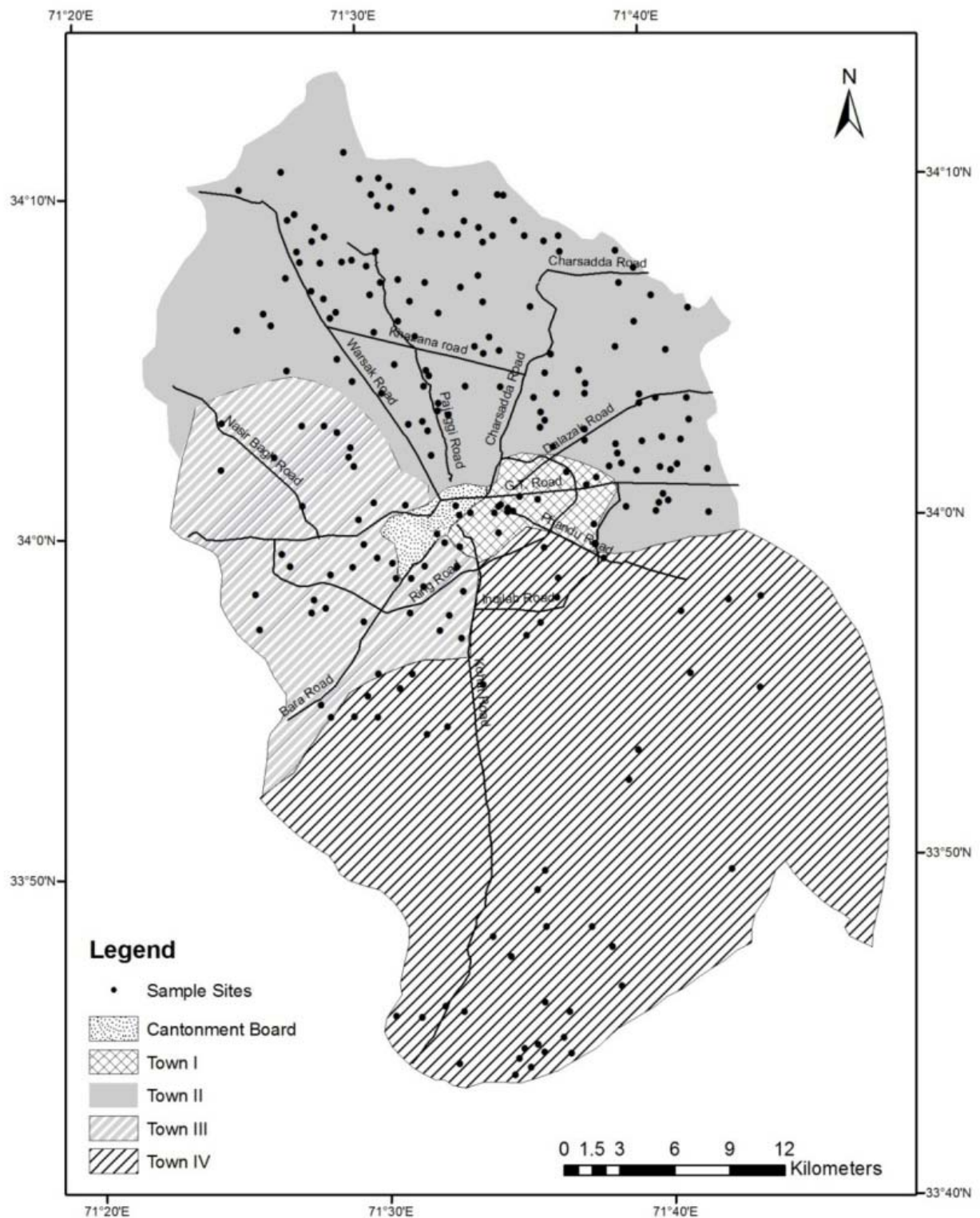


Figure 5.7 Sample Sites for Land Value Data

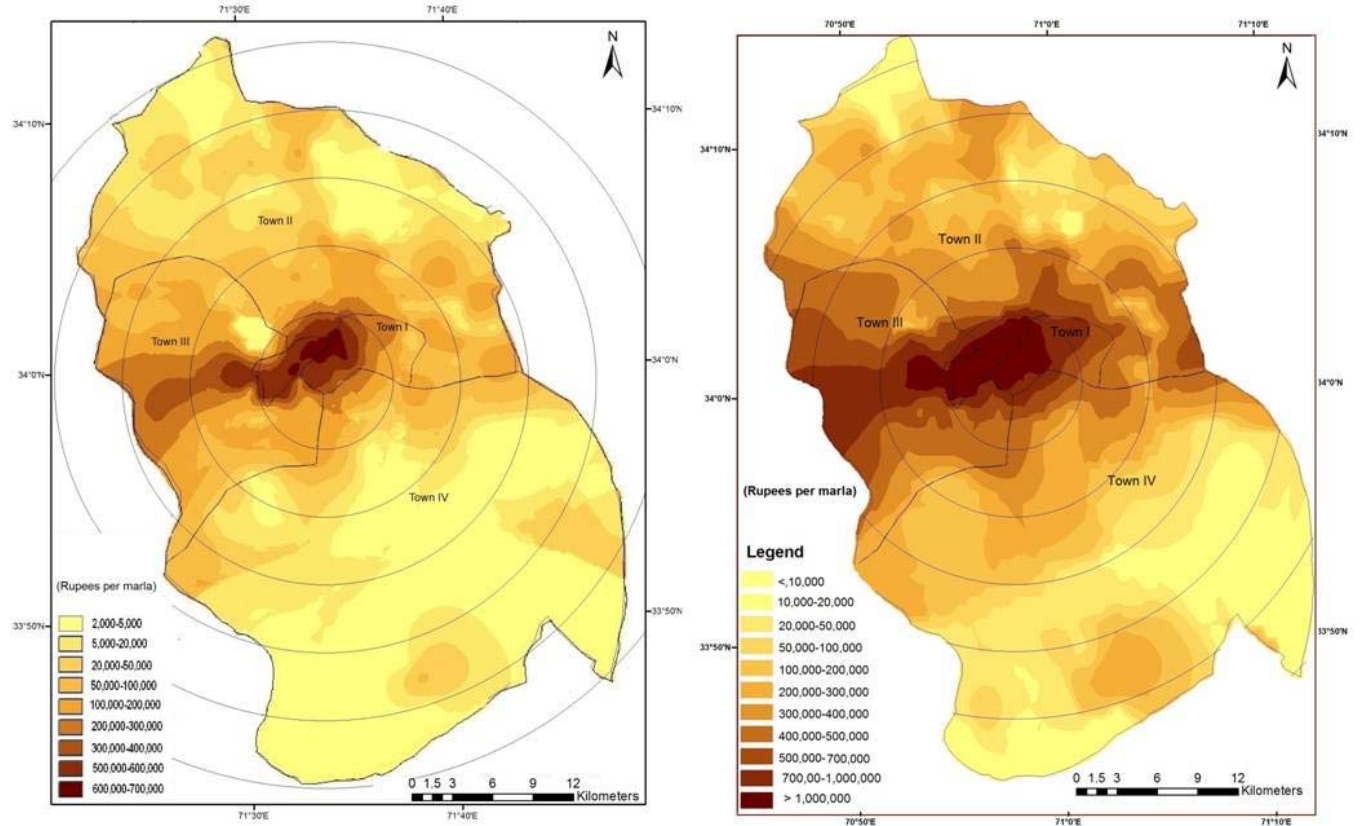


Figure 5.8 Peshawar City District: Land Values in Open Market (a) 2000 (b) 2009

Land values in Peshawar have seen steep climb in the last decade (Fig. 5.8). An example of this is the peak values at the core, which jumped up from Rs. 0.7 to 1 (one) million per marla (A marla is a local unit of land measurement equivalent to 25.2929 square metres or exactly 160th of an acre) between 2000 and 2009.

The land value map of 2000 (Fig. 5.8a) shows an inner core of highest land value declining gradually outward and a secondary nucleus in the west comprising of university town and commercial area along Khyber Road. The University Town in secondary nucleus was a high-class residential area, which is now being converted to commercial uses at a very fast rate. The primary and secondary nuclei have merged as a continuous belt in 2009. Another high land value area is Hayatabad Township. Since residential values are always lower than commercial land values; therefore, land values in Hayatabad are not as high as at the city centre or university town.

Concentric rings of 5 kilometer were also drawn on the map to analyze the curve of land value gradient (Fig 5.9). Comparing land value gradient with land use gradient (Table 5.2) clearly show that inner zones where commercial and residential land uses are dominant, the land values are the highest. In about half the innermost zone land values are between Rs. 0.8 million to over 1 million per marla. This percentage of highest values drops in the next outer zone – B and further as one moves out. In the outer zones, where there is a preponderance of farm and rangeland the land values are at their lowest.

Table 5.4 Land Value Gradient, 2009

Land values (Rupees per marla)	Zones of 5- Kilometer Width from the Centre to Periphery				
	A	B	C	D	E
<10,000	0	11	12	23	42
10,000-20,000	0	9	10	16	21
20,000-50,000	0	8	6	11	11
50,000-100,000	0	6	13	14	9
100,000-200,000	1	3	15	18	12
200,000-300,000	4	21	11	5	3
300,000-400,000	16	15	15	8	1
400,000-500,000	12	12	11	4	1
500,000-700,000	22	7	7	1	0
700,000-1,000,000	15	5	0	0	0
>1,000,000	30	3	0	0	0

Source: Field Survey, 2009

The land value curve confirms the above finding indicating sharp fall as one moves out of the core and the land use changes from commercial to residential and gradual fall as the built environment is replaced by agriculture and range land (Fig. 5.8).

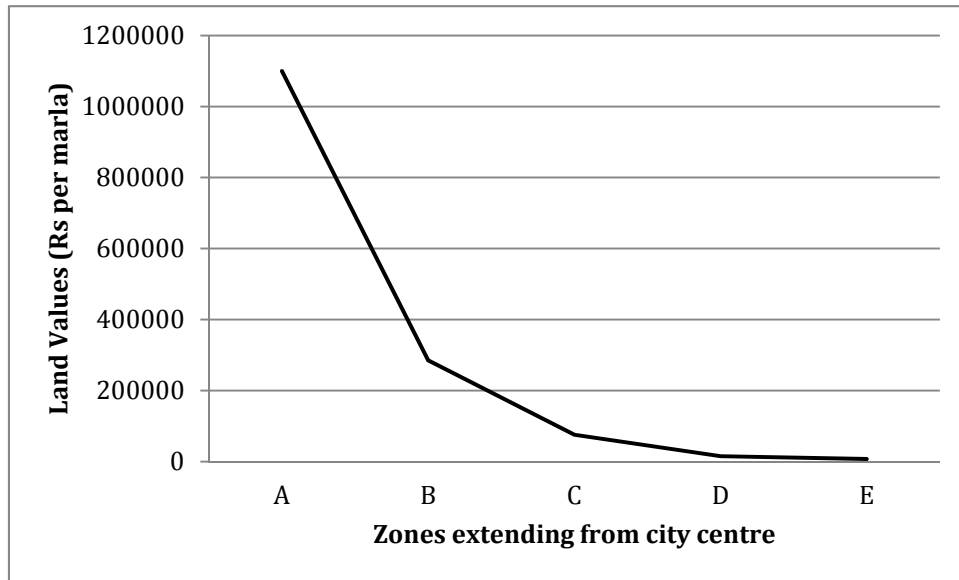


Figure 5.9 Peshawar City District: Land Values Gradient (2009)

b. Other Market Forces

Other market forces that have impact on land use dynamics are demand and supply, availability of infrastructure, size of plot, and age and condition of buildings. The conversion of sites of old buildings into plazas in CBD and along arterial roads provides clear empirical evidence of operation of such market forces. A very good example of the same is conversion of site of Deans Hotel into a big shopping mall with hundreds of shops, a hotel and a marriage hall. The development of multistory office block right opposite to it is another example of the same.

5.3.2.4 Demographic, Social and Technological Factors

Increasing population and change in social status as well as attitudes are other factors that impinge upon the demand for certain type of land use. For example, housing needs increased in the city as a result of growing population, income and enhanced social status. Initially people did not like to move away from the main city and preferred to move in contiguous areas like Nishtarabad adjacent to old city or Gulberg and Defence in the neighbourhood of Cantonment. They did not like to move far from the city. For example when the first phase of Hayatabad Township, located in outskirts, was opened in eighties the number of applicants for the available plots were the same as the number of plots,

some of which were of two kanals in size (1200 Sq. Yard). However, the attitude has changed and there is tough competition now to seek plots in Hayatabad, because it has become an elite residential area of Peshawar. Other new residential estates are also springing in the fringe by conversion of agricultural lands into housing colonies.

The increase in automobile ownership for transport particularly after the opening of bank loans for purchasing cars has also encouraged the housing development in the periphery of the city.

5.4 Land Use Policies and Planning

Multiple government agencies and political interests influence and control land use in Peshawar City District and due to lack of coordination between them, there is little or no cohesive urban land use planning. Individual agencies such as City and Town District Governments, Cantonment Board, Peshawar Development Authority, and Defense Housing Authority promote programmes and projects within their own jurisdictions. Moreover, interest groups representing estate agents, land developers, and builders, as well as market operators and transporters pursue their own agenda resulting in haphazard development of land use and urban growth. This has put both built and natural environment under serious stress. Commercial activities of all types are increasing in the city and new lobbies of varied interest groups have emerged as powerful players in determining the form that the city is taking. Besides promotion of coordination among various government agencies, these lobbies need to be involved in decision-making and the development they undertake needs to be guided by professional advice.

Holistic urban development is also lacking and cash-strapped City District Government turns to provincial and federal governments for funding infrastructure projects. Provincial and Federal governments, in turn, obtain the capital to undertake large urban development projects from multilateral funding organizations. Hence, there is no comprehensive urban planning and city development is therefore 'project-based' and ad-hoc. Under these circumstances urban environment, both built and natural, is under serious stress with impacts on the quality of architecture, urban design and aesthetics as well as parameters of ambient environment such as air, water, noise levels, sanitation,

and ecology. Since, transport has not been factored into land use policies and schemes, severe problem of traffic congestion has emerged with associated impacts on the urban economy and competitiveness. Road encroachments, mixed local and through traffic and use of poor quality fuel have also aggravated congestion, delays and air pollution. Moreover, encroachment of agricultural land, together with loss of land cover is affecting the landscape and ecology.

In terms of market, escalating property prices and housing expenditures, limited investment in housing, and limited availability of housing finance indicate significant potential distortions. It has been argued by some scholars and experts that Laissez faire is the best policy to “manage” land-use and development patterns. However, without planning and regulations, land markets will not only generate enormous external costs but would also fail to provide public facilities such as parks, open spaces, major infrastructure and urban services. Thus, the solution to developing proper land use is to have policies with the proper balance, or division of labor, between the public and private sector. This is rather difficult but seems to be the best way for developing and managing urban land appropriately

5.5 Conclusion

The urban spatial structure of the Peshawar, in terms of land use conforms to a multiple nuclei model. Historically, the city has evolved from different nuclei - walled city, Cantonment, University Campus and town, Hayatabad Residential Estate etc. Functionally the commercial core has a dual character with a central market in the walled city and another in cantonment. Karkhano market is another commercial nucleus, which serves as outlying business centre of Peshawar city district where most of the imported goods are marketed. The residential area surrounds commercial core of the city. Industries and transport terminals are located in the fringe on major highways. Main industrial nucleus is located in Hayatabad industrial area while others are located on the Kohat road, Warsak road and G.T road. The University Campus is the main educational complex. High-class residential areas are located inside the cantonment or fringes of the city such as University Town and Hayatabad Township, both located at the western

fringe. Middle class residential areas are concentrated mainly in and around the walled city. Low class residential areas are located at the periphery of the city in low-lying areas or depressions formed due to extraction of clay for brick kilns that have now been abandoned. A number of villages have also been engulfed during the expansion of built up area of the city. Other villages and their farmland surround the core built up area of the city.

A major consideration in extending the boundary of Peshawar city district was ‘physical consolidation’ of the urban Peshawar with its rural fringe. However, no land use plan has emerged as yet in order to give a practical shape to this idea or to guide future expansion and haphazard development in land use has become a norm. A study of land use dynamics reveals that the residential area has increased by more than two and a half times during the last two decades primarily at the expense of farm land. Built environment and associated brick kiln industry are two main threats to farmland in Peshawar city district. Despite this loss, it is rather encouraging to note that the area under cultivated land has also enhanced by addition of over 20,000 hectares. This increase was achieved mainly in the southern part of the district by conversion of cultivable waste to farmland in the last twenty years.

Multiple government agencies and political interests influence and control land use in Peshawar City District and due to lack of coordination between them, there is little or no cohesive urban land use planning. Moreover, absence of land use regulations and density standards together with informal processes in operation has resulted in haphazard development and promoted low-density elite middle-income colonies creating an uncontrolled and automobile-dependent urban sprawl. It has also resulted in shortage as well as extremely high price of land for housing. Further this unplanned development have had serious impacts on the quality of architecture, urban design and aesthetics as well as parameters of ambient environment such as air, water, noise levels, sanitation, and ecology. Since, transport has not been factored into these schemes and developments, severe problem of traffic congestion has also emerged with associated impacts on the

urban economy. The city district therefore has to face tremendous future costs in dealing with these problems associated with unguided spatial land use developments.

CHAPTER 6

URBAN FARMING

6.1 Introduction

"Urban farming", in this document refers to agriculture practiced within the boundary of the Peshawar City District. Apart from the lots used for growing crops, it includes raising livestock or milk cows for own-consumption or sale in the neighbourhood markets. Despite massive increase in built up area, agriculture is still the most important and dominant land use in the Peshawar City District. However urban farming in Peshawar, as in the rest of the country, has not been given any importance by city planners, although in many cities across the world, agricultural use of land has been accepted and formalized. This chapter analyses the urban farming in Peshawar City District. The chapter is divided into six sections. After this brief introduction, the next section discusses the spatial distribution of farmland in the District. The third section analyzes the farmland dynamics viz-aviz other land uses. It is followed by a description of crops in the farmland. The fifth section analyzes the policy aspects of urban agriculture while the concluding section summarizes findings of the chapter.

6.2 Farmland Distribution

Farmland comprises 57.4 percent of the total area of the district. It is distributed around the core of the city district, where the built up area is concentrated (Fig. 6.1). Perennial canals taken out from the Kabul River irrigate most of this land in the eastern and northern part of the city. Agricultural land in the south is by and large rain fed. The water table in the South is quite deep. A large tract in the south is also rangeland.

As per official revenue records, the cultivated area has been gradually increasing in Peshawar city district from 1991 to 1997 but since then it has reached a plateau (Fig. 6.2) at around 74,000 hectares at the turn of the century. It is rather interesting to note that while a large chunk of agricultural land is being eaten up by built

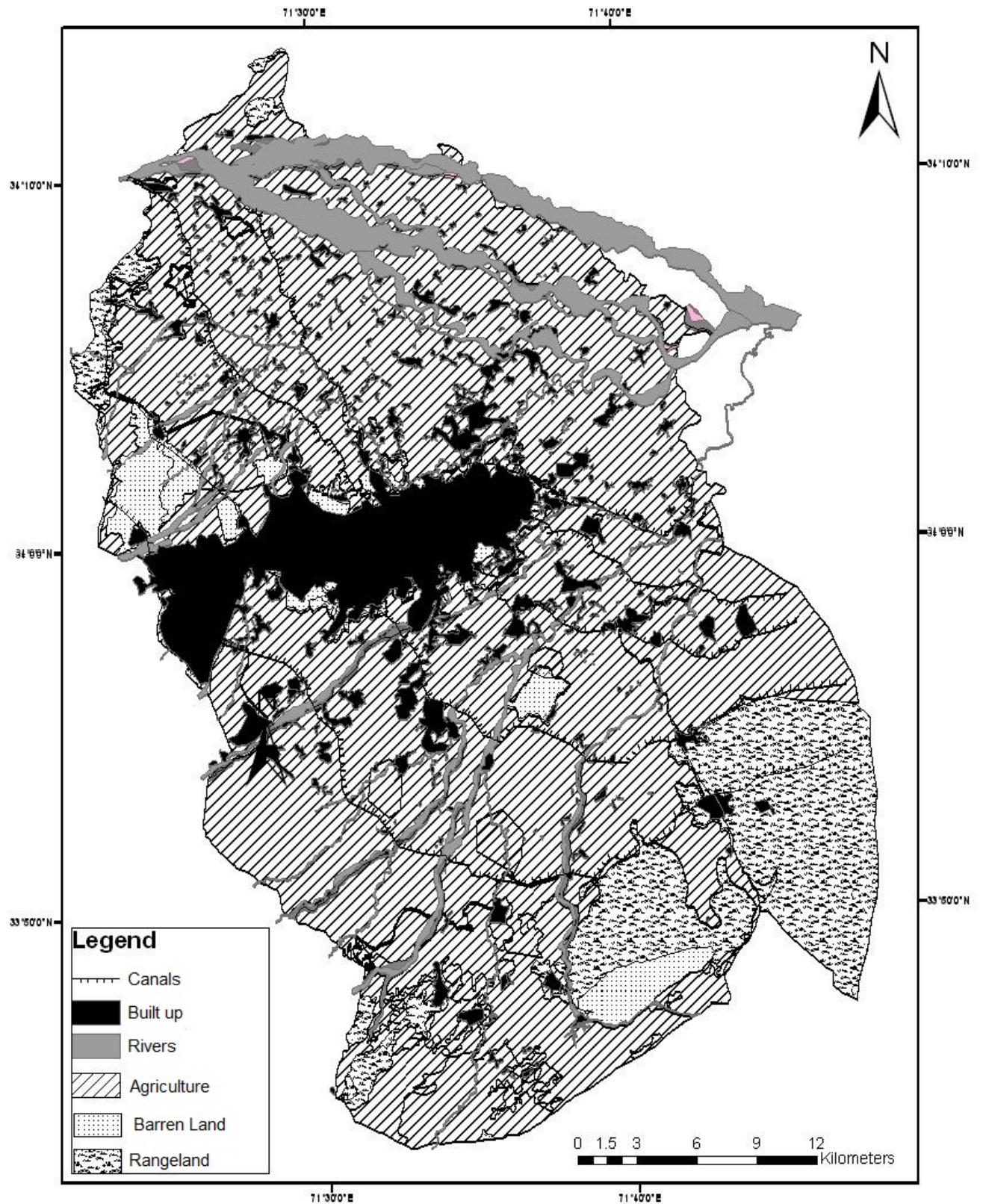


Figure 6.1 Peshawar City District: Farm Land distribution

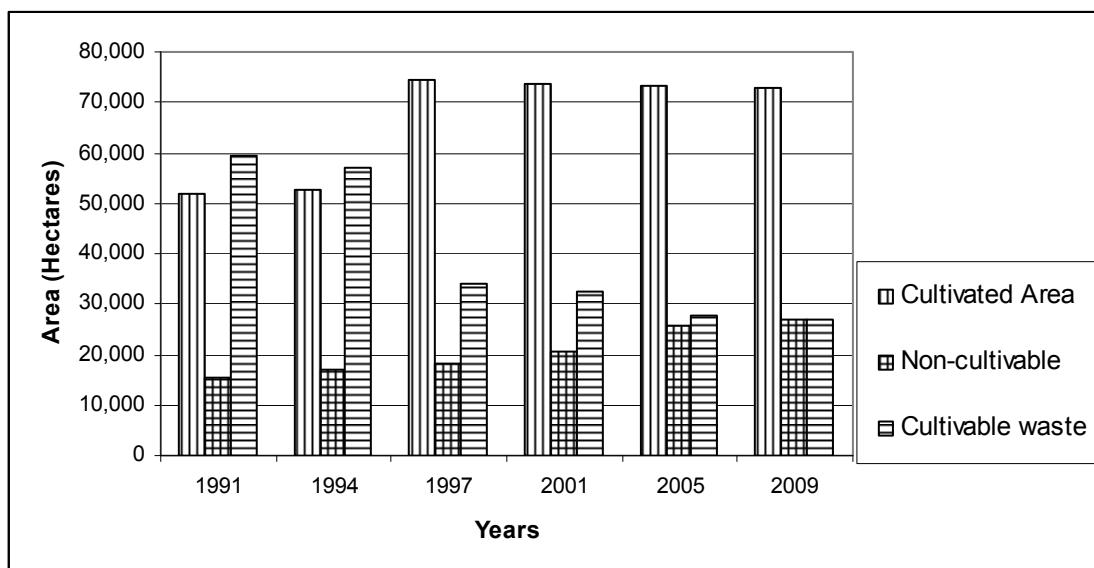


Figure 6.2 Peshawar City District: Trends in Availability of Farm Land

Source: Official Revenue Records, 1991-2009

Table 6.1 Conversion of farmland, 1991-2009 (Area in hectares)

