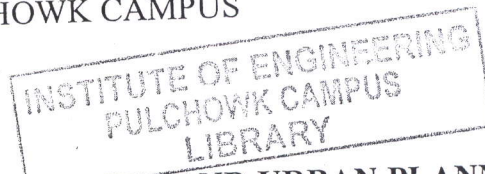




TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
PULCHOWK CAMPUS



DEPARTMENT OF ARCHITECTURE AND URBAN PLANNING
M.SC. PROGRAM IN URBAN PLANNING

DEVELOPMENT PATTERN OF URBAN FRINGE IN
KATHMANDU VALLEY
(A CASE STUDY OF SAIBU AND DHAPASI AREA)

SUBMITTED BY

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DUW



SUNITA DUWAL (066/MSUP/219)

A THESIS REPORT
SUBMITTED TO DEPARTMENT OF ARCHITECTURE AND URBAN PLANNING IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE
DEGREE OF MASTER OF SCIENCE IN URBAN PLANNING

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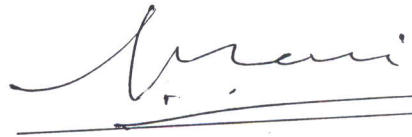


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ABSTRACT

The recent rise in urban growth and decentralization of economic activities has made urban fringe topical issues in both local and international debates. There are lots of transformations in the urban fringe landscape in the last two decades that makes it highly vulnerable to risks as much as expected of the city itself owing to large agglomeration of people and economic activities in this area. Lack of dependable institutions and absence of government has caused problems on jurisdictional administration of these urban hinterlands.

Kathmandu valley, which is the most populous metropolitan region in Nepal, is the main political and administrative centre, a major tourist Centre and an economically strategic location in the country. High population growth, dramatic land use changes, and socioeconomic transformations have brought the paradox of rapid urbanization and environmental consequences to the valley. Along with new developments within the city fringes and rural villages, shifts in the natural environment and newly developed socioeconomic strains between residents are emerging. Such rapid demographic and environmental changes and weak land use planning practices in the past decades have resulted in environmental deterioration, haphazard landscape development, and stress on the ecosystem structure. Consequently, more and more agricultural lands and forest lands have been converted into urban areas and human settlements over the past few decades (Thapa & Murayama, 2009).

This research will discuss physical changes in the urban fringe of Kathmandu valley and the socioeconomic factors and other pressures underlying these changes. The rapid urbanization in Kathmandu is stretching municipal boundaries and converting open spaces and agricultural fields into concrete jungles. Between 1984 and 2000, agricultural land in the Valley decreased from 62 to 42%. If this trend continues, by 2025 there will be no agricultural fields left in this once fertile Valley” (Subba, 2008). The research explores the reasons for this type of development pattern and recommends the conservation of urban fringe through the adoption of proper planning approach involving a mixture of urban and agricultural land uses.

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CHAPTER I INTRODUCTION

1.1 Urbanization and Urban fringe development

Urbanization refers to the process that leads a spatial concentration of households and economic activities within a limited area. It is simply the outcome of social, economic and political developments that lead to urban concentration and growth of large cities, changes in land use and transformation from rural to metropolitan pattern of organization and governance. Due to push and pull factors people from both rural and urban areas settle in the capital city and convert it into mega city. That is why vast majority of the mega cities are located in less developed countries.

Urban fringe forms the interface between the urban and rural areas and variety of populations occupies or uses the fringe areas. Urban fringe development is a process of transition of land from its rural use to urban use. It is a complex process that involves many concerns such as change in landownership pattern, land transfer process, types of development, regulatory measures and their enforcement. The process of fringe development may be taken place either by rural actors or by urban actors, may be in formal way or in informal way.

