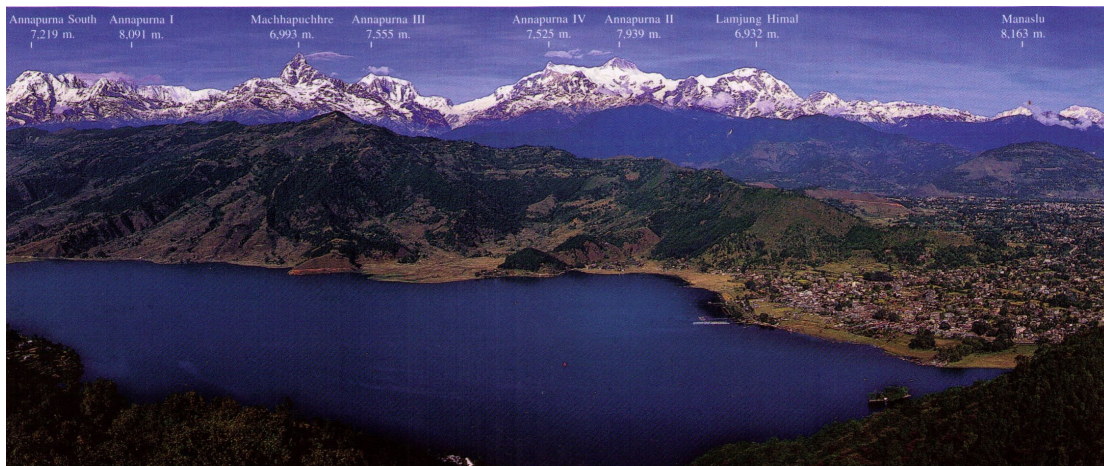


URBAN GROWTH AND LAND USE CHANGE IN THE HIMALAYAN REGION: A CASE STUDY OF POKHARA SUB-METROPOLITAN CITY, NEPAL

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Annapurna Himalayan Range & Fewa Lake view from Pokhara, Nepal

Abstract

Land is basic natural resource to human being which is available every corner of the world. The concept of changing land use pattern is often considered a holistic approach of land surface, which is related to the use of land in a certain region at a certain time. Pokhara Sub-Metropolis is located in central part of the country directly falls under the shadow and in the south-facing lap of the majestic Mt. Machhapuchhre and Mt. Annapurna. Urban growth and land use transformation are affecting sustainable use of the bio-physical resources for the food, fuel wood, fodder, clothing and shelter. This study analyzed the relationship between the urban growth and land use changes and their impact on the Pokhara Sub-metropolis. Primary and secondary sources of information- Topographical and aerial photographs were used to document land use changes. All the information was digitized and changes were evaluated quantitatively using GIS and RS.

Analysis of the study shows that eradication of endemic of malaria, tourism development, education institutions, hospitals, air and road network and pension paying camps have contributed the rapid urban development of Pokhara Sub-metropolis in one hand and the natural phenomena- lakes, river, suitable climate and beautiful scene and sceneries of Himalayas have added the urban growth and resultant the change in urban land use on the other.

1. Background

Urban land use, which deals with surface utilization, is an important aspect of urban geography (Ranjitkar, 1983). Growth and development of a city is reflexive to urban land use changes because effects of urban growth visualize in the shape, size, function, uses and urban environmental condition. It is related to urban population growth, number of places, economic growth and change (Dickens, 1973: 45-60). Functional

establishments and provision of urban amenities attract more and more population to move onto the towns and cities, and settle there.

In Nepal, the history of origin of towns goes back to medieval period (Shrestha, 1981: 127) but the process of urbanization began only in the decade of 1950s. Besides these, Nepal has still low level of urbanization in terms of a number of towns and proportion of population. Nepal remains one of the least urbanized countries in the world and also in South Asia. While this low level of urbanization is a matter of considerable concern for the economic development of the country, the present state of urbanization and urban development also manifests distinctive characteristics and problems that demand urgent attention. Urbanization and the consequent process of economic, social and even political changes that it entails has to be very much part of Nepal's development vision because a large proportion of population live in far-flung settlements without adequate infrastructure, facilities and services, and depend on traditional agriculture as a source of livelihood. Diversification of agriculture, creation of off-farm employment opportunities, creation of conditions where the comparative resource advantages of particular regions can be fruitfully realized, and dealing with issues of gender and ethnicity, among others, is facilitated by the process of urbanization. While the nature and form of urban development may be debated, the fact that urbanization has to be an integral part of Nepal's development agenda can hardly be contested.

In the case of developed countries, there is intense use of urban areas. Non-commercial functions occupy space mainly in the peripheral zone. But in developing countries like Nepal, core area of the city is still devoted to agriculture. Consequently, urban economy is primarily based on agriculture. However, the present scenario of the major towns of Nepal shows a rapidly changing pattern of urban land uses.