Land Type	1991		1994		1997		2001		2005		2009	
	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
Cultivated Area	51,957	41	52,632	41.6	74,315	58.7	73,612	58.1	73,139	57.7	72,712	57.4
Non-cultivable	15,377	12.1	16,998	13.4	18,205	14.3	20,598	16.3	25,892	20.4	27,126	21.4
Cultivable waste	59,376	46.9	57,080	45	34,190	27	32,500	25.6	27,679	21.9	26,872	21.2
Total	126,710	100	126,710	100	126,710	100	126,710	100	126,710	100	126,710	100

Source: Revenue Record: 1991-2009; SPOT Image, 2009

up area, parts of cultivable waste is also being brought under plough. The changing trend of farm or cultivated land viz-a-viz non cultivable land or land lost permanently to built up area and cultivable waste over time is given in table 6.1. The cultivated area in Peshawar city district in 1991 was about 41 percent of the total land in the district. This increased to around 58.7 percent in 1997. However, since then the equilibrium is barely maintained and the land loss to built up area has enhanced compared to addition of new cultivated land.

Increase in farmland was recorded both in irrigated land as well as in un-irrigated or rain fed land. Cultivated land under irrigation has increased at faster rate than un-irrigated as shown in table 6.2 & figure 6.3.

Table 6.2 Irrigated vs Un-irrigated Land, 1991-2009 (Area in hectares)

Land Type	1991		1994		1997		2001		2005		2009	
	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
Irrigated land	47,915	92.2	46,902	89.1	66203	89	70947	96.4	70039	95.8	69153	95.1
Rain Fed (Dry Farming)	4,042	7.8	5,730	10.9	8112	11	3665	3.6	3100	4.2	3559	4.9
Total	51,957	100	52,632	100	74,315	100	73,612	100	73,139	100	72,712	100

Source: Land Revenue Record, 1991-2009

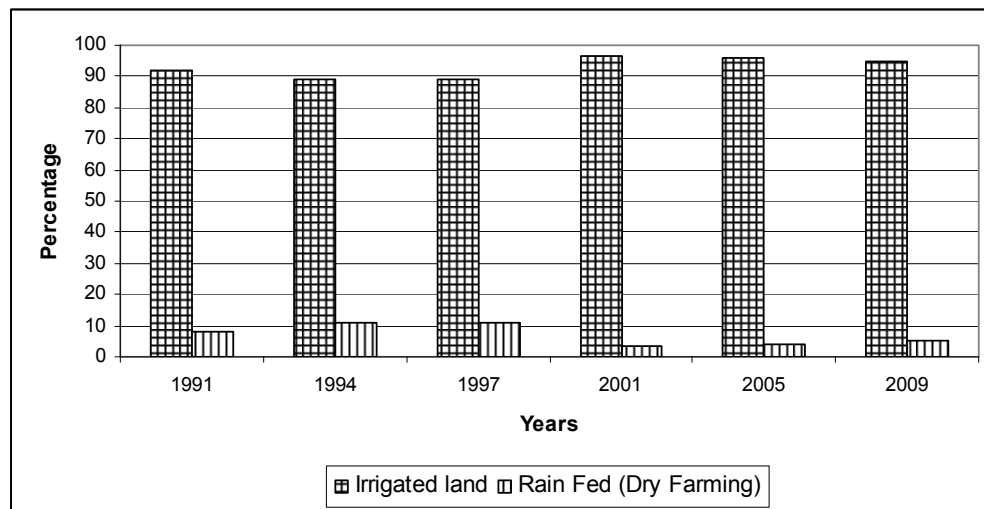


Figure 6.3 Irrigated Vs Un-irrigated Land (1991-2009)

Since 1991, rain fed area has fluctuated several times depending on the rainfall. During the years of better rainfall more area was cultivated through dry farming.

6.3 Farm Land Dynamics

6.3.1 Pattern of Farmland Transformation

Under the influence of a variety of natural and man-made factors, farmland is constantly being transformed in the Peshawar City District. This transformation needs

comprehension and monitoring in terms of its causative factors because it carries substantial implication for food security in a country like Pakistan where population continues to multiply. The highlights of this both negative and positive transformation of farmland in the Peshawar City District over 1991-2009 period are given below.

- Residential land use was the biggest consumer of farming land. Some 8,748 hectares of farmland was lost for residential purposes since 1991. Only 1,105 hectares of residential area was developed on other land. This means that 89% of the new residential development took place over the agricultural land.
- Brick kilns were the second largest consumer after residential land use. Area under brick kilns increased from 970 hectares to 2,360 hectares adding some 1,390 hectares during this period. Bulk of it i.e. 1,120 hectares was on prime agricultural land and rest on non-cultivated land.
- About 271 hectares of agricultural land was eaten up by commercial land uses. Only 73 hectares of residential land was consumed for this purpose meaning that 79 % of commercial expansion took place over agricultural land mostly along the new Ring Road.
- The industrial land use increased very slowly from 366 hectares to 426 hectares. The expansion was mainly over agricultural land
- While the above losses were taking place, there was also a gain in the farmland mainly by bringing cultivable waste area of around 26,600 hectares under plough. The cultivable waste in the city district was reduced from 46.9 percent of the total area to only 21.2 percent in the last two decades.

The spatial pattern of these changes has been given in figure 6.4. Whatever intermittent farming land existed within or adjacent to built up area of the city was consumed by residential area. Pocket of farming land remaining along main roads were encroached by commercial land uses particularly along the new Ring Road. Industrial use mainly marble factories occupied some 60 hectares of farmland along Warsak Road. However brick kilns occupied a large part of farmland, about 1,120 hectares, in the southern part of the City District. The expansion of farmland has been mainly in the fringe areas (Fig. 6.4). Most of the cultivable land is located in the southern part of the city district. This

cultivable waste was gradually brought under plough under the increasing pressure for food.

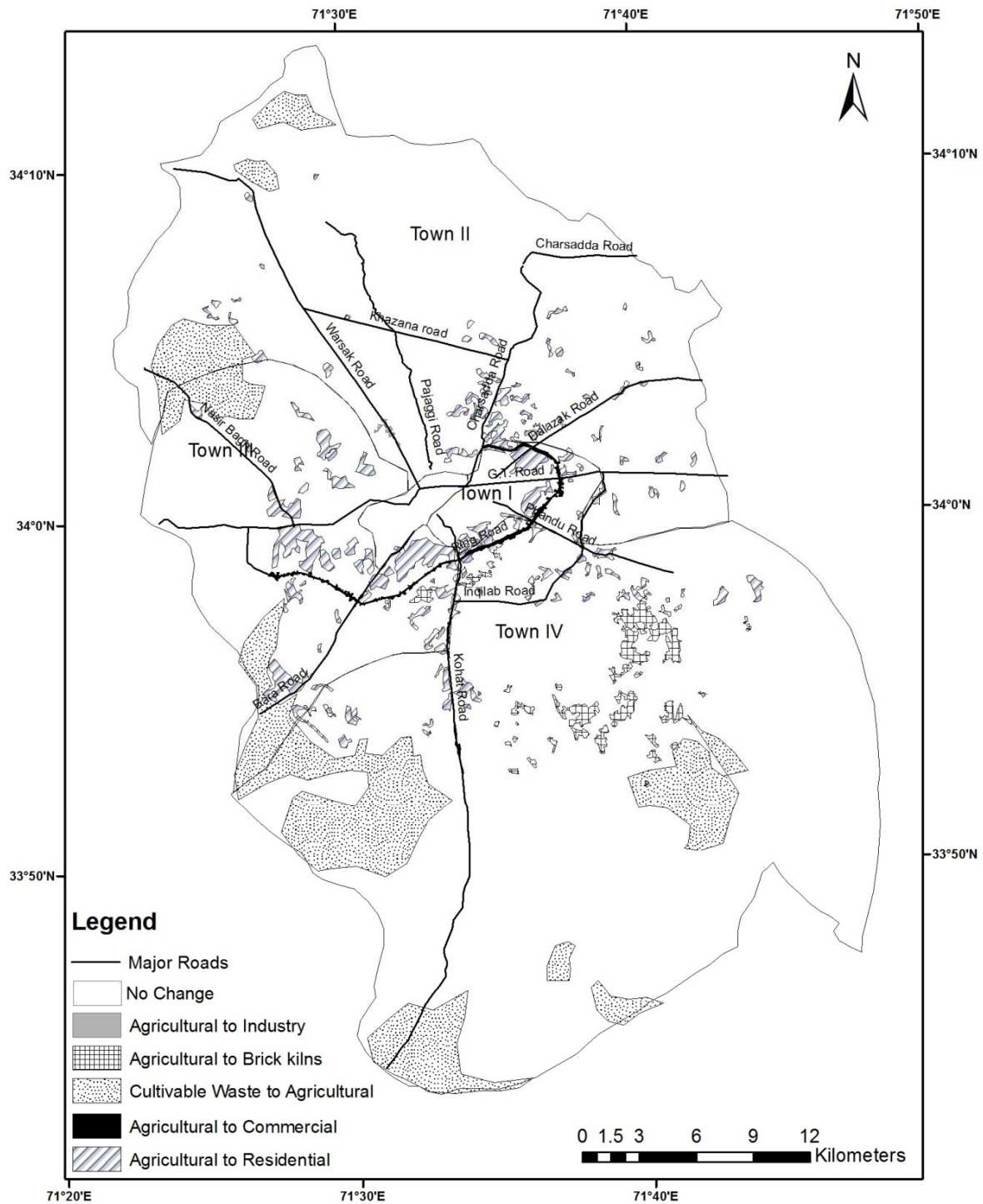


Figure 6.4 Peshawar City District: Farmland Conversion, 1991-2009

The most alarming aspect of encroachment on farmland in Peshawar City District is the loss of prime agriculture land. Peshawar city district has lost 11,193 hectares of land in different land capability categories to built up area. Table 6.3 indicates that the city district lost 8,456 hectares in Class I, 461 hectares in the Class II and 410 hectares in Class III categories. These three categories constituted prime agricultural land with little or no limitation. Only 246 hectares of marginally cultivable Class IV land was lost to urban uses.

**Table 6.3 Loss of Agricultural Land in Peshawar City District
by Land Capability Classes**

Land capability class	Area lost (Hectares)	Percentage Share
Class I	8456	76
Class II	461	4
Class III	410	4
Class IV	246	2
Class VII	1620	14
Total	11,193	100

Note: The classes given here follow the land capability classes of soil survey of Pakistan. No area of the City District falls under class V or VI category.

A comparison of farmland conversion map (Fig. 6.4) with the land capability map (Fig 6.5) also indicates change in spatial dimension. In the northern part of the City District, mainly along the major roads like Charsadda Road, Warsak Road and Pajagi Road, most of the class I land was primarily converted to residential uses though a small part was also encroached by marble factories on Warsk Road. In the southern part of the city bulk of class I land was lost along Kohat road and Ring road to residential and commercial uses. A considerable part of the class II land was also converted to brick kilns as well as residential uses. Only in the western part of the city most of the barren land classified as class VII land was converted to residential, commercial and industrial uses. These included residential and industrial area of Hayatabad Township as well as commercial area along Khyber Road in outlying Karkhano market. With the existing growth trend in

the north and east of the built up area, it appears that future expansion in built up area will further aggravate the problem of encroachment on the prime agricultural land.

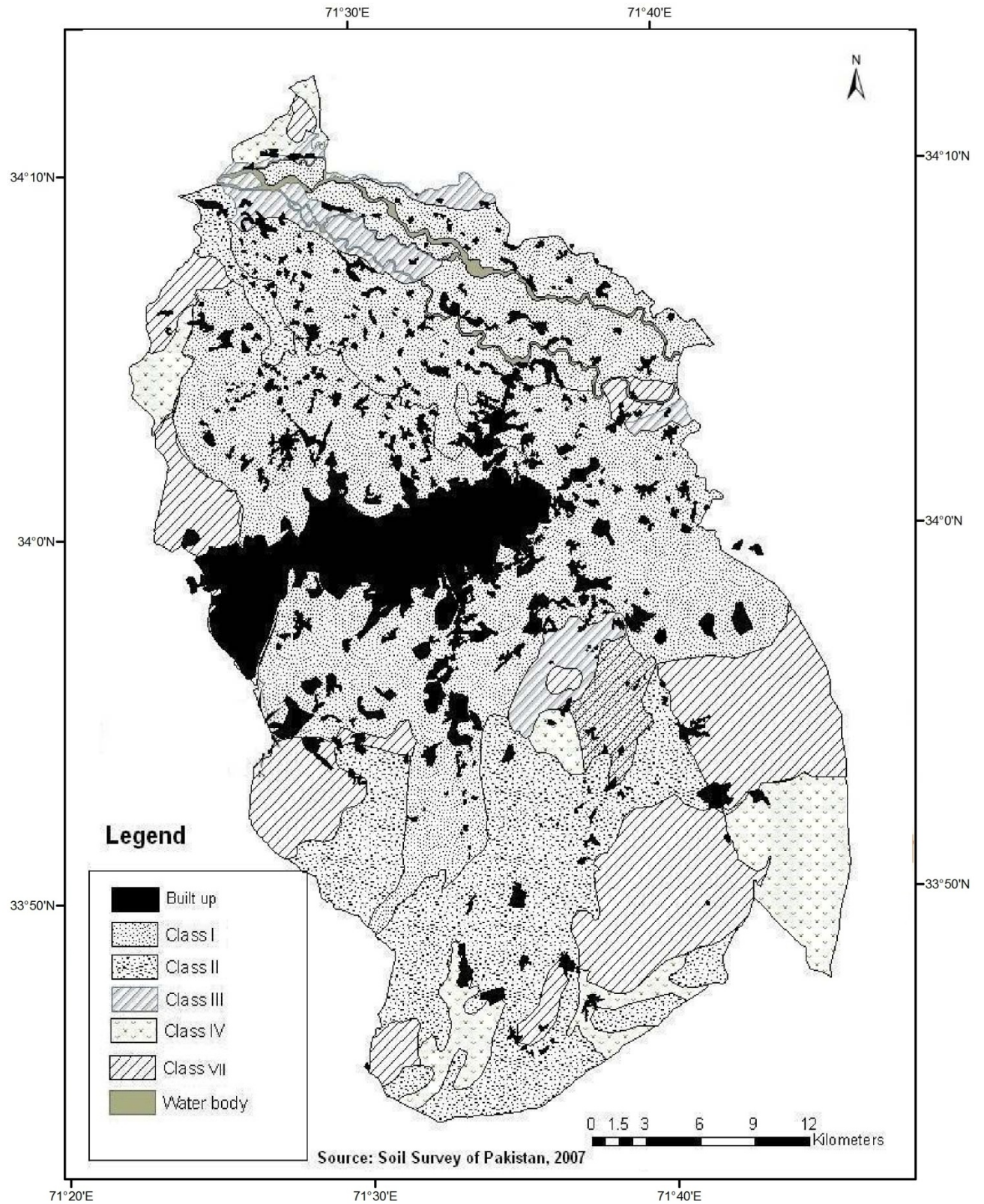


Figure 6.5 Land Capability Classes and Built up Area in Peshawar City District

6.3.2 Causes of Farmland Transformation

The farmland conversion in Peshawar city district is evidently the outcome of urban land market system, where demand and supply are playing a major role. According to estimates made by Peshawar Development Authority (PDA) every year about 800 hectares of land is required for new housing (GoNWFP, 1998). As most of the land around the built up area near the core city is good agricultural land so the residential land use compete primarily with this land for conversion into built environment. A generalized model to indicate the weight of land value and distance from the city centre on existing land use and land transformation in Peshawar is given in figure 6.6.

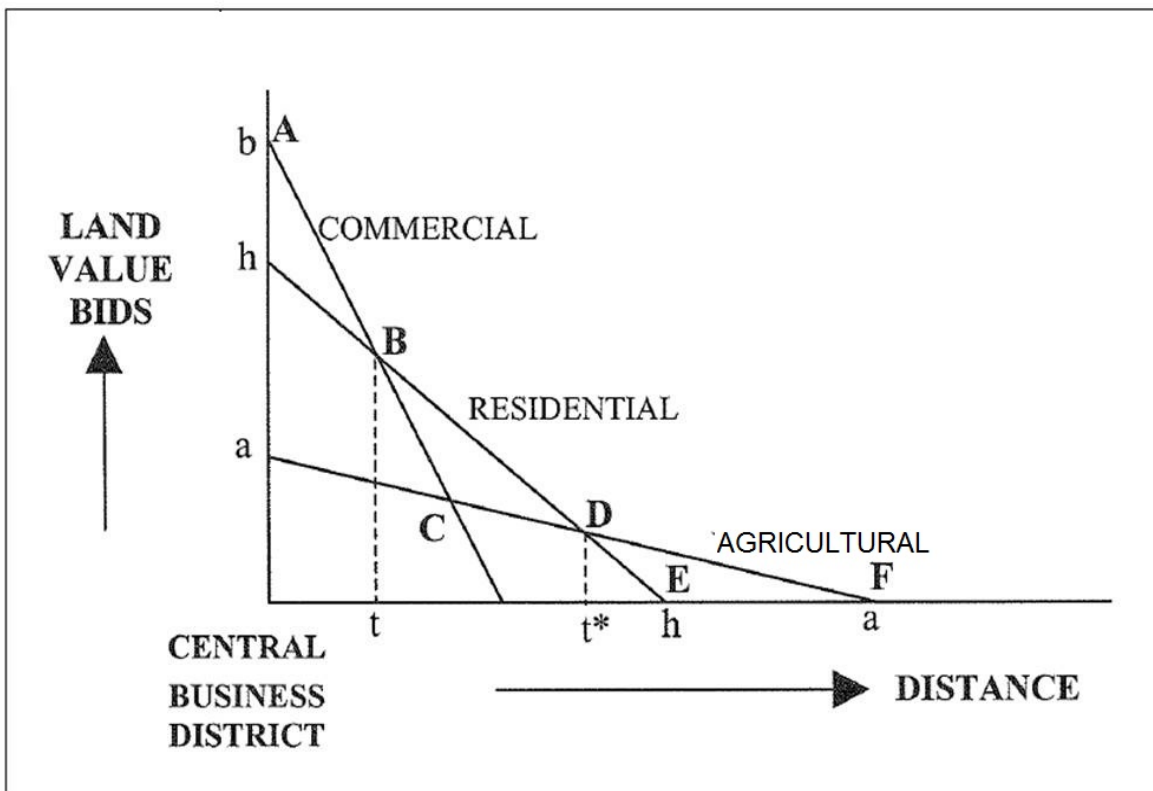


Figure 6.6 Land Value curve, indicating bid rent for different land use classes competing for the available land in Peshawar City District

The model in figure 6.6 illustrates bid value curves. The figure indicate that land transformation in Peshawar city district is essentially the product of competition between different land use classes each one bidding for available land, producing rings of land use around the city where the commercial land occupy closest locations to the city centre and agricultural land being the farthest. The commercial activities are located in the sites from

the city center to “t”, then followed by residential land use outward from “t” to “t*” and from “t*” outwards from the city center lies the farming land. Land use dynamics discussed in the last chapter confirm such pattern of land use for Peshawar City District. This pattern is due to the fact that commercial activities are ready to pay highest cost for the land. Sites that stretch out between “t” and “t*” dominate land values that the residential uses would be ready to pay (“BD”). For locations outward from “t*”, the maximum price is “DF”, the value that the agricultural land use would pay, and the least price is shown as “DEF”. This pattern of market mechanism indicates that land values among “CBD” and “t” are highest followed by land values between “t” and “t*” and away from “t*”. The land value gradient curve “ABDF” is having a negative slope, demonstrating a negative correlation between land value and distance from the city centre.

6.4 Cropping on Farmland

6.4.1 Cropping Pattern

Cropping pattern is the proportion of area under various crops at a point in time (Hussain, 1979). It is influenced by physical as well as social and economic factors. Among physical factors physiography, soil, climate and water availability are vital, while among economic factors land value, and market factors are very significant. Social factors such as prestige of land ownership and local customs and traditions are also quite important. In Peshawar City District physical factors permit growing of crops round the year in two cropping season i.e. Kharif or summer and Rabi or winter. Therefore total cropped area is more than net sown area. The cropped area is more during Rabi as compared to Kharif season (Fig. 6.7). It is due to better rainfall during Rabi season.

