

City Profile: Kathmandu

Rajesh Bahadur Thapa (Corresponding author)

Division of Spatial Information Science

Graduate School of Life and Environmental Sciences, University of Tsukuba

1-1-1 Tennodai, Tsukuba City, Ibaraki 305-8572, Japan

Phone: +81(29)8535694 Fax: +81(29)8536879

Email: thaparb@yahoo.com; thaparb@geoenv.tsukuba.ac.jp

Yuji Murayama

Division of Spatial Information Science

Graduate School of Life and Environmental Sciences, University of Tsukuba, Japan

Shailja Ale

Central Department of Geography, Tribhuvan University, Nepal

Abstract

Kathmandu is the capital of Nepal and forms the core of the nation's most populous urban region. Kathmandu has been important economically, administratively, and politically for hundreds of years. With its ancient monuments scattered around, Kathmandu is an emerging city where several plans and concepts have been implemented for its development. Like many cities of the developing world, the city has been facing rapid population expansion, daunting socio-economic problems and issues of inadequate urban management of expansion, including poor infrastructure and squatter settlements, with severe environmental consequences including air, water and other forms of pollution. In this profile, Kathmandu is defined as comprising the two contiguous and closely interlinked administrative entities, Kathmandu Metropolitan City and Lalitpur Sub-Metropolitan City. The paper analyzes historical urban development process, current plans and programmes, land use change and some contemporary socio-economic indicators of Kathmandu city, traces the major urban problems of the city, and considers future direction for its development.

Keywords: City Profile, Kathmandu, Lalitpur, Patan, Basantapur, Durbar Square, Bagmati River, UNESCO Heritage Sites

Introduction

Urbanization is a dominant phenomenon in virtually all developing countries. It has been observed in Nepal from the 1970s onward, showing one of the highest rates in Asia and the Pacific (ADB/ICIMOD, 2006). The number of urban centres in Nepal grew from 16 to 58 between the years 1971 and 2001 and the urban population increased from 0.4 million to 3.2 million, an eight times increase in this thirty-year period.

Kathmandu, the capital and main political centre of Nepal, lies in the bowl-shaped Kathmandu valley, a natural region which contains some of the oldest human settlements in the central Himalayas. The city comprises two densely populated urban centres, 'Kathmandu Metropolitan City' and 'Lalitpur Sub-Metropolitan City'¹. Originally separate, these two centres have grown together in recent times. While still distinct politically and administratively, they are so interlinked and adjacent with each other that there are no longer clear geographical and socio-cultural boundaries to be found between them. People from both cities share many common resources. Therefore, these two urban centres are considered together as a study unit and are referred to in this paper simply as 'Kathmandu'. The city, so defined, extends over 65 square kilometres of area and had a total population of 834,837 in 2001. Kathmandu, together with three nearby municipalities within the valley, Kirtipur, Madhyapur Thimi and Bhaktapur, form the Kathmandu metropolitan region. There are also many agricultural villages in the peripheral parts of the metropolitan region and beyond.

With the restoration of multi party democracy in 1990, the democratically elected government adopted the liberal market led economic policy in Nepal (MoF, 2005). The policy opens the door for investments in businesses, financial markets and industries in the country, which have direct and indirect impacts on the city development process. Foreign investors are treated equally as local investors to attract many foreign direct investments. However, Nepal has had internal problems in the last decade and political turmoil has weakened policy implementation and left the city with a slow pace of economic change. The most prevailing problem has been the declaration of the 'People's War' in 1996, leading to frequent change of government and to

¹ According to the Local Self Government Act 1999, the urban centres in Nepal are classified into Metropolitan Cities, Sub-Metropolitan Cities, and Municipalities.

administrative instability. Violence, frequent strikes and blockades and lack of law and order have lost the confidence of business communities, leading to significantly lower investment levels and the closure of some businesses and industries in the city.

After briefly reviewing Kathmandu's origins and culture, this profile examines the economic, social and physical development of the modern city. It identifies the major challenges facing the city, addresses the major urban problems, and considers future directions for its development.

Geographical Setting

Kathmandu is situated within the geographic coordinates 27°38'32" to 27°45'7" North latitudes and 85°16'5" to 85°22'32" East longitudes (Figure 1). The city lies at an average altitude of 1,350 meters above sea level. The climate is sub-tropical cool temperate. In general, the annual maximum and minimum temperatures were between 29.7° Celsius in May and 2° Celsius in January respectively. Annual rainfall was 1,740 mm in 2003, the extreme year of the decade for both temperature and rainfall (CBS, 2005). Heavy concentration of precipitation occurs in June to August as a result of southeast monsoon winds (HMGN, 1969). Average humidity in the city is 75%.

[Figure 1]

Kathmandu is located within the valley's Bagmati river system of which eight tributaries drain the city. The system has always been the city's main source of water for drinking and irrigation and it holds religious, cultural and social value (ADB/ICIMOD, 2006). The city has two principal landforms, i.e. alluvial and flood plains along the rivers and slightly more elevated river terraces, locally called '*tars*'. The city area is generally flat, with slope less than 1 degree, and soils have predominantly loamy and boulder texture (Haack and Khatiwada, 2007). Historically, what is now city land was highly productive agricultural land: major crops cultivated in the city fringes include rice, wheat, maize, potatoes, mustard and a number of other seeds used for oil production. A large variety of vegetables are increasingly grown throughout the year outside the Ring Road providing fresh products to city dwellers.

Origins and Culture

Kathmandu city (along with other urban centres inside the valley) and its culture date back at least 2000 years to the pre-historic Kirat period (Shrestha et. al., 1986). Its origin is seen to be closely associated with the legendary draining of the Kathmandu valley, recounted in the Vansabali chronicles. The valley floor was said to have been a great lake (this is confirmed by geological research) but was drained by a Chinese Saint, Manjushree. He cut a passage through the ridge at the Chobar gorge, south of Kathmandu, and thus made the Valley bottom available for habitation. (Ranjitkar, 1983). Gradually, according to the chronicles, settlements agglomerated into a town located between Swayambhu and Gujeswari areas (Ranjitkar and Manandhar, 1981; Shrestha et. al, 1986). The town was governed by Gopalbansi (cow herders) from 900 to 700 BC; by Mahisapal (buffalo herders) from 700 to 625 BC; and by Kirats from 625 BC to 100 AD (Regmi, 1999). The historical evidences, however, prove the existence of the town only from the rule of Lichhavis, who migrated from the Gangetic plains of Northern Bihar in India. They developed the town and ruled from 100 BC to 1000 AD. An Indo-Tibet trade route was opened in the Lichhavi era in the 7th century. By the end of the 10th century the town had come to be known as Kantipur.

Mallas from far western Nepal ruled the town from 1257 to 1768 AD. King Jayasthiti Malla (1380-1395) was the most popular among the kings in this period, known as a great politician, reformer and judicious administrator. He introduced the Hindu based cast system, classifying society into the several castes which still survive today. He also stratified the land into four categories: *abbal* (highly productive), *doyam* (medium productive), *sim* (productive) and *chahar* (less productive). The Malla era ended in the 18th century after the expanded town had been divided into three small kingdoms: Kathmandu, Patan (presently Lalitpur) and Bhaktapur. The period had been marked by extraordinary achievements in urban planning, architecture, arts/crafts, infrastructure achievements, and the development of socio-cultural institutions for urban management. We can still observe today the evidences of the Malla period, in surviving urban elements throughout the Kathmandu metropolitan region: in the three principal cities, Kathmandu, Patan and Bhaktapur, especially their Durbar Squares (Figure 2); in

the secondary towns, Thimi and Kirtipur, and in six satellite settlements, Deopatan, Chabahil, Naxal, Bungamati, Harisiddhi and Panauti (Shah, 2003).

[Figure 2]

Prithivi Narayan Shah, king of Gorkha, conquered the three cities in 1768 and declared Kathmandu capital of the newly unified Nepal. Thereafter, the city developed as main political and administrative centre of the country. In 1846, Jung Bahadur Kunwar came to power and founded the Rana regime (1846-1950). Unlike previous rulers, the Rana built palaces in prime agriculture land in the city periphery. Eventually, new settlements developed around the palaces since these areas provided facilities such as drinking water, electricity and good roads. Thus began the process of suburbanization of Kathmandu and its encroachment on productive agricultural land. A democratic movement eventually ended Rana rule in 1950. Thus the earlier settlements evolved from lake-bed to paddy agricultural land to the present day urban societies. The agricultural landscape transformed dramatically, since the 1960s, into an urban form stretching across the valley, driven by migration into the capital and the spread of vehicular arteries (Shah, 2003; Haack and Rafter, 2006).

Reflecting its long history, Kathmandu has a great variety of cultural and heritage sites including settlements, palaces, monuments, religious sites such as temples and monasteries, historic ponds, taps, and finely embellished public wells. Five out of the ten UNESCO World Heritage Sites in Nepal, namely Pashupatinath temple, Boudhanath and Swayambhunath monasteries, and the Durbar Squares of Basantapur and Patan are located in the city (NTB, 2006). These two Durbar Squares² (together with a third in Bhaktapur Municipality) hold particular significance for their historic arts and crafts. Along with numerous other historical and religious monuments and unique festivals of national and international importance, they account in large part for the influx of tourists in the city.

² The Durbar squares include several temples. During the Mallas period they were places of residence of the King where administrative, military and pilgrimage services were provided to their people. Now these squares are opened for tourist and religious purposes.

Planning Modern Kathmandu

The first official census (1952/54) reported that only ten settlements in Nepal met the criterion to be urban centres, five of them in Kathmandu valley. Construction of the Tribhuvan highway in the 1950s, linking to India and the Araniko highway to China, in the 1960s (DoR, 2004) widened commercialization and external influences in Kathmandu city. These roads also enabled people from outer regions to migrate into Kathmandu. Nepal's first and only international airport was constructed for the city in 1949 and flights to some Indian cities started in the late 1950s, helping to attract wider communities from around the world into Kathmandu. Along with the establishment of infrastructures bringing easy access to the city, the agglomeration of rural settlements of Kathmandu valley into the city began in early 1960s.

Although an early development agency had been established in 1935 (NPC, 2002), urban development planning in Nepal started effectively in the 1960s. The Town Development Committee Act, promulgated in 1963 and further amended in later years, created a legal basis for preparing and implementing urban development projects (Gyawali, 1997). A first physical development plan for Kathmandu valley was finalized in 1969 (HMGN, 1969). The plan aimed to preserve the historical and cultural heritage, and to guide urban development through land use planning, with a particular aim to prevent sprawl in city fringe areas and ensure settlement densification. It adopted the multi-nucleated regional growth strategy with linkage of dispersed settlement in the valley, continuation of existing growth tendencies of the Kathmandu-Patan complex and the bi-polar development of Bhaktapur by reinforcing transportation linkages and expanding settlement. The government promulgated a Town Development Implementation Act in 1972 to implement the plan. Under it, the Kathmandu valley Town Development Committee (KVTDC) was formed in 1976 to assume overall responsibility for planning and regulating urban growth in the region.

In the same year, KVTDC prepared the Kathmandu Valley Town Development Plan (KVTDP) based on the physical development plan of 1969 to manage the city growth. This plan formulated three broad zoning concepts: Zone A as city core (Kathmandu and Lalitpur); Zone B as city fringe; and Zone C as planned settlements in the rural villages of the region. It led to the development of a ring road (28 km, Figure

1) around Kathmandu and Lalitpur municipalities that, in the mid-1970s, significantly accelerated the urbanization process in the city's rural periphery.

However these plans were reluctant to address the city's other long term problems, the impact of which we can still observe today. Traffic congestion, lack of drinking water and unplanned growth eventually degraded Kathmandu's urban environment, threatened the health and quality of life, adversely affected the tourism prospects and reducing related employment opportunities, and threatened cultural and heritage sites (Adhikari, 1998; IUCN, 1999; ADB, 2003).

A new 'Structural Plan of Kathmandu Valley', was prepared with the assistance of UNDP and the World Bank, in 1987, aiming to provide guidelines for the physical development of metropolitan region for the year 2010. But due to the major change in the political situation in 1990, this plan was shelved – not for the last time the fate of plans was determined by the political circumstances in the country.

More influential was the 'Kathmandu Valley Urban Development Plans and Programmes', a series of detail integrated plans for the city development, prepared in 1991 and implemented in the new democratic environment. The plans focused on urban expansion in the peripheral areas of Kathmandu and Lalitpur outside the Ring Road as well as on other areas beyond the city's boundary, and made a number of strategic recommendations related to land use (focusing on land pooling and guided land development programmes), environment, infrastructure, financial investment, industrial policy and intuitional aspects for urban development in the Kathmandu metropolitan region (HMG, 1991). The central government also gave high priority in its national plans (Ninth Five Year Plan 1992-97) to upgrade infrastructure, services, and improve the environment in the city core.

Eleven land pooling³ projects have been completed in the Sorakhute area and elsewhere, and seven others are being implemented of which three are about to complete (ICIMOD, 2007). Similarly, guided land development programmes have been successfully implemented to date along some 280 kilometres of new roads in the city's periphery (Karki, 2004). Other successful and visible achievements of the 1991 Plan include: stone paving of market centres; pedestrianization of Durbar Squares; roads

³ For more information regarding the 'land pooling' and guided land development programme in Nepalese context, see Karki, 2004; ICIMOD, 2007.

renovation with side drains; streets and footpaths improvement in strategic tourist areas; improvement in waste management; construction of overhead pedestrians bridges; renovation of public parks; building public toilets in strategic areas of the city; improvements in the Bishnumati river (a north-western tributary of Bagmati river system) corridor; storm water drainage improvement; and industries relocation. However, overall conditions of the roads, land use fragmentation and growth of unplanned housing in fringes, chronic drinking water problems and degraded air quality in the city evidence the long term visionary weakness of the plan.

Socio-economic Conditions

Demographic Change

As we have seen, after the abolition of Rana regime in 1951, increased accessibility to Kathmandu helped make the city a centre of attraction for people from all parts of the country and also from neighbouring countries (Poudel, 2005). Rapid development of economic opportunities, facilities and urban amenities in the city, and uneven allocations of resources for development and institutionalization in the rest of the country have added to the pressures for migration to the capital. In 2001, a large volume of the population (42%) living in the city was migrants, including external (foreign-born) population sharing 3.51% of the total population. Under these pressures, the annual growth rate of urban population in Kathmandu accelerated from 1.27% per year in 1961 to 4.51% in 2001 (Table 1). Readjustment of the boundary of Kathmandu in different time periods also played a role in the city's population increase.

The 1952/54 census reported that the city had 148,762 inhabitants, that is, 62.43% of Nepal's total urban population. By 2001, the city's population had reached 834,837, but by then it was only 25.86% of Nepal's urban population⁴. By the year 2011, the city is forecast to be home to 1.2 million, that is, adding some 400,000 more inhabitants to its current population (Pradhan and Perera, 2005).

[Table 1]

⁴ The dramatic drop in Kathmandu's share of national urban population is due very largely to the expansion of urban population elsewhere in the country, Metropolitan Region and Kathmandu Valley.

With regard to causes of migration to Kathmandu, the CBS (2004) study reported that, among internal (Nepalese) migrants to the city, decisions to migrate were stated to be due to factors such as family reasons (50%)⁵, job searching (18%), easier life style (14.2%), education/training (9.1%), natural disaster in source area (0.6%), political reasons (0.3%) and other purposes (3.8%). External migrants, who are mainly concentrated in the city core area, are there mainly for business, skilled labour work, study and diplomatic mission. External migrants are much fewer in number than the internal migrants but their proportion has increased in the past decade because of the conflict in the country.

Kathmandu is densely populated with 12,664 persons/km², as compared to an urban population density of 985 persons/km² in the country as a whole (Sharma, 2003). Within the city periphery, with its hillocks and sloping lands, is less dense. However, real estate developers are currently making efforts to attract many residents by providing facilities and access to the hillier areas (Figure 3). Extremely high numbers of people dwell in close proximity to the city core where mostly temporary migrants reside in a compact commercial cum residential housing units running business in first floors and using other floors for store and residential purposes. Multiple family residential apartments are recently being introduced in the city fringes.

[Figure 3]

Economy and Employment

The challenges and opportunities in Kathmandu have attracted people from different parts of the country. Migration of qualified and better-off people has made it the most competitive city in the country, and has helped in its prosperity. The population census of 2001 classes 41% of the total population in Kathmandu city as economically active. 44% of the total households in the city were involved in agriculture and small scale non-agriculture economic activities (Table 2).

[Table 2]

⁵ In Nepal, most women have to go to their husband's house after marriage, which might be considered as the major factor in 'family reasons' for migration in Kathmandu.

A significant 17,000 households (9% of Kathmandu's households) is involved in agriculture and related activities in the city fringe. They grow paddy, wheat, maize, beans, mushroom, vegetables, and variety of fruits including banana and orange, and also rear cattle and poultry as livestock husbandry. In recent years, the traditional agricultural system in the periphery is undergoing significant transformation and farmers in the city are increasingly interested in commercial farming such as floriculture and horticulture, rather than subsistence farming.

Both 'manufacturing' (formal sector) and 'cottage' industries have developed in the city and its periphery. Manufacturing industries include: food processing and beverages, home appliances, garments and carpets, bricks and construction materials, and machinery. Two industrial estates, Balaju and Patan, were established in 1960 and 1963 respectively where 98% of investments are from the private sector (Table 3). Of the 202 firms started in the two estates since their inception, 147 are currently in operation, 20 are in the development stage and 35 have closed.

[Table 3]

Apart from the two estates, industries are located on major highways in the periphery of Kathmandu, especially the Tribhuvan Highway and Araniko Highway (Figure 1). The carpet industries are concentrated in and around the Swayambhu and Boudha areas. Brick kilns are mostly established to the southern part of the city just outside the Ring Road.

However, the number of industries overall in the city has decreased drastically, by no less than 37%, in the last decade (Table 4). The effect on employment has been severe, with many people left jobless. Kathmandu Valley Urban Development Plans and Programmes (HMG, 1991), Industrial Enterprises Act 1992 (IEA, 1992) and Industrial Location Policy 1997 (ICIMOD, 2007) have played a crucial role to reduce the presence of large-scale industries in the city. Most of the polluting industries such as distilling, cement and tanning were closed or relocated outside the city. For example, Himal Cement Factory was closed whereas Bansbari Leather and Shoe factory was privatised on the condition of relocation to the outer area of metropolitan region (ICIMOD, 2007).

[Table 4]

As well as reducing existing industries, the new environmental measures taken by the government created controls on the establishment of new ones. Proposals for new industries in Kathmandu have to pass several screening formalities including those established by the Environmental Protection Act and Environmental Protection Regulations of 1997. They also, incidentally, now face huge land acquisition costs due to recent steep rises in land prices in the city.

In addition to the formal sector industries, cottage industry continues to make an important contribution to production and employment in the city. Small-scale non-agriculture economic activities overall, including both industry and services taken together, employ some 35% the city households. Cottage industry includes: metal and lead working, carpet and textile weaving (pashmina, readymade garments), traditional food processing and preservation, and household products including ornaments such as wood handicrafts, and paintings (Thanka painting). Handicraft industries, especially metal handicrafts, are concentrated in Patan.