2. Study Area

Pokhara Sub-Metropolis lies in the broad valley of Seti River covering an area of 5645.74 hectare located on the southern foot of the Mt. Annapurna and Mt. Fishtail Himalayan region (83° 58' 30" to 84° 2' 3" east longitudes and 28°10' north to 28° 16' north latitudes). It is situated on the. Seti River dissects it into two parts. Enchanting natural beauty and its unique social and cultural heritage are responsible for the present development of town (Poudel, 1982: 21). Population of Pokhara Sub-Metropolis is 156312. The dominant community groups are Brahmin, Chhetri, Gurung, Magar, and Newar.

Pokhara is formed due to quaternary deposits of different formations. The quaternary deposits consisted of mostly the calcareous, these rocks are karstified in the form of sinkholes, caverns solution chimneys and pinnacles. The valley is one of the heaviest rainfall recipients of the country, sometimes both conditions weak lithostructure and heavy downpour of rainfall together work to bring hazardous situation. Pokhara valley had experiences of frequent seismicity $M > 4$ to > 7 magnitudes (Bajracharya, 1994). Considerably, these factors determine the planning of the valley (Fig. 1).

Being the regional headquarters of western region and the second tourist center after the Kathmandu, it has attracted a large population from the surrounding areas. It accounts for the highest growth rate of population among the designated towns in the country. Pokhara Sub-Metropolis is selected as the study area because of its rapid process of urbanization and fast changing land uses.

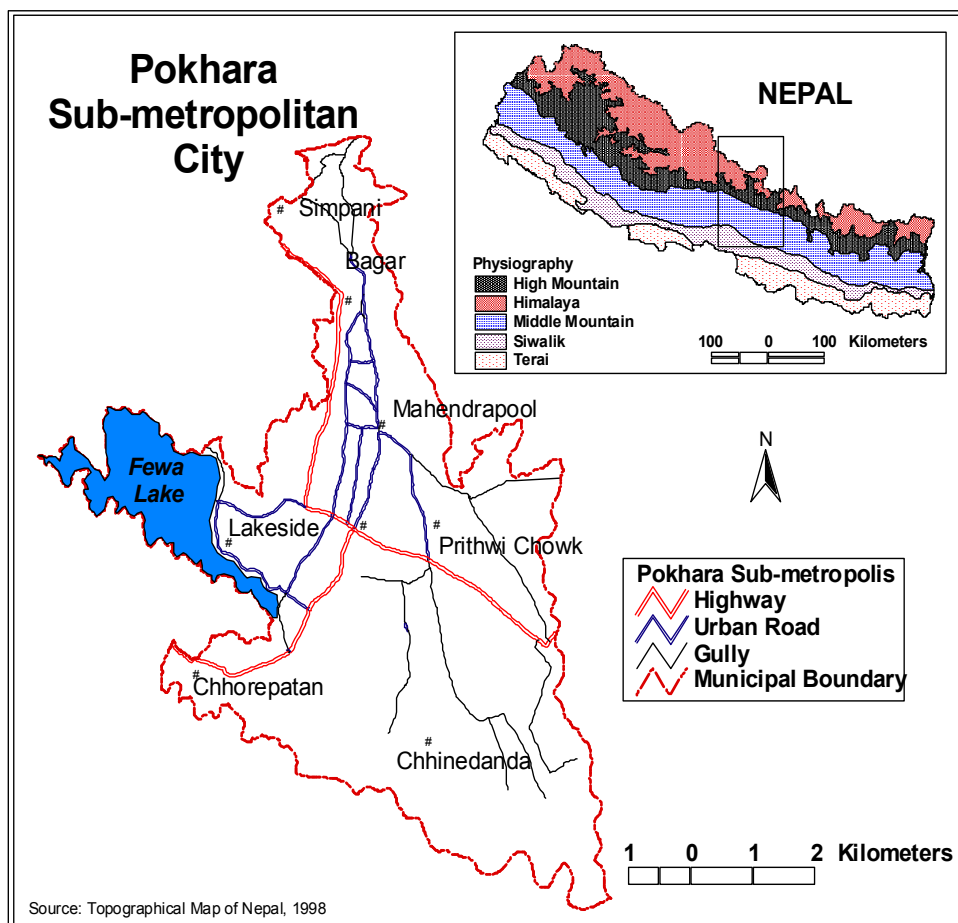


Fig.1: Location of study area. (Map by author)

3. Objectives of the Study

The main objective of this study is to trace out the urban growth and land use changes of Pokhara Sub-Metropolis. The specific objectives are:

- to outline the trend of urban development of the city, and
- to analyze the changing land use pattern from 1978 to 2000.

4. Methodology

4.1 Data sets

The study is based on both primary and secondary information. The primary information were obtained through field observation and interview with knowledgeable persons as key informants. The secondary information were collected from Pokhara Sub-Metropolis office, publications of Central Bureau Statistical, and published and unpublished reports. Spatial analysis relies on 2 land use data sets. Firstly, data of 1978 are obtained from land use maps (scale 1:50,000) compiled from ground-verified aerial photographs (scale 1:50,000) by Land Resources Mapping Project (LRMP). Secondly, data of 1999 are obtained from topographic maps (scale 1:25,000) published by Survey Department, government of Nepal in 1999 and field verification of 2000. The topographic map contains the information on land use and topography. Because land use information contained in both data sets (1978 and 2000) are based on the aerial photographs at the same scale (1:50,000), the error arising from the map scale is speculated to be minimal.

The identification and classification of land cover types adopted from Pokhara Physical Development Plan 1974, was classified on 8 categories for analysis. The maps were digitized using ARC/INFO™.

4.2 GIS Analysis

GIS software ARC/INFO has been applied to analyze the data. All the coverage has been UNION one by one. Each coverage consists value, which would have been added into the table operation. The final union

coverage consists the total score value in each of the polygon. Their value is summed up in the table operation. The land use changes value is derived from the total land use changed value. Overlaying the 2 land use layers created a 1978-2000 land use change map. This map shows the change in land use over the period of 22 years.

5. Analysis and Result

5.1 Growth Pattern of Urbanization

Nepal has low level of urbanization in terms of both urban population and number of towns. Out of the total population of the country only 13.4 per cent population live in the urban areas whilst more than 15 per cent population are urban in South and South-East Asian countries. In the 18th century, urban centers in Nepal were developed mainly in Kathmandu valley. After the unification of Nepal, Pokhara, Butwal, Tansen Ilam etc. were emerged as the trade centers outside Kathmandu valley. Most of them were developed at the break-of-bulk-points along the Indian and Tibetan trade routes (Blaikie, et al, 1982: 123). Consequently, different level of administrative centers developed at the strategic locations and supported for this growth of higher-level urban centers. Blaikie et.al. (1982) has also stated that urban growth in the hills of Nepal became apparent only after 1950 with the expansion of bureaucracy, overall increases in the volume of trade and the formation of infrastructure network.

Municipalities according to the Local Self-Governance Act 1999 are classified into three categories: *Mahanagarपालिका* (Metropolitan city), *Upa-Mahanagarपालिका* (Sub-Metropolitan city), and *Nagarपालिका* (Municipality). Metropolitan city is a municipality with a “minimum population size of 300,000, annual revenue of at least Rs. 400 million, facilities of electricity, drinking water, communication, paved main and subsidiary roads, provision of specialised health services, essential infrastructure for international sports events, adequate opportunities for higher education in different fields, at least one established university, adequate urban facilities, and an area that has already received the status of a sub-metropolitan city. Similarly, sub-metropolitan city is a municipality with a minimum population size of 100,000, annual revenue of at least Rs. 100 million, facilities of electricity, drinking water, communication, paved main roads, education and health services of a high standard, general infrastructure for national and international sports events, provision of public parks and a city hall and similar urban facilities, and an area that has already received the status of a municipality. The Act lays down (a) minimum population size of 20,000 in the Tarai and 10,000 in the hill/mountains, (b) annual revenue of 5 million in the Tarai and 500,000 in the hill/mountains and “minimum urban facilities such as electricity, road, drinking water, communication and other similar urban facilities” as necessary conditions for the designation of municipal status.

The growth in urban population and places in Nepal is shown in Table 1. In the five decades since the 1950s urban population increased from 0.238 million to 3.23 million while the number of designated urban places increased from 10 to 58. The percent of urban population in the country has grown from 2.9 percent to 13.9 percent. Intercensal percentile increase in urban population over the preceding census year was highest during the decade of the seventies. It may be noted that average annual change in percent of urban population has been steadily increasing since the seventies. It was 0.07 in the fifties, 0.04 in the sixties, 0.24 in the seventies, 0.28 in the eighties, and 0.47 in the nineties.