The total cropped area in the City District has been fluctuating since 1986 but overall a decreasing trend has been observed. This decline has resulted from the encroachment of prime agricultural land by built up area over. Although new land has been brought under farm resulting in enhancement of cultivated land but because of comparatively low fertility, the cropping had to be limited to one season resulting in overall decline in the cropped area. A major reason for fluctuation during various years has been fluctuation in

rainfall. In the better rainfall years, the cropped area enhances whereas in low rainfall years it shrink (Fig. 5.6).

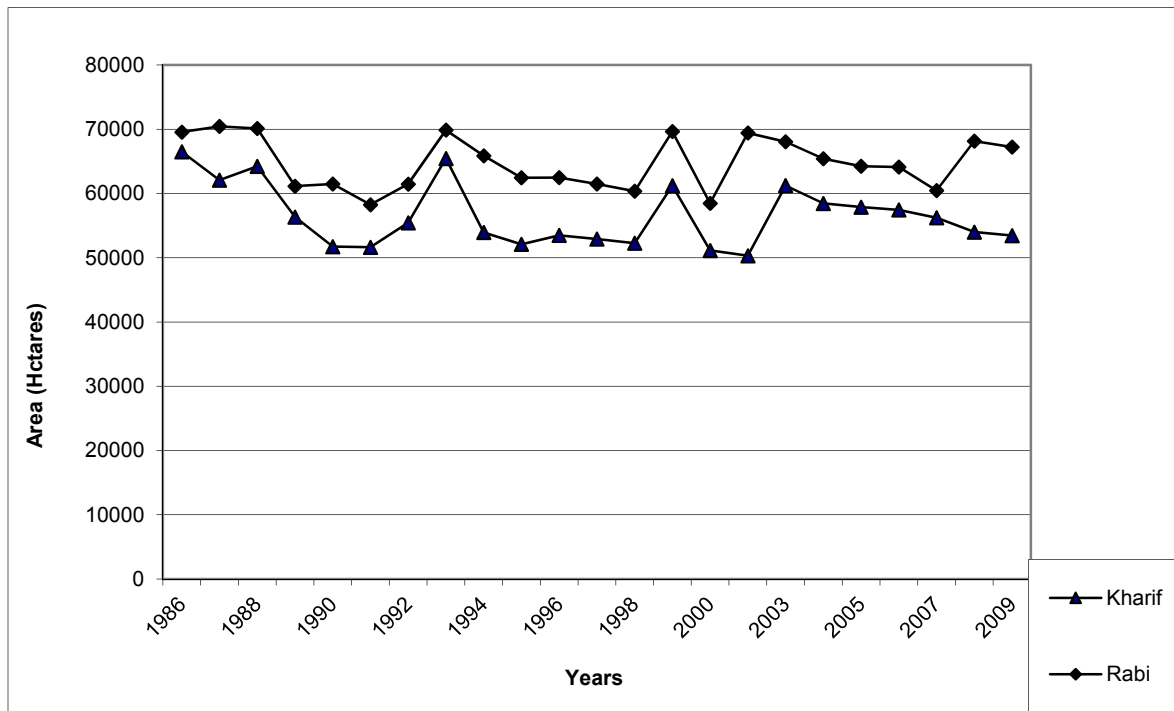


Figure 6.7 Peshawar City District, Fluctuation of Total Cropped Area (1986-2009)

Source: Revenue Record 1986-2009

6.4.2 Crop Types

Main crops in Kharif season are maize, fodder, sugarcane, vegetables and orchards (Table 6.4 & Fig. 6.8). The area under maize and sugarcane has been steadily decreasing while the area under fodder and vegetable is increasing indicating an enhancement of dairy and truck farming under the growing influence of urbanization. The need for fodder has been so great that a major part of the maize crop (which was previously used primarily for human consumption) is also used as fodder for farm animals in the city.

Table 6.4 Peshawar City District, Cropping Pattern Kharif, 1988- 2009 (Area in hectares)

Year	Maize	Fodder	Fodder Maize	Sugar cane	Vegetable	Orchards	Others
1988	33962	7048	3078	16021	1244	2681	199
1992	28384	4550	3065	16200	1364	1695	167
1996	25527	4838	4107	14709	1662	2461	192
2003	24421	5468	4366	12027	1829	3179	164
2006	24989	8178	5987	11786	2189	3246	154
2009	21676	9410	6123	11253	2520	2405	165

Source: Land Revenue record 1988-2009

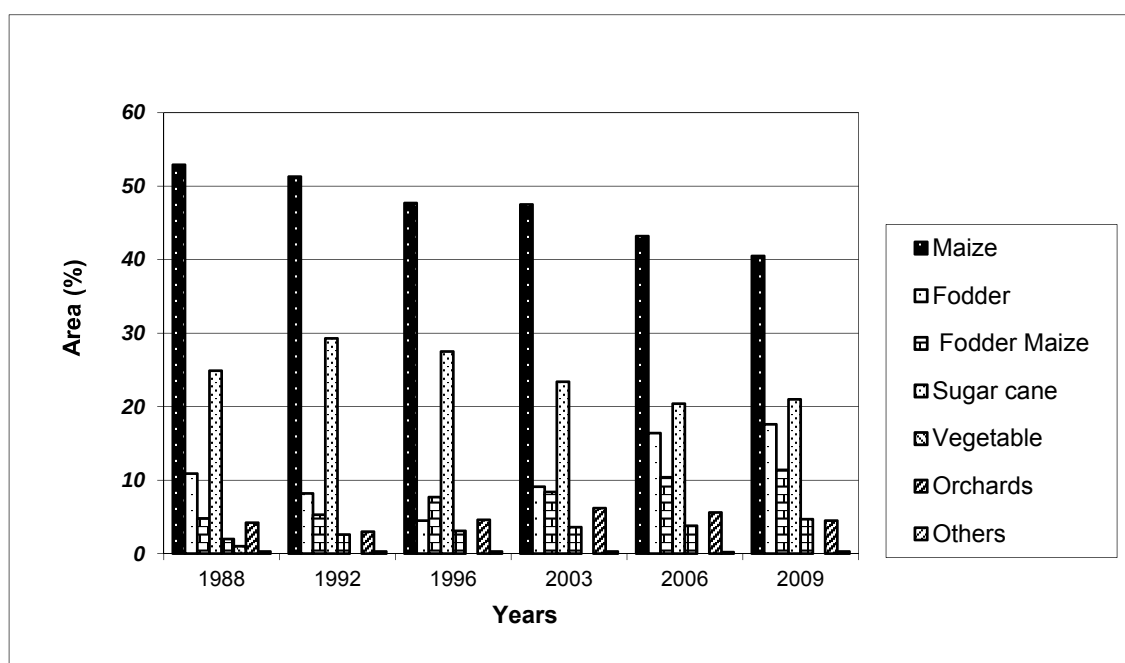


Figure 6.8 Peshawar City District, Kharif Cropping Pattern (1988-2009)

The table further indicates that area under fodder maize has been increasing and area under maize is declining over time. This is due to the fact that demand for dairy products is high in Peshawar city district which increases the need for fodder. During focused group discussions it was revealed that people use maize as a fodder because it increases the milk production of the cattle. Increasing population together with improved marketing and transport facilities have also provided incentive for growing vegetables, fruits as well as dairy products. Although the land revenue record shows decline in the orchards, a field survey showed that the area under orchards has enhanced. The declined area under

orchards appears to have resulted from wrong reporting by the revenue officials. Since the water charges (*Abyana*) are higher for the orchards than for other crops, the landowners tend to bribe the revenue officials (*Patwari*), to report their orchards as fallow land or under other crops. There is no check on such misreporting of information.

Main crops in the Rabi season were wheat, fodder, and vegetables. Area under different crops in Rabi season is given in table 6.5. Wheat fodder is same as maize fodder, whereby wheat is used as fodder.

Table 6.5 Peshawar City District: Cropping Pattern Rabi, 1988- 2009 (area in hectares)

Year	Wheat	Barely	Clover (Fodder)	Sugar beet	Vegetables	Wheat Fodder	Others
1988	56300	1283	10079	1168	1072	160	61
1992	48789	966	8039	842	1229	187	93
1996	50348	812	9329	735	1088	93	73
2003	46328	607	9098	352	1510	120	49
2006	51560	527	10046	156	1678	89	67
2009	51745	345	9067	123	1780	129	45

Source: Revenue Record, 1988-2009

Despite some decline, wheat continues to dominate the Rabi crop (Fig. 6.9). The fluctuation in area under wheat is mainly because in the years of better rainfall area under wheat increases in rain fed southern part of the city district, while it declines in low rainfall years.

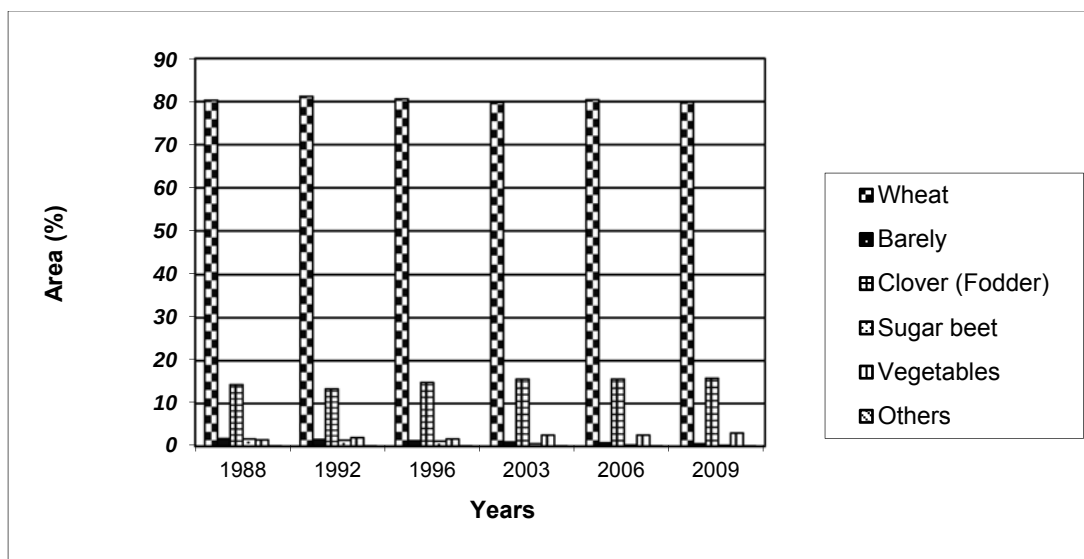


Figure 6.9 Peshawar City District: Rabi Cropping Pattern (1988-2009)

Next important crop in Rabi season was clover used as a fodder. It is used in rotation with wheat to increase soil fertility but need for wheat is so great that more and more land is devoted to wheat than any other crop. Even during Rabi season the area under vegetable has increased while farmland under fodder is more or less constant, indicating enhancement of truck and dairy farming.

6.4.3 Spatial Distribution of Crops

Spatial distribution of crops is influenced by many factors like types of soil, irrigation facility, slope and distance from the market. The most important factor for distribution of crops in the city district is the market factor. The spatial distribution of crops is shown in figure 6.10. This map shows concentration of crops during both Kharif and Rabi season. This map was taken from soil survey of Pakistan. The next figure 6.11 shows concentration of individual crops based on dominant percentage of area under these crops. The table and map show clear concentration of truck and dairy farming near the built up area of the city district with the predominance of vegetables, orchards and fodder crops in the inner ring or areas adjoining the built up area of the city. There is also a concentration of dairy farms, which supply fresh milk to the city. The construction of ring road increased the accessibility of this area to the market. As the distance increases from the main core city, growing of cereal and other crops such as wheat, maize and sugar

cane increases. One important thing to notice, however, is that wheat, the staple food crop is grown throughout the farmland in the Peshawar city district.

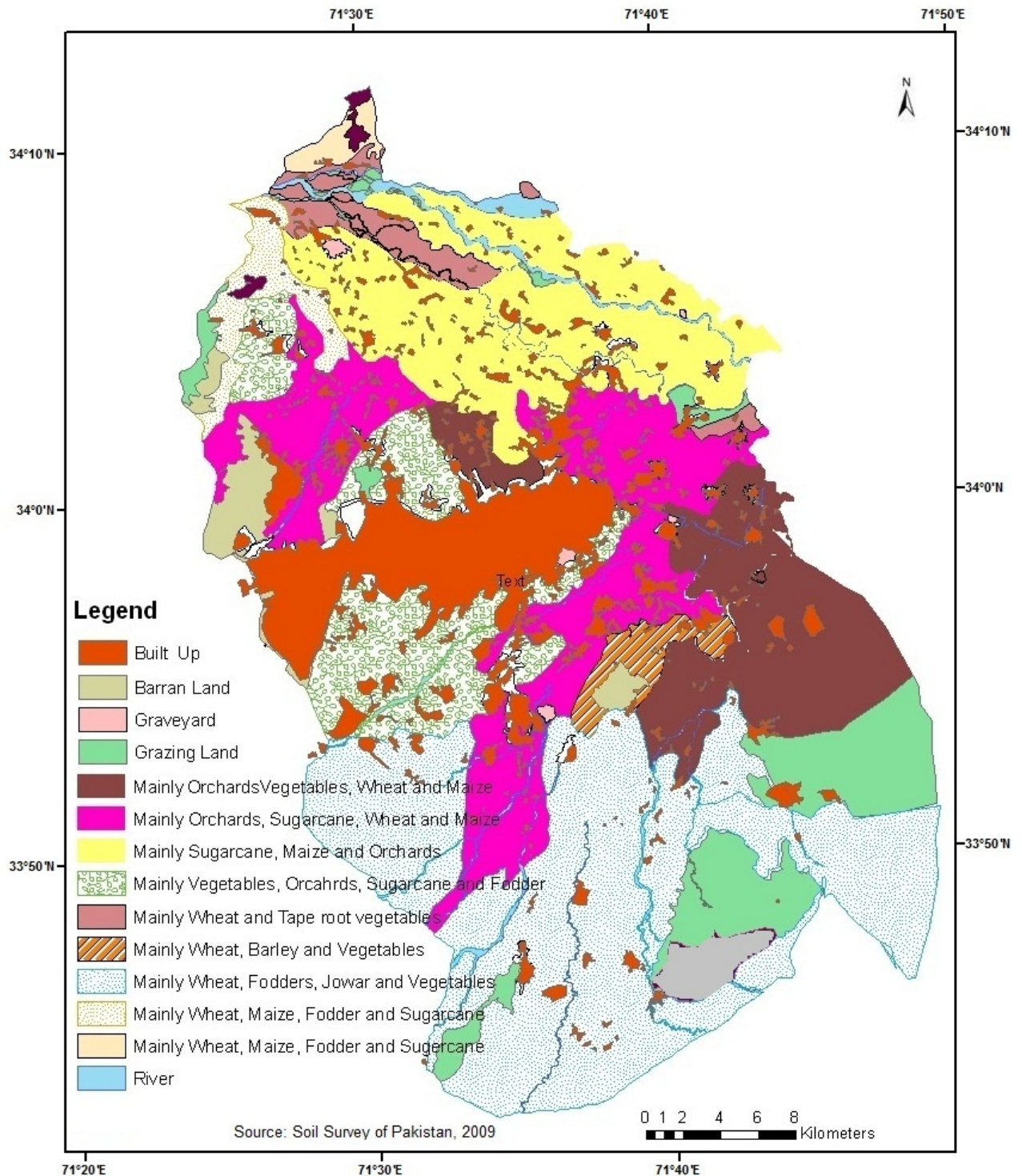


Figure 6.10 Peshawar City District: Spatial Distribution of Crops

Besides market factor, availability of irrigation water and soil quality has also influenced the spatial distribution of crops. Flat northern part of the district, the flat flood plain of Kabul river and its tributaries, with best irrigation facility is devoted mainly to water loving crops mainly, sugarcane (Fig. 6.11). Other crops grown in that area include maize in the Kharif and wheat in Rabi season. Orchards are also common in this area. Contrary to this in southern rain fed part of the district, where canal irrigation is non-existent over large area and water table is deep, wheat and fodder are the main crops. In some patches, fodder and vegetable are also grown by irrigation from seasonal streams and tube wells.

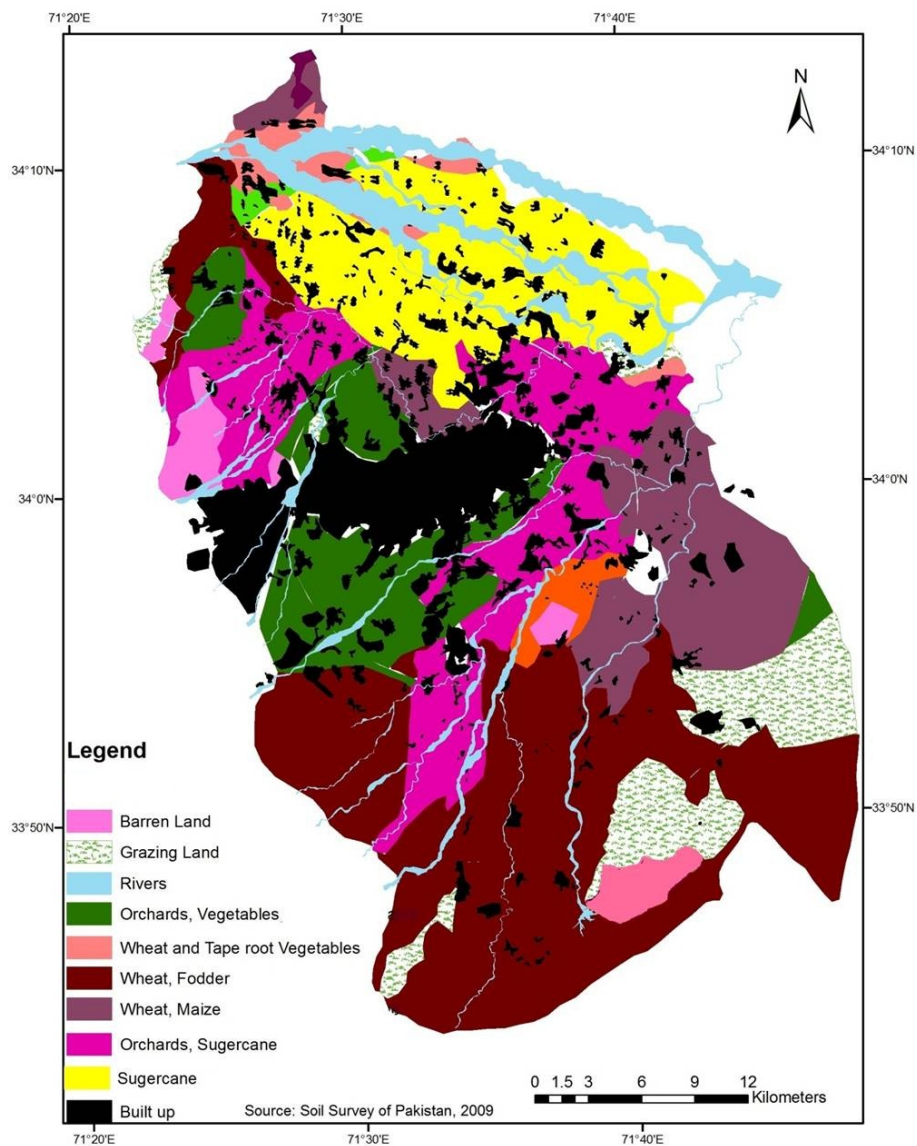


Figure 6.11 Spatial Distribution of Dominant Crops, 2009

6.5 Policies to Contain Farm Losses

The above analysis has brought forward the importance of Peshawar City District as an important agricultural area and has shown that the growing urbanization is encouraging high value agricultural production through dairy and truck farming. Simultaneously, it has also brought to limelight the fact that there is a continuous loss of prime agricultural land in the district due to encroachments mainly by residential use. It is losing some 516 hectares of agricultural land every year. Urban invasion of agricultural land has become a reality that the planners not only in Peshawar but rest of Pakistan have to recognize and live with. Nevertheless, they can contain it through developing and implementing appropriate policies.

This policy would need to be based on the rationale of cause – affect relationships. Since the cause of conversion of farmland is market driven therefore, the solution to prevent the process has to be market-driven with a scientific foundation. It means that agriculture has to be made economically profitable to compete in the urban land market and counter the forces that switch good farmland to other uses. In order to achieve this first and foremost agriculture would need to be recognized as an urban function and included in city plan.

Currently, agriculture is an unorganized activity in Peshawar City District and for that matter even in other cities of Pakistan. Improper livestock keeping needs organized dairy farming and crop growing, bulk of which is done for subsistence purposes. There is a need to develop these along scientific lines to increase the yield. The current low productivity and yield (Table 6.6) is a major hindrance to commercial viability of agriculture.

The Economic Growth Framework for Pakistan estimates that overall unachieved agricultural potential in the country is from 67 to 84 percent (GoP, 2011). In urban areas including Peshawar City District it is about 60 percent (Table 6.6).

Table 6.6 Peshawar City District: Yield Gaps of Major Crops

Crop	Peshawar (Tonnes/ha)	Progressive farmers Yield (Tonnes/ha)	National average (Tonnes/ha)	Yield Gap w.r.t* Progressive Farmers yield (%)
Wheat	2.3	4.6	2.6	50
Maize	2.8	7.4	1.8	62
Rice	2.1	4.6	2.8	54
Sugarcane	51.4	106	48.6	52

Source: Agricultural Statistics, N-W.F.P., 2009; Agricultural Statistics of Pakistan, 2009

*** w.r.t = With respect to**

The Framework attributes “factors such as traditional farming practices, inefficient irrigation methods, high input costs, lack of bio-safety regulations and insufficient institutional credit for poor farmers as the main cause of low yield.” It argues, “given the substantial yield gaps, there are immediate opportunities to increase production through improved soil and water management, use of quality certified seeds, balanced use of fertilizers and proper plant protection measures” (GoP, 2011).

