URBANIZATION TREND AND URBAN POPULATION PROJECTIONS OF PAKISTAN USING WEIGHTED APPROACH

Bahrawar Jan*, Mohammad Iqbal*, Iftikharuddin**

ABSTRACT

Pakistan is confronting over the years with rapid growth of urbanization. The researchers, planners and administration need to identify and rectify the problem of urbanization prevailing since independence but more serious over the past two decades. In this study, the problem of urbanization is quantified with the help of relative measure or index, which enables us to judge how the level of urbanization changes since independence. In ten most populous cities of Pakistan, containing the major part of total urban, the population growth over the split- interval reveals the seriousness of the problem. This can be judged by the population trends of these cities, alarmingly increasing over the past two decades. To take steps in the future, planning for urbanization must be based on precise urban population projection. In fact, province-wise split of the urban-rural population and its projection have great relevance and importance with development plans and their implementations. A specially designed method for the Urban-Rural population projection based on the Weighted - Matrix approach indicate that the Urban population of Pakistan in 1998 with 32.5% of the total is expected to rise to 50% by the year 2030. The tempo of urbanization in the low urbanised provinces like N.W.F.P and Baluchistan is considerably higher, while it is low in the highly urbanised province of Sindh.

INTRODUCTION

Urbanization is one of the serious global problems. As development takes place from agricultural to an industrial sector, large-scale migration of rural residents to towns and cities takes place. During this process, the growth rate of urban areas is typically double the pace of overall population increase. Some 29 percent of the world population was living in urban areas in 1950; this figure was 43 percent in 1990, and the estimated figure for the year 2000 is about 50 percent (Encarta Encyclopaedia Deluxe, 2002).

Urbanization eventually leads to a severe decline in the number of people living in the countryside, with negative population growth rates in rural areas of some countries, e.g. Thailand. Rapid growth of overall population has deferred this event in most less-developed countries, but it is projected to occur in the early decades of the 21st century (Shekhar and Ram, 2001).

Due to unrestricted movement within a country, certain areas or regions grow faster, mainly due to in-migration. Consequently, their population growth rates would be higher than the national average, while other areas experience a slow growth rate due to out-migration. In a developing country like Pakistan, such migration generally takes place for economic reasons, from the rural to the urban areas, resulting in higher growth rate in the latter. The growth rate of the urban population in Pakistan during the census conducted in 1972 and 1981 was 4.4%, whereas the rural population of the country grew at 2.6% annually during the same period. Thus, due to continuously higher growth rate of urban population its percentage went up from 18% in 1951 to 28% in 1981 and to 32.52% in 1998. Currently, 35% and more Pakistan's population is estimated to be living in urban (Population Projections by NIPS, 2000).

An important aspect of the urbanization pattern is that it is unevenly distributed with pockets of high urbanization and very low elsewhere. The phenomenal growth of a few large cities is another aspect of Pakistan urbanization. The city of Karachi alone contributes 21.7% to the total urban population of Pakistan, while the city of Lahore contributes 12.7%. They along with the biggest 7 cities (Faisalabad, Rawalpindi, Multan, Hyderabad, Gujranwala, Peshawar, Quetta contain 54.6% of the Pakistan urban population (Pakistan Educational Cell, 2001). To know the rational of this phenomenon, we have to discuss the problem along with the factors responsible.

Migration from villages to cities:

A kind of internal migration, of considerable importance, is the one from villages to cities. The rapid growth of population puts constraints on the existing resources. For example, the repeatedly partitioning of the cultivating land into small pieces makes the livelihood of the large families into big trouble. This is one of the reasons that people migrated in search of employment towards the cities. Such increasing trends are creating considerable problems for the urban as well as rural areas. This problem seems to be of a very serious nature for the villagers, causing the poor people to leave their houses, farms and close relatives. It is quite natural to

* Department of Statistics, University, of Peshawar – Pakistan.
** Government College Hayatabad Peshawar – Pakistan.

ask, why and how the problems of urbanization arise and what are the main factors responsible for these problems.