Table 1
Growth in urban population and urban places in Nepal, 1952/54 – 2001

Census Year	Urban Population (in '000)	Number of Urban Places	Percent of Population Urban	Increase in Urban Population (percent)
1952/54	238.3	10	2.9	
1961	336.2	16	3.6	41.1
1971	461.9	16	4.0	37.4
1981	956.7	23	6.4	107.1
1991	1695.7	33	9.2	77.2
2001	3227.9	58	13.9	90.4

5.1.1 Histogenesis of Pokhara Sub-Metropolis

In the early period, Pokhara was essentially a market center situated in the broad valley of Seti and its tributaries. Because of the strategic location between mountain and Terai, it became an important staging point between east-west and the Trans-Himalayan trade route (Gurung, 1965: 32). The history of Pokhara City begins with the periodical religious gathering during the medieval period and permanent bazar after the unification of Nepal in 1769 B.S. Nevertheless, in the prehistoric time, the prehistoric men should have lived on the hilltops in the vicinity of Pokhara before setting down in the valley floor (Shrestha, 1996:35). Houses were scattered and there were no symptoms of urbanity. (Chemjong, 1966: 135)

In the 19th century, Pokhara became a considerable town, a mart frequented by merchants from Kathmandu, Palpa, Malebum, etc, and afforded duties that in so poor country were reckoned considerable (Halmilton, 1972: 242). Oldfield (1980) described it as a largest city, well inhabited and famous for its copper manufacturing. According to Perceval London (1975), Pokhara is the second city in Nepal, outside the Kathmandu Valley and addressed that it was a significant town having about 10,000 population. Kuwaguchi during his visit from Kathmandu to Tibet in 1899 stated, "Pokhara looked like a town of villas at home, the size being chosen for the beauty of its natural scenery" (Gurung, 1980: 147). An Italian scholar Giuseppe Tucci visited Pokhara in 1951 and introduced it as "the largest after the Kathmandu but it is not really a town at all, it is an enormous bazar widening along endless street". According to Harka Gurung (1961), Pokhara was remained as the heartland of the kingdom of Nepal, which had linear market development till 1961. The recently flourished Pokhara City is the outcome of long efforts of development and strategic location on the beautiful valley in the central part of the country.

5.1.2 Changes in Area and Boundary

The extension of boundary is related to urban growth. The rapid influx of migrants and political interest of the leaders led to the extension of the boundary of the Pokhara Sub-Metropolis.

In the beginning, there were 13 wards covering 3013.61 ha. area of the Pokhara valley. The present Pokhara Sub-Metropolis having 18 wards and area accounts for 5645.74 ha after changes and extensions of boundary and 18 wards (Fig. 2).

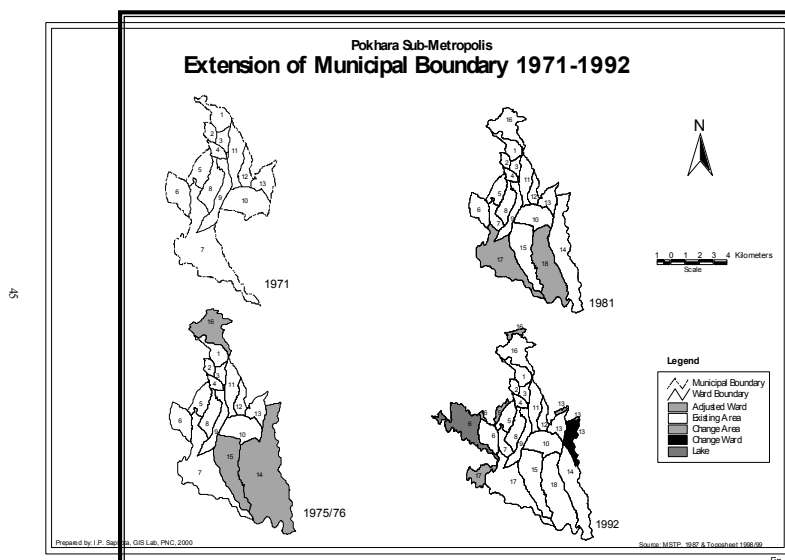


Figure 2

5.1.3 Population Growth and Distribution

The population of the Pokhara Sub-Metropolis has rapidly been increasing in the recent years. According to the census of 1991, the growth rate of Pokhara Sub-Metropolis is 7.41 per cent, which is far greater than the national average growth rate of urban population (i.e, 5.89).

The population of Pokhara Sub-Metropolis in 1952/54 was 3755, which has increased to 95286 in 1991. In between 1952/54 and 1961, the population increased by 5.36 per cent but in 1971, it increased to 14.30 per

cent. This high growth rate was mainly due to migration of population from its peripheral villages. Extension of the city area boundary was an equally important factor to increase the urban population. From 1971 to 1981, the rate of growth of urban population decreased to 8.51 per cent. In this inter-census period, the influx of migrants slowed down, however, extension of the city area boundary and natural growth caused to increase the growth rate. In between 1981 and 1991, the growth rate of population accounted for 7.41 per cent. The estimated population for the year 1998 on the basis of this rate of change is 157055 (Table 2).