Problems of urban fringe in developing countries are quite often and very similar in nature. Most of the developing countries experience spontaneous development pattern rather than planned growth. Therefore, the most overwhelming problem associated with urban fringe in most developing countries is that the development of land takes place in informal way where associated land development activities take place without conforming state rules and regulations. Due to high demand of land, low lying areas are also being filled up for various development purposes without considering any environmental considerations. The emphasis is only on accommodating the increasing population, not to ensure better living standard. Therefore, the newly developed fringe areas are seldom provided with adequate facilities. All the phenomena are nothing but the reflection of poor urban fringe management (Haack & Rafter, 2006).

1.2 Urban fringe in Kathmandu valley

Kathmandu valley, the capital city of Nepal; like other capital cities of Asian countries- is undergoing urbanization in a very high rate. Recently, it has an estimated population of 2.51

million with an annual growth rate of 4.3%. Such urbanization pressure results in gradual change of predominantly agricultural and natural landscape to an urban landscape. The increased urbanization coupled with regional imbalances (centralization of socio-economic and political activities) and the hope of employment opportunity, centralized political set up, trading concerns, institutional services and better life has lured the people towards the urban centres. This concentration of services has accentuated urban development in the valley (Rana, 2008).



Figure 1: A perspective view of urban fringe development in Kathmandu Valley
Source: Author

In Kathmandu valley, there has been rapid increase in the population growth in the suburbs as compared to the municipal area. The table indicates that the peripheral increase is far more than the municipal in the year 2001-2011 than 1991-2001 except Bhaktapur which has slightly lower peripheral growth than previous decade. Figure 2 shows that during 1991-2001 the annual growth rate of municipal and peripheral area in all three districts have no significant variation. But during 2001-2011, there is big difference in population growth rate of municipal area and peripheral areas (except Bhaktapur) with huge increase in peripheral population. This indicates that the urbanization is growing in the rapid way in the fringe area. The decrease in the municipal growth rate suggests that it may be due to the decline of the availability of the land in the municipal area and also may be due to the cheaper land price in the fringe area. However, Bhaktapur has a different scenario which is probably due to low economic and political activities in comparison to other two districts.

Due to rapid urbanization, the valley is facing unplanned urban sprawl (particularly in the urban fringe area) and the concerned agency has failed to pace up the development of the haphazard growth. It is likely that the uncontrolled population growth and inadequate services and facilities will eventually threaten the urban fringe, thus expanding the city towards the fringe area. So, the fringe area should be taken as the vibrant development of the city.

Table 1: Population growth trend in Kathmandu valley

District	Location	Population			Annual growth rate	
		1991	2001	2011	1991-2001	2001-2011
Kathmandu	Municipal	458343	712681	668251	4.51	-0.64
	Peripheral	216957	351140	1072726	4.93	11.82
	Total	675341	1063821	1740977	4.65	5.05
Lalitpur	Municipal	115865	162991	223285	3.47	3.20
	Peripheral	116743	144893	243499	2.18	5.33
	Total	232388	307884	466784	2.85	4.25
Bhaktapur	Municipal	93375	120294	168152	2.57	3.41
	Peripheral	79577	105661	134875	2.88	2.47
	Total	172952	225955	303027	2.71	2.98
Entire valley	Municipal	667624	995966	1059688	4.08	0.62
	Peripheral	412007	601694	1451100	3.86	9.20
	Total	1080631	1597660	2510788	3.99	4.62