For urban areas like Peshawar City District an important component of the strategy to enhance productivity in agriculture will be to change the production pattern to higher value-added activities such as vegetable and fruit farming, animal husbandry and dairy farming. In this connection lessons can be learnt from the countries where urban agriculture has been accepted as an important activity for growing food (including healthy organic food) and efficient marketing by saving transport costs. Argentina, Brazil and Cuba, are cases of countries with well-recognized policies for urban agriculture (Veenhuizen, 2006). Some other countries like China, Botswana, Benin and Zambia are also making efforts to launch such policies that help urban agriculture (Zeeuw, 2011). Many of them framed such policies in the light of comprehensive strategy like, Poverty alleviation policy, Sustainable urban Development and Food Security. Supportive city policies are also being advocated for urban agriculture and development of local food system. A good number of city governments in developing countries are preparing strategies on urban farming for example Rosario in Argentina, Kampala, Dar es Salaam, and Bulawayo in Zimbabwe (Veenhuizen, 2006; Zeeuw, 2011; Smit, Nasr and Ratta, 2001; Veenhuizen and Danso, 2007).

City agencies even in the developed countries have given importance to framing urban agricultural policies, which also provide important lessons. For example “mixed and integrated land use systems envisaged in the US cities call for a new view of zoning and land use approaches. They call for neighbourhood-based food and energy production, nutrient recycling and water conservation” (Chaturvedi and Sarkar, 2012). Chicago City Council provides a very good example of how to work with various stakeholders in promoting urban agriculture. Working in tandem with its sister agencies, urban agriculture experts and community members, it drafted an ordinance to promote viable, productive urban agriculture, which was approved in September 2011. The new rules among other things will allow for limited produce sales in residential areas, relax parking and fencing rules for larger urban farms and allow for aquaponics - sustainable, symbiotic food production systems. Policies and practices in other US cities for urban agriculture also provide examples of opportunities provided to people to grow significant quantities of healthy food in their neighbourhoods, backyards and on vacant lots. One of the main advantages being cited is to enhance ecological sustainability while advancing local economic resilience. Such practices assume even more significance in the wake of climate change. Opportunities exist in Peshawar city district to promote urban agriculture on wider scale lines to promote food security as well as help sustainable environmental management.

6.6 Conclusion

The area under farm increased substantially in Peshawar city district from 1991 to 1997 but since then it has reached a plateau at around 73,000 hectares. However, It is rather interesting to note that while a large chunk of agricultural land is being consumed by built up area, parts of cultivable waste is also being brought under plough. However, the land capability statistics indicate that most of the farmland lost belonged to the class I and class II soils which are the best farming land in the city while the new land added was mostly in class IV category in rain fed area of the district. This trend is harmful for future of agriculture in the city district.

The spatial pattern of land use change indicates that the farmland within or adjacent to built up area of the city was consumed by residential area but pocket of farmland along main roads were encroached by commercial land uses particularly along the new Ring Road. Industrial use mainly marble factories occupied some 60 hectares of farmland along the Warsak Road. Brick kilns also encroached upon a large part of farmland, about 1,120 hectares, in the southern part of the City District.

Peshawar, in total is losing some 545 hectares of agricultural land every year and whether planners like it or not urban invasion of agricultural land has become a reality that they have to recognize and live with. Nevertheless, they can frame policies to contain it through developing and implementing appropriate policies. This policy would need to be based on the rationale of cause – affect relationships. Since the cause of conversion of farmland is market driven therefore, the solution to prevent the process has to be market-driven with a scientific foundation. It means that agriculture has to be made economically profitable to compete in the urban land market and counter the forces that switch good farmland to other uses. In order to achieve this first and foremost agriculture would need to be recognized as an urban function and included in the city plan.

An analysis of cropping pattern indicates that wheat, maize, fodder and vegetables constitute the most important crops of the area. Land under fodder has been increasing rapidly for consumption by dairy industry, which is expanding in the urban fringe. Area under vegetables is also enhancing due to growing urban market. These trends indicate the possibility of shifting to high value crops and dairy product. However, the yield of these products would also need enhancement at least to the level of yields obtained by progressive farmers in Pakistan to make them commercially viable.

Chapter 7

FARMLAND DYNAMICS IN PERI-URBAN ENVIRONMENT

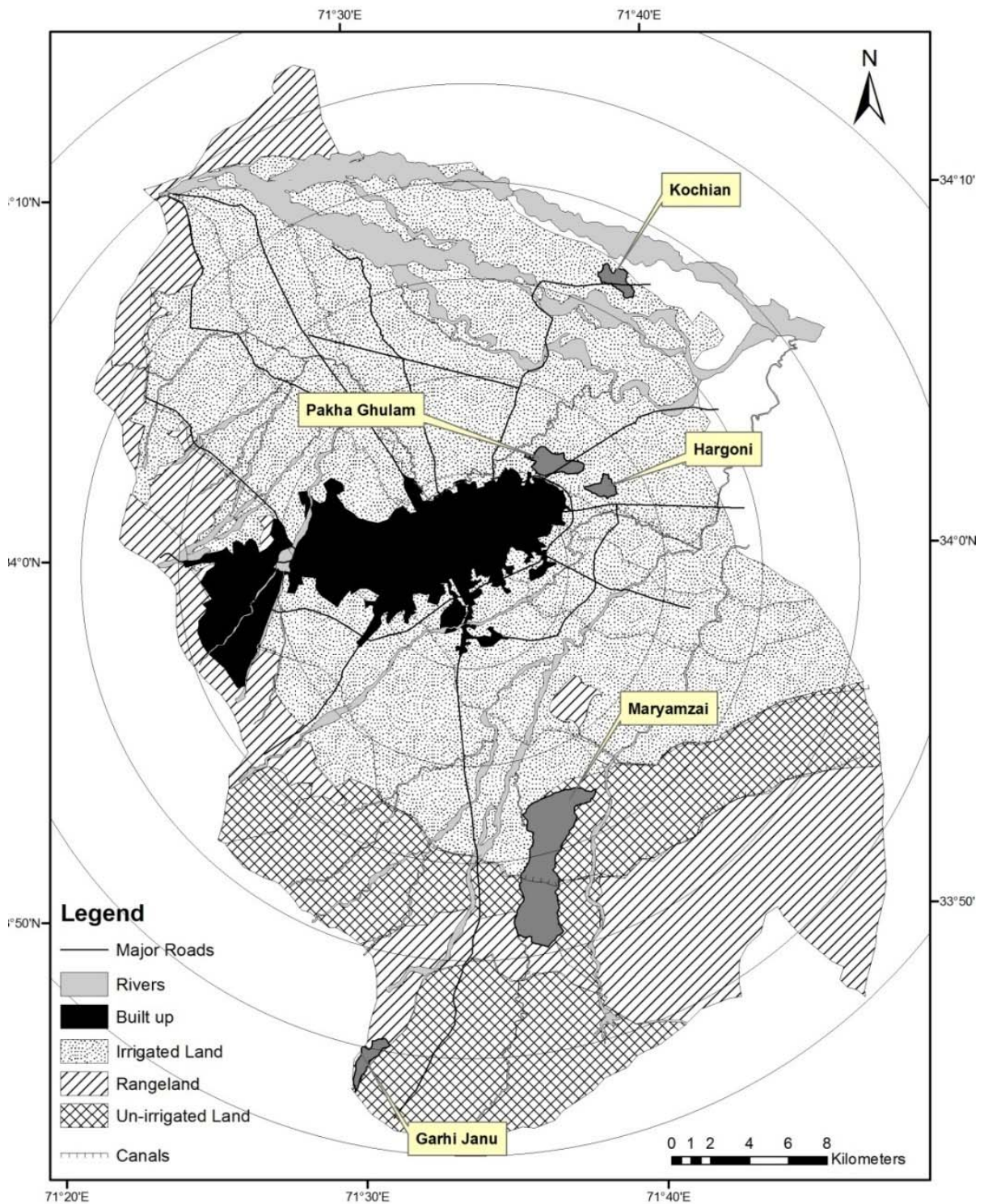
7.1 Introduction

Demographic, spatial and administrative expansion of Peshawar has resulted in encroachments of areas that were earlier distant from the city and rural in character. These areas or Mauzas (revenue villages), which now administratively form part of the City District, have seen increased accessibility due to improvements in transport as well as rapid increase in private vehicle ownership. Hence, the fast increase in city's reach or "sphere of influence" during the last few years has rapidly transformed peri-urban areas due to increased interaction with and access to the city's economy, in terms of capital, labour, goods and services. This chapter is devoted to study the land use dynamics of urban, peri-urban and rural continuum in Peshawar City District. The chapter has been divided into six sections. The brief introduction is followed by a section that highlights profile of Mauzas or villages within the City District selected for this study. The next two sections give their land use and cropping dynamics' respectively. The following section examines the problems and constraints faced by peri-urban agriculture particularly on the basis of focused group discussions conducted. The findings of the chapter are summarized in the concluding section.

7.2 Profile of Selected Villages

Five Mauzas or villages, which now form the part of the City District, were selected on the stratified random sampling basis. Three agro-ecological zones i.e. irrigated, un-irrigated and rangeland were used as strata, while the villages were randomly selected at varying distance from the core within these zones. Since the largest agro-ecological zone was irrigated, three villages were selected from this zone, while one was selected from rangeland. No village was totally in rain fed area, therefore a village was selected with comparatively larger area under rain fed category. The location of villages thus selected is shown in Fig. 7.1 and their profile is given in Table 7.1. Maryamzai, a very large village situated partly in the rain fed and partly in irrigated zone in southern part of the

city, is the largest while Hargoni, located in irrigated zone in the north, is the smallest in both area and population.



**Figure 7.1 Peshawar City District: Location of Sample Mauzas/villages
(Circles area drawn from centre at 5-km interval)**

Table 7.1 Profile of Mauzas/ Villages Selected for the Study

Mauza/Revenue Village	Area (ha)	Population (1998)	Distance from Centre of the City District (Kilometers)	Agro-Ecological Zone
Pakha Ghulam	345	9,986	06	Irrigated
Hargoni	115	1,147	09	Irrigated
Kochian	202	3,663	17	Irrigated
Maryamzai	1392	16,442	20	Rain fed & irrigated
Garhi Janu	151	2,203	25	Rangeland
Total	2205	33,441	-	-

Source: Revenue Record, 2009 & District Census Report, 1998

All sample villages had local land records, which were obtained from the *patwaris*, or land revenue officers of the respective villages. These records contained information on general land use, cropping patterns and household land ownership etc.

7.3 Land use Dynamics in Sample Villages

The land use pattern in 1991 and 2009 in selected villages in terms of absolute Figures is given in Table 7.2, while their percentages are shown in figure. 7.2. Overall cultivated lands (net sown and current fallow land) dominate, constituting three fourth of the total area of the sample villages in 2009. If one includes the cultivable waste land (due to factors such as being common land) and rangeland, the total agricultural area comes to 83 percent of the total area. The non-cultivable land use (including built environment, area under roads, water bodies, brick kilns, graveyards and other such uses), where agriculture is not possible, constituted 17 percent of the total. In 1991, cultivated land was 92 percent and non cultivable land was 8 percent of the total.

A marked decline (9%) in agricultural area is the result of urbanization pressure. The reduction in permanent pasture illustrates the process of sale and acquisition of village common lands, which traditionally had been important resources for poor section of the agricultural society, who used these for cattle grazing and collection of wood for fuel.

The built up area almost doubled during 1991-2009. If this trend continues in future, it will further reduce the cultivated land.

Table 7.2 Type of Land Use in Selected Mauzas/ Villages, 1991 and 2009 (Area in Hectares)

Sample Village	Built up		Cultivable waste		Non-cultivable		Net sown		Current fallow		Total Area of Mauza/Village
	1991	2009	1991	2009	1991	2009	1991	2009	1991	2009	
Hargoni	4	24	2	1	2	15	97	69	10	6	115
Pakha Ghulam	20	62	35	30	6	6	255	236	28	12	345
Kochian	16	24	11	10	6	6	150	147	19	15	202
Maryamzai	78	124	155	133	37	97	764	738	357	301	1,392
Garhi Janu	5	6	55	32	2	2	77	101	12	10	151
Total	123	240	258	206	53	126	1,343	1,291	426	344	2,205

Source: Revenue Record, (1991-2009)

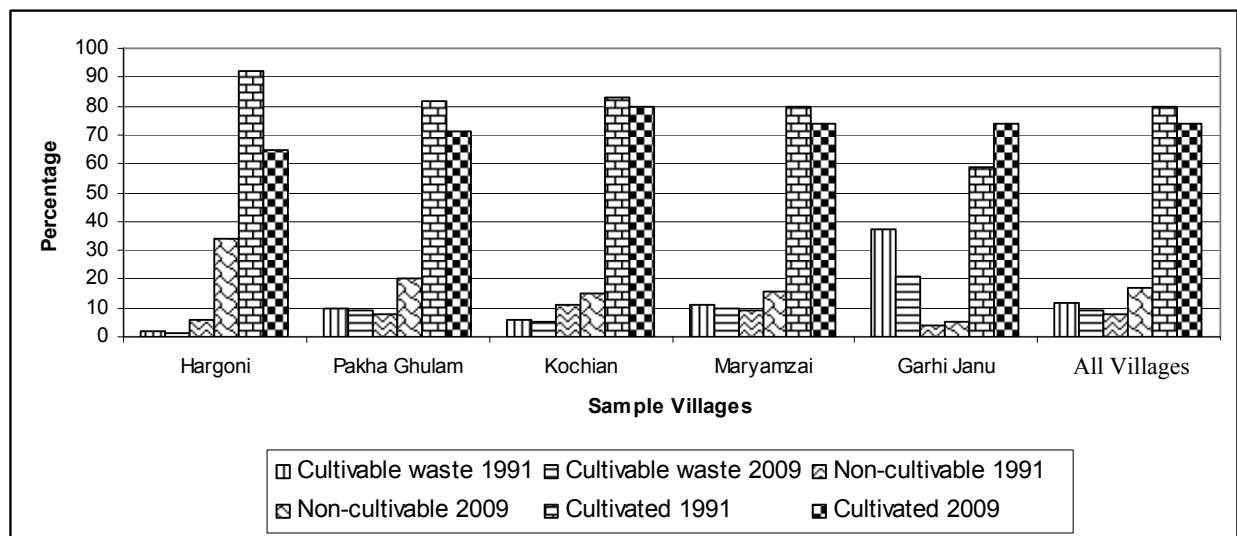


Figure 7.2 Type of Land use (percentages) in Selected Mauzas/Villages, 1991-2009

A comparison between villages shows that overall cultivated area has reduced in all villages except Garhi Janu. Among individual mauzas/ villages, those located within 10-kilometer radius have low percentage of cultivated land compared to those located

outwards. The intensity of temporal changes in land use is also high in mauzas/villages located near the center. For example in Pakha Ghulam the built up area increased from 20 hectares in 1991 to 62 hectares in 2009 enhancing by more than three times (Table 7.2 & Fig. 7.3). Overall, non-cultivable uses in this mauza increased from 9 to 20 percent between 1991 and 2009 (Fig. 7.2). In case of Hargoni, the built up area increased from just 4 hectares in 1991 to over 24 hectares in 2009, 6 time increase in 18 years (Table 7.2 & Fig 7.4). The cultivated land in 1991 in that mauza constituted over 92 percent of the total area, while in 2009 it diminished to 64 percent of the total area (Fig. 7.2). The construction of motorway and northern bypass through Hargoni has caused the shrinkage of farming land. Currently a number of small private housing schemes are underway and it is anticipated that the cultivated land will further shrink in the near future.

In contrast to Pakha Ghulam and Hargoi, land use changes in Kochian were slow. The built up area here increased from 16 hectares to 24 hectares between 1991 and 2009 (Fig. 7.5). The cultivated land in the village still accounts for four fifth of the area.

The built up area in Maryamzai increased from 78 to 124 hectares during 1991-2009 period. The major change has been in non-cultivable land (including both built up and other uses) which almost doubled in absolute term (Table 7.2). This was due to enormous increase in brick kilns which in 1991 occupied an area of 10 hectares (Fig 7.6a) that enhanced to over 70 hectares in 2009 (Fig. 7.6b), a seven time increase. It is important to note that brick kilns are mostly located on the prime irrigated agricultural land. Current fallow has also reduced gradually, although even now a fairly large area is left fallow. If water for irrigation is made available to this land, it can be sown to compensate for the loss of land to brick kilns and other non-agricultural uses.

Land in mauza Garhi Janu, located in the extreme south of the City District, is not irrigated by any perennial canal. Whatever cultivated land exists is irrigated by channels taken out from springs or local streams in the area. Land use pattern in Garhi Janu is somewhat different from other sample mauzas as shown in the Table 7.2. Cultivated land here actually increased in the last two decades because a large area of cultivable waste (rangeland) was brought under cultivation. The cultivable waste reduced from 55 hectares

to about 32 hectares between 1991 and 2009 (Fig 7.7). The built up area increased at much slower rate than other areas in Peshawar for two reasons. Firstly the distance from the city centre and secondly because of its situation next to tribal area, where law and order situation at present is not satisfactory.