These small-scale industries have so far been less affected by recent environmental policies and controls in the city. But measures are currently in preparation to relocate potentially polluting ones, such as brick kilns, textile dyeing and carpet washing, plastic and rubber foam, and beverage making, to city fringe areas, or alternatively to require them by regulation to implement cleaner production methods to maintain the environment in the city (ICIMOD, 2007).

The service sector too is of increasing importance in Kathmandu, providing trade/business, transport and a wide range of other services. Tourism related services such as hotels, restaurants, pubs and bars, touring and travel agencies are already providing considerable employment in Kathmandu, with the city's five world heritage sites and many places with local, historical and cultural importance have great potential for further growth⁶. Similarly, the education and health service sectors in the city also provide skilled employment. Kathmandu city is known as the main educational and medical treatment hub in the country and major educational institutes and hospitals, both private and public, are well established. New types of commercial services have

⁶ Kathmandu is also a gateway for major tourist destinations in Nepal. Totals of 385,297 and 375,398 tourists were recorded in the year 2004 and 2005, 90% of whom entered through the city (ICIMOD, 2007).

been emerging too such as internet/cyber parlours, computer, photocopying and communications.

After the restoration of democracy in 1990, the government initiated a range of economic reform policies to enhance industries, businesses and employments in the country. Some of the important reforms were: removal of import license; full convertibility of Nepalese Rupees; liberalization to open joint venture financial institutions; announcement of Foreign Investment & One Window Policy; Foreign Investment & Technology Transfer Act and Industrial Enterprises Act of 1992; the India Trade Treaty of 1996; a value added tax system; and freeing banks' deposits for private sector investments (MoF, 2005).

These economic policies proved, however, to be limited in their ability to change the socio-economic status of the city to the extent that had been expected because unanticipated factors have weakened their implementation in recent years. Reference has already been made to the internal political and administrative instability and the insecurity prevailing in parts of the country since 1997. Other negative factors have included the Nepal-India Trade Treaty in 2002 which made several restrictions in export to India that also caused the closure of certain industries whose market was targeted to India (MoF, 2005). Also, free market policies and globalization, especially the abolition of the quota system on MFA (multifiber arrangements) in 2005, have played key roles in the collapse some of the garment industries in Kathmandu.

In spite of these problems, however, due to market globalization, rapid development in information technologies and high remittances received from labour export in the last decade, the *per capita* income of Kathmandu increased from NPR 24,084 (US\$ 437)⁷ in 1996 to NPR 45,816 (US\$ 628) in 2004 (CBS, 2004). The *per capita* income of Kathmandu has always remained higher than that of the other urban areas in Nepal (US\$ 209 in 1996 and US\$ 348 in 2004).

⁷ US\$ 1.00 was computed @ 55.00 NPR (Nepalese Rupees) in 1996 and @ 73.00 NPR in 2004 (Forex: <http://www.nrb.org.np/>).

Land Use, Infrastructure and Environment

Urban Structure and Land Use

Urban growth is by no means restricted to Kathmandu itself. KVTDC (2002) reported that the built-up area in Kathmandu metropolitan region doubled, growing from 5% to 10% of land area, between 1984 in 2000. The latest urban land use map of Kathmandu itself (Figure 4) shows the built-up area now covering 38% of total city land (Table 5). Agriculture land is still however the largest land use, covering more than half the city's land area. Forest cover, open space and water bodies show nominal existence. [Figure 4]

[Table 5]

Figure 5, based on the images acquired by earth observation satellites in different time periods in the past four decades, illustrates very clearly the typical pattern of land use change in peripheral Kathmandu in recent decades. It shows the radical transformation of the landscape pattern in the Boudhanath area, northeast of the city, in recent years. In 1967 the area was almost all agriculture land (Figure 5A). Very few small houses can be observed along the main road and around the Boudhanath Stupa⁸. This predominantly rural agriculture landscape gradually changed to peri-urban landscape with increasing human settlement in 1970s and 1980s. This can be observed in Figure 5B: built-up space can be seen to have spread outward from the Stupa and the main road. Lands abutting on the main road were by 1991 almost all occupied by housing units. In the image, some housing units can be seen standing alone in the agriculture fields making evident the start of land fragmentation and indicating a lack of control by urban planning. This pattern of growth reflected the weakness of the earlier plans and programs formulated in 1970s and 1980s which often lacked any micro visions for development in the city periphery. Moving on to the present day, no more space for agriculture can be observed in Figure 5C. Almost all space has been

⁸ Bouddhanath Stupa has a long historical, cultural and socio-economic significance for the city. It is located in the area of an ancient trade route to Tibet where for many centuries Tibetan merchants rested and offered prayers. When Tibetan refugees entered Nepal in the 1950s, many of them decided to live around Bouddhanath. Since then, a complete township has developed around Bouddhanath area. The Stupa as a landmark is clearly discernible in the multi-temporal images.

transformed to become built-up area. Plots are seen to be even further subdivided and it remains the case that no patterns of planned housing development can be observed.

Similar cases are found in other areas of city periphery (Thapa et. al, 2007). However, a few private builders have started planned housing colonies in the city periphery since the late 1990s.

[Figure 5]

Kathmandu city must overcome a number of significant problems if it is to attain the status of a modern city. Principal among these issues are related to transportation, water supply and sanitation, and other environmental issues.

Transportation

Kathmandu is not connected with modern bulk carrier infrastructures such as the railway. Thus the only means of transportation in the city is by road but an inadequate road infrastructure is one of the city's major problems. The Ring Road (Figure 1) circles the built up area and connects all major radial roads which give access to rural settlements in the metropolitan region or provide transportation corridors to other neighbouring cities. With this exception, however, the road network is very poor: urban roads are commonly narrow and crooked. Other problems include: insufficient parking space in the city; traffic signals and signage are lacking even in some area of city core; the mixture of vehicle types, poor driving, bad parking, and roadside trading add to traffic congestion which is common in the city. Frequent traffic congestion, fumes and excessive noise are most evident consequences.

Buses, minibuses, vans, pickups, trucks, cars, *tempo* (three wheelers) and motorcycles are the modes of transportation for services and daily commuting in the city, including for the thousands of people who commute to and from rural and fringe areas to the city core from early dawn till dusk. Privately owned public transportation serves 57% of the total passengers during peak hours (Figure 6). The number of motor vehicles in the city has increased rapidly in recent years. In the last 15 years from 1989 to 2004, registered vehicles in Kathmandu increased 6.8 times to reach 249,282 vehicles in July 2004, almost 60% of all vehicles registered in the country (ADB/ICIMOD, 2006; Dhakal, 2006).