Source: CBS, 2011

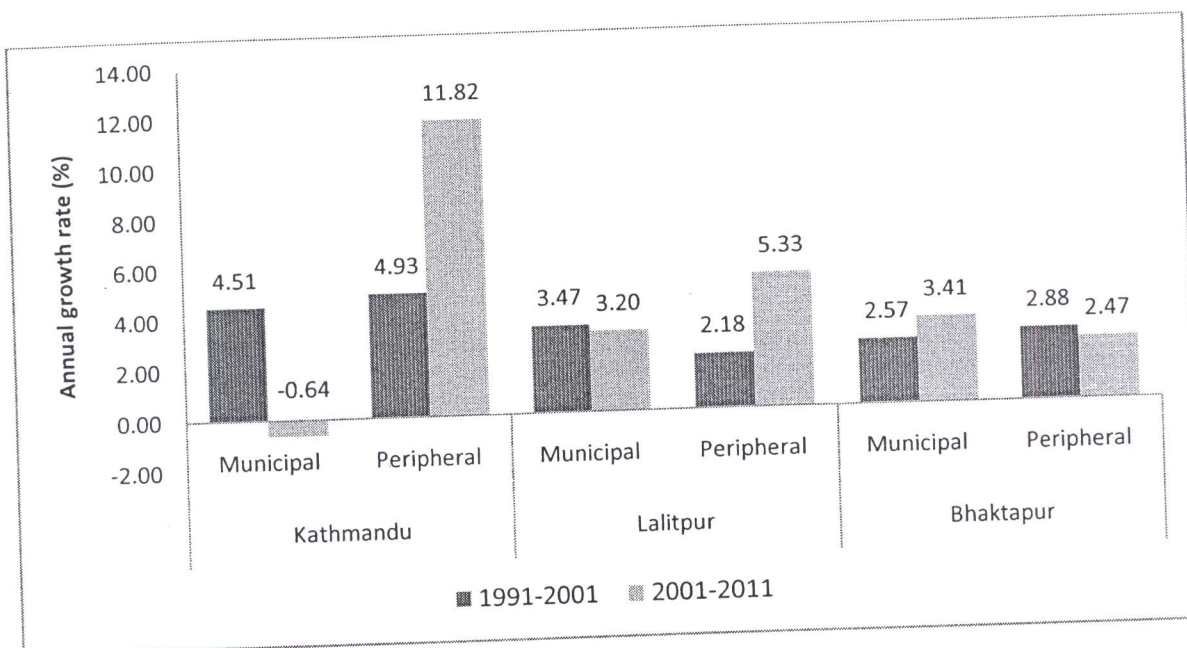


Figure 2 Annual population growth rate of Kathmandu valley

Several urban land use development planning and policy initiatives for the valley have been made by the government in the past decades (Thapa et al., 2008). A latest planning document 'Long Term Development Concept for Kathmandu Valley' (Kathmandu Uptyakako Dirghakalin Bikas Avadharana) was released in 2002 (KVTDC, 2002). This document as planning reference conceptualizes scenarios to develop the Kathmandu metropolitan region by 2020. This plan focuses on developing Kathmandu as a central city core, Lalitpur as sub-city cores, surrounding satellites market centres; efficient land use plan

and conservation of prime agricultural lands, promotion of tourism and allied services, easy transport linkages and accessibility to open spaces.

All these policy recommendations eventually affect the future spatial pattern of urbanization. These policies and strategies undertaken by government can help to counter negative impacts of urban sprawl and provide some future perspectives as well if they are implemented in proper way.

1.3 Rationale of the study

The present urbanization trend in Kathmandu valley has pressurized on the development of the fringe areas in haphazard manner. Recently the fringe areas are developing in a fast pace without any defined pattern. The result of this type of unplanned conversion of fringe land has far reaching consequences on the urban environment as well. Moreover, the existing fringe area of the valley is accompanied by serious problem of infrastructure services and public facilities. Hence, if not properly planned then all the fringe areas will develop in the disorganized way which in the later time will be converted into unhealthy city. To develop the city and to stop the possible hazards in the later time, the urban fringe areas have to be managed in a proper way to make a planned city for future.

Even there are different plans and policies for the development of Kathmandu valley, there had not been serious study on Fringe area management. The fringe area has grown in an uncoordinated and unguided process leading to unplanned urban sprawl causing adverse effect on the whole environment. So, this research will be helpful in reviewing the policies and efficient measures required for making the planned city. It will give the clear picture of physical development trend of urban fringe in Kathmandu valley in terms of change in land use, expansion of built up areas, change in urban form, change in physical infrastructures and services. It will also indicate the significant factors influencing these changes.