Table 2
Population Growth since 1952-1998

Years	Pokhara		Nepal	
	Population	Growth Rate (%)	Population	Growth rate (%)
1952/54	3755	-	238275	-
1961	5413	5.36	336222	1.64
1971	20611	14.30	461938	2.05
1981	46642	8.51	956721	2.62
1991	95286	7.41	1695719	2.08
2001	156312	5.6	3227879	2.25

Source: MSTP 1987, CBS, 2001

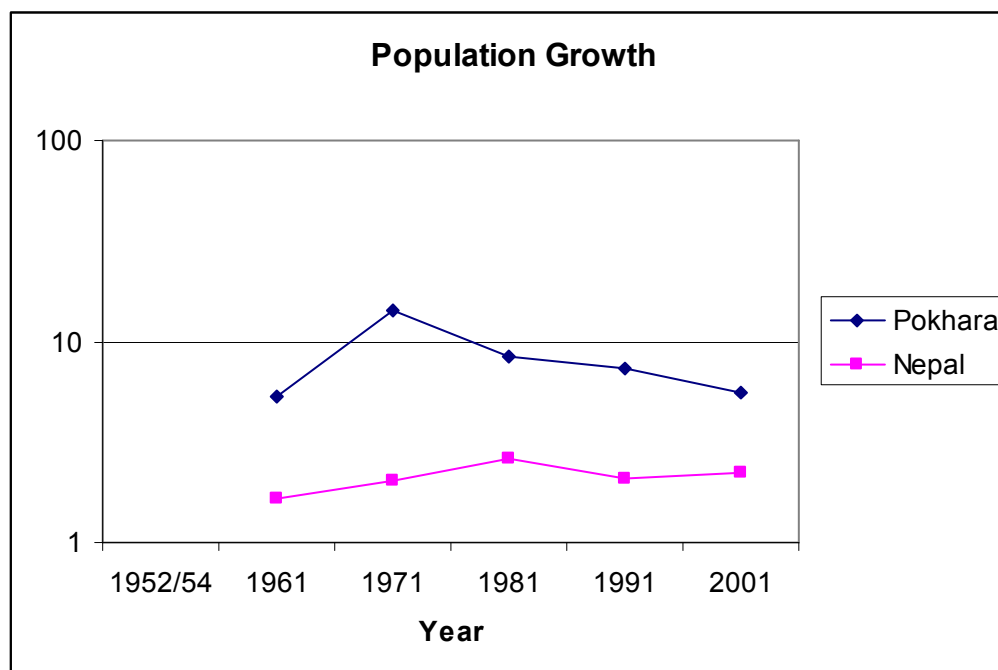


Figure 3

5.2 Changing Urban Land Use Pattern

5.2.1 Land Use Pattern, 1978

Most of the urban areas of Pokhara Sub-Metropolis were accommodated by transportation policy. Most of the land parcel along the road was accommodated by commercial cum residential area which accounted to only 2.85 per cent whereas roads were allocated around major urban area with the coverage of 1.54 per cent of the total area (1231.11). On the other hand, the private residential areas were concentrated in area with the coverage of 0.44 per cent.

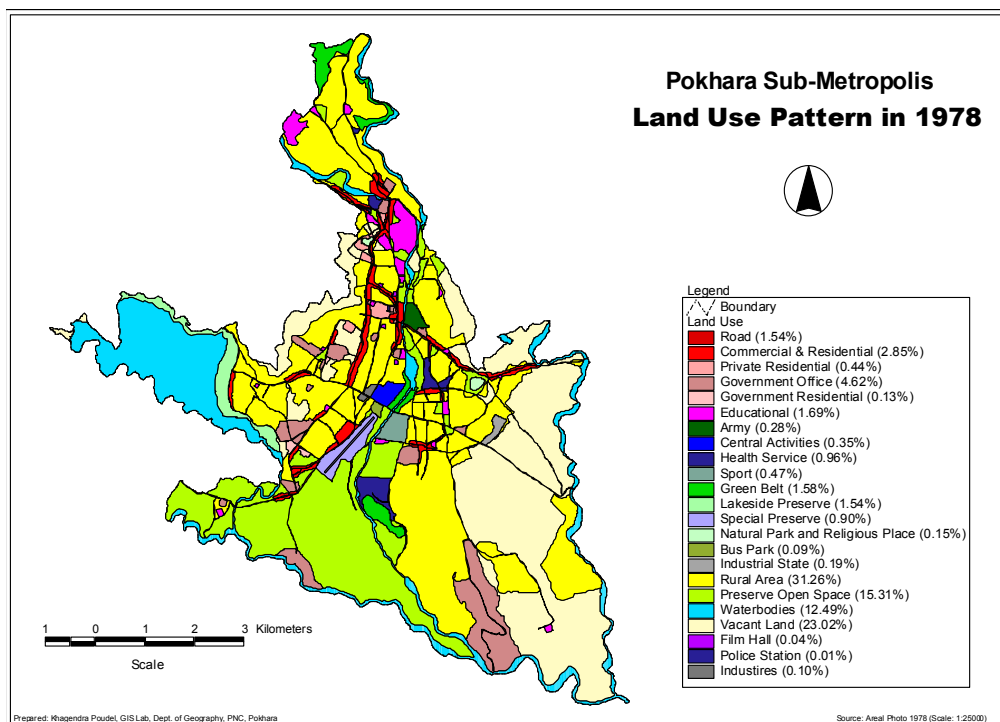


Figure 4

The institutional areas are located in the western part of Seti River covering 8.04 per cent area. This zone includes government offices area, government residential, educational, institutions, army camp, central activities, health service and police station, which has accounted to 4.62, 0.13, 1.69, 0.28, 0.35, 0.96 and 0.01 per cent respectively.

Open space has been squeezed because of encroachment of urban slum dwellers and crossing the road network (Money, 1975:127) Open space has been used to dump the solid waste for example peace crop forest area has been used for disposal of solid waste. The proportion of land used by stadiums, greenbelts, lakeside preserves, natural parks, cinema halls and religious places account for 0.47, 1.58, 1.54, 0.15, 0.04 and 0.15 per cent respectively.

Water bodies have occupied 12.49 per cent area in a remarkable figure, which includes the Phewa lake, Kamal Pokhari and Seti river. Transportation areas are allocated around the city including road, bus park and airport, which all together accounted for 2.53 per cent with the small patches of land parcels.

Similarly, the vacant and rural-urban areas are the noticeable figures, which were occupied 31.26 and 23.02 per cent respectively. These two components occupied more than 54 per cent of the total coverage of 5645.66 ha. Industrial area occupied minimal (0.29%) area but the significant feature of urban morphology (Table: 3 & Fig.4).

Table 3
Land Use Change in Pokhara Sub-Metropolis from 1978 to 2000

(Area in hectare)

S.No.	Land use Types	Years		Change	
		1978 (Area)	2000 (Area)	Area (1978-2000)	Percentage
1	Commercial	161.00	392.57	231.57	143.83
2	Residential	24.62	416.35	391.74	1591.43
3	Institutional	453.82	587.81	133.99	29.52
4	Transportation	151.96	379.93	227.98	150.03

5	Industrial	15.84	16.91	1.07	6.74
6	Open Space	1076.93	264.31	-812.62	-75.46
7	Rural-Urban	1756.11	1114.28	-641.82	-36.55
8	Vacant Land	1299.88	1720.90	421.03	32.39
9	Water Bodies	705.60	752.67	47.07	6.67
	Total	5645.74	5645.74	-	-

Source: Derived from Aerial Photo 1974, Aerial Photo 1996, Topo-sheet 1999 and Field Verification 2000.

5.2.2 Land Use Pattern, 2000

The urban land use pattern of Pokhara Sub-Metropolis is based on aerial photographs of 1996 and field observation of 2000. The salient features of urban morphology have been categories in nine major groups and 28 sub-groups. The most common activities of urban areas are private residential and commercial-cum-residential have occupied 7.38 and 6.95 per cent respectively whereas industrial activities are limited within only 0.3 per cent area.

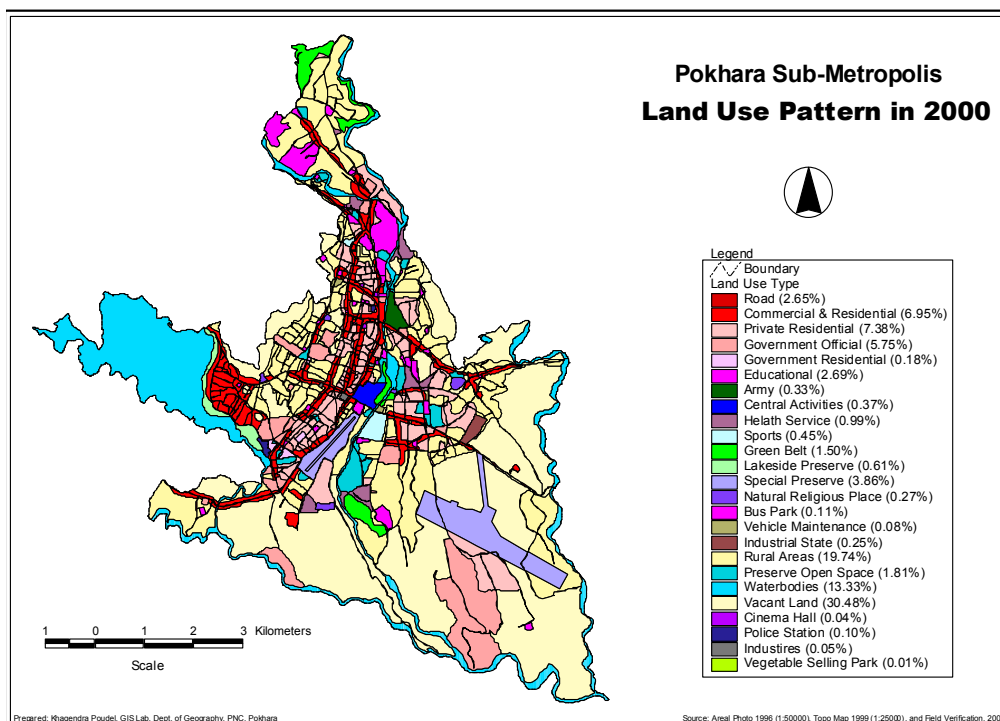


Figure 5

The transportation areas allocated in Bus Park, airport, vehicle maintenance and purposed airport have occupied 6.7 per cent area of Pokhara City. The institution area includes government offices, government residential areas, educational areas, army camp, central activities, health service and police station. These areas occupied 10.41 per cent whereas the government official and educational institutions have the dominant figures. The recreational and open space, specially, sport area (stadium), green belt, lakeside preserve, natural park and religious places and film halls have occupied 0.45, 1.50, 0.61, 0.27, 1.81 and 0.4 per cent respectively. However, in total, 4.68 per cent area is devoted to this purpose. The surface of Phewa lake, Kamal Pokhari and gorges of Seti River have occupied 13.33 per cent area as the aesthetic source of water bodies. The rural-urban area and southern part of the Indian pension camp have occupied 19.74 per cent area, whereas the cultivated land (vacant) have occupied 30.48 per cent for the agricultural purposes. (Table 3 & Fig. 5)

5.2.3 Land Use Change from 1978 to 2000

Land use pattern of the urban area is a fundamental concern in the reflection of cumulative needs of urban residents for many years. Since the designation of Pokhara as a municipality, the process of urbanization was very fast growing in respect of road, transports in the city than other areas. Establishment of government offices and extension of urban facilities brought remarkable changes in land use pattern of Pokhara Sub-Metropolis.

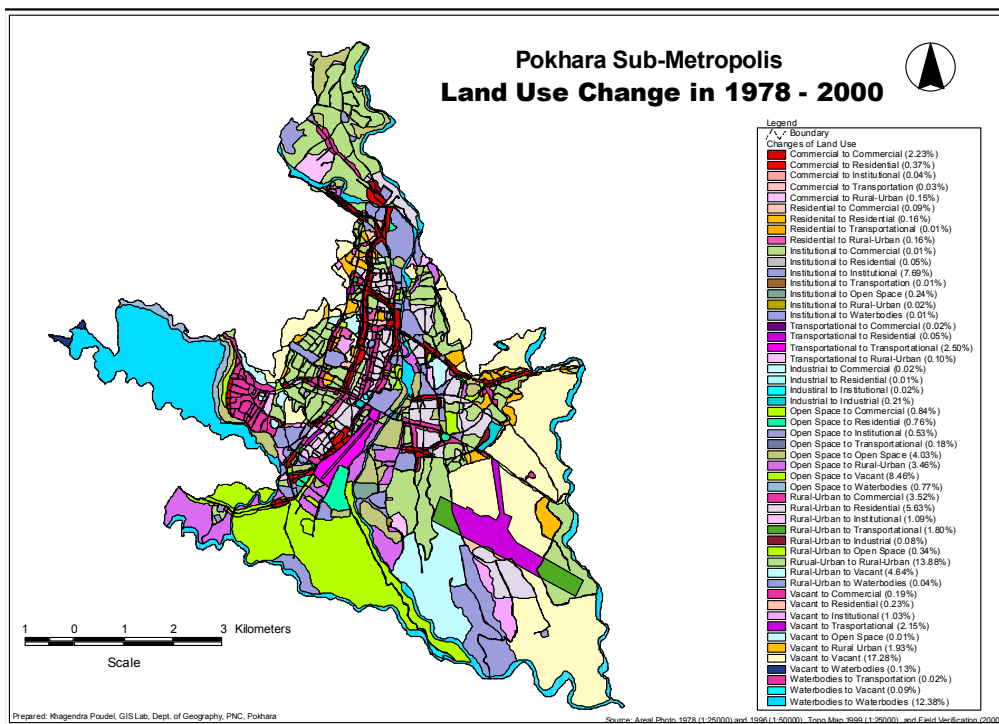


Figure 6

For 22 years, land use of Pokhara Sub-Metropolis has been significantly changed. Residential, commercial, Institutional and transportation areas are extended either by modifying the established functions or by developing rural-urban area and vacant lands (Dikens,1973: 234-36). In between 1978 and 2000, the commercial and residential area was increased by 143.86 per cent with the loss and gain of 0.62 and 4.72 per cent respectively in the overall urban land use changes. The residential area shares 0.16 per cent of the total area increased to 1577.27 per cent of the total area. Likewise, the residential area has lost 0.9, 0.2, 0.17 and 0.003 per cent to commercial and residential, transportation, rural-urban area and vacant land. It was gained from commercial, institution, transportation, industrial, open space, rural-urban and vacant land (0.37, 0.05, 0.02, 0.8, 5.63 and 0.3) per cent respectively Table 3 & Fig. 6).

Similarly, the institutional area had lost to commercial, residential, transportation, open space, rural-urban and water bodies together accounted to 0.35 per cent from the overall figure. On the other hand, it had gained by 2.72 per cent from the same area. However, transportation area had constituted 2.50 per cent in this period. It has lost 0.02, 0.06, 0.002 and 0.109 per cent from the commercial, residential, institution and rural-urban area while it had gained 0.04, 0.02, 0.02, 0.003, 0.18, 2.81, 2.15, and 0.01 per cent from the commercial, residential, institution, industrial, open space, rural-urban vacant and water bodies respectively. Likewise, the industrial area was increased by minimal area by 0.1 per cent. The Match factory area was merged in commercial, residential, institution and transportation areas. The open spaces changed into commercial, residential, institution, transportation, rural-urban, vacant and water bodies, which were followed by 0.85, 0.8, 0.53, 0.18, 3.46, 8.46 and 0.77 per cent respectively. Rural-urban area shared 13.88 per cent as the remarkable figure in both year whereas the lost was 17.22 and gained 5.85 per cent of the overall land use while it was followed by 5.61 (lost) and 13.22 (gained) from the overall figure. However, the main dominant change had been found in open space to vacant (8.45%). The area of water-bodies was not significantly changed. The lost was 0.117 and gained 0.945 per cent respectively. However, most of changes had been found in rural-urban and

vacant areas, which have decreased day to day due to conversion of built up area. While the commercial, residential, and institution areas are increasing from the changes of Rural-urban, vacant and open spaces.

6. Conclusion

Generally, Pokhara municipal area was populated after the eradication of malaria. Different socio-economic factors contributed to the evolution of urban settlement from a small bazaar located at the trans Himalayan trade route. Since 1950, eradication of endemic of malaria, starting point of trekking to Annapurna and Dhaulagiri region and pilgrimage to Muktinath, concentration on the different level education institutions, establishment of Hospitals, road network connection and establishment of the British and Indian pension paying camp contributed for the growth of Pokhara town.

Pokhara Sub-Metropolis is a rapidly growing city of Nepal. It accounts for the highest growth rate of population (5.6%) in the country. The development of physical and social infrastructure has not gone side by side the growth in number of population. Urban land is randomly utilized for different purposes.

The urban area, Pokhara Sub-Metropolis has been dominated by commercial-cum-residential, residential, institutional, industrial, transportation and rural-urban areas whereas vacant land, open space, and water bodies have also covered a significant proportion of the urban area. The rural-urban area was most dominant land use pattern in 1978. It covered about 31.10 per cent of the total area. In 2000, proportion of rural-urban area has reached 19.74 per cent. However, it decreased by 36.55 per cent during the last 22 years.

The vacant land was the second dominant land use in 1978, which covered about 23.02 per cent area whereas it remained 30.48 per cent in 2000. The rate of its increase is accounted for 32.39 per cent. Water-bodies account for 13.33 per cent and increased by 6.67 per cent in the 1978 land use data.

Most significant features of urban morphology are commercial-cum- residential, which occupied merely 2.85 per cent in 1978, and 6.95 per cent at the end of 2000. The rate of its increase in residential area is the most accountable than in others. In 1978, the proportion of residential area was 0.44 per cent, and has increased by 7.37 per cent in 2000. The rate of its increase was 1591.10 per cent as the dominant figure of overall land use change in Pokhara Sub-Metropolis. There was a nominal increase in the industrial area, which was accounted for 0.28 per cent and 0.3 per cent in 1978 and 2000 respectively. Transportation area was increased by 150.02 per cent whereas institutional area increased by 29.52 per cent. The recreational and open spaces are however, decreased by 75.46 per cent. It was mainly due to the encroachment of commercial, residential and institutional areas.

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