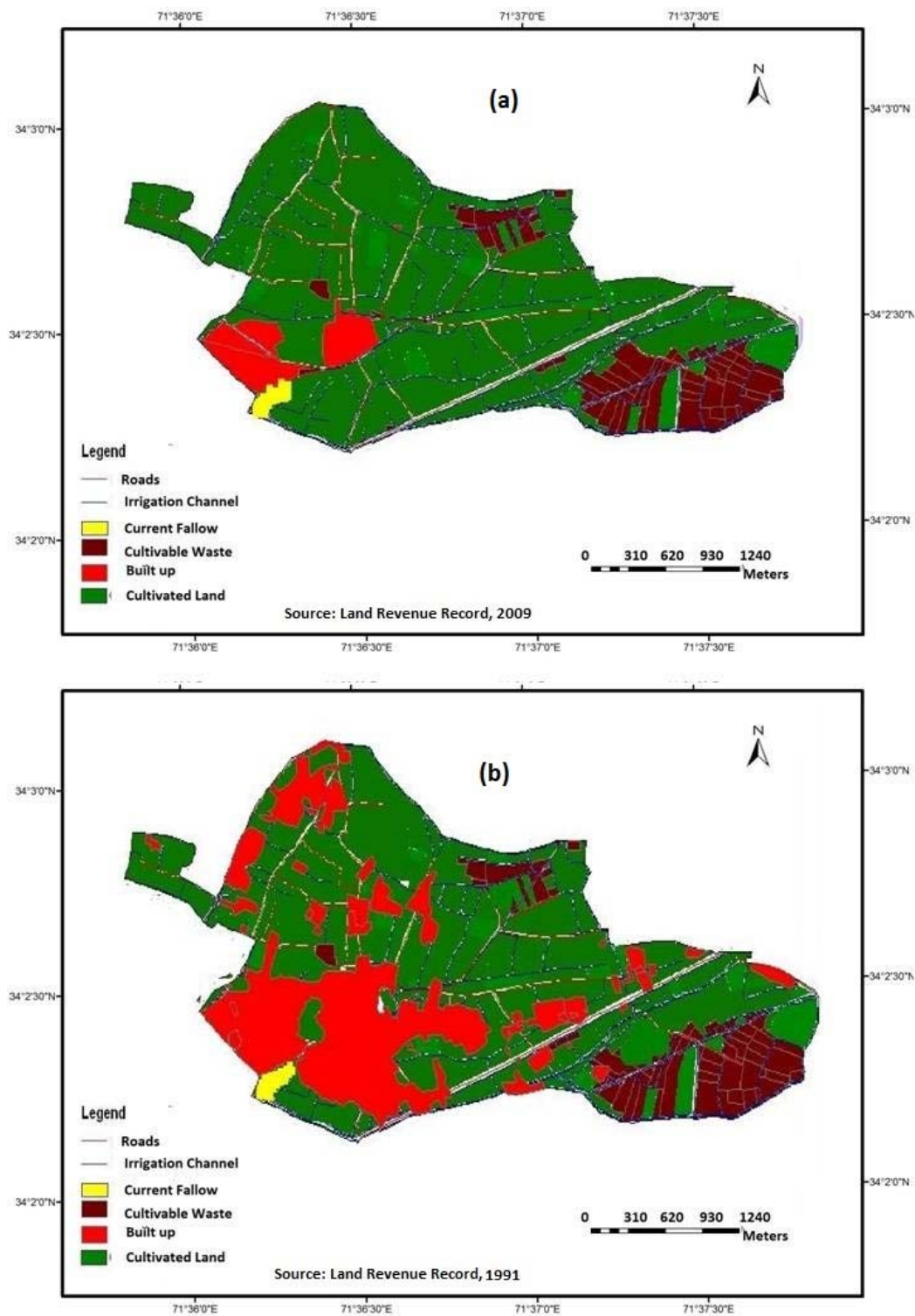


Figure 7.3 Pakha Ghulam: Land use pattern (a) 1991 (b) 2009

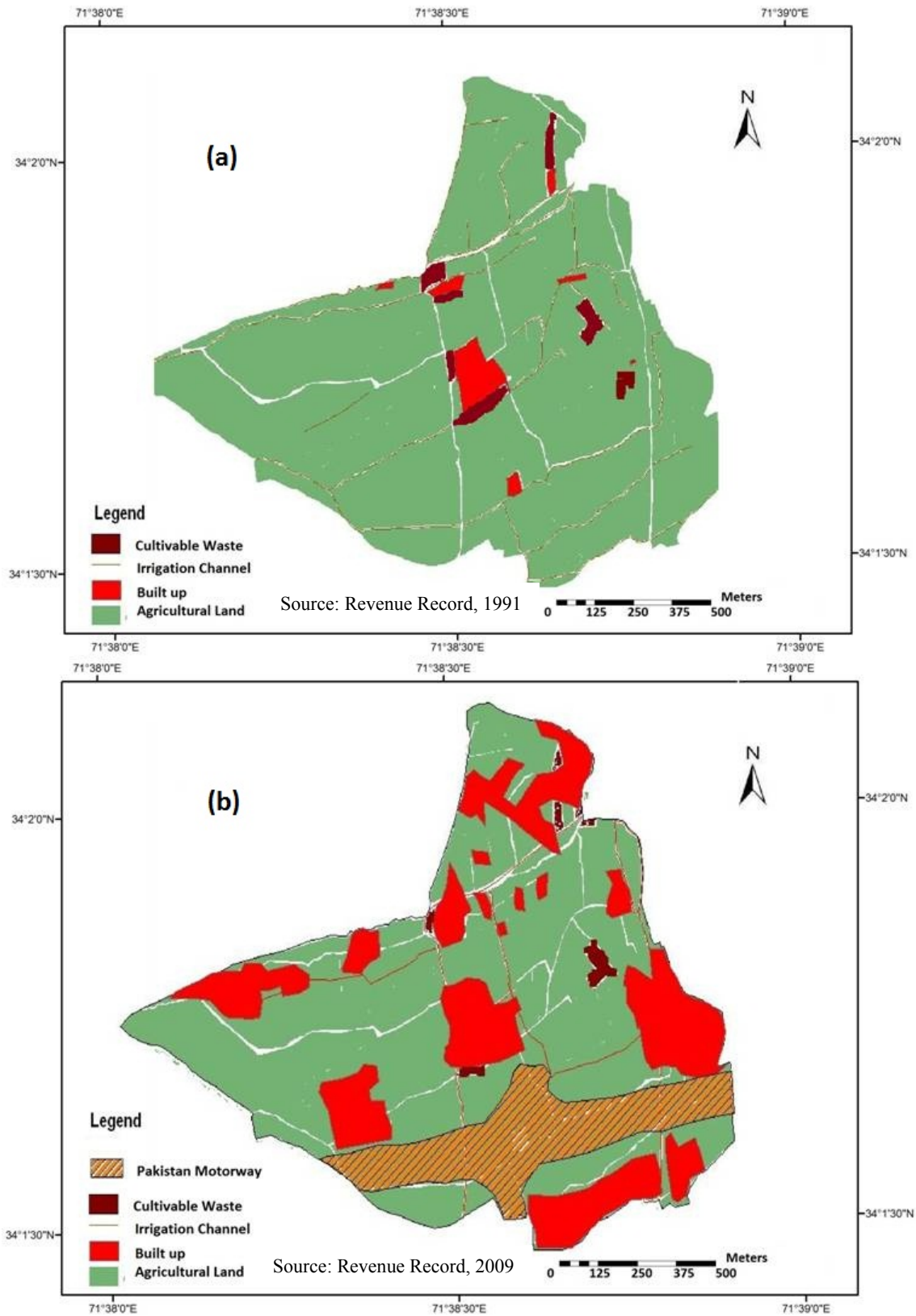


Figure 7.4 Hargoni: Land use pattern (a) 1991 (b) 2009

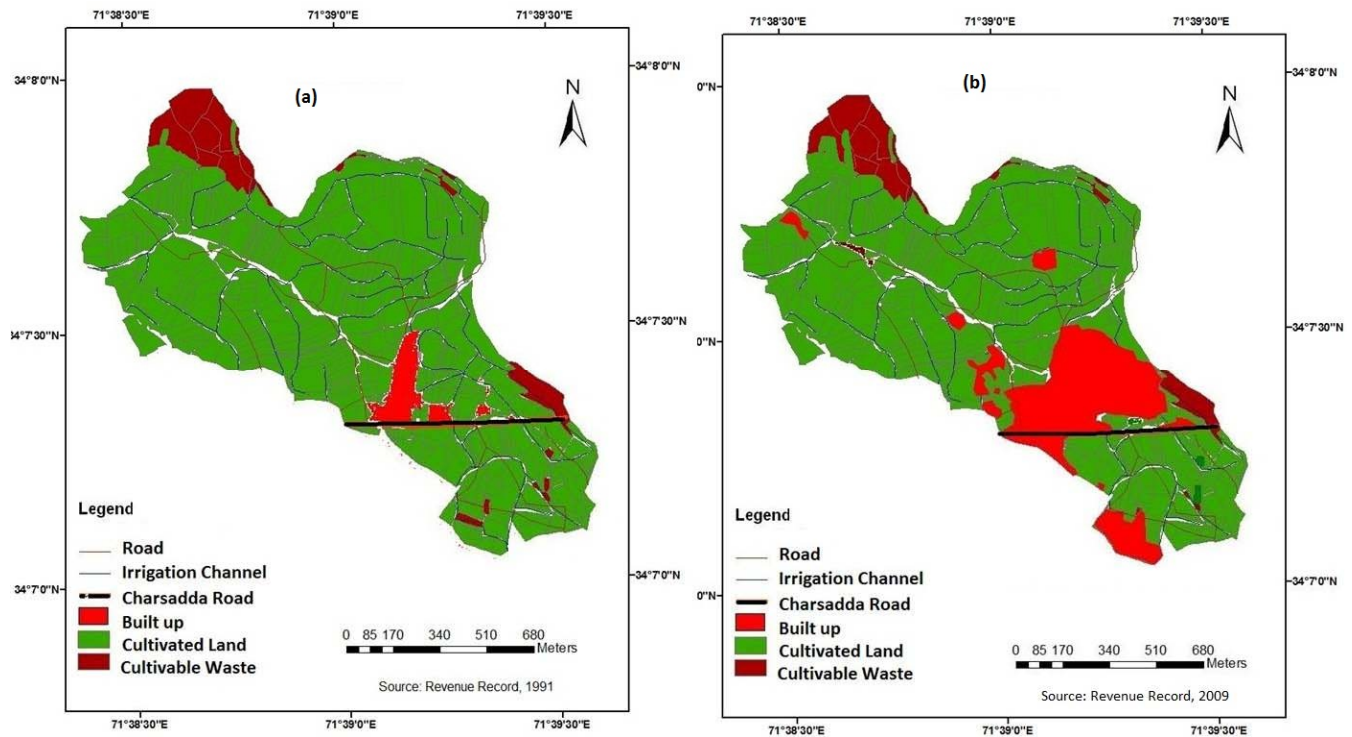


Figure 7.5 Kochian: Land use pattern (a) 1991 (b) 2009

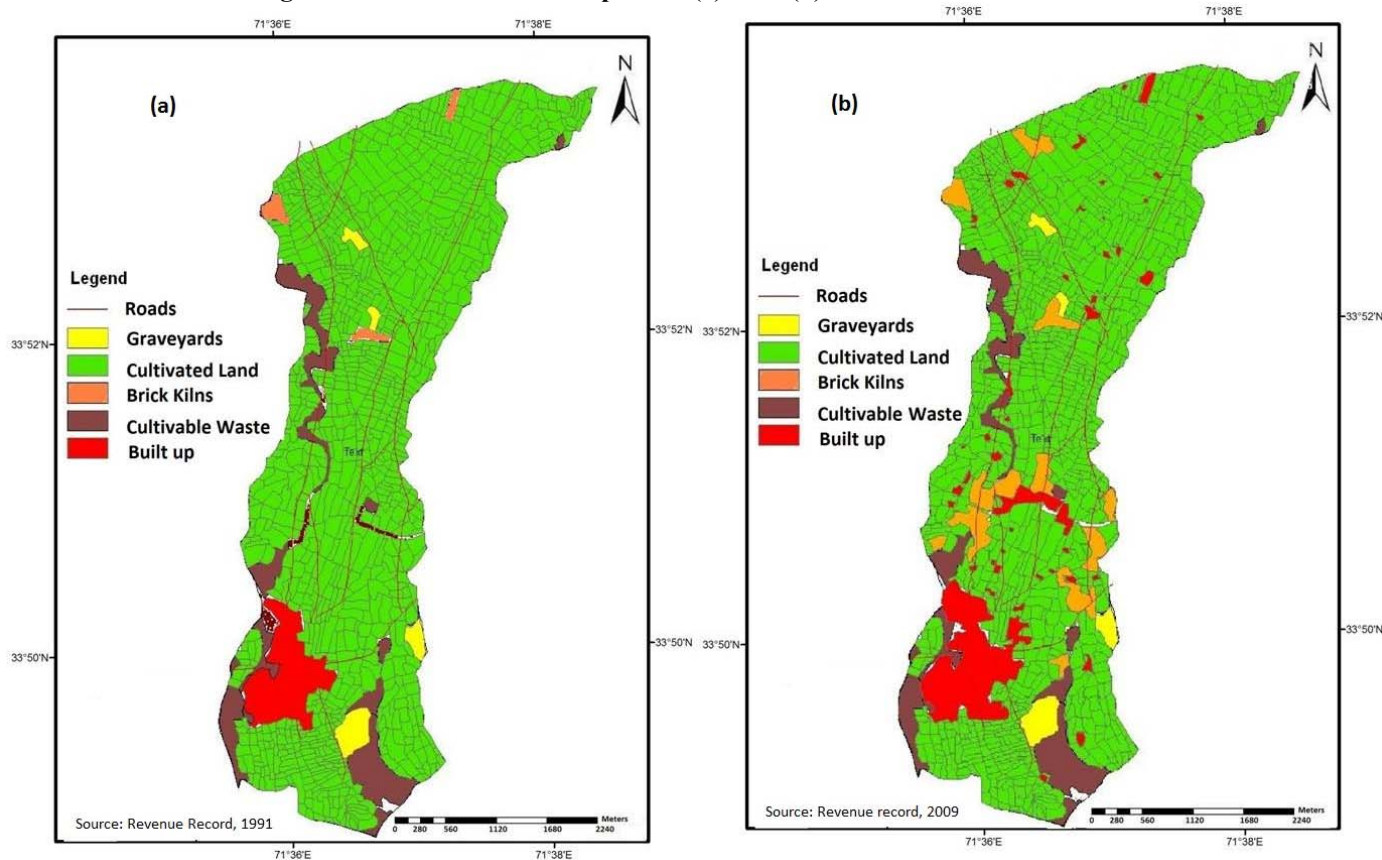


Figure 7.6 Maryamzai: Land use pattern (a) 1991 (b) 2009

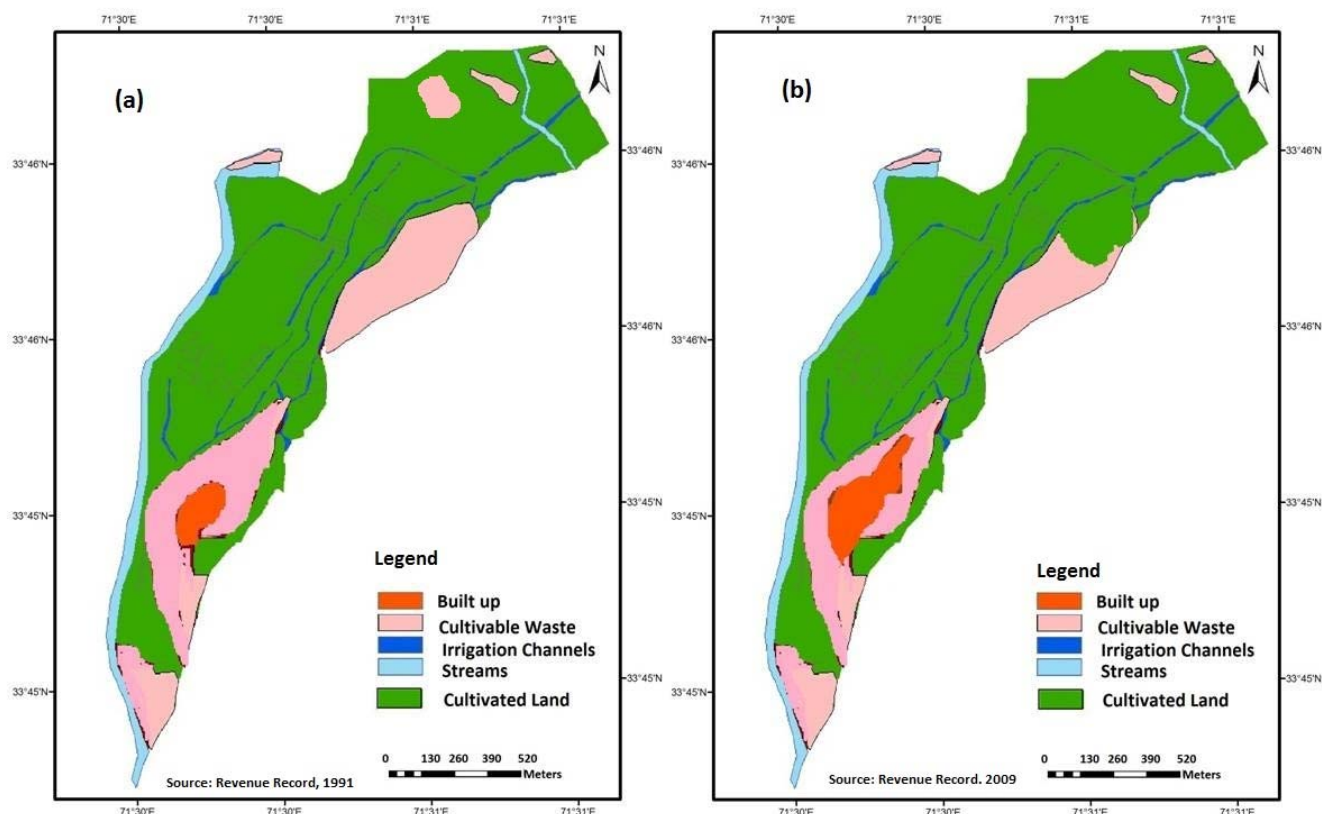


Figure 7.7 Garhi Janu: Land Use Pattern (a) 1991 (b) 2009

7.4 Cropping Dynamics

Important Rabi (winter) crops in sample mauzas were wheat, fodder and vegetable. Wheat was the dominant Rabi crop covering an area of 1,093 hectares (Table 7.3) in 2009, almost the same as in 1991. Wheat has highest percentage in terms of area among the Rabi crops (Fig. 7.8).

Table 7.3 Rabi Cropping Pattern by Mauzas/Villages, 1991-2009 (Area in Ha)

Mauza	Wheat		Fodder		Vegetable		Current fallow	
	1991	2009	1991	2009	1991	2009	1991	2009
Hargoni	70	41	26	28	8	7	4	1
Pakha Ghulam	167	150	78	102	17	25	11	5
Kochian	113	101	39	49	8	9	8	5
Maryamzai	740	721	262	183	46	49	56	45
Garhi Janu	45	80	24	17	5	6	14	9
Total	1135	1093	429	379	84	96	93	65

Source: Revenue Record, (1991-2009)

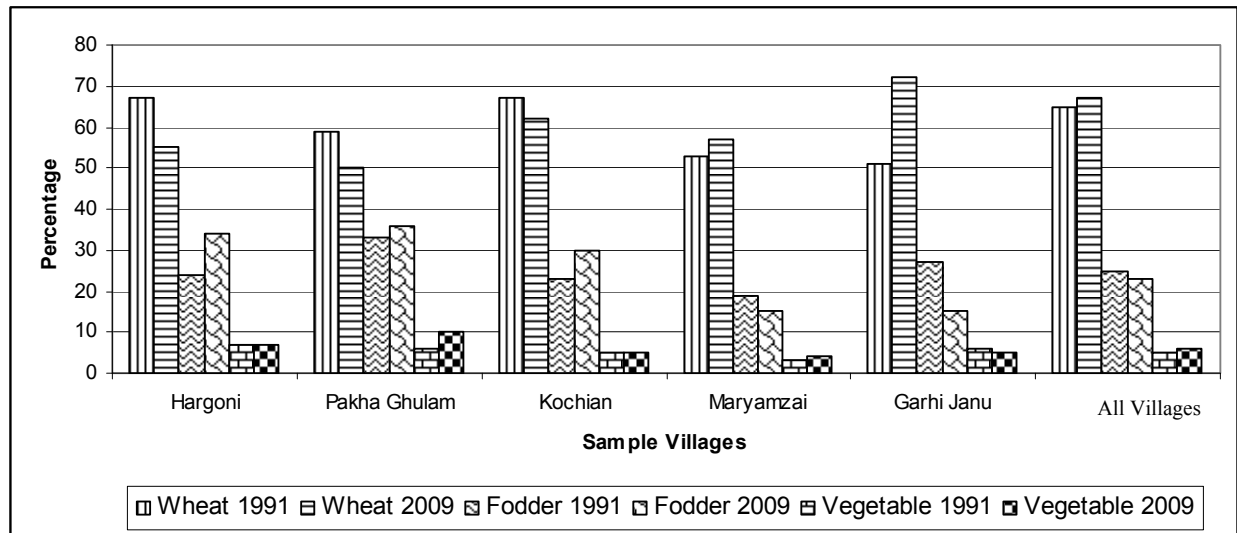


Figure 7.8 Rabi Cropping Pattern by Mauzas/Villages, 1991-2009 (Percentage of Area)

Sugarcane was dominant Kharif crop in all mauzas located in the northern side of the City District, whereas maize was the principal Kharif crop in the southern section of the study area. Maize was common in mauzas located at the periphery of the city. It was utilized as fodder in the sample mauzas located close to the city centre due to concentration of dairy farming in that area. The Table 7.3 and 7.4 show that in both Rabi and Kharif, fodder is the next important crop. The increase in acreage of fodder over time in all sample mauzas (Fig. 7.10 to 7.14), indicates its rising demand for dairy cattle. Area under vegetables also increased since 1991 (Table 7.3 & Fig 7.9) indicating growth of in truck farming. Area under vegetable farming was particularly high in those mauzas situated near the city centre (Fig 7.8 & 7.9). This trend signifies the importance of market factor on cropping pattern in the City District.

Table 7.4 Cropping Pattern, Kharif by Mauzas/Villages, 1991-2009 (Area in ha)

Mauza	Maize		Fodder		Sugarcane		Orchards		Vegetable		Current Fallow	
	1991	2009	1991	2009	1991	2009	1991	2009	1991	2009	1991	2009
Hargoni	13	0	22	25	50	38	5	3	13	8	3	1
Pakha Ghulam	14	0	59	106	135	127	14	12	32	36	28	5
Kochian	25	34	29	32	98	76	5	3	7	10	6	8
Maryamzai	426	325	172	262	117	112	12	14	36	46	452	309
Garhi Janu	21	43	9	13	42	10	10	4.4	20	3	43	38
Total	499	402	291	438	442	363	46	36.4	108	103	532	361

Source: Revenue Record, (1991-2009)

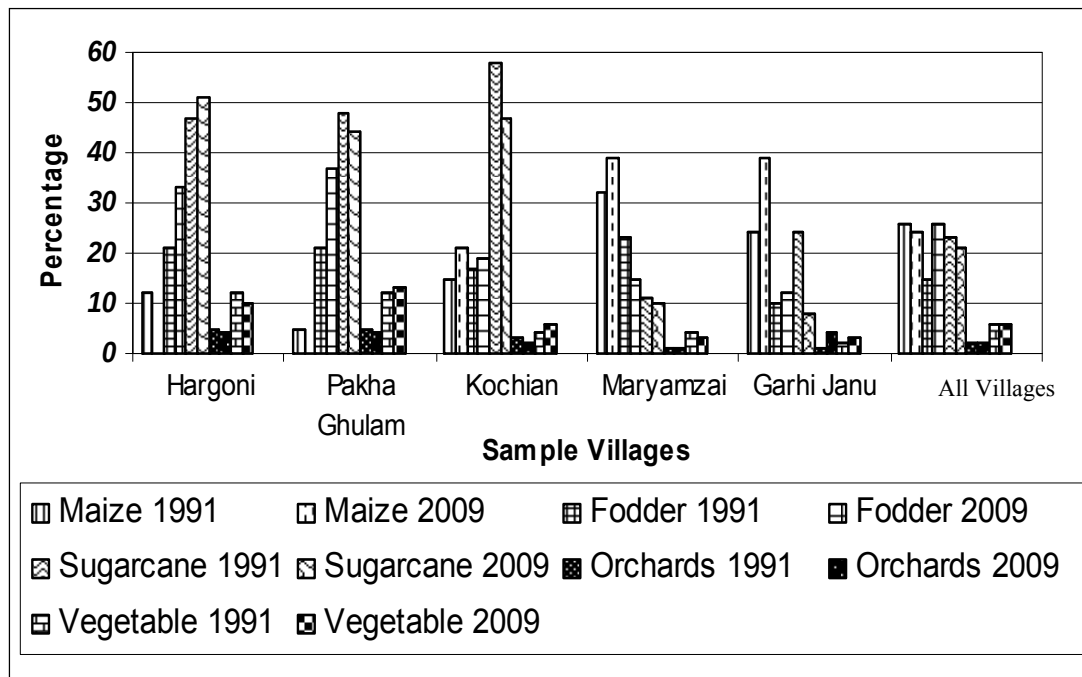


Figure 7.9 Cropping Pattern, Kharif by Mauzas/Villages, 1991-2009 (Percentage of area)

The Figure 7.9 reveals that area under orchards has been fluctuating but overall an increasing trend has been observed in the last two decades. As far as current fallow is concerned its percentage was more in the rain fed villages than in the irrigated villages. Overall area under this category has decreased. Acreage of current fallow usually depends on availability of water for irrigation. During Rabi season due to better rainfall,

its acreage is small (Table 7.3) while in the Kharif season because of low rainfall, its area is always large (Table 7.4).

Mauza-wise cropping pattern indicates that Pakha Ghulam has considerably changed from predominantly food crops and cereals to dominantly cash crops and fodder. Sugarcane was the most important cash crop in Kharif and wheat in Rabi season. Although their acreage has somewhat reduced because of expansion of built up area but still they dominate among crops (Fig 7.8 & 7.9). Pakha Ghulam being located near the main city is very important source of milk for the urban market, therefore fodder crops are dominant here in both Rabi and Kharif seasons. Demand for fodder has been so high that even the maize in 2009 was totally used as fodder (Fig. 7.10b).

Like other mauzas in Hargoni, wheat in Rabi and sugarcane in Kharif were major crops (Fig 7.11). However, the area under these crops has reduced since 1991 because of shrinkage in cultivated land due to encroachment by built up area. Fodder and vegetables are grown over a large area in this village located close to core city. However, due to construction of Pakistan Motorway and northern bypass, much of the area under fodder and vegetables has been lost (Fig 7.11).

Like other parts of Peshawar wheat was the most dominant crop in Kochian. Area under wheat was much more than any other crop both for 1991 and 2009. However, as Figure 7.12 indicates area under fodder and vegetable has increased at the expanse of wheat and sugarcane (Table 4.3 & 7.4). Kochian is located half way between Peshawar and Charsadda that is why dairy products and vegetables have a ready market in both cities.

Wheat was chief crop in Rabi season in Maryamzai (Tables 7.3 & 7.4). It was cultivated over 740 hectares of land in 1991, which reduced to 721 hectares in 2009 due to expansion of built up area and brick kilns (Fig. 7.13). Maize was dominant Kharif crop but its area decreased from 425 hectares in 1991 to 325 hectares in 2009 as some of the maize was consumed and recorded as fodder in the later year. Area under fodder has enhanced in the last two decades. Similarly, during the same period land devoted to vegetable also slightly increased both in Rabi and Kharif. Sugarcane was another

important crop, cultivated over extensive area in 1991 that slightly reduced in 2009. The Figure (7.13 c & d) shows that sugarcane was grown only in the northern part of Maryamzai where canal irrigation was available. No sugarcane was grown in the southern part because rainfall is not sufficient to grow this crop.