Thus this research is expected to add more understanding on the physical aspects of urban fringe development and institutional role of the government in proper management of fringe.

1.4 Problem Statement

It is also important from the viewpoint of natural resources and continuity of agricultural activities. Despite its specific importance the metropolitan fringe is frequently ignored

within the area of urban studies. The reason of not finding many studies on this field is the complexity of the area and difficulties in making research at these areas.

Likewise, the urban fringe or the suburban cities is an indivisible part of urban crises. The urban fringe doesn't stand alone but is the integral part of the great metropolitan area (Kathmandu valley). The development of the fringe area as well as the urban centre should go parallel in order to make a perfect planning, but this is not happening in the reality. The fringe area of the city is developing in a haphazard growth due to the lack of proper planning policies of land use pattern or the proper infrastructure development. Due to lack of policy for the development of the urban fringe, has been the cause of creating a haphazard growth.

The pressure of urbanization-whether that is migration or spill over population from the core- is spreading to the fringe area in the form of low density sprawl. This is resulting in both loss of agriculture land and haphazard residential land use pattern. Provision of infrastructure services become not only expensive in low-density condition but basic infrastructure also grossly lack in fringe areas with most depending on the city centre and outlying nodes for employment and other services.

So all these problems can be summarised as follows:

- Ribbon development along transportation corridor creating problem in future expansion of the road.
- Deficiency of physical infrastructures
- Loss of greenery
- Unregulated development
- The decline of farming
- Haphazard residential land use pattern

1.5 Objectives

The general objective of the research is to understand the trend of urbanization, urban growth and physical characteristics of urban fringe in Kathmandu valley. More specifically, the study seeks to understand development pattern of urban fringe in reducing further haphazard growth. Therefore, the overall objective of the study is to identify the problems and opportunities of the development pattern of urban fringe and examine the factors of urban sprawl in fringe area.

More specifically, the study focuses on the following objectives:

1. To identify the emerging physical development pattern of urban fringe in the Kathmandu valley.
2. To determine the planning strategies that can be applied to achieve planned development of the urban fringe of Kathmandu valley.

1.6 Research questions

1. What are the physical characteristics of emerging urban fringe development?
2. Why does the urban fringe development occurring in haphazard manner?
3. How could the urban fringe be developed in planned way?

1.7 Expected output

The expected outputs of the research study will be as follows:

- The clear scenario of the development of the urban fringe from the physical perspective point.
- The comprehensible picture of the development trend of the urban fringe can be notified and will be helpful in adding a clear concept about the development pattern.

1.8 Scope of the study

- The study will focus on the growth of the urban form, physical as well as social sector, land use pattern and level of infrastructure and services of the urban fringe area.
- The study will incorporate the fringe areas of Kathmandu valley in general and focuses on the selected area for case studies. The focus is given in problems related in the haphazard development of the fringe area and analysis will be carried out to find the solution for the better management.

CHAPTER II THEORETICAL FRAMEWORK

2.1 Defining Fringe area

2.1.1 Urban Fringe: Concept

The term urban fringe was first time used by (Smith, 1937) in 1937 to describe the built up just outside the Corporate limit of the study. Afterward, different scholars from different discipline have defined fringe area in their own requirements but there is no precise definition for it. (Pryor, 1968) described it as the zone of the transition in land use, social and demographic characteristics between urban built up areas and the rural hinterland. (Fesenmaier, Goodchild, & Morrison, 1979) identified it as 'the area in which the land is utilized in an urban manner while at the same time certain attributes of the rural are present as well'. The simplest definitions of urban fringe is a zone around the built up area of a city where city and country land uses overlap"(Willis, 2005).

According to (Bryant, Russwurm, & McLellan, 1982), the urban fringe area can be divided into three major types- inner fringe, outer fringe and urban shadow as shown in Figure 3 below. "The *inner fringe* is characterize by land in advance stage of transition from rural to urban uses- land under construction, