Inventive
Peer-Reviewed, Open Access Journal
ISSN: 2773-7977 (Print)
ISSN: 2773-8183 (Online)
Volume 2, July, 2020, PP: 58-73

Urban Population Growth, Environment and Related Problems in Pokhara Metropolitan City

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Abstract

Pokhara is one of the most naturally beautiful cities in the world with a unique geological setting. This important tourist city is under intense pressure from rapid urbanization and population growth. Various types of hazards and risks are rapidly increasing in Pokhara due to the lake of knowledge among the people regarding land use practices, particularly the increase in built-up areas. Population growth, especially urban population growth, is a major issue of the twenty-first century, not only in Nepal but also in all the developing and the developed countries of the world. Although Nepal is a country of low level of urbanization, urban population is rapidly increasing since last half century, which has brought various problems to face because of lack of proper urban planning in time. This study is important for raising awareness among policy makers and other public officials to include multiple hazard risk mitigation in land use policies and plans. Establishing connections between urban expansions, escalating population growth and multiple hazards and risk assessment will also improve in modelling the latent impact of future catastrophes and emergency preparedness.

Key words: Growth, hazards, immigration, sinkholes, urbanization, urban population,

Received 28 June 2020, Reviewed 10July 2020, Published 21 July 2020

Introduction

Population growth is a global phenomenon since the evolution of human settlement. Fertility, mortality and migration are the major components of population dynamics which bring changes in size, growth, distribution and other demographic characteristics of a certain locality on the one hand and physical, socio-economic transformation on the other hand. The villages are the byproduct of the development of agriculture in areas where there is an adequate water supply and

fertile soil. Many of earliest villages in the world were found developed in the major river basins of the Nile, the Tigris, and the Euphrates rivers along with the coastal region of Mediterranean sea (Gallion & Eisner, 1986). The cultivation of plants enables men to change their economy, to produce food and to live in permanent settlement. Peasant communities eventually gave rise to urban communities and urban settlements. The oldest well-documented urban settlement is Ur, in Mesopotamia, the present day in Iraq (Husain, 1994; James & Roberts, 1990). The greatest phase of urban development occurred after the Industrial Revolution of 1779 in Europe.

In Nepal, throughout the eighteen century probably only the settlement of the three town of Kathmandu Valley i.e Kathmandu Patan and Bhadgaon, could properly be described as towns (Blakie, Cameson & Seddon, 2001). After unification of Nepal in 1768, Kathmandu became the capital of unified Nepal. Due to the rapid spread of Newar traders and small manufacturers from Kathmandu to Pokhara and other parts of Nepal assisted for the development of commercial activities in the beginning. In 1785, Kaski was merged into greater Nepal (Shrestha, 2000). The historical growth of Pokhara town shows that the bazaar of Pokhara came into being only after the immigration of the Newar people from Kathmandu Valley in the mid eighteenth century. Trade Treaty of 1923 between Nepal and British India, industrial development of 1930s and 1940s and the political change of 1951 had significant impact on the urban growth in Nepal (NPC, 2000; Shrestha, 1981).

The Study Area

The study area is selected as Pokhara Metropolitan City, which was declared as a Metropolitan City on March 10, 2017. It is also the capital city of the Gandaki province. Pokhara is nearly 200 kilometers west from the national capital, Kathmandu. It is the largest Metropolitan City of