Broadly, the factors leading to high urban concentration are divided into two components. First, the factors that create hurdles, in making the local conditions conducive and for better and prosperous life, are less fertile area, less production, non-availability of health facilities and sanitation problems, lack of quality education, non-availability/non- existence of social system based on justice and equality. These are the factors responsible for migrating the people or families from rural to urban areas. Second the cities offer better employment opportunities and quality of life, which inspire the rural population in general and the young generation in particular for migration (Population Educational Cell, 2001).

Focus of the study

Urbanization process as noticed over the past two decades has posed some serious problems. The high gap between the rural and urban development results into large proportion of rural to urban migration. Also in urban areas there is a pressure for creation of new job opportunities, strengthening of present health facilities, construction of houses etc, due to high growth in urban units. The influx of the people and migration of the families towards cities put tremendous pressure on the resources of these localities. After some times it becomes a real challenge for the administration to maintain the required facilities and the standard of life in the cities.

The urban population projection needs to be addressed for appropriate future planning. In this study the population projection has been made till 2050 at provincial levels, in a different way considering the death, birth and in and out migration rates. The varying urbanisation trends have been observed in different provinces.

Limitations

In the present study an attempt has been made to minimize the effect of the assumptions made in the projections due to the non-availability of the reliable data. However, some of the limitations of the study are given below.

1. The migration data used taken from the census might have several discrepancies. For example the mobility of the population is difficult to be measured, because the reliable data on the number of migrants is not available (State of Population in Pakistan, 1991).
2. Due to non-availability of the separate birth and death rates in the urban/rural areas of each province, these rates are replaced by province-wise rates prevailing in the general population. This may effect on the accuracy of the estimates obtained.

3. It is commonly understood that population projections is considerably difficult, as it is subject to the frequent and wide fluctuation (Siegel; 1972).

MATERIALS AND METHODS

The study is mainly based on the secondary sources of the data. The relevant demographic data are taken from census report of Pakistan for the year 1951, 1961, 1972, 1981, and 1998 (Population Census report, 1961, 1998 Census Report, 2002, 1981 Census Report, 1984 and 1972 Census Report, 1973). A relative index has been made for showing the extent of urban concentration since first census 1951, which provide the relative change since that time. This index takes the relevant urban/rural population of 1951 census as a base for the rest of the census figures. That is,

Relative Index for the rise of population = (P_t / P_0) *100

i.e.(Population at time 't' *100)/(Population in the base year i.e. 1951).

Since urban part of the Pakistan's population is mainly based on 10 big cities, therefore, their relative growth is studied taking the respective population in 1951 as base. More detail study of the level of urbanisation with respect to time is made in the split time intervals.

Weighted Matrix Approach for Population Projection

To anticipate the extent of the forth coming issues of urbanization, the population projections has been made for future. Numerous methods are available for this purpose but in this study a specially designed method " Urban- Rural Populations Projections based on weighted matrix approach" has been used. In this method, internal migration is particularly focussed. This method incorporates the birth, death and migration rates in the urban/ rural areas separately.

Let **P(t)** – Population size at time t**, b**- birth rate, **d**- death rate,

O- migration rate, subscripts: **u** - urban, **r** - rural

The gross components contributing in the calculation of projected population are

$g_{uu}=1+ b_u – d_u – O_{ur}$, $g_{ru}= O_{ru}$, $g_{rr}=1+ b_r – d_r – O_{ru}$ *and* $g_{ur}= O_{ur}$

The mathematical model used for the purpose of urban-rural population projection (given below), extrapolate the urban population at time t, $P_u(t)$ by taking birth, death rates and out-migration from the urban domain along with the adjustment needed due to out-migration from the rural domain. The same approach is used to predict rural population $P_r(t)$.

$$P_u(t)=(1+ b_u - d_u - O_{ur})* P_u(0) + O_{ru}* P_r(0)$$
$$P_r(t)= O_{ur}* P_u(0) + (1+ b_r - d_r - O_{ru})* P_r(0)$$

Alternatively, we can write, $\begin{bmatrix} P_u(t) \\ P_r(t) \end{bmatrix} =$

$$\begin{bmatrix} g_{uu} & g_{ru} \\ g_{ur} & g_{rr} \end{bmatrix} \begin{bmatrix} P_u(0) \\ P_r(0) \end{bmatrix}$$

or $$P(t) = G * P(0),$$

where $G = \begin{bmatrix} g_{uu} & g_{ru} \\ g_{ur} & g_{rr} \end{bmatrix}$ is termed as weighted-matrix.

Population projection based on this method seems to be some what appealing, as the parameters vary from urban to rural part of the population. Furthermore the major components responsible for the growth of the urban and rural populations are taken into consideration. An extension of the above idea is applicable, i.e. to convert the mathematical model into lagged distributed model, subject to the availability of the data about the relevant parameters for the past 10 years.

For the purpose of urban-rural projection of the target year, the above mathematical expressions are incorporated in simple program macros in Visual BASIC. The program on execution gives us year-wise urban-rural projected population along with the total population and percent urban, till the target year. Separate tables, containing the information about population, are obtained for the country and the provinces.

Analysis and Discussion

To look at the extent of the urban concentration, Table-1 contain the indices and respective figure-1, which gives how the level of urbanization changes over the years, is presented.

The above table and figures indicate that as compared to 100 urban people in 1951 there are 161 in the year 1961.Where as the corresponding figure the rural is 120. After the span of 30 years (1981) the urban population rise to almost 4 times to that in 1951, during the same period the rural population rise 2.2 times. Noticeable, with the passage of just 17 years (1998), urban population is more than 7 times of that in 1951, whereas the rural population in comparison rise to more than 3 times to that its corresponding figure in 1951. It means that the difference between the relative rise of the urban and rural take a big leap from 1981 to 1998.

Urban population explosion

The rapid migration from rural to urban areas makes the cities densely populated or cause city expansion or both. Apart from Karachi and Gujranwala where the population according to1998 census increases 9 times to that in 1951, most of the cities show 6 times population growth since 1951.

Table 2 sketches how the population of ten big cities of Pakistan changes during the previous 68 years. Karachi is the largest city of Pakistan, where the population was 2.5 lakh in 1931, now in 1998 the total number of people residing there are 93 lakh, which means, in comparison to 1931, current population is 35 times greater. More or less, the situation is the same for other main cities of Pakistan. It will be more informative to split the time span of 1941 to 1998, into intervals of 1941-61, 1961-81, 1981-98 and then observe how the population of 10 big cities of Pakistan grow within these stated intervals.

Table 3 and Figure 2 show the population growth of the major cities of Pakistan in the split time interval contain important information. Mostly the population of these cities grows 2 to 3 times within the stated intervals. Generally, these cities grow at higher rates with the passage of time, with the exception of Faisalabad, Karachi and Hyderabad where the extraordinary growth climb to 6, 5 and 3 times respectively from 1941 to 1961. The zigzag lines provide the information about varying population growth of the cities of Pakistan. The lines indicating the rise in 1981 and 1998 are matching, however they are substantially different from the one showing the population rise of cities in 1961. This shows that the population size of these cities over the past 40 years grows in a specific pattern.

Apart from the cities of Fasialabad, Karachi, Hyderabad and Multan, which indicate very high population growth (mainly due to high in-migration) during 1941-1961 period, the rest of the cities show increasing relative population growth rate with the passage of time. The capital of the two provinces, the city of Peshawar and Quetta indicate steady rising growth over the past 40 years. The cities of Sialkot,

Rawalpindi, Lahore and Gujranwala showing the same trend, but with less intensity.

Population projection

Urban-rural population projection based on G-matrix is enacted. The relevant parameters for the expression are incorporated using the population data of census 1998. Separate numeric is substituted for the same set of parameters, while projecting the urban-rural and total national and provinces population. The same data is displayed with the help of line chart. The common feature of these line charts (Fig 3) are, (i) the lines indicating the urban population possess small intercept as compared to the lines for the rural, reflecting the current small urban population in the base year as compared to the rural. (ii) The line for urban population is considerably steeper as compared to the corresponding line representing rural population. (iii) The common point of intersection between the lines for the urban and rural populations indicate the time when the urban-rural population coincide i.e. each contributing 50% to the total population. This point of intersection for the whole country, and the provinces is expected to occur at different point of time, for the whole country the projected year of balancing is 2030-31. The same point where the urban-rural is at par with each other for the provinces of Punjab, Sindh, N.W.F.P and Baluchistan is expected to be the year 2030, 2001, 2047 and 2040 respectively.

For convenience and comparison a compact table (Table-4) has been made, which contain the total population along with the percentage of urban population of Pakistan and provinces in the respective years.

Table-4 and Figure-3 indicate the projected national population for the year 2030 is 244.1155 million. By that time the level of urbanization is expected to reach 49.45%, obtain by stated method and is quite close to the figure (48.9%) given by United Nations Populations Division, world urbanization prospects (The 2001 Revision). However, it does not match with the figure of 49.3% for the year 2025, given by the Pakistan National Institute of population Studies, July 2000. The corresponding figure for the year 2025 in this study is 47.33%.

Province-wise population projection reveals that Punjab where 31.267% population is urbanized according to 1998 census is projected to 50.07% urbanized by 2030 (Table 4), where the total expected population in the same year is 135.476 million. Urbanization rate of this province matches with that of the whole country. The interception of the two lines in Figure 3 (b) also shows that the Panjab will have 50% Urban population in 2030.

Sindh province currently has the highest proportion of urban population, which is 48.75% according to 1998 census. This figure will rise by 12 percent, which means the projected level of urbanization for the year 2030 is 60.73%, by the time the total population of the province is expected to reach 55.02 million. The interception of the two lines in Figure 3 (c) shows that the Sindh will have 50% Urban population in 2001. Although, currently the percentage urbanized is considerably high in Sindh, however the tempo of urbanization is projected to lower down in the future.

N.W.F.P is the lowest urbanized province of Pakistan, having 16.87% urbanization according to 1998 census. However, the proportion urbanized is expected to rise to maximum (24.5 points), and become 41.36% by the year 2030, as expected the total population of the province reach 33.57 million. Figure 3 (d) shows that the NWFP will have 50% Urban population in 2047.The level of urbanization is expected to be very high in the future.

Baluchistan is another low urbanized province, the latest census indicate that 23.89% of the people reside in the urban area. The projected urban percentage is 45.56 by 2030, showing a rise of 22 percent. Figure 3 (e) shows that the Baluchistan will have 50% Urban population in 2040.

CONCLUSION

In this study some important aspects of urbanisation in Pakistan has been identified and studied. Main findings are listed below.

Urban population of Pakistan is unevenly distributed. Large pockets of urbanisation exists in the province of Sindh, where almost half of the population is already urbanised, while in the provinces of N.W.F.P and Baluchistan it is too low (16.87% and 23.89% respectively).

i. The population growth of the 10 big cities of Pakistan over the past two decades indicate that the problem of urbanisation in mainly restricted to major cities and ultimately causing considerable problem there.
ii. Apart from Fasialabad, Karachi and Hyderabad (where the population take a big leap during 1941-61), the rate of urbanisation, with the passage of time, increases steadily for the other major cities of Pakistan.
iii. The population growth of these large cities in the same interval of time showing zigzag

pattern, which means that population growth varies from city to city during the period. However, the growth pattern of each city over the past 40 years showing consistent rising trend.

iv. Tempo of urbanisation in the low urbanised provinces of N.W.F.P and Baluchistan is considerably high. A statistical indicator of the rise in population from 1981-98 for the respective provincial capital (Peshawar and Quetta) showing highest growth during the period (3.6 and 3.58 times as compared to 1981).

v. The projected figure of the total population for the year 2030 is 244.1155 million, by the time when the percentage of population urbanised is expected to climb to 49.45%.

vi. The line chart for the projected total, urban, rural population of Pakistan and provinces, provide

vii. the information that currently lower line for the urban population, become closer then supersede with the passage of time from the respective line for the rural population. This happen, because the line representing urban population is steeper as compared to its counterpart for the rural.

viii. The urbanisation rate in the province of Punjab matches with the overall rate prevailing in the country. This pattern is expected to be followed in the future.

ix. For the highest urbanised province of Sindh it is expected that the rate of urbanisation will slow down in the future. In contrast, the lower urbanised provinces of Baluchistan and N.W.F.P are projected to show high rates of urbanisation in the future.

Figure-I: Year-wise Urban Rural Population Index

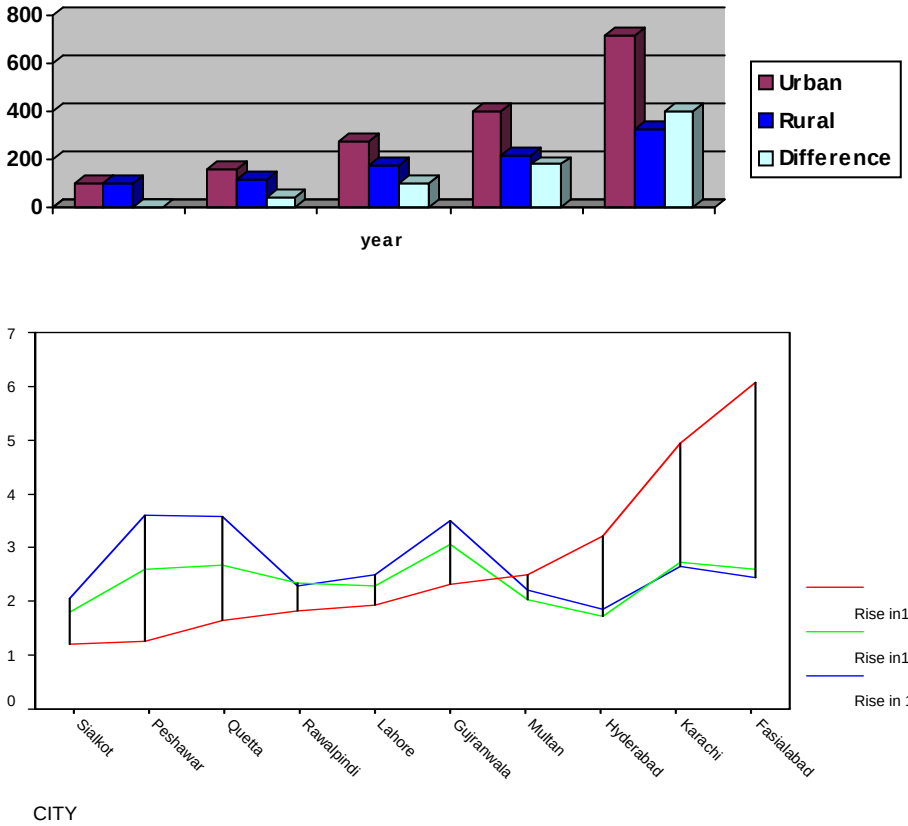

Fig. 2: Intercensal Variations in Populations of Ten Big Cities

Figure- 3 (a) Urbanization Trend for Pakistan

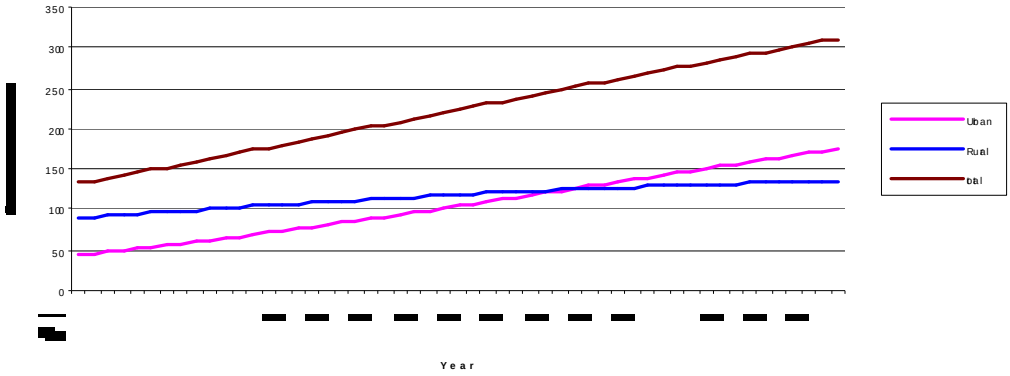

Figure3 (b) Urbanization Trend for Punjab

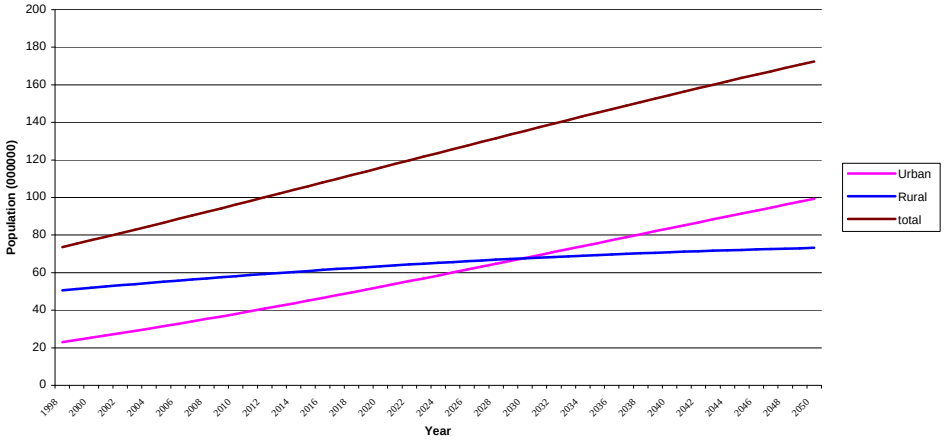

Figure 3 © Urbanization Trend for Sind

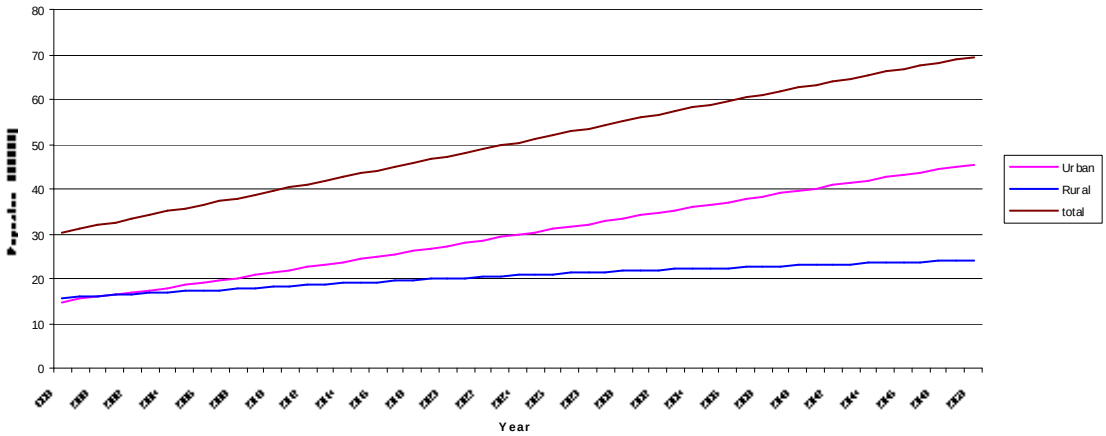

Figure 3 (d) Urbanization Trend for NWFP

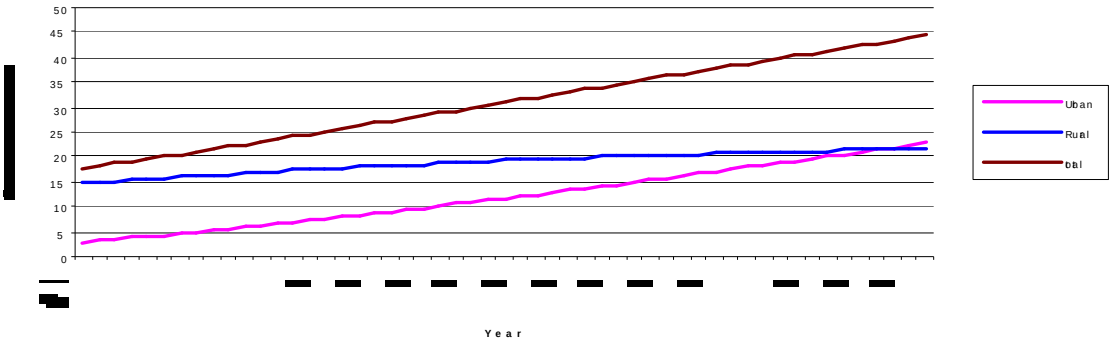

Figure 3 (e) Urbanization Trend for Baluchistan

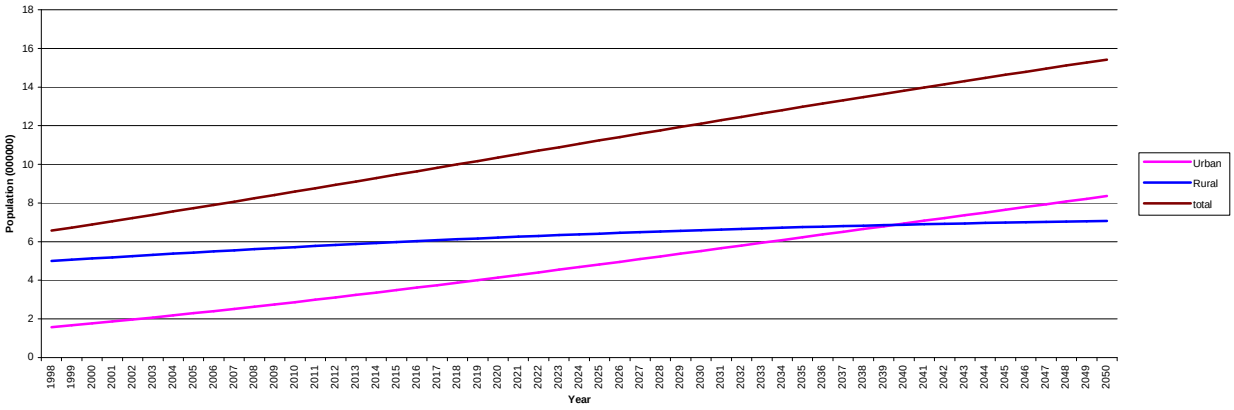

Table I: ***Population and Index of the relative change in the urban-rural population as compared to 1951***

Year/area Population	1951	1961	1972	1981	1998
Urban	5985497	9654572	16593651	23841471	43036404
Rural	27754670	33225806	48715689	60412173	89315875
Total	33740167	42880378	65309340	84253644	132352279
Indices	1951	1961	1972	1981	1998
Urban	100	161	277	398	719
Rural	100	120	176	218	322
Difference	0	41	101	180	397

Table II: ***Increase in the population of ten big cities of Pakistan (Population in million)***

Serial No.	City name	Year 1931	1951	1998	Increase in Popn from 1951
1.	Karachi	0.264	1.068	9.27	9 times
2.	Lahore	0.430	0.849	5.06	6 times
3.	Fasialabad	0.043	0.179	1.10	6 times
4.	Peshawar	0.122	0.155	0.99	6 times
5.	Rawalpindi	0.119	0.237	1.41	6 times
6.	Gujranwala	0.059	0.121	1.12	9 times
7.	Multan	0.120	0.190	1.18	6 times
8.	Hyderabad	0.102	0.242	1.15	5 times
9.	Quetta	0.060	0.084	0.56	7 times
10.	Sialkot	0.101	0.156	0.42	3 times

Note: The data is taken from Census report of Pakistan (2002)

Table III: ***Population of the 10 big cities of Pakistan (in millions), along with the relative rise in the intervals.***

SNO	CITY	YEAR 1941	YEAR 1961	YEAR 1981	YEAR 1998	Increase during 1941-1961	Increase during 1961-1981	Increase during 1981-1998
1	Sialkot	.139	.167	.302	.422	1.20 times	1.81 times	2.07 times
2	Peshawar	.173	.218	.566	.983	1.26	2.60	3.60
3	Quetta	.065	.107	.286	.565	1.65	2.67	3.58
4	Rawalpindi	.185	.340	.795	1.410	1.84	2.34	2.29
5	Lahore	.672	1.296	2.953	5.443	1.93	2.28	2.51
6	Gujranwala	.085	.196	.601	1.133	2.31	3.07	3.50
7	Multan	.143	.358	.732	1.197	2.50	2.04	2.22
8	Hyderabad	.135	.435	.752	1.167	3.22	1.73	1.86
9	Karachi	.387	1.913	5.208	9.339	4.94	2.72	2.66
10	Fasialabad	.070	.425	1.104	2.009	6.07	2.60	2.44

Table IV. ***Projected population (million) along with the urban percentage of Pakistan and Provinces***

Administrative unit		1998	2005	2010	2015	2020	2025	2030
PAKISTAN	Population	132.35	155.91	173.29	190.95	208.74	226.51	244.12
	% Urban	32.52	36.99	39.89	42.56	45.04	47.33	49.45
PUNJAB	Population	73.62	86.61	96.21	105.98	115.84	125.70	135.48
	% Urban	31.27	36.31	39.56	42.54	45.27	47.78	50.07
SINDH	Population	30.44	35.66	39.50	43.39	48.29	51.18	55.02
	% Urban	48.75	52.00	54.07	55.97	57.70	59.28	60.73
N.W.F.P	Population	17.74	21.10	23.61	26.18	28.81	31.45	34.09
	% Urban	16.87	23.40	27.62	31.50	35.07	38.34	41.36
BALOCHISTAN	Population	6.57	7.73	8.59	9.47	10.35	11.24	12.11
	% Urban	23.89	29.70	33.44	36.87	40.02	42.91	45.56

REFERENCES

Population Educational Cell (2001), Curriculum Wing, Ministry of Edu. Islamabad.

1998 Census report of Pakistan (2002), Pakistan Census Organization (PCO), GoP.

1981 Census report of Pakistan (1984), Pakistan Census Organization (PCO), GoP.

1972 Census report of Pakistan (1973), Pakistan Census Organization (PCO), GoP.

Population Census report (1961), Pakistan Census Organization (PCO), GoP

Seigel S. (1972). Development and Accuracy of Projection of Population and Households in United States, Demography 9 (1): pp. 51-68.

Population Projections (1998-2025) Pakistan and Provinces by NIPS July 2000.

Microsoft Encarta Encyclopaedia Deluxe, 2002.

Sheker Chander and Ram F. (2001) Ward-Wise Population Projection of Greater Mumbai: A different Methodological Approach. Paper presented in XXIV Indian Social Sciences Congress held at Chandigarh, India during March 1-5, 2001.

State of Population in Pakistan (1991) National Instt. of Population Studies, Islamabad.