Cropping pattern of Garhi Janu is quite different than other mauzas because of its farthest location from the core city. Grains are more common here compared to fodder. Large area of land was left fallow here due to non-availability of water for irrigation. Moreover, in Garhi Janu the built up area was not affecting the cultivated land as it is located at higher elevation at a distance from it (Fig 7.14). Dominant crops in this mauza are wheat in Rabi and maize in Kharif season. Area under both enhanced after 1991 as more cultivable waste land was brought under plough (Tables 7.3 & 7.4). Part of the area under current fallow was also given to crops in 2009. Unlike other mauzas area under fodder here declined during Rabi season from 27 percent in 1991 to 15 percent in 2009.

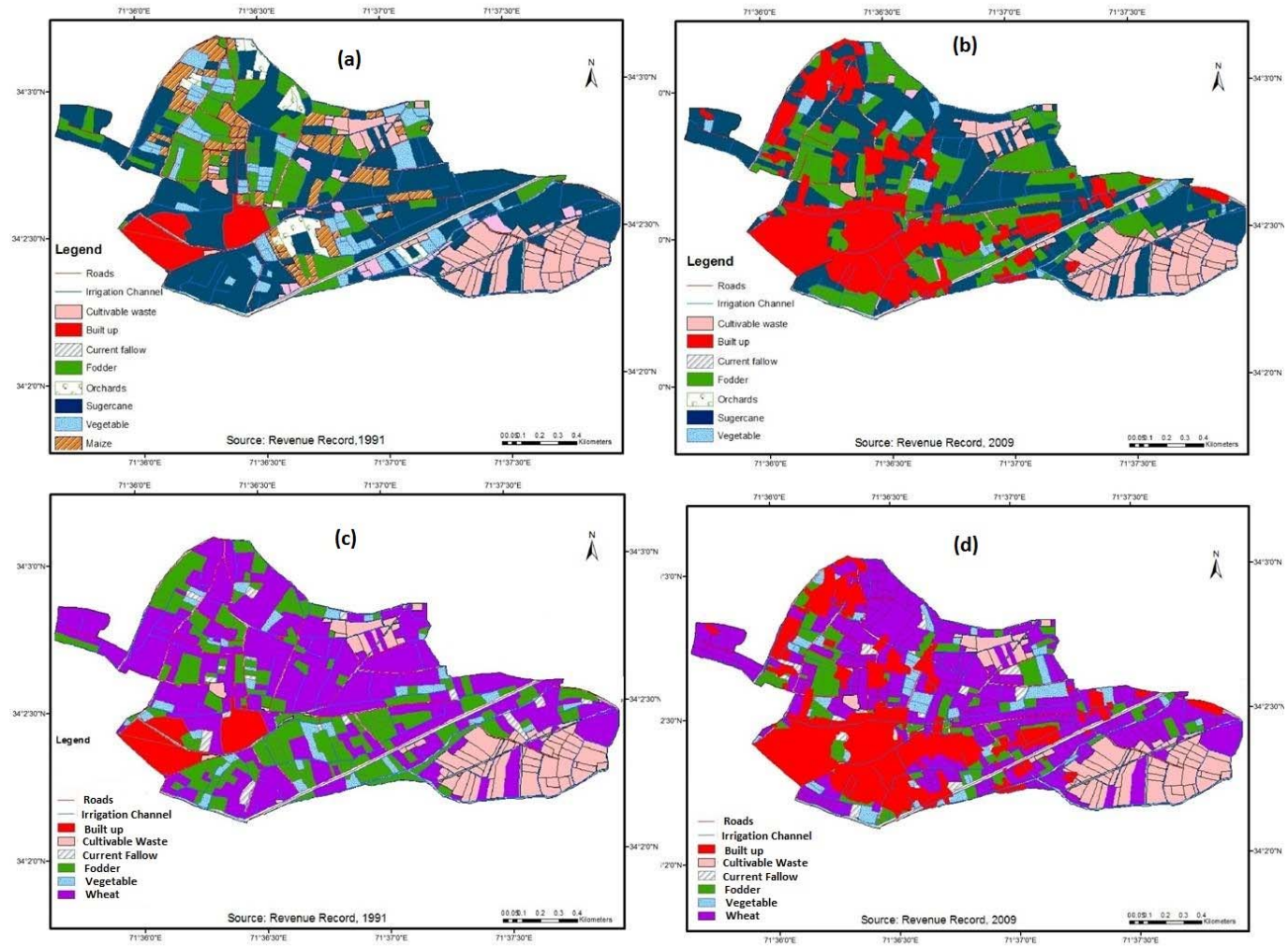


Figure 7.10 Pakha Ghulam: Cropping Pattern
 (a) Kharif, 1991 (b) Kharif, 2009 (c) Rabi, 1991 (d) Rabi, 2009

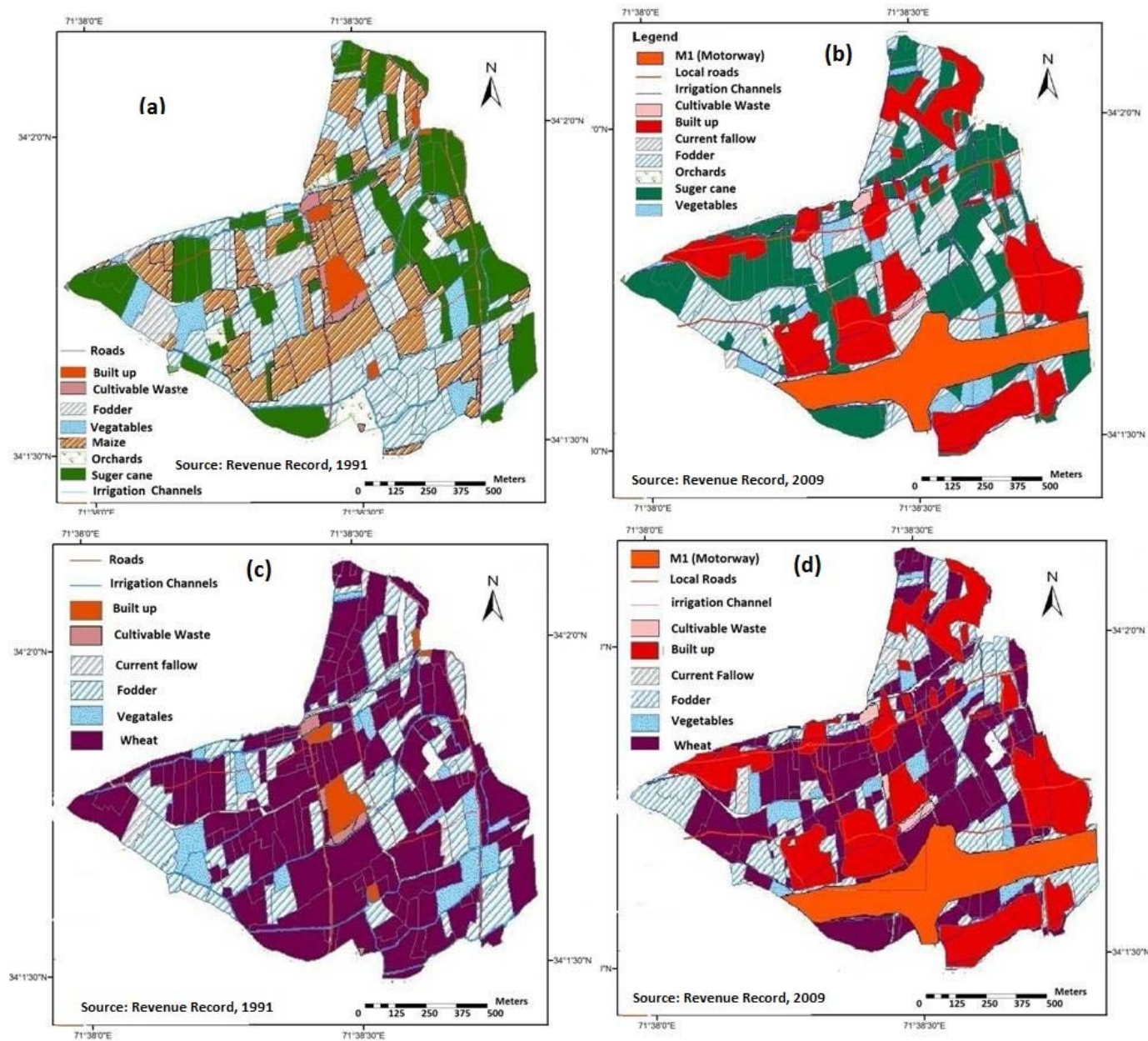


Figure 7.11 Hargoni Cropping Pattern
 (a) Kharif, 1991 (b) Kharif, 2009 (c) Rabi, 1991 (d) Rabi, 2009

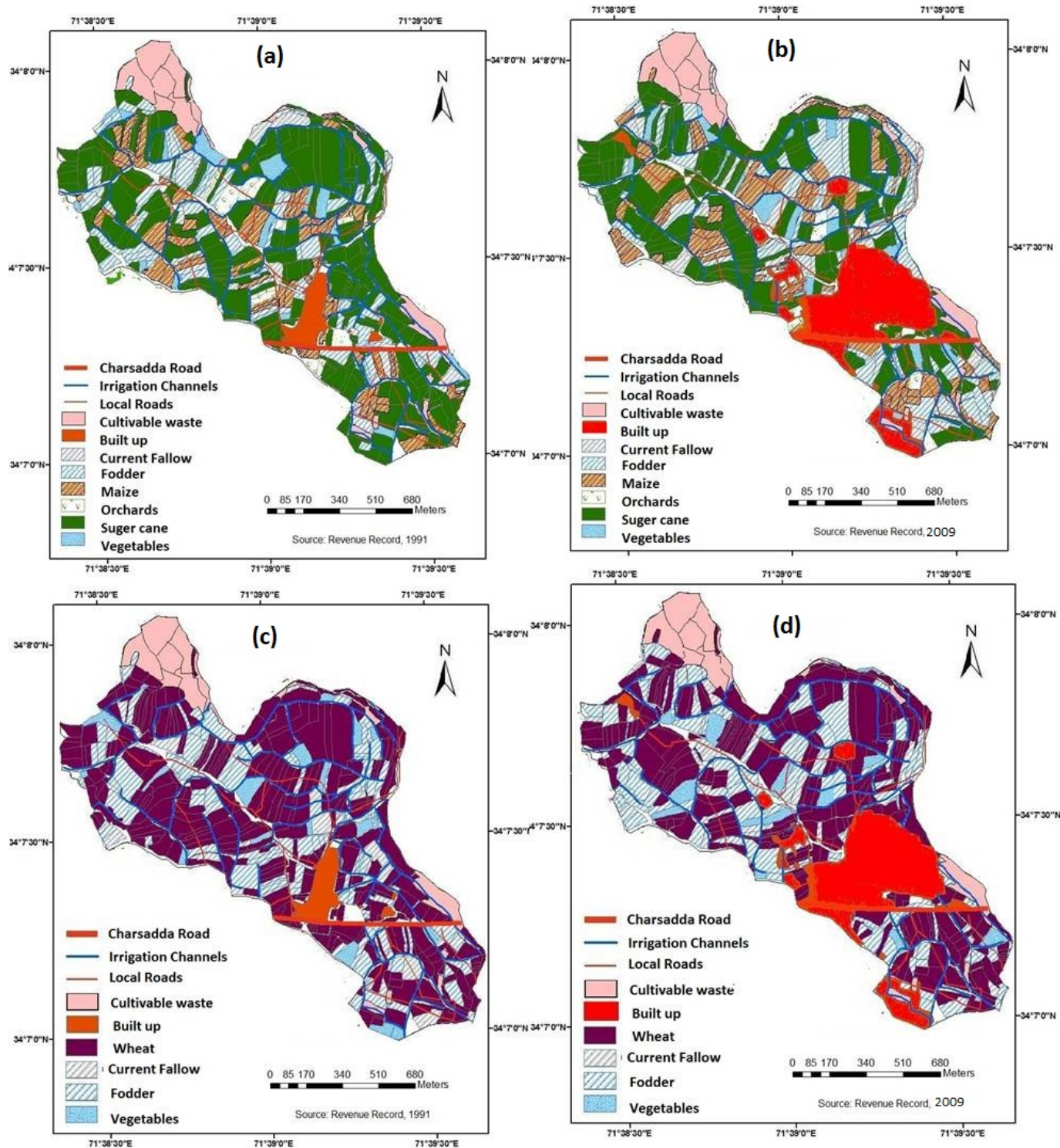


Figure 7.12 Kochian Cropping Pattern
 (a) Kharif, 1991 (b) Kharif, 2009 (c) Rabi, 1991 (d) Rabi, 2009

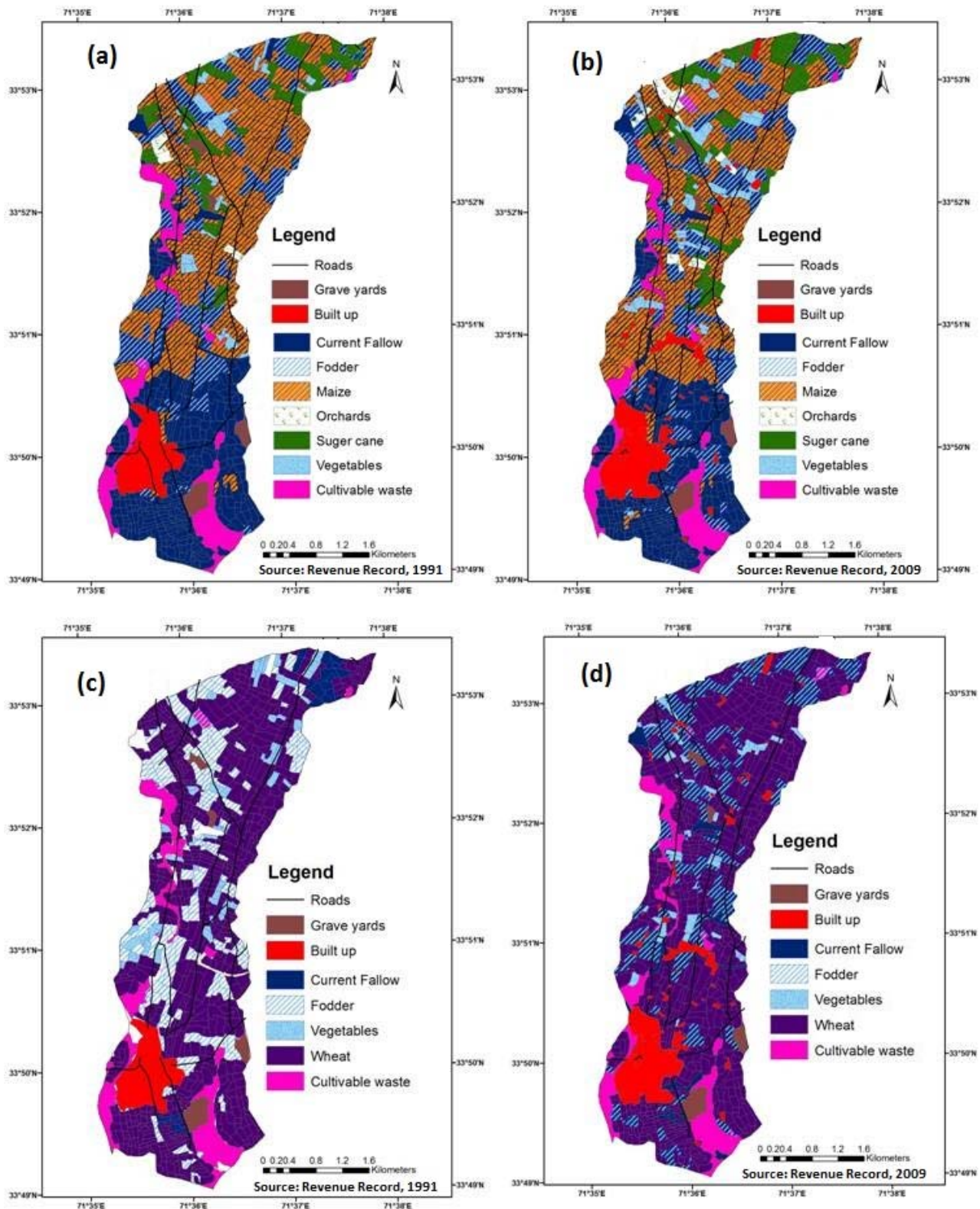


Figure 7.13 Maryamzai: Cropping Pattern
 (a) Kharif, 1991 (b) Kharif, 2009 (c) Rabi, 1991 (d) Rabi, 2009

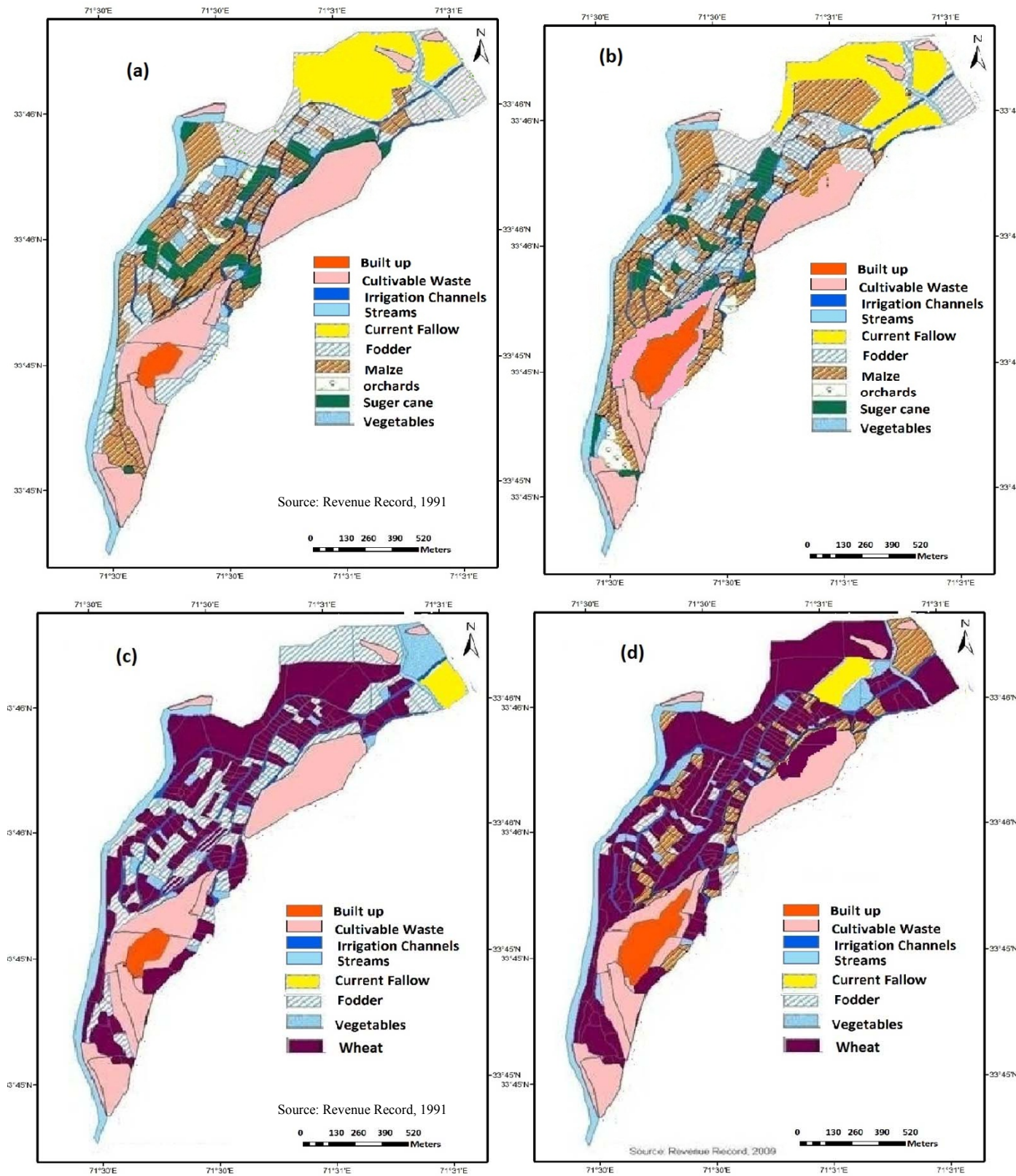


Figure 7.14 Garhi Janu: Cropping Pattern
(a) Kharif, 1991 (b) Kharif, 2009 (c) Rabi, 1991 (d) Rabi, 2009

7.5 Loss of farmland: Contributing Factors

As mentioned in previous chapter, one would have assumed that due to exposure to better technologies and growing methods, accessibility to inputs and market, yield per acre would be quite high in cultivated area of the mauzas included within the city district. This however is not the case. It is mainly because of lack of support from the Government particularly the local one. In addition lack of access to land, farm fragmentation, poverty of farmers and lack of access to credit as well as high costs of inputs are some of the factors contributing low yields and ultimate loss of farms to other uses in the mauzas engulfed into the city boundary.

7.5.1 Low Yields

Table 7.5 indicates that there is a huge gap between the yields in sample mauzas compared to progressive farmers yield within Pakistan. In some cases the yield gap is as high as 69 percent. Usually this gap is less in the irrigated lands compared to rain fed area. Owing to better soils and growing conditions in Peshawar City District, there is great potential to enhance yield per hectare of land, which can be achieved by promoting modern cultivation methods and techniques and using better varieties of seeds and support of the government.

**Table 7.5 Sample villages: Yield Gaps of Major Crops w.r.t* Progressive Farmers yield
(in Percentages)**

Crop	Progressive farmers Yield (Tonnes/ha)	Hargoni		Pakha Ghulam		Kochian		Maryamzai		Garhi Janu		Peshawar City District	
		Yield	Yield Gap	Yield	Yield Gap	Yield	Yield Gap	Yield	Yield Gap	Yield	Yield Gap	Yield	Yield Gap
Wheat	4.6	2.4	48	2.3	50	2.5	46	2.1	54	1.9	59	2.3	50
Maize	7.4	2.5	66	2.3	69	2.8	62	2.9	61	2.5	66	2.8	62
Sugar cane	106	52	51	51	52	55	48	48	55	46	57	52	52

Source: Agricultural Statistics, N.W.F.P., 2009; Agricultural Statistics of Pakistan, 2009;

Field Survey, 2009 (w.r.t = With respect to)

Much of the city district mauzas consist of class I and class II soils with little or no limitations for crop growth. Only in the southern parts of the district the soils are comparatively poor (class III–V). However, as discussed below the existing precarious farming conditions will need improvements.

7.5.2 Low access to Land

The distribution of agricultural land is highly skewed in the mauzas of Peshawar City District. For example, almost 69 percent of the landholdings were less than 2 hectares (ha) and 85 percent of the landholdings were less than 3 ha (Table 7.6). Basically farmers with less than 1 ha of land are "marginal" and those with 1-2 ha are "small" farmers. Almost 5 percent of the households were landless and 69 percent had marginal or sub marginal landholdings. Leasing land or employment as agricultural labourers are the main means of becoming involved in agriculture and both are common. Several landless farmers leased in more than 2 ha land. They paid to the land owners in kind or cash at fixed annual rates.

Table 7.6 Number of Farm Ownership by Size in Sample Mauzas, 2009

Mauza/Revenue Village	<0.5 ha	0.5-1 ha	1-2 ha	2-3 ha	3-4 ha	4-5 ha	5-8 ha	>8 ha	Total	
									Number of farms	%
Pakha Ghulam	36	47	32	24	12	15	3	1	170	100
Hargoni	45	52	12	15	3	6	2	1	136	100
Kochian	12	23	22	12	11	8	2	3	93	100
Maryamzai	65	78	23	32	15	18	19	18	268	100
Garhi Janu	45	52	12	15	3	6	2	1	136	100
Total	203	252	101	98	44	53	28	24	803	100

Source: Revenue Record, 2009; Field Survey, 2009

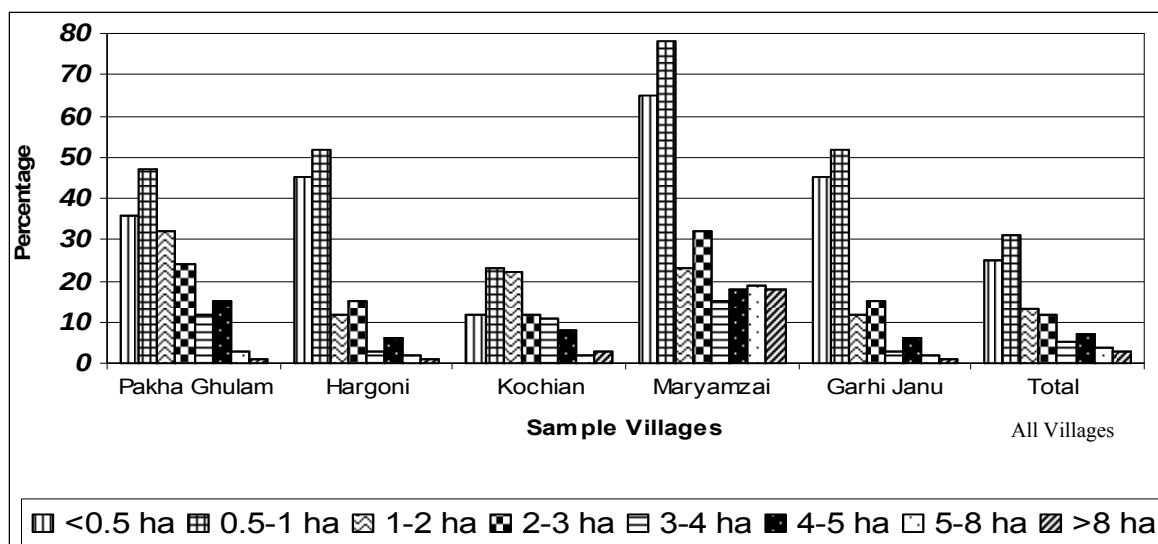


Figure 7.15 Percentage of Farm Ownership by Size in Sample Mauzas/villages, 2009

The lease rate varied for different areas depending on location and quality of land. For irrigated land it was Rs 12,000 in Pakha Ghulam and Hargoni located near the city but reduced to Rs 9,000 per annum in Maryamzai. It was generally less than Rs 5,000 for rain fed land. In southern parts of the district like in Maryamzai and Garhi Janu payments is usually in kind. Usually, when the payments is in kind, the production is shared equally between the land owner and leasing cultivators. In such cases the input charges including water charges (*Abyana*), seeds and fertilizers are shared by both parties.

7.5.3 Farm Fragmentation

One of the major problems facing agriculture in the City District that inhibits modern farming is fragmentation of farms that inhibits modern farming practices. As discussed in the previous section, majority of farms in sample mauzas are less than one hectare. These are even smaller in the Mauzas located near the city centre in the north (Fig. 7.16 & 7.17).

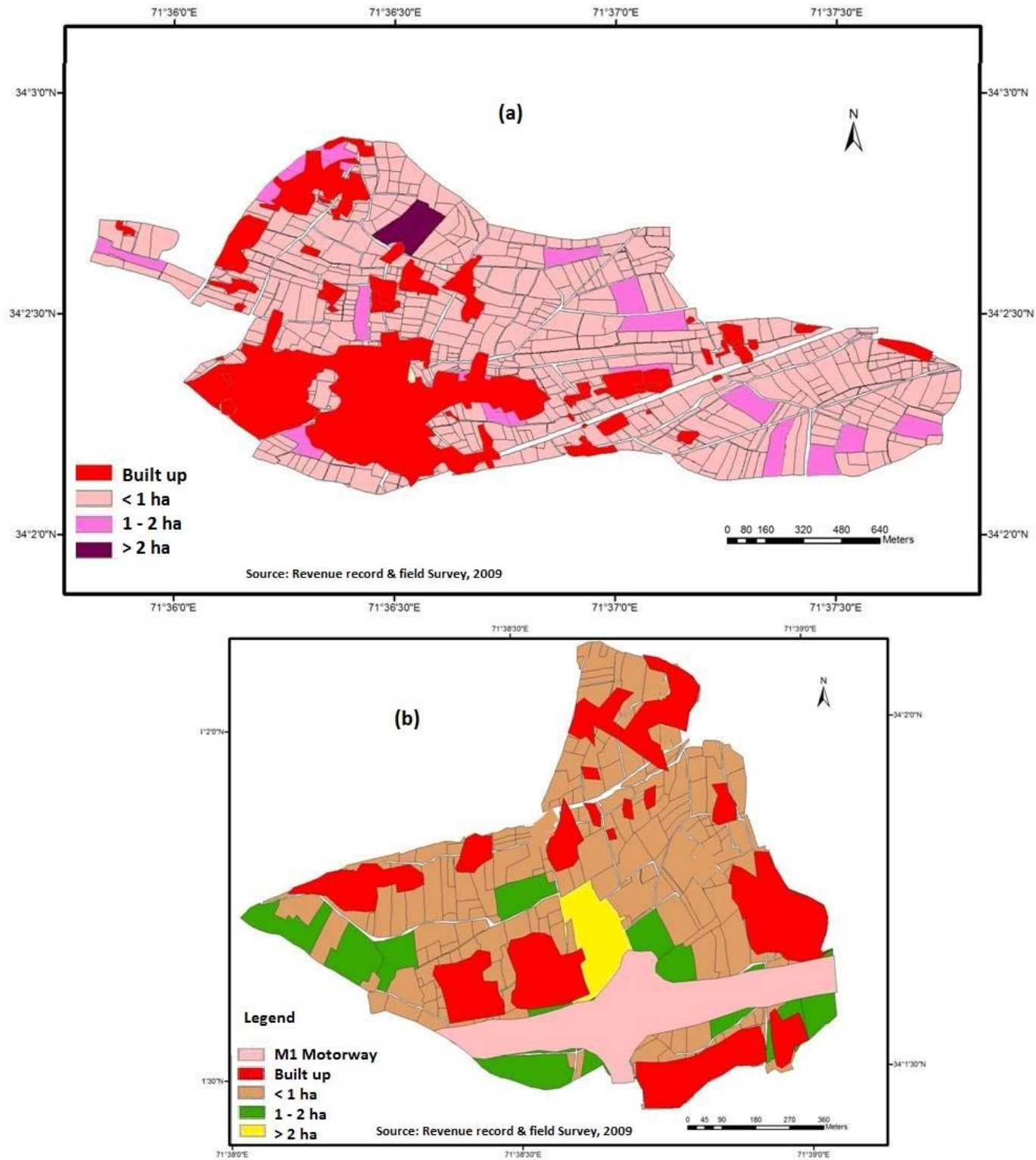


Figure 7.16 Fragmentation of Farms, 2009: (a) Pakha Ghulam (b) Hargoni

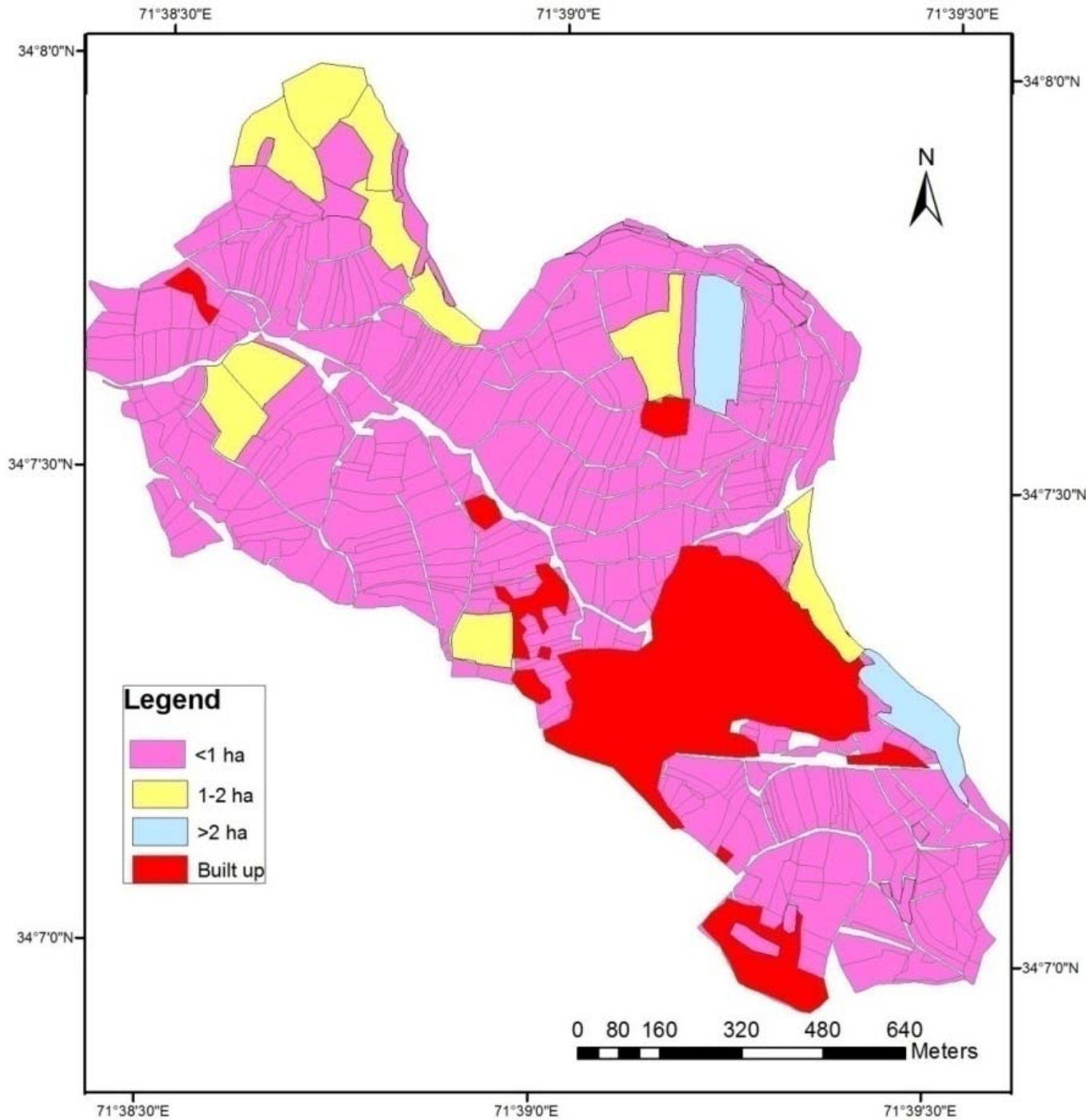


Figure 7.17 Fragmentation of Farms in Kochian, 2009

The Figures indicate that only one farm fragment in each of the two mauzas Pakha Ghulam and Hargoni was more than two hectares, while more than 95 percent of these were less than one hectare. In case of mauzas located in the south, with big chunk of rain fed land, farms are comparatively large (Fig 7.18), although even here, most are smaller

than one hectare. In Garhi Janu many fragments were over 3 hectares but they belonged to cultivable waste land (Fig. 7.18). Preponderance of small farms and poverty is hindering commercial agriculture and encouraging marginal farmers to sell their land to developers.

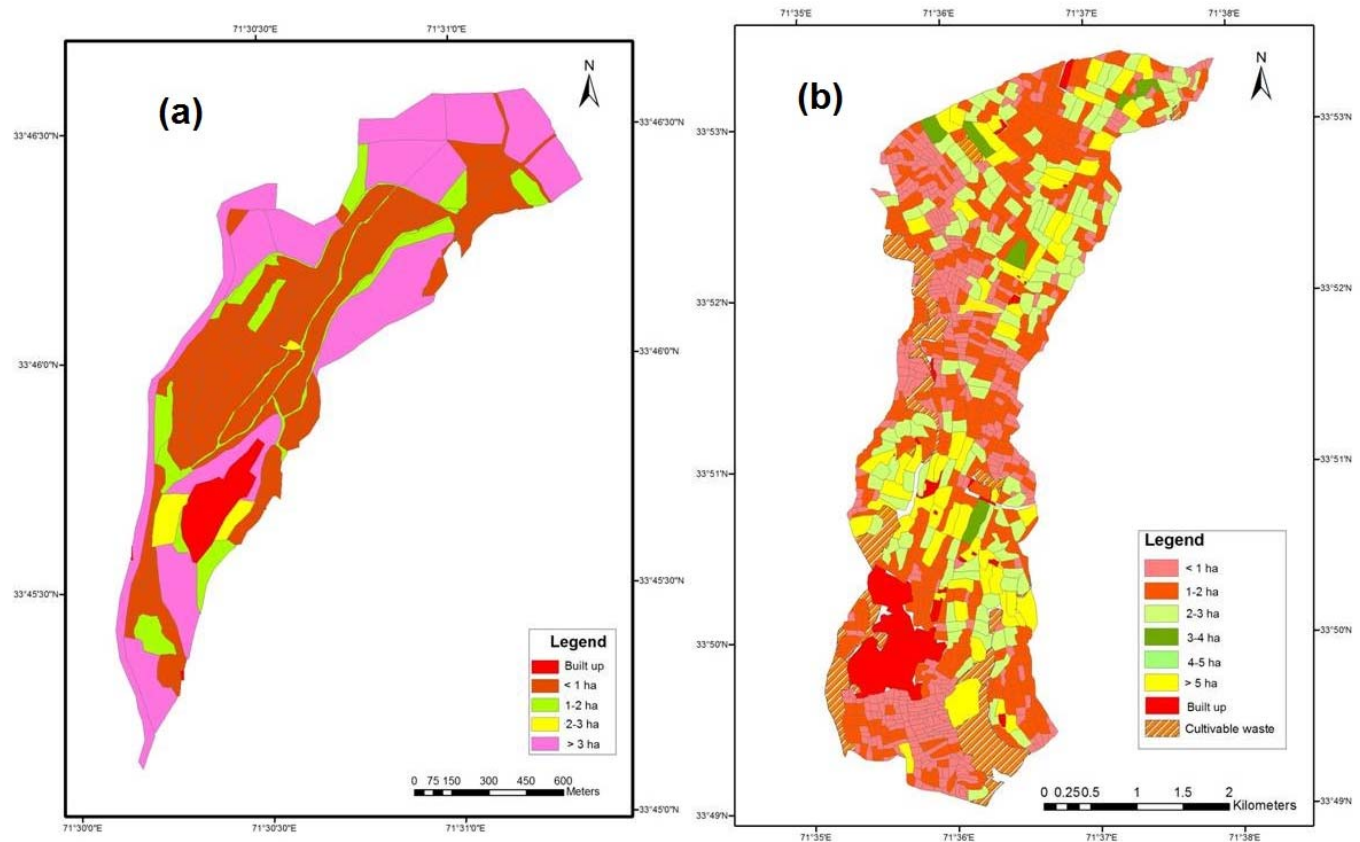


Figure 7.18 Fragmentation of Farms, 2009: (a) Garhi Janu (b) Maryamzai

7.5.4 Farmers Perception

A focused group discussion was arranged in all sample mauzas to obtain farmers perception on the key problems hindering commercial agriculture and resulting in low crop yields. The main issues raised in these discussions included non-availability of water for irrigation, high price of fertilizers, lack of access to high yielding varieties of seeds, lack of credit facilities, marketing issues, small holdings and poverty of the farmers.

7.5.4.1 Water

Water availability was considered as a major problem particularly in southern part of the district. In Maryamzai and Garhi Janu generally the Rabi crops are dependent on rainfall. Even in the irrigated land of Maryamzai the farmers complained about the insufficiency of water particularly during the growing season in both Kharif and Rabi seasons. Majority of the farmers were of the view that available water for irrigation is not sufficient for their crops. This problem is more acute during the Kharif season. Farmers in Maryamzai for example usually leave about one third of their cultivated land as fallow in Kharif season. Due to scarcity of water, the areas located at the tail end of canals do not receive sufficient amount of water for irrigation. Looking at the problem scientifically, the basic problem is that of water conservation. The gravity flow irrigation canal system is resulting in considerable water wastage through evaporation. Use of irrigation methods such as drip irrigation and sprinklers etc. practiced elsewhere could lead to water conservation and expanding irrigated area.

7.5.4.2 Fertilizer, Seeds and Farm Machinery

The farmers were of the view that inputs such as fertilizers, high yielding varieties of seeds, and farm machinery which could enhance yield had become too expensive. A market survey indicated that it was true (Table 7.7).

Table 7.7 Changes in Cost of Agricultural Inputs, 1991-2009

In put	Price in 1991	Price in 2009	Change	%
Di-Amoniaphasphast) DAP/ 50 Kg Bag	Rs. 1200	Rs. 4200	3000	250
Urea/ 50 Kg bag	Rs. 400	Rs. 1700	1300	325
Ploughing by tractor	Rs. 150/ hour	Rs. 900/ hour	750	500
Seeds (wheat local)/ 50 Kg Bag	Rs. 250	Rs. 1250	1000	400
Seeds (wheat high breed)/ 50 Kg Bag	Rs. 350	Rs. 1900	1550	423
Seeds (maize local)/ 50 Kg Bag	Rs. 200	Rs. 1100	900	450
Seeds (maize high breed)/ Kg Bag	Rs. 50	Rs. 600	550	1100

Source: Field Survey, 2009

Table 7.7 indicates that prices of all types of inputs have increased exorbitantly in the last two decades. High inflation and increasing demand are the main factors responsible for this price hike. The highest increase was observed in prices of high yielding varieties of

seeds (maize) and rates of hiring tractors since 1991. Nevertheless, the farmers were ready to pay higher prices for high yield breed of maize as its production is much higher than local seeds.

7.5.5 Credit

Investment is important in achieving high yield but due to prevailing poverty, farmers indicated that they needed credit facility but most of them were not even aware of the credit facilities extended by various institutions. At present 26 microfinance institutions and commercial banks are assisting the farmers by providing agriculture credit all over the country. They include; Habib Bank Limited (HBL), Allied Bank Limited (ABL), United Bank Limited (UBL), Muslim Commercial Bank (MCB), two specialized banks, i.e., Zarai Taraqiati Bank Limited (ZTBL), Punjab Provincial Corporative Bank Limited (PCBL), and 14 private domestic banks.

The only source, about which the farmers had some knowledge, was Zarai Taraqiati Bank Limited (ZTBL), which extends limited credits to the farmers but the interest on the credit is so high that most of the farmers cannot bear the costs. ZTBL offers different schemes for farmers, the best among which is Kissan Dost Scheme (KDS) but interest rate even on this is 11% -quite high. Interest rates on other schemes vary from 11 to 14.3 %. Further, the procedure of obtaining loans at these exorbitant interest rate is so cumbersome that majority of the farmers cannot fulfill the criteria. That is why no one was found to have availed the credit facility.

7.5.6 Market

Marketing in many cases is through the middlemen who make considerable profit. There is no system of organized marketing through which poor farmers could sell their products in the market directly.

7.5.7 Land Market

Because of low yield, high cost of agricultural inputs and the difficulties pointed out above, a number of farmers are selling their lands to speculators for housing development. The ever growing housing market with the fast increase in the city district

population is encouraging individuals and marketing groups of all types to buy land across Peshawar. This has also resulted in price hike, which have indeed risen enormously particularly in mauzas adjacent to city core (Table 7.8).

Table 7.8 Land Values (per marla) in Sample Mauzas, 1991-2009

Mauza	1991	2000	2009
Hargoni	20,000	55,000	300,000
Pakha Ghulam	25,000	60,000	350,000
Kochian	4,000	8,000	35,000
Maryamzai	1,800	3,000	6,000
Garhi Janu	1,500	2,500	5,000

Source: Field Survey, 2009 (1 marla = 25.2929 sq. meter)

The table indicates that rise in price of land in Pakha Ghulam and Hargoni near core city was more rapid compared to other mauzas during the last two decades. The rates increased by more than five times in the last two decades. One factor contributing to the increase was construction of ring road. Prior to construction of ring road, access was limited; however, ring road opened avenues for new residential colonies. Conversely, increase in land values has been rather slow in Kochian, Maryamzai and Garhi Janu. However, the land values have started rising rapidly in Kochian located on Charsadda road. While, land values are still very low in Garhi Janu as it is located at the farthest distance from core.

The above observations show that the urban agricultural system in Peshawar City District needs radical change for making it viable in the long term. Otherwise marginal farmers who are in majority may keep selling their land to developers for housing and process of land conversion may continue.