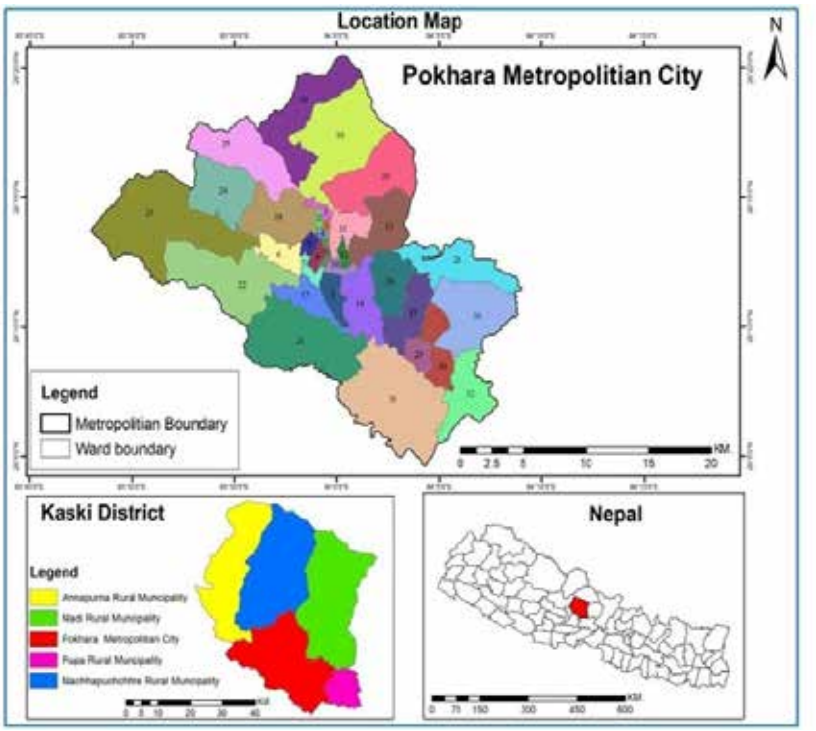

Figure 1. Study area

Nepal in terms of area, number of wards, and the second largest after Kathmandu in terms of population. Geographically, Pokhara metropolitan city is in the lap of the Annapurna range, in the hilly region of the country. It is surrounded by many hills
like Kahun, Arba, Thulakot. Rupakot, Mattikhan, Pumbibhumdi, Panchase, Kaskikot, Sarangkot, Dhital, Gharmi and Armala. It is situated in between 28°04'10" north to 28°20'30" north latitude, and 83°48'40" east to 84°09'50" east longitude. Its area is roughly 464.24 square kilometres. It has a height ranges from 418 metres above sea level in the confluence of Kotrekhola and Seti river, to 2115 metres in Armala hill top. In the east, the boundary of Pokhara metropolitan city lies between the Madi and Rupa Rural Municipalities of Kaski. To the west is Annapurna Rural Municipality of Kaski along with the borders of Parbat and Syangja districts. In the north are Machhapuchchre and Madi Rural Municipalities and in the south lies Syangja and Tanahun districts (figure 1).

Methodology

This study is based on secondary data, which are taken from CBS, Pokhara metropolitan office, and other sources such as books, magazines, journals, departmental publications and research reports. Field observation method was also done to find the environmental impacts.

Geography of Pokhara Metropolitan City

Pokhara has unique physical features in comparison to other valleys of the country. It is a terrace valley plain formed by fluvial glacial deposition. It is composed of lowland, gorges, terraces, caves, valleys, hillocks and hills. It is gently sloppy from the north to south. Pokhara is also known as the lake city, as it contains many lakes like the Phewa, the Begnas, the Rupa, the Khaste, the Maidi, the Dipang, the Neureni, the Kamalpokhari and the Gunde, which attract large number of foreign and national visitors every year. The natural features make Pokhara a major touristic hub of the nation. The altitude is the main affecting factor of climate of the city. The climate of the city is humid sub-tropical in the lower altitude and cool temperate in the higher altitude. In the summer, temperatures generally range from 25^0C to 30^0C, and in winter the temperature ranges from -2^0C to 15^0C. Pokhara receives the highest rainfalls in Nepal, the Lumle of Annapurna Rural Municipality receives the highest rainfall in the valley (more than 5600 mm per year). During the pre- monsoon due to convectional air current afternoon shower is common here. The vegetation of the city is mostly sub-tropical deciduous and is predominantly covered with deciduous and mixed forests upper part. Common species of natural vegetation are Chilaune, Katus, Tooni, Sisau, Pipal, Simal, Bamboo etc. There is variation in the types of soil according the formation of the valley. The major types of soil are sandy gravel, conglomerate, alluvial, lacustrine and residual.