[Figure 6]

These great increases, and the consequent increase in traffic, have not been matched by provision of roads and infrastructure, the result being persistent traffic congestion. Urban development is taking place without adequate planning or provision of transport infrastructure, and with inadequate consideration of the nature and composition of the traffic. Several plans and projects for public transport have been made by the government but these have often failed: electric trolley bus project in the city is one of the examples of failure.

Water Supply

A major infrastructural deficiency in Kathmandu is the shortage of drinkable water. Available supplies are insufficient in quantity and quality for the city's needs. Piped water supply covers only a small portion of urban residents, and the supply is usually intermittent. Inadequate quantity, chronic drinking water shortage, and a high rate of water loss, due to leakage and illegal connections, are major issues related to water supply in the city (IUCN, 1999; ADB, 2006). One third of the city households lack access to safe drinking water. Inadequate sewerage too leads inevitably to water contamination and disease.

The search for additional sources of water supply through sustainable projects is often complicated by conflicts of interest between the city and communities in the surrounding region. In addition, there are budgetary difficulties in raising the substantial sums required to improve the efficiency and safety of the water distribution network by re-laying pipes to reduce leakage and prevent contamination. To address these problems in some extent, implementation of a multimillion-dollar project, the Melamchi Drinking Water Project, has commenced with multilateral assistances. But due to the current political turmoil in the country and the vested interests of political parties, completion of the project on time seems very unlikely as it already passed prescheduled date for September 2006.

Environmental Issues

The rapid growth of the urban area coupled with the inability of the government to keep pace with the demand for infrastructure and services has caused the emergence of a number of urban environmental problems in Kathmandu. Unplanned urbanization, and especially the often haphazard development of industrial units, has generated a range of environmental problems affecting human health and welfare. Air and water pollution are becoming a serious problem. Urban land also is polluted due to the absence of urban services and to the messy disposal of human waste. The institutional system has failed in large degree to respond to these challenges (Adhikari, 1998; ADB, 2002).

Currently the most highlighted environment problem is air pollution. Kathmandu is particularly liable to it, due to its location in a bowl shaped valley with little natural air movement for much of the year. Emission of dust due to smoky motor vehicles and construction works, and the release of particulate matters (PM) by small-scale industries such as brick kilns are major sources of air pollution (Dhakal, 2006; Haack and Khatiwada, 2007). The increased air pollution is a consequence too of rapid growth in the number of motor vehicles, inferior quality and maintenance of automobile engines, adulterated fuel products and presence of polluting factories within the valley. Noise pollution is also increasing, due principally to aircraft noise, because of the international airport's close proximity to the city core, to outdated vehicle engines, and industries located near residential areas (IUCN, 1992; Adhikari, 1995; UNEP, 2001). Recently, the Ministry of Environment, Science and Technology prepared a comprehensive draft action plan for air quality management of Kathmandu aiming to meet National Ambient Air Quality Standards within five years (ICIMOD, 2007). However, the challenge is to implement the plan in order to improve the air quality in the city.

Sewerage systems, often combined with storm water drainage systems, exist in some places in the city but their coverage is insufficient and they are in a poor maintenance condition. The sewage treatment plants in Kathmandu are not functioning and the untreated sewage has to be discharged directly into the rivers. As a result, the condition of the Bagmati river system has severely deteriorated: aquatic life is virtually inexistent, human bathing for religious purposes has decreased, and the river water is

now very bad for agricultural use. Groundwater in the city is also contaminated due to seepage from pits and septic tanks, and open defecation.

Solid waste disposal used to be a major problem in the city. However, a recent agreement was reached with local people to dispose of the city's waste at Sisdole landfill site (25-km away north from the city centre in Nuwakot District) for two years, by which time a long-term solution is expected to be ready at Okharpauwa landfill site in the same locality (ADB/ICIMOD, 2006; ICIMOD, 2007). The 3Rs concept ("reduce, reuse, and recycle") for solid waste management is also getting recognition in the city.

Other Issues

The emergence of urban slums and squatter settlements in the city is relatively new and still small in size compared with other cities in South Asia (ADB/ICIMOD, 2006). In the past decade, many in-migrants to Kathmandu had been displaced from the countryside as a result of political conflict. In the city, they have started encroaching on public land, specially the areas around the riverbanks (Figure 7). Although there is currently no official definition of 'slums' or 'squatter settlement', a recent study suggests that in 1985 there were 17 squatter settlements with 2,134 inhabitants in the metropolitan region. Since then they have grown to 33 settlements with a population of 6,355 in 1992, and to 61 having a population of 11,862 in 2000 (Pradhan and Perera, 2005). Figure 7 presents an example of squatter settlements on the bank of the Manohara, a tributary of the Bagmati river system adjacent to south-east corner of the international airport.

[Figure 7]

There are also issues concerning cultural and heritage sites in Kathmandu. IUCN declared some years ago that 'the physical state of the cultural and heritage sites and the monuments in Kathmandu Valley is fast deteriorating' and it identified the cultural and heritage sites along polluted rivers as the worst affected (IUCN, 1999). However, the government in response has made significant efforts for improvement: UNESCO has now removed many of the ancient temples and monuments in Kathmandu (and elsewhere in the valley) from the United Nations World Heritage list of sites in danger (UNESCO, 2007).

Current Plans and Programmes

Several major planning initiatives have been made by the government in the last decade, focusing mainly on the Kathmandu valley. 'Environment Planning and Management of the Kathmandu Valley', a planning document published in 1999 provided analysis of existing ecological and environmental problems of metropolitan region and of possibilities of limiting the growth of Kathmandu city through a programme of 'secondary adjoining towns' (IUCN, 1999). It recommended policies for urban land use development, including to: a) discourage urban development on agriculturally productive areas, river banks, terrace edges, ecologically hazardous zones, and areas lacking basic infrastructures and urban facilities; b) plan and develop 'eco-towns' in the metropolitan region; c) improve transportation networks; d) modify the existing sewerage system; and e) rehabilitate degrading and collapsing traditional settlements in the city. The Local Self-Governance Act 1999⁹ was passed in order to implement the policies more smoothly at local level. But due to the absence of elected bodies (municipal government)¹⁰ at local level, their implementation seems fragile and their impact, at least in the city, is yet to be seen.

The 1999 document paved the way however, to formulating a new 'Long Term Development Concept for Kathmandu Valley' (*Kathmandu Uptyakako Dirghakalin Bikas Avadharana*) in 2002. This is a latest planning document prepared by KVTDC and approved by the government. It puts forward complete scenarios to develop the Kathmandu metropolitan region for 20 years. Key recommendations made by this long term plan are the promotion of the tourism led service sector; guided urban development seeking compact urban form and the conservation of agricultural land; infrastructure development coordinated with land use; a new outer ring road to connect the traditional settlements in the metropolitan region; and rigorous regulation of areas defined as

⁹ The Local Self-Governance Act 1999 added numerous tasks and responsibilities to local bodies: management and delivery of almost all sectoral services; preparation of both long-term and short-term policies, plans, and programs; coordination of partnership with NGOs and civil society in development; and promotion of the private sector in service delivery and revenue generation.

¹⁰ Elected body may run the local government for maximum of five years. In Nepal, no elections have been held since 1997 because of the deteriorating political situation.

environmentally sensitive. The plan proposes to develop Kathmandu city as 'core city' in the metropolitan region but this concept is not greatly developed.

The 'Long Term Development Concept' has already shown some achievement. The government has approved the outer ring road (66-km long) which will pass through several compact traditional settlements in the valley. The Chinese government agreed to provide necessary assistances while the land will be acquired through land pooling system which may take long time to complete the project (ADB/ICIMOD, 2006). While situated entirely outside the Kathmandu limits, the outer ring road project is expected to have a substantial impact in relieving pressure of traffic within the city.

It remains to be seen whether these new plans will be more effective than their predecessors in the long term - in themselves and insofar as they benefit Kathmandu. Urban and regional development plans have now been made for five decades with support from donor agencies but, as we have seen, they have had, with the notable exception of the 1990 'Plans and Programmes', very limited impact in reality. Political turmoil and lack of stable government in the country have become major barriers for implementing plans and programmes in recent years. Certainly, the political situation in the country is now improving but other difficulties too persist in the way of planning in Kathmandu, such as the existence of multiple parallel administrative units within a small geographic area in the metropolitan region. While the regional planning requirement may be satisfied by promoting and strengthening the KVTDC, there remains the need to create effective planning instruments at local level to tackle the city's many problems.

Concluding Remarks

Kathmandu city has long exhibited the attributes of a typical city in the Himalayan region. History has witnessed its development as a strategic centre of power, politics, culture and commerce. In recent years, the city has become home for nearly one million people. Rapid urbanization is a sign of economic prosperity for a city, but it brings also bio-physical changes that have great and often problematic impacts upon the living environment. The metropolitan region of Kathmandu, surrounded by complex mountainous terrain, has very limited land resources for new developments. Burgeoning population, unguided urban development and daunting urban environmental problems

are serious concerns in Kathmandu. Haphazard and unguided processes of land use change invite such diverse consequences as inadequate housing, urban services and air pollution in the city.

Although several new economic reform policies were initiated after restoration of democracy in the country, the decade long political turmoil and public insecurity led to the collapse of a significant number of industrial firms and businesses in the city, although environmental protection regulations and market globalization were pertinent factors also in this decline. The weakness of transportation and other infrastructure are also responsible for the sluggishness of economic change in the city. A period which seemed to promise great benefits from the new policies of economic liberalization and economic transformation of the city has proved to a large extent one of wasted opportunities.

However, the decline of manufacturing industries and emergence of new services in the city may offer hope for revitalizing the city environment in future. The current horizontal trend of urban growth in the metropolitan region consumes much space. More vertical growth through developing higher rise buildings and multifamily residential area may be necessary to conserve limited land resources in the city and beyond.

Effective urban development strategies and land use planning have to be worked out at local as well as regional level and will depend for their success on better communication between different line agencies and stakeholders.

Acknowledgements

The authors wish to thank to the City Profile editor and the anonymous reviewers for their creative comments and suggestions that significantly help us to improve this manuscript. The first author would like to thank to the Government of Japan for providing the MEXT scholarship.

References

ADB (Asian Development Bank) (2002) *Urban and Environmental Improvement Project, Nepal*. RRP: NEP 32239.

- ADB (Asian Development Bank) (2003) *Kathmandu Urban Development Project*. PPA: NEP 24321.
- ADB (Asian Development Bank) (2006) *Nepal: Preparing the Kathmandu Valley Water Distribution, Sewerage, and Urban Development Project*. Technical Assistance Report, Project no: 34304.
- ADB/ICIMOD (Asian Development Bank/International Centre for Integrated Mountain Development) (2006) *Environment Assessment of Nepal: Emerging Issues and Challenges*. Kathmandu.
- Adhikari, A P (1995) Environmental Problems in the Kathmandu Valley: Some Issues in Planning and Management. *Contribution of Nepalese Studies*. **22**, 1-19.
- Adhikari, A P (1998) *Urban and Environmental Planning in Nepal – Analysis, Policies and Proposals*. The World Conservation Union (IUCN), Kathmandu.
- CBS (Central Bureau of Statistics) (2001) *Population of Nepal (Selected Data – Central Development Region)*. His Majesty's Government of Nepal, Kathmandu.
- CBS (Central Bureau of Statistics) (2004) *Nepal Living Standard Survey 2003/04, Statistical Report Volume II*. His Majesty's Government of Nepal, Kathmandu.
- CBS (Central Bureau of Statistics) (2005) *Statistical Year Book of Nepal*. His Majesty's Government of Nepal, Kathmandu.
- Dhakal, S (2006) *Urban Transportation and the Environment in Kathmandu Valley, Nepal*. Institute for Global Environmental Strategies, Japan.
- DoR (Department of Road) (2004) *List of Important Roads and Status*. Road Statistics, Government of Nepal.
- Gyawali, H (1997) *A Case Study on Municipal Development Fund in Nepal*. Town Development Fund Board, Kathmandu.
- Haack, B N and Khatiwada, G (2007) Rice and Bricks: Environmental Issues and Mapping of the Unusual Crop Rotation Pattern in the Kathmandu Valley, Nepal. *Environmental Management*. **39**, 774-782
- Haack, B N and Rafter, A (2006) Urban Growth Analysis and Modelling in the Kathmandu Valley, Nepal. *Habitat International*. **30**, 1056-1065.
- HMGN (His Majesty's Government of Nepal) (1969) *Physical Development Plan for the Kathmandu Valley*. Department of Housing and Physical Planning, Kathmandu.

- HMGN (His Majesty's Government of Nepal) (1991) *Kathmandu Valley Urban Development Plans and Programmes*. Department of Housing and Physical Planning, Kathmandu.
- ICIMOD (International Centre for Integrated Mountain Development) (2007) *Kathmandu Valley Environment Outlook*. Kathmandu.
- ICIMOD/UNEP (International Centre for Integrated Mountain Development and United Nation Environment Program) (2001) *Kathmandu Valley GIS Database*. Kathmandu.
- IDM (Industrial District Management) (2007) *Present Status*. IDM Ltd., Balaju <http://www.idm.com.np> [Accessed 11.7.2007].
- IEA (Industrial Enterprises Act) (1992) <http://www.fncci.org/iea92.pdf> [Accessed 21.8.2007]
- IUCN (The World Conservation Union) (1992) *Environmental Pollution in Nepal: A Review of Studies*. His Majesty's Government of Nepal, National Planning Commission-National Conservation Strategy Implementation Program, Kathmandu.
- IUCN (The World Conservation Union) (1999) *Environmental Planning and Management of the Kathmandu Valley*. His Majesty's Government of Nepal, Ministry of Population and Environment, Kathmandu.
- Karki, T K (2004) Implementation Experiences of Land Pooling Projects in Kathmandu Valley. *Habitat International*. **28**, 67-88.
- KVTDC (Kathmandu Valley Town Development Committee) (2002) *Long Term Development Concept of Kathmandu valley*. Kathmandu Valley Urban Development Committee, Kathmandu.
- MoF (Ministry of Finance) (2005) *Economic Policy on International Trade, Investment and Employment*. Policy Studies, Ministry of Finance, Government of Nepal. http://www.mof.gov.np/economic_policy/policy_study.php [Accessed 17.9.2007].
- NPC (National Planning Commission) (2002) Housing, Building and Urban Development, In *10th Five Year Plan*. National Planning Commission, Government of Nepal, Kathmandu.

- NTB (Nepal Tourism Board) (2006) *UNESCO Heritage Sites*.
http://www.welcomenepal.com/brand/destinations_unecso.asp [Accessed 25.8.2007].
- Poudel, K (2005) Kathmandu Valley: Citizens in the Bowl at Risk. In *Seminar on Vulnerable Cities; Hazards, Risks and Preparedness*. Department of Geography, Delhi School of Economics, University of Delhi, Delhi, March 18-19.
- Pradhan, P and Perera, R (2005) *Urban Growth and its Impact on the Livelihoods of Kathmandu Valley, Nepal*. UMP-Asia Occasional Paper No. 63.
- Ranjitkar, N G (1983) *Change in Agricultural Land Use and Land Value in Urban Fringe of Kathmandu City*. PhD Dissertation, Institute of Humanities and Social Sciences, Tribhuvan University, Nepal.
- Ranjitkar, N G and Manandhar, M S (1981) Spatial Expansion of Kathmandu City. *Geographical Journal of Nepal*. **3-4**, 25-35.
- Regmi, R R (1999) *Dimension of Nepali Society and Culture*. SAAN Research Institute, Kathmandu.
- Shah, B (2003) Heritage Conservation and Planning New Development in Bhaktapur, Nepal. In *6th US/ICOMOS International Symposium on Managing Conflict & Conservation in Historic Cities*. Annapolis, Maryland, April 24-27.
- Sharma, P (2003) Urbanization and Development. In *Population Monograph of Nepal Volume 1*. Central Bureau of Statistics, Kathmandu.
- Shrestha, C B, Khatry, P K, Sharma, B and Ansari, H (1986) *The Historic Cities of Asia – Kathmandu*. Centre for Nepal and Asian Studies (CNAS), Tribhuvan University, Kathmandu.
- Spiny Babblers (2007) *Traditional Arts: World Heritages Sites and Complexes*.
http://www.spinybabblers.org/art_complex/index.php [Accessed 6.6.2007]
- Thapa, R B, Murayama, Y and Bajimaya, M (2007) Monitoring Land Cover Change in Kathmandu City Using Spatial Metrics and Remote Sensing Techniques. *Nepalese Journal on Geoinformatics*, **6**, 76-84.
- UNEP (United Nation Environment Program) (2001) *Nepal: State of the Environment 2001*. Regional Resource Center for the Asia Pacific, Bangkok.
- UNESCO (United Nations Educational, Scientific and Cultural Organization) (2007) *Kathmandu Valley World Heritage Site removed from the List of World Heritage in Danger*. UNESCO Kathmandu.

Table 1. Population Trend in Kathmandu*, 1952/54-2011

Years	Population	Population density/km ²	APGR*** %
1952/54	148762	2257	-
1961	168732	2560	1.27
1971	209451	3177	2.19
1981	315035	4779	4.17
1991	537123	8148	5.48
2001	834837	12664	4.51
2011**	1240957	18825	4.04

*Note: In all tables, Kathmandu is defined as Kathmandu Metropolitan City and Lalitpur Sub-Metropolitan City taken together.

**Projected Population.

*** Annual Population Growth Rate.

Sources: Sharma (2003); Pardhan and Perera (2005).

Table 2. Economic Demography of Kathmandu city, 2001

Description	Total	Percentage
Economically active population	339852	(40.71)
Households: Total	187151	(100.00)
Households in agriculture activity *	17109	(9.14)
Households in small-scale non-agriculture activities **	65594	(35.05)
Other households	104448	(55.81)

*Households involved in agricultural land, livestock and poultry farming.

**Households operating small-scale non-agricultural economic activities, which are comprised of five categories: manufacturing, trade/business, transport, services and others.

Source: CBS (2001).

Table 3. Industrial Estates in Kathmandu

Description	Industrial Estate		Total
	Balaju	Patan	
Area in hectares	34.10	14.91	49.01
Government investment (million NPR [*])	13.20	25.80	39.00
Private investment (million NPR)	2000.00	410.60	2410.60
Firms: Total	94	108	202
Operational Firms	62	85	147
Firms in construction	14	6	20
Firms closed	18	17	35
Employment	3800	1472	5272

*NPR denotes Nepalese Rupees.

Source: IDM (2007).

Table 4. Industrial Firms and Employment in Kathmandu

Census year	Firms	Employment
1991/92	2029	114513
1996/97	1241	88677
2001/02	745	52247

Note: Data is aggregated from the districts level sources (Kathmandu and Lalitpur districts).

Source: CBS Manufacturing Census (<http://www.cbs.gov.np>).

Table 5. Land Use in Kathmandu, 2001

Land use	Area in Hectare	Percentage
Agriculture	3793.85	57.56
Built-up Area*	2509.92	38.08
Open field	125.37	1.90
Forest	133.29	2.02
Water body	29.04	0.44
Total	6591.47	100.00

* Built-up Area category includes, in addition to the usual urban uses, the Airport, HM Government Secretariat, Industrial area, and Royal Palace. (See Figure 4)

Source: ICIMOD/UNEP (2001).

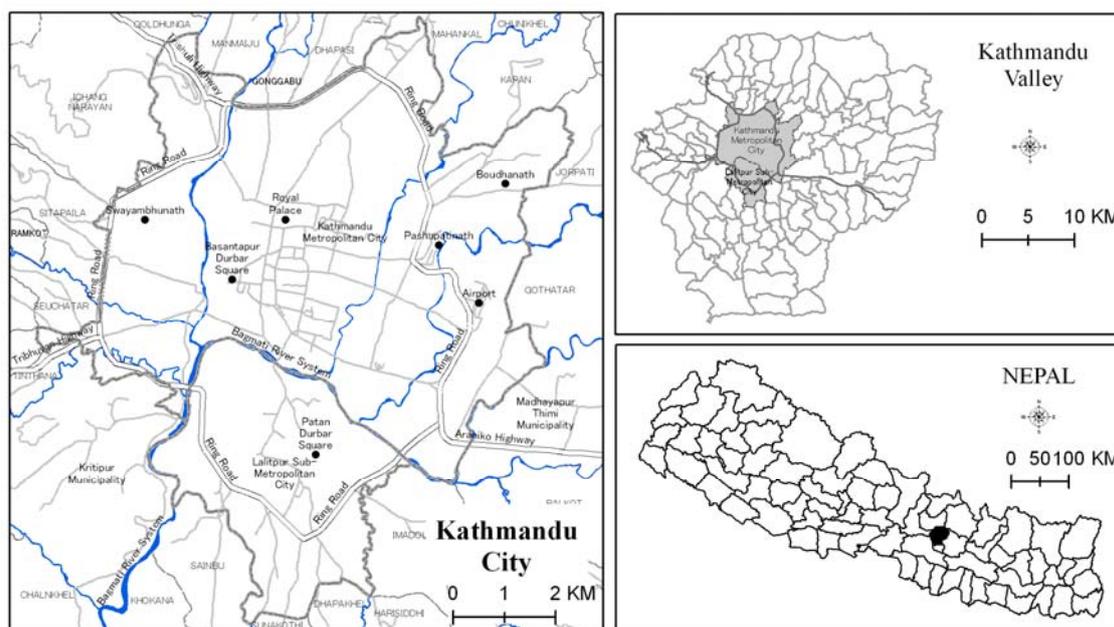


Figure 1 Study area – Kathmandu in its spatial context.



Figure 2 Durbar squares developed in Malla period. From left: Basantapur, Patan and Bhaktapur (Spiny Babler, 2007).



Figure 3 New housing developments by private builders on hillock near to Kalanki, South-West edge of Ring Road.

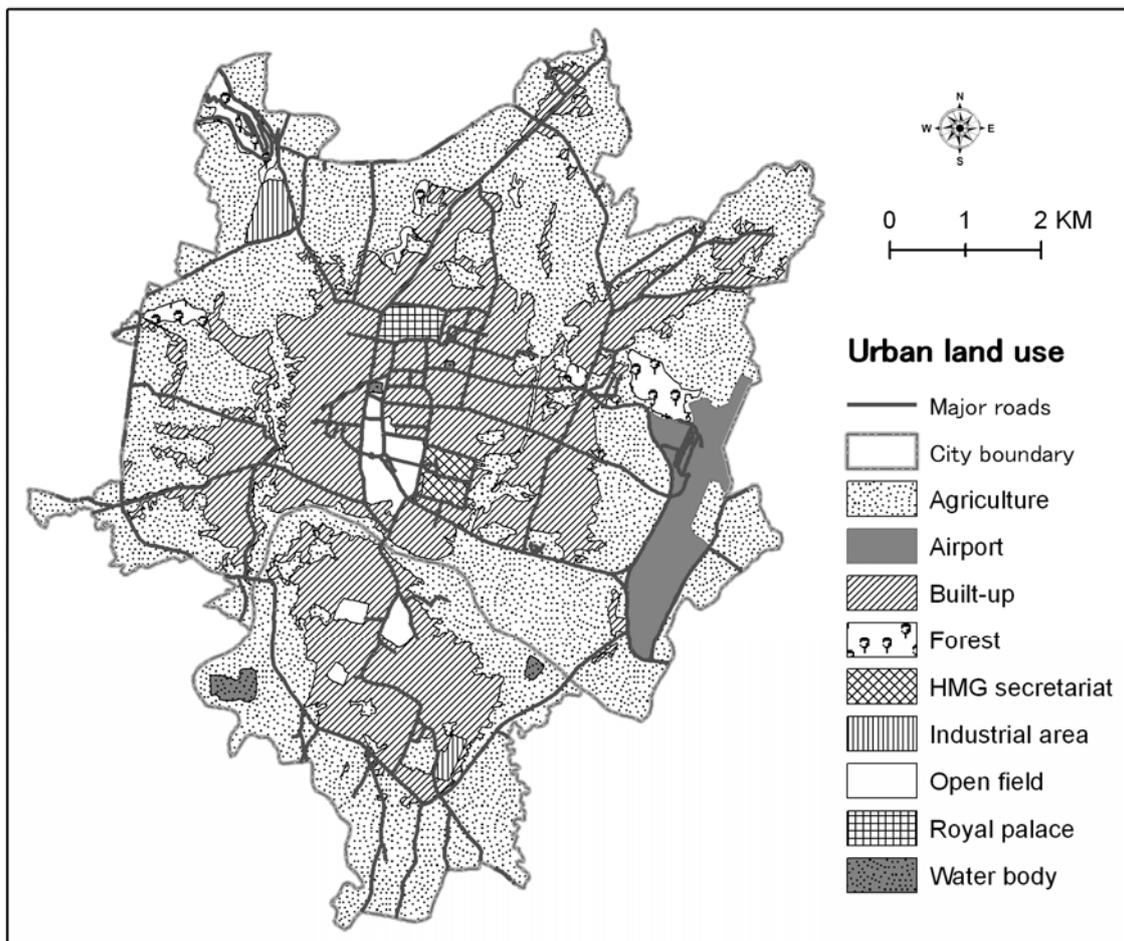


Figure 4 Land use map of Kathmandu city. Data source: ICIMOD/UNEP, 2001.



Figure 5 Landscape change in Boudhanath area since 1967 using satellite-imaging technologies. The scenes cover 1100x700 meter ground space approximately. Sources: [A] Corona image 1967, [B] Spin image 1991 and [C] Google Earth 2007, Copyright, Digital Globe and Europa Technologies.



Figure 6 Peak hour traffic congestion in city core of Kathmandu.



Figure 7 Squatter settlements on the bank of the Manohara, a tributary of Bagmati river system (400 meter away from South-East corner of Tribhuvan International Airport runway). Sources: [A] IKONOS image 2000 and [B] Google Earth 2007, Copyright, Digital Globe and Europa Technologies.