7.6 Conclusion

Analysis of land use and farming dynamics in peri-urban environment indicates that major changes have taken place in the sample mauzas. The changes have been more drastic in those mauzas/villages located near the core city than those located away from

it. Hargoni and Pakha Ghulam located near the core have significantly changed during the last two decades from pure agricultural to pre-dominantly non-agricultural. This was due to fast conversion of farm land to built up area. Both mauzas have excellent irrigation facilities and very fertile soil but continuing farming has become a losing proposition due to low yields in the absence of Government support and spending and rising cost of agricultural inputs. This is particularly the case with the small farmers, who dominate the farming community. The success of housing schemes on agricultural land has inspired individuals and groups of all types to join the race and they have been buying land across Peshawar, with the massive growth in the city district population. With the consequent sprawling of built environment in all directions; the land that provided residents with fresh supplies of vegetables are vanishing and fields that produced wheat, sugar cane and maize is also shrinking. In some cases lands with crops still cultivated in them have also been purchased at low rates by speculators. A few amongst them spotted the potential of the trade some time back and, possessing resources to spare, purchased agriculture fields from farmers who could not make ends meet because of low financial yield from crops. Members of the farming community possessing lands encircling core city due to woes of land speculators feel that they have a bargain at hand that can help them start life anew in another field. In the absence of research one does not know if the hopes of similar farmers materialized in the past but nevertheless the outcome has been loss of cultivable land.

As one moves away from the core, agricultural land increases in the mauzas. Maryamzai and Garhi Janu located away from the city core are still predominantly farming communities and expansion of built up area has been rather slow there. Kochian located at about 17-kilometer distance from the city centre also continues to maintain its agriculture character although it is also experiencing change lately. It is time to introduce policies that could help retain farmland in the long run. This can be only done through a clearly defined and strictly implemented policy, a policy that should disallow exploitation of prime agricultural land for non-productive purposes. It has to be realized by both the government as well as general public that the encroachment of urban land uses over farmland is cutting into national food basket and the present policy, or the lack of it, is

ultimately bound to cause greater shortages and further dependence on import of foodstuff. Therefore the present practices of encroachment on farmland cannot be allowed to continue. However, the commercial pressure on farmlands has to be tackled through exploitation of available commercial opportunities. Urbanization, for example, presents important opportunities to farmers. It provides farmers new opportunities for selling higher value crops and dairy products. Development of nurseries, vegetable farms, orchards and vineyards, and other high-value crop and dairy industries assist in promoting commercial agriculture. Many farmers have the potential towards adjusting their enterprises to take advantage of new economic opportunities at the urban fringe. However, Government support is indispensable towards this end.

While discussing interrelationship between urban and peri-urban areas, it is important to note that suburbanization brings urban and rural people as well as their problems together. Just like city dwellers and urban institutions have legitimate concerns about the use and condition of rural natural resources, similarly rural populations have legitimate concerns about urban-based pressures on the natural milieu. These shared interests in the natural environment have important economic, social, and political implications in the future and demand balanced policies. Land conservation is one critical element in achieving long-term economic growth and sustainable development that should take into account provision of housing while providing safeguard to prime agricultural land.

Chapter 8

FINDINGS AND CONCLUSION

Peshawar is one of the oldest existing cities of Asia. Its uninterrupted history goes back to several centuries; a fact confirmed by the ongoing deepest and widest excavation of the world at Gor Khatri within the walled city. Located at the mouth of Khyber Pass, the city has been the centre of trade between Central and South Asia and beyond to the Middle East. However, at the time of British occupation, Peshawar was a comparatively small walled city with an area of 193 hectares.

The first major and planned expansion took place when the British added a twin city or cantonment to the west of the walled city. This enhanced the area of the city to 919 hectares. The only major new addition to Peshawar after the development of cantonment in pre independence era was the establishment of Islamia College in the early years of the twentieth century, which later became the nucleus of the present University Campus. After independence from the British rule in 1947, Peshawar became the capital of the then North-West Frontier Province (now Khyber Pakhtunkhwa). This resulted in an increase in the City's administrative and financial functions and promoted a relatively faster growth in built up area, which increased from 2,853 hectares in 1947 to 4635 hectares in 1981. During this period, (1947-81) expansion in built up area was at the rate of 52.4 hectares per year, which was more than double over the previous period (1866-1947). The urban growth became extremely rapid after Soviet invasion of Afghanistan with the large-scale exodus of refugees from that country into Peshawar in 1979. Annual expansion of built up area went up by almost five times from just 52 hectares per year during 1947-1981 period to more than 254 hectares per year between 1981 and 1991. This rate enhanced further to 545 hectares per annum after 1991. The expansion in built up area was also accompanied by a major boundary extension in 1981, which resulted in expansion of urban administrative area of Peshawar from 1678 hectares in 1947 to 11,100 hectares in 1981. The last boundary extension took place in 2001, which increased the administrative area of Peshawar to 126,710 hectares, designating it as the City District with four towns in it.

Several new nuclei of development were initiated during post-independence period. Among these were University Campus, University Town, Hayatabad Township and two industrial estates on Kohat and Jamrud Roads. A number of peripheral villages such as Tehkal Bala, Tahkal Payan, Hazar Khwani, Nauthia, Landi Arbab Chughalpura, Sardar Garhi, Babu Garhi, Pahari Pura, Deh Bahadur, Malakander and Pakha Ghulam were also engulfed into expanding city. Residential expansion also started around the walled city and cantonment. Among the new residential areas were Nishtar Abad, Gul Bahar Colony, Sheikh Abad, Zeryab Colony, and Faqir Abad in the East and Gulberg, Danish Abad, and Shaheen Town, Nauthia Jadeed etc. in the west. With these developments, the urban spatial structure of the Peshawar started conforming to a multiple nuclei model.

Functionally the commercial core in Peshawar has a dual character with a central market in the walled city and another in cantonment. Karkhano market is another commercial nucleus, which serves as outlying business centre of Peshawar city district where most of the imported goods are marketed. The residential area surrounds commercial core of the city. Industries and transport terminals are located in the fringe on major highways. Main industrial nucleus is located in Hayatabad industrial area while others are located on the Kohat road, Warsak road and G.T road. The University Campus is the main educational complex. High-class residential areas are located inside the cantonment or fringes of the city such as University Town and Hayatabad Township, both located at the western fringe. Middle class residential areas are concentrated mainly in and around the walled city. Low class residential areas are located at the periphery of the city in low-lying areas or depressions formed due to extraction of clay for brick kilns that have now been abandoned. A number of villages have also been engulfed during the expansion of built up area of the city. Other villages and their farmland surround the core built up area of the city.

Urban expansion in Peshawar resulted from spontaneous growth with unplanned isolated constructions, especially along the roadsides and in the city fringes. The urban sprawl first set its foot in 1960s along the major roads radiating out of the city and cantonment. It then started expanding in a leapfrog fashion encroaching upon agricultural lands in the

fringe with minimum of facilities and all the harmful environmental and social consequences. It led to the emergence of varied land use association whereby new residential extensions (except a few planned ones such as Hayatabad and Defense Colony), old villages, industry and commerce, city services and farming intermingled in a random fashion. The haphazard growth often resulted in the development of slums or undesirable residential areas with lack of services and amenities, piecemeal commercial development, and intermixes of conforming and non-conforming land uses.

The pattern of urban sprawl can be seen in patches of residential areas or brick kilns dispersed throughout the farmland. The main factors responsible for the development of urban sprawl in Peshawar can be grouped into three categories - economic and market; demographic and social and planning, institutional and legal. Economically the growth in income enhanced housing demand and encouraged developers to undertake fast construction of new housing units and other infrastructure without proper planning. A serious outcome of this scenario of rapid construction was speculation, manipulation of real estate and fast increase in the price of land. High demographic growth rate at over three percent also put heavy pressure on demand for housing and encouraged urban sprawl. In the absence of implementation of master or local plan (A master plan was developed for the city in 1965 and a structure plan was developed in 1986 but neither of them were even approved) the stakeholders both public and private particularly real estate developers took their own decisions and contributed to urban sprawl.

Multiple government agencies and political interests influence and control land use in Peshawar City District and due to lack of coordination between them, there is little or no cohesive urban land use planning. Moreover, absence of land use regulations and density standards together with informal processes in operation has resulted in haphazard development and promoted low-density elite middle-income colonies creating an uncontrolled and automobile-dependent urban sprawl. It has also resulted in shortage as well as extremely high price of land for housing. The poor are therefore forced to occupy low lying abandoned land under brick kilns with minimum of facilities. The unplanned development has had serious impacts on the quality of architecture, urban design and aesthetics as well parameters of ambient environment such as air, water, noise, sanitation,

and ecology. Since, transport has not been factored into many new schemes and developments, severe problem of traffic congestion has also emerged with associated impacts on the urban economy. Thus the city district has to face tremendous future costs in dealing with these problems associated with unguided spatial land use developments. The key factors responsible for failure of planning relate to lack of political will and institutional and policy failures. Poor institutional set up, lack of coordination among government agencies, inadequate funds and legal and regulatory shortcomings were other constraints in the way of plan preparation, approval and implementation. Sustainable growth of Peshawar and success of future planning endeavors including control of urban sprawl in the city will hinge upon alleviation of these problems and require:

- Generation of political will among all stakeholders particularly decision makers and politicians through dissemination of information and creation of awareness
- Rationalization of present institutional framework with overlapping jurisdictions by placing development departments under one agency. This agency could be City District Government (CDG) or a new autonomous authority.
- Enhancement of institutional capacities for planning and implementation by the development of human resources through education and training.
- Establishment of a coordination mechanism to rationalize and link the decision-making processes with the budget, infrastructure improvement and land management.
- Evaluation of the efficacy of planning and zoning regulations to check premature conversion of agricultural land, development standards, land registration/transfer procedures, rent control laws, property taxation, etc.
- Enactment of appropriate legislation for the formulation, approval, implementation, review and monitoring of spatial plans, in the wake of vacuum created by the expiry of LGO 2001.
- Provision of adequate funds or empowerment of local government to generate funds for development projects for controlling urban sprawl
- Adoptions of a development strategy to implement action for solving the urban sprawl problems in order of priority. The prioritization should be based on three

factors - needs of the people of Peshawar, amount of available resources and capacity for implementation.

- Utilization of remote sensing and GIS and Smart Growth Audit as tools for monitoring of growth and creation of link between planning and implementation in a rational way.

In terms of land use, three fourth area under the boundary of city district still consists of farm or rangeland. In the built up area, the residential land use dominates, followed by industrial use (inclusive of brick kilns). The commercial area comes next. The spatial distribution, as expected, shows a concentration of built up area in the centre. Irrigated farming is primarily on the outskirts in the north and east, while dry or rain fed farming is dominant in the south. All the rangelands are located in the southern part of the city district.

It is rather interesting to note that while a large chunk of agricultural land is being eaten up by built up area, parts of cultivable waste is also being brought under plough. Overall, the farmland gradually increased in Peshawar city district from 1991 to 1997 but since then the agricultural area has reached a plateau at around 73,000 hectares. The farmland in Peshawar city district in 1991 was about 41 percent of the total land in the district. This increased to around 58.7 percent in 1997. However, since then the equilibrium is barely maintained and the land loss to built up area has enhanced compared to addition of new cultivated land. In order to get maximum return from their farmland, some farmers are trying to shift to vegetable or truck farming as well as dairy farming to take advantage of the growing urban market for these products. However these are isolated efforts and no organized ventures are visible for the purpose.

The most alarming aspect of encroachment on farmland in Peshawar City District is the loss of prime agriculture land. Peshawar city district has lost 11,193 hectares of land in different land capability categories to built up area. The analysis indicates that 8,456 hectares of farmland was lost from Class I, 461 hectares from Class II and 410 hectares from Class III categories. These three categories constituted prime agricultural land with little or no limitation. Only 246 hectares of marginally cultivable Class IV land was lost

to urban uses. Conversely, gain in the farmland was achieved mainly by bringing cultivable waste area of around 26,600 hectares under plough. The cultivable waste in the city district was reduced from 46.9 percent of the total area to only 21.2 percent in the last two decades. However, most of the area brought under cultivation did not belong to prime agricultural land and was mostly from the rain fed area in southern part of the city district.

Residential land use was the biggest consumer of farmland during 1991-2009 period. Some 8,748 hectares of farmland was lost for residential purposes. Only 1,105 hectares of residential area was developed on other land. This means that 89% of the new residential development took place over the agricultural land. Brick kilns were the second largest consumer after residential land use. Area under brick kilns increased from 970 hectares to 2,360 hectares adding some 1,390 hectares during this period. Bulk of it i.e. 1,120 hectares was on agricultural land and rest on non-cultivated land. About 271 hectares of agricultural land was eaten up by commercial land uses. Only 73 hectares of residential land was consumed for this purpose meaning that 79 % of commercial expansion took place over agricultural land mostly along the new Ring Road. The industrial land use increased very slowly from 366 hectares to 426 hectares. The expansion was mainly over agricultural land.

Analysis of land use and farming dynamics in peri-urban environment in this research also indicate that major changes have taken place in the sample Mauzas. The changes have been more drastic in those Mauzas/villages located near the core city than those located away from it. Hargoni and Pakha Ghulam located near the core, for example, have significantly changed during the last two decades from pure agricultural to predominantly non-agricultural as a result of conversion of farm land to built up area. Both mauzas have excellent irrigation facilities and very fertile soil but continuing farming has become a losing proposition in these mauzas, due to low yields in the absence of Government support and spending, increasing farm fragmentation and rising cost of agricultural inputs. This is particularly the case with the small farmers, who dominate the farming community. On the other hand the successes of housing schemes on agricultural

land have inspired individuals and groups of all types to join the race and they have been buying land across Peshawar.

The consequence is sprawling of built environment in all directions; the land that provided residents with fresh supplies of vegetables are vanishing and fields that produced wheat, sugar cane and maize are also shrinking. In some cases lands, even with crops still cultivated in them, have been purchased at low rates by speculators. A few amongst them spotted the potential of the trade some time back and, possessing resources to spare, purchased agriculture fields from farmers who could not make ends meet because of low crop yield and meager financial returns. Members of the farming community possessing lands encircling core city due to woes of land speculators feel that they have a bargain at hand that can help them start life anew in another field. In the absence of research one does not know if the hopes of similar farmers materialized in the past but nevertheless the outcome has been loss of cultivable land.

The above analysis has brought forward the importance of Peshawar City District as an important agricultural area and has shown that the growing urbanization is encouraging high value agricultural production through dairy and truck farming. Simultaneously, it has also brought to limelight the fact that there is a continuous loss of prime agricultural land in the district due to encroachments mainly by residential use. The city district is losing some 545 hectares of agricultural land every year. Urban invasion of agricultural land has now become a reality that the planners not only in Peshawar but rest of Pakistan have to recognize and live with. Nevertheless, they can contain it through developing and implementing appropriate policies.

This policy would need to be based on the rationale of cause – affect relationships. Since the cause of conversion of farmland is market driven therefore, the solution to prevent the process has to be market-driven with a scientific foundation. It means that agriculture has to be made economically profitable to compete in the urban land market and counter the forces that switch good farmland to other uses. In order to achieve this first and foremost agriculture would need to be recognized as an urban function and included in city plan.

Currently, agriculture is an unorganized activity in Peshawar City District and for that matter even in other cities of Pakistan. Improper livestock keeping needs organized dairy farming and crop growing, bulk of which is done for subsistence purposes. There is a need to develop these along scientific lines to increase the yield. The current low productivity and yield, even compared with progressive farms in Pakistan is a major hindrance to commercial viability of agriculture.

The Economic Growth Framework for Pakistan estimates that overall unachieved agricultural potential in the country is from 67 to 84 percent (GoP, 2011). In urban areas including Peshawar City District it is about 60 percent. The Framework attributes “factors such as traditional farming practices, inefficient irrigation methods, high input costs, lack of bio-safety regulations and insufficient institutional credit for poor farmers” for low yields. It argues, “given the substantial yield gaps, there are immediate opportunities to increase production through improved soil and water management, use of quality certified seeds, balanced use of fertilizers and proper plant protection measures” (GoP, 2011). For urban areas like Peshawar City District an important component of the strategy to enhance productivity in agriculture will be to change the pattern of production to higher value-added activities such as vegetable and fruit farming, animal husbandry and dairy farming.

In this connection lessons can be learnt from the countries where urban agriculture has been accepted as an important activity for growing food (including healthy organic food) and efficient marketing by saving transport costs. Argentina, Brazil and Cuba, are cases of countries with well-recognized policies for urban agriculture. Some other countries like China, Botswana, Benin and Zambia are also making efforts to launch such policies that help urban agriculture. Many of them framed such policies in the light of comprehensive strategy like, Poverty alleviation policy, Sustainable urban Development and Food Security. Supportive city policies are also being advocated for urban agriculture and development of local food system. A good number of city governments are preparing strategies on urban farming for example Rosario in Argentina, Kampala, Dar es Salaam, and Bulawayo in Zimbabwe.

Finally, while discussing interrelationship between urban and peri-urban areas, it is important to note that suburbanization not only brings urban and rural people but their problems together too. Just like city dwellers and urban institutions have legitimate concerns about the use and condition of rural natural resources, similarly rural populations have legitimate concerns about urban-based pressures on the natural milieu. These shared interests in the natural environment have important economic, social, and political implications in the future and demand balanced policies. Land conservation is one such critical element in achieving long-term economic growth and sustainable development that should take into account provision of housing while providing safeguard to prime agricultural land. Use of urban organic waste as manure and utilization of wastewater for irrigation in urban agriculture offer other avenues for promoting urban sustainability. A major consideration in extending the boundary of Peshawar city district was ‘physical consolidation’ of the urban Peshawar with its rural fringe for mutual benefit. However, no land use plan has emerged as yet in order to give a practical shape to this idea of complementarity or to guide future expansion rationally.

It is important to develop a flexible plan for the purpose. More importantly however, it has also to be realized by both the government as well as the general public that the encroachment of urban land uses over farmland is cutting into national food needs and the present policy, or the lack of it, is ultimately bound to cause greater shortages and further dependence on import of foodstuff. Therefore the present assault on urban farmland cannot be allowed to continue but the commercial pressure on farmlands has to be tackled through exploitation of available commercial opportunities. Urbanization, for example, presents important opportunities to farmers. It provides farmers new avenues for selling higher value crops and dairy products. Development of nurseries, vegetable farms, orchards and vineyards, and other high-value crop and dairy industries assist in promoting commercial agriculture. As stated earlier, many farmers have the potential towards adjusting their enterprises to take advantage of new economic opportunities at the urban fringe. However, Government support is indispensable towards this end. The recognition of urban and peri-urban agriculture as urban land use, and its integration in land use plans and creation of a favourable policy environment are critical and basic steps

towards this end. Some other actions needed to foster sustainable and safe urban and peri-urban agriculture would include:

- Promote, establish and strengthen farmer organizations in urban and peri-urban areas.
- Review current policies and by-laws for removing legal restrictions on urban agriculture and to include measures that would effectively encourage and promote sustainable and environmentally safe urban agriculture
- Integrating urban and peri-urban agriculture into urban planning and policymaking, by characterizing the specific urban context and different types of urban and peri-urban agriculture.
- Promote research for supporting urban farmers and improve their capabilities through extension, training, technical advice, services and technology transfer.
- Enhance the competitive edge of urban farmers over other urban activities by enhancing means to increase productivity and economic viability of urban agriculture through provision of appropriate advice, inputs and credit.
- Support market-oriented and entrepreneurial urban farming including organic farming.
- Promote measure to conserve irrigation water for wider use by replacing extravagant gravity methods by sprinkler or drip irrigation.
- Promote conversion of waste generated in the city to compost/organic manure.
- Utilize wastewater of the city for Irrigation by adapting safe measures for the same;
- Support innovation in urban activities whereby agriculture could complement other employment.
- Improve urban institutional coordination for the development and implementation of complementary policies for promoting urban and peri-urban agriculture.

ANNEXURE

LIST OF UNION COUNCILS

Town I			Town II		
Union Council No	Name of Union Council	Population	Union Council No	Name of Union Council	Population
1	Khalisa-I	16160	5	Hassan Garhi-I	21493
2	Khalisa-II	22650	6	Hassan Garhi-II	18402
3	Mahal Therai-I	23418	64	Lala	17087
4	Maha Therai-II	25274	65	Chamkani	20977
7	Shahi Bagh	18102	66	Budhai	19587
8	Faqir Abad	16313	69	Wadpaga	19212
9	Sikandar Town	19645	70	Pakha Ghulam	20000
10	Gulbahar	18330	71	Kankola	25900
11	Shaheem muslim Town-I	19674	72	Nahaqi	25677
12	Shaheen Muslim Town-II	21429	73	Gulbela	24910
13	Shaikh Junaid Abad	23015	74	Khatki	18492
14	Lahori	18337	75	Takhtabad	27776
15	Karimpura	16642	76	Khazana	23387
16	Ander Sher	17014	77	Hryana Payan	25961
17	Asia	25836	78	Kafoor Dheri	21359
18	Jehangirpura	19019	79	Shahi Bala	20911
19	Ganj	18746	82	Jogani	19773
20	Yakatoot-I	16705	83	Panam Dheri	21146
21	Yakatoot-II	26196	84	Garhi Sher Dad	17345
22	Yakatoot-III	20255	85	Pajagi	22903
23	Wazir Bagh	24695	86	Larama	15272
24	Kakshal-I	19128	87	Daag	2321
25	Kakshal-II	18998	88	Mathra	28958
26	Akhoon Abad	24755	89	Kaniza	18975
30	Bana Mari	17754	90	Chaghar Matti	18425
	Total population	508090		Total Population	537138

Town III			Town IV		
Union Council No	Name of Union Council	Population	Union Council No	Name of Union Council	Population
29	Deh Bahader	23979	27	Hazar Khwani-I	23043
31	Nauthia	22656	28	Hazar Khwani-II	25164
32	Deri baghbanan	17256	45	Urmar Payan	19261
33	Landi Arbab	20985	46	Urmar Miana	18992
34	Nauthia Jadeed	23188	47	Urmar Bala	24007
35	Pawaka	24757	48	Musazai	17139
36	University Town	18786	50	Sheikh Mohammadi	27743
37	Shaheen Town	25832	51	Badaber Maryamzai	16442
38	Tehkal Payan-I	17286	52	Surizai Bala	15398
39	Tekal Payan-II	15805	53	Badaber Hurizai	16108
40	Tehkal Bala	26026	54	Mattani	26320
41	Palosi	25399	55	Maryamzai	19336
42	Malakandhir	22236	56	Mashogagar	30728
43	Hayatabad-I	17033	57	Sulaiman Khel	15782
44	Hayatabad-II	17554	58	Sheikhan	26375
49	Bazid Khel	26422	61	Adezai	19438
59	Sarband	22093	62	Azakhel	19692
60	Pushtakhara Payan	25174	63	Sherkera	15387
80	Regi	25532	67	Surizai Payan	16744
81	Sufaid Dheri	29668	68	Mera Surizai Payan	16744
91	Achini Bala	27891	92	Mera Kachori	25512
	Total Population	475558		Total Population	435540

Source: Election Commission of Pakistan, 2000

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