History of Pokhara Metropolitan City

The history of Pokhara begins as a part of an important ancient trading route between China and India. In the 17th century, it was a part of the kingdom of Kaski, one of the Chaubise Rajya ruled by a branch of the Shah dynasty. In 1730 AD, Pokhara was assimilated by Prithvi Narayan Shah into his kingdom. By then, it had become an important trade center. It was envisioned as a commercial center by the king of Kaski in the mid-18th century AD. When the Newars of Bhaktapur migrated to Pokhara, upon being invited by the king, they settled near locations such as Bindabasini, Nalamukh, Bhairabtol, Ganeshtol, Sangukomukh, Ranipauwa, Gaudakomukh etc. The ethnic make-up of Pokhara was largely Khas and some Dalits. Before the 1960s, the main valley area of Pokhara was considered a malarial zone, and Gurungs and Magars of the hills were few in number. Later, a permanent market started being established, and malaria eradications programs were conducted. Increasing transportation and urbanization led to rapid expansion of the city, and introduced Muslim settlers as well as Thakali migrated from the mountains. Thakali people previously used to maintain warehouses when they came during the winter to trade goods. After Tibet's annexation in 1959, trade declined and many of these Thakalis permanently settled in Pokhara. Education played a major factor in attracting people from the hills, especially retired army personnel. Such pensioners started forming small enclaves in various parts of town, and changed the town's ethnic composition. Foreign remittance then started playing a big factor in Pokhara's economy, providing capital for many of the businesses and industries (Adhikari, 2003).

Pokhara is not an old town like the towns of Kathmandu valley. But in perspective of modern development, it is the only town in Nepal that has consistently gone up the rank hierarchy since 1962 (Poudel, 2008). Nepal has not only a low level of urbanization but the very definition of urban area is based on a certain size of population rather than the functional character of the locality (Gurung, 1981). The 1952/54 census provides data on 10 “prominent” settlements with a population of over 5000. The 1961 census for the first time defined an urban area or a ‘sahar’ as “an area with a population cluster of 5000 and over and having an urban environment such as high school, college, judicial and administrative offices, bazaar, communication facilities, mills, factories, etc “, but also indicated that the definition was not strictly followed (Sharma, 2003). Urban centers named “Nagar Panchayat” after the Nagar Panchayat Act of 1962, having population not less than 10,000. In 1990 with the reestablishment of the multiparty system, the Nagar panchayats were renamed Nagarpalika. The municipality Act of 1992 and the Local Self Governance Act of 1999 redefined and classify municipal areas into three categories:

Mahanagarpalika (Metropolitan city), Upa-mahanagaralika (Sub-metropolitan city) and Nagarpalika (Municipality).

Pokhara's administrative history starts from 1960 after it become Nagar Panchayat. In 1966 divided into thirteen wards. In 1990 after the promulgation of the new constitution, it was declared as municipality. Pokhara municipality was upgraded to sub-metropolitan city on 1st February 1996 with 18 wards in the initial phase. On 2nd December 2014 the area of sub-metropolitan city was extended by merging the nearest VDC. The ten Village Development Committees were Lamachaur, Bhalam, Kahun, Arbabijaya, Nirmalpokhari, Kristi, Pumdibhumdi, Sarangkot, Hemja and Armala and the number of wards increases to 27. According to the report urban restructure committee on 10th March 2017 the nearest municipality called Lekhnath along with the seven VDCs of the periphery such as Chapakot, Bhadauretamagi (wards 3 to 9), Kaskikot, Puranchaur, Mauja, Kalika (wards 1 to 5), and seven wards of Majhthana (1, 4-9) were merged together to form Pokhara-Lekhnath metropolitan city. On 10th June 2018 the municipal assembly proposed to change the name to Pokhara metropolitan city, which was approved on 8th August 2018 by the council of ministers of federal government and was published in government gazette on 10th September 2018 (Pokhara Darpan, 2019).

Data Analysis and Presentation

Population Status of Pokhara Metropolitan City

Pokhara was a small town with less than 5000 inhabitants till 1954 (Gurung, 1969). According to the first scientific census report of Nepal, 1952-54, population size of Pokhara Bazar (town) was 3755. In 1961, the total population of Pokhara was recorded 5413. During that period, there were only ten urban centers designated as urban area in Nepal but Pokhara was not considered as urban region at that time. Between early sixties and early seventies, three important events took place which brought a remarkable change in the population growth of the town. In the early sixties, malaria was eradicated from Pokhara and in the early seventies Pokhara was linked by two national highways i.e. is Prithvi Highway and Siddhartha Highway, and in the mean time it was made headquarter of the Western Development Region now the provincial capital of Gandaki Province.

In 1961, the number of wards of the Nagar Panchayat extended from 10 to 16 accounting the total population 5413 (Table 1). In 1971, the total urban population of the sixteen designated municipalities was 461,938 and Pokhara was ranked in the 6th position in terms of population size. In 1981, Pokhara was ranked the fifth populous city after Kathmandu, Biratnagar, Lalitpur and Bhaktapur. In 1991 and 2001 census, Pokhara was ranked fourth, but in 2011, Pokhara was recorded the second largest sub-metropolitan city of the country. According to the CBS record the total population of Pokhara in 1971, 1981, 1991, 2001 and 2011, 2017 was recorded 20611, 46642,

95286, 156312, 255465 and 414141 respectively. During the year 1971 due to the area expansion of the Pokhara municipality, so the population growth rate is seen higher in 1971 (Table 1). This rate was found high during 2017 as periphery of rural areas were merged to Pokhara metropolitan city. In the year 2017 when it was declared as Metropolitan City 48.6 percent of the population are male and 51.5 percent are female population. The sex ratio is 94.57 males per 100 females. The total number of households are 105,623 with an average family size of 3.92. The population density is 892.08 persons per square kilometer. The Metropolitan City consists of mixed ethnic groups, religions and cultures. The major castes by population are Brahmin (27.78 %), Gurung/Ghale (16.16 %), Chhetri (15.55 %), Magar (9.13 %), Kami/Sunar (6.93 %), Newar (5.42 %), Damai (3.23 %), Tamang (2.76%), Sarki (1.98 %), Thakuri (1.39 %), Gharti/Khawas (1.42 %) and the rest are other castes/ethnic groups. The major mother tongues in the city are Nepali, Gurung, Magar, Newari and Thakali. The major religions are Hinduism, Buddhism, Islam and Christianity. In Pokhara metropolitan city, mixed ethnic communities live including Dalits in all the wards (Pokhara Darpan, 2019).

Table 1: Population change in Pokhara

Year	Total Population	Absolute Change	Population Growth Rate
1954	3755	-	-
1961	5413	1658	6.31
1971	20611	15198	28.08
1981	46642	26031	12.63
1991	95286	48644	10.43
2001	156312	61026	6.40
2011	255465	99153	6.34
2017	414141	158676	10.35

Source: Pokhara Darpan, 2019

Population Distribution and Density by Ward wise 2017

Population distribution is uneven in different wards of Pokhara Metropolitan City because of the difference in physical, economic, socio-cultural and infrastructural factors. The main factors of uneven distribution of population is because some of the wards of neighbouring VDC wards were merged with Pokhara Metropolitan City. The highest population is found in ward 17, 8, 16, 10, 13. The lowest population is found in ward 20, 28, 23 and 24 respectively (Table 2).

Table 2: Ward wise Area, Population Distribution and Density of Population in Pokhara Metropolitan City 2017

Ward	Major areas	Area sq.km	Population	Density/ sq.km
1	Bagar	1.54	15513	10073.38
2	Bindhyabasini	0.6	8729	14548.33
3	Nadipur	0.63	9462	15019.05
4	Gairapatan	0.51	9119	17880.39
5	Parsyang	1.78	14803	8316.29
6	Baidam	6.33	14729	2326.86
7	Masbar	1.97	12875	6535.53
8	Prithvichok	1.76	26080	14818.18
9	Nayabazar	1.22	16626	13627.87
10	Ramghat	1.96	18470	9423.47
11	Fulbari, Ranipauwa, Kahun	6.97	14716	2111.33
12	Matepani	1.4	11613	8295.00
13	Kahukhola, Arwa	15.38	17077	1110.34
14	Chauthe, Majharipatan, Chhinedada	13.36	13225	989.90
15	Rambazar	5.12	17027	3325.59
16	Batulechaur, Lamachaur, Armala	34.68	20278	584.72
17	Birauta, Chhorepatan	7.89	26752	3390.62
18	Sarangkot	17.77	8354	470.12
19	Puranchaur, Lamachaur,Gharmi	11.04	10642	963.95
20	Bhalam, Mauja	22.94	4022	175.33
21	Nirmalpokhari, Kristi	35.9	9090	253.20
22	Phumdibhumdi	32.11	7391	230.18
23	Chhapakot, Bhadaure	47.8	4917	102.87
24	Kaskikot	18.5	5892	318.49
25	Hemja	22.38	12262	547.90
26	Bijaypur, Rakhi,Kandhanidada	12.13	11394	939.32
27	Arghun, Archele,Sisuwa	12.23	9583	783.57
28	Kalika, Majhathana	17.57	4727	269.04
29	Bhandardhik	4.22	8961	2123.46
30	Dhungepatan, Mohoria, Trikang	9.4	10823	1151.38
31	Lamaswara, Begnas, Sundaridada	24.46	7378	301.64
32	Khudi, Satmuhane,Badahare	15.01	10677	711.33
33	Bharatpokhari	44.18	9806	221.96
Institutional		-	11128	-
	Total	**464.24**	**414141**	**892.08**

Source: Statistics Office, Kaski, 2019.

Ward wise Area

The area of the wards were not distributed evenly. The area of some wards were found from 47.8 Sq. Km (ward 23) up to below 0.5 Sq. Km (ward 4). The wards attached with the rural fringe are larger in terms of area such ward no: 25, 20, 31, 22, 16, 21, and 23 (Table 3).

Table 3: Ward wise Area in Pokhara Metropolitan City 2017

Area (person/sq. km.)	No. of wards	Wards	Major areas
Below 1 sq. km.	3	4, 2, 3	Gairapatan, Bindhyabasini, Nadipur
1-2 sq. km.	7	9, 12, 1, 8, 5, 10,7	Nayabazar, Matepani, Bagar, Prithvichok, Parsyang, Ramghat, Masbar
2-5 sq. km.	1	29	Bhandardhik
5-10 sq. km.	5	15, 6, 11, 17, 30	Rambazar, Baidam, Fulbari, Ranipauwa, Kahun, Birauta, Chhorepatan, Dhungepatan, Mohoria, Trikang
10-15 sq. km.	4	19, 26, 27, 14	Chauthe, Majharipatan, Chhinedada, Puranchaur, Lamachaur,Gharmi, Bijaypur, Rakhi,Kandhanidada, Arghun, Archele,Sisuwa Chauthe, Majharipatan, Chhinedada
15-20 sq. km.	5	32, 13, 28, 18 24	Khudi, Satmuhane,Badahare Kahukhola, Arwa Kalika, Majhathana, Sarangkot, Kaskikot
Above 20 sq.km	8	25, 20, 31,22, 16, 21, 33,23	Hemja, Bhalam, Mauja, Lamaswara, Begnas, Sundaridada, Phumdibhumdi, Batulechaur, Lamachaur, Armala, Nirmalpokhari, Kristi, Bharatpokhari, Chhapakot, Bhadaure

Source: Statistics Office, Kaski, 2076.

Ward wise Distribution of Population

The population of Pokhara metropolitan city is increasing rapidly. The population is high in core area of the city and the population in the periphery of the core are less. Better educational facilities, health facilities, employment opportunities, commercial facilities and so on has helped to increase the population. Because all these facilities people from the rural areas started to migrate in the core area of metropolitan city. The Population according to ward wise is shown in the table

4. The density of population is high in ward 4 **(G**airapatan) which is 17880.39 persons/sq.km and ward 3 (Nadipur) have 15019 persons/sq.km. Likewise ward 23 (Chapakot, Bhadaure) has 102.87 persons/sq.km and ward 20 (Bhalam, Mauja) has 175.33 persons/ sq.km (Table 5).

Table 4: Ward wise Population in Pokhara Metropolitan City 2017

Population	No. of wards	Wards	Major areas
Below 5000	3	20, 28, 23	Bhalam, Mauja, Kalika, Majhathana Chhapakot, Bhadaure
5000-10000	11	24,31, 22, 18, 2, 29, 21, 4, 3, 27, 33	Kaskikot, Lamaswara, Begnas, Sundaridada,Phumdibhumdi, Sarangkot, Bindhyabasini, Bhandardhik, Nirmalpokhari, Kristi, Gairapatan, Nadipur, Arghun, Archele,Sisuwa, Bharatpokhari
10000-15000	11	19, 32, 30, 26, 12, 25, 7, 14, 11,6,5	Puranchaur, Lamachaur,Gharmi, Khudi, Satmuhane,Badahare, Dhungepatan, Mohoria, Trikang, Bijaypur, Rakhi,Kandhanidada, Matepani, Hemja, Masbar, Chauthe, Majharipatan, Chhinedada, Fulbari, Ranipauwa, Kahun, Baidam, Parsyang
15000-20000	5	1, 9, 15, 13, 10,	Bagar, Nayabazar, Rambazar, Kahukhola, Arwa, Ramghat
Above 20000	3	16, 8, 17	Batulechaur, Lamachaur, Armala Prithvichok, Birauta, Chhorepatan

Source: Statistics Office, Kaski, 2019.

Table 5: Ward wise Density in Pokhara Metropolitan City 2017

Density (person/sq.km)	No. of wards	Wards	Main areas
Below 500	9	23, 20, 33, 22,2 1, 28, 31, 24, 18	Chhapakot, Bhadaure, Bhalam, Mauja, Bharatpokhari, Phumdibhumdi, Nirmalpokhari, Kristi, Kalika, Majhathana, Lamaswara, Begnas, Sundaridada, Kaskikot, Sarangkot
500-1000	7	25, 16, 32, 27, 26, 19, 14	Hemja, Batulechaur, Lamachaur, Armala, Khudi, Satmuhane,Badahare, Arghun, Archele,Sisuwa, Bijaypur, Rakhi,Kandhanidada, Puranchaur,

			Lamachaur,Gharmi, Chauthe, Majharipatan, Chhinedada
1000-5000	7	13, 16, 32,27, 26, 19, 14	Kahukhola, Arwa, Dhungepatan, Mohoria, Trikang Fulbari, Ranipauwa, Kahun, Bhandardhik, Baidam, Rambazar, Birauta, Chhorepatan
5000-10000	4	7, 12, 5, 10	Masbar, Matepani, Parsyang, Ramghat
above 10000	6	1, 9, 2, 8, 3, 4	Bagar, Nayabazar, Bindhyabasini, Prithvichok, Nadipur, Gairapatan

Source: Statistics Office, Kaski, 2019.

Environmental and other urban issues

The accumulation of wealth and availability of economic resources and job opportunities in the core of urban center have resulted into the concentration of population in the congested metropolitan areas and thus helps to create big and skyscrapers (Singh, 1997). Nepal, one of the least urbanized countries in the world, faces very serious environmental and socio-economic urban problems especially in Kathmandu,

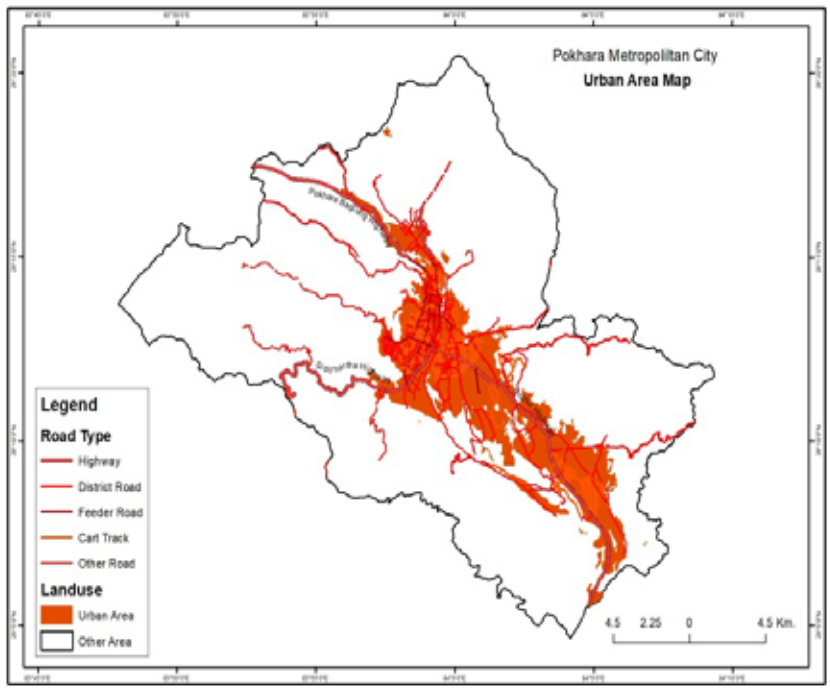

Figure. 2

Pokhara, Lalitpur, Bhaktapur, Bharatpur, Biratnagar, Birgunj and other urban centers. Pokhara is a major center of urban population concentration in the Gandaki province and it is the first largest metropolitan city in terms of area where 5.86 % of population resides. At present, the immigration

and rapidly increased population's need and their consumption and utilization pattern of various resources, Pokhara has faced various types of urban problems. The environmental problems such as air, water, noise and land pollution is increasing posing serious health hazards various urban localities. As the territory increases after its declaration as metropolitan city the environment, the environment quality of the urban area is gradually decreasing due to several factors like urban population growth, under investment in infra-structure, basic services and civic amenities; vehicular growth, lack of effective planning and regulatory framework and its weak implementation (NPC, 2000). The urban built-up area is increasing and agriculture land is decreasing (figure 2).

Environmental problems arises in Pokhara, because of rapid migration from the periphery of adjoining rural areas. The rate of migration is high because of the better facilities in the urban core region. Apart from this residential expansion and other socio-economic opportunities in Pokhara Metropolitan City and unemployment and lack of opportunities in neighboring villages tends to increase the population The past studies depicts that the built up area has greatly increased since 1977. In this year, there was 3.50 sq. km urban built-up area which was increased to 18.62 km^2 and 28.44 km^2 in 1999 and 2010 respectively (Rimal, 2011). Areas of open field and cultivated land have decreased subsequently while there is a little change in water body and sandy area. Squatter settlements have greatly increased, forest area has been encroached and its density has also decreased after 1977. Cultural and religious heritage is deteriorating due to the increase in population which results in various types' of pollution in the city. Due to the lack of sound sewerage system, rain water does not flow easily and remains stagnant in low leveled areas and finally percolates underground. It is the major cause of land submergence in different areas of Pokhara. The limestone contained in the underground layer of Pokhara town favours in the formation of caves and caverns. Mahendra Cave, Davis Fall, Gupteshor Cave are the burning examples of such topography, where plenty of stalactite and stalagmites are developed. Drinking water facility is not sufficient and the supplied drinking water is not suitable to drink during the peak monsoon season. This problems is seen due to poor filtration of drinking water in the source. Proper slaughtering house/station has not been constructed yet. Animals for meat are slaughtered in various densely populated urban built-up areas without taking care of sanitation. So, those areas are greatly polluted by animal wastes. Because of such polluted environment, people of those localities are highly affected by water borne disease like diarrhea, jaundice, typhoid and other infectious diseases.

Being the largest Metropolitan City of the country in terms of area the city don't have proper drainage system. During the rainy season the roads of the core are fully flooded and the water get drained along the road in the river Seti River and in Phewa Lake which resulted to the lake siltation. In various locations, sewage is disposed into Seti river and Fewa lake. Most of the

people in Pokhara are still unaware to keep environment clean. The waste generated from the houses and commercial areas are not collected on regular basis by the Metropolitan office. The disposal of waste is also not scientific. People are still unware of classification of the solid waste. Still the people of the city use to collect huge amount of solid waste and are dispose into the sewage channels, which are connected to the river Seti, lake Phewa, Phirke stream, Bulaundi stream and Phurse stream. The adverse effects of this flow can be seen in the Seti river in Ramghat (figure 3).

Figure 3

Because of the greater economic opportunities and comparatively better life in urban area, a large number of people from surrounding rural areas have started to migrate in Pokhara which resulted to squatter settlement in different wards of Pokhara Metropolitan City. In the year 1989 there were 427 squatter households in 25 localities in Pokhara. The city having squatter settlements are dominated by Gurungs (31%), 28.3% scheduled casts (Kami, Damai, Sarki), Newars (12.9%), Kshettris (10.5%) and the rest 13.9% includes Brahmans, Magars and Tamangs (KC et al, 1992). Major settlement areas viz. Old Bus Park (ward 9), Nayabazar (ward 9), Ramghat (ward 10), Nagintol (ward 10), and Shankartol (ward 09) are noticeable. At present, such squatter settlements are developed in other various parts of Pokhara Metropolitan City such as in Laltin Bazar, bank of Bijayapur Khola, bank of Khudi Khola, both sides of Phirke Khola, Yamdi, both sides of Bulaundi Khola, Okhaldhunga near Kamal Pokhari, Patneri, Lameaahal, Musetunda, Chapkobot,

Paitekodada, Badhare, Ghumti, and so on. Such settlements are always vulnerable to landslide and flood during monsoon season, which has been noted every year.

Because of encroachment upon public properties/land by individuals, the numbers and areas of pond, squares, spots of gathering, roads and other open spaces have greatly decrease. Due to the increase of population the city is facing serious traffic problem, it become difficult to manage the traffic in the city. The metropolitan office is trying to manage the traffic problems in the city, it has recently started to construct fly over in Srijana Chowk (ward 8). After its completion it can be known whether the fly overs can manage the traffic problems. Increased number of automobiles and consumption of fuels have greatly contributed to air pollution and rise in urban temperature in the city. Haphazardly and illegally constructed houses and the settlements without appropriate planning have deformed the urban landscape of Pokhara Metropolitan City. It is found so because all the houses were constructed in the neighbouring VDC, during that period the norms of urban planning was not compulsory in the rural areas. Apart from this the hilly wards of the metropolitan city is facing a problem of landslide during the monsoon season. It is increased due to unplanned and haphazard cutting of the hill slope for transportation. The major hilly wards of the metropolitan city are 33, 31, 28, 24, 23, 22, 21, 20, 18, 13 & 16. Ward no; 23, 4, 2 and some of the wards like, 16, 19, 17, 4, 3, 2, 9 are very much sensitive in terms of geological structure. As these wards are found by the glacio-fulvial deposition. Among this wards ward no 16, 19 and 17 in the Pokhara Metropolitan City a number of sinkholes and sites of land subsidence have been reported (Table 6). Geologically, all of these recorded sinkholes lies in the Ghachok formation (Hagen, 1969). This formation is the debris flow deposits that comprises of boulder-to silt-sized sediments with limestone fragments and capped by a 1–3 meter-thick silty layer.

Table: 6. Sinkhole and land subsidence hazard areas of Pokhara Metropolitan City

SN	Ward No.	Location	Potential Hazard
1	16	Settlement and cultivated area near Kali khola and Jumleti khola meeting place	Sinkhole/land subsidence
2	4, 5, 9, 11, 16, 17	Mahendrapul area, Ranipauwa area and settlement around Phirke Khola Bridge near Ganesh Tol in Parsyang Mahendra cave, Bat cave and Gupteshwor area New road nearby the Pokhara Sub-Municipality Office	Gorge, Sinkhole/land subsidence

Source: Genesis Consultancy Pvt. Ltd, 2009

The area from Baidam and Rastra Bank to Baglung Buspark, Chhorepatan and its adjoining areas, Pokhara stadium and adjoining areas and the left bank of the Seti River near the Golf palace are also susceptible to land collapse and subsidence when a large earthquake occurs (Genesis Consultancy, 2009). The southern peripheries of the Powerhouse, Gupteshwar cave, Mahendra cave and Chamero cave areas, which are regularly visited by tourists, have a high likelihood of sinkhole development within the Phewa formation (Koirala, 1996). The areas of Chipledhunga, Mahendra Pool, Male Patan, Masbar, Lamachaur, Nadipur and Tersapatti are additional sinkhole collapse-prone areas of Pokhara valley (Genesis Consultancy, 2009).

Conclusion

The ward wise population growth in Pokhara has been found that population growth has occurred tremendously in the Metropolitan City. It is because of the merging of the wards of previous VDC. As it is rapidly growing urban center in the country the population is growing in geometrical ratio. The population has is growing due to the immigration of people from the rural hill areas. When Pokhara was linked with Kathmandu, India, Bhairahawa, Butwal, Narayangarh, Gorkha, Baglung , Beni, and Mustang by road and air networks, it developed a strong economic base from remittance, tourism, social services and so on. Among the tourists who visit Nepal, about one-third of them visit Pokhara because of its scenic beauty. It is also called tourist's capital and a large number of tourists preference to have a direct visit to Pokhara. In this context, the completion of the construction of Regional International Airport should not be delayed.

Large cultivated areas of Hemja and some settlements at Jaimure of Armala, some city core areas, such as Palikhe Chowk, Bindyebasini, Archalbot, Bhairabtole, and the periphery of Mahendra cave, Bat cave and Gupteshwar area, along with the new road area, have already witnessed sinkholes, gorges and land subsidence, respectively. The settlements and the landscapes around these areas are at high risk for future disasters. The settlements, cultivable lands and grasslands near the river banks of the Seti River and its tributaries have a high threat of flooding, and the settlements there need to be relocated to safer areas.

However, at the same time it has created various problems in the field of environment, housing, health service, safe drinking water, solid waste disposal, electricity, etc. It doesn't mean that population should not increase at this rate. It rather means high priority should be given to the sustainable urban development plan. So, the government, its related institutions and agencies, NGOs and INGOs should give proper attention to make policies, necessary programs and their proper implementation to cover the needs and demands of this tremendously growing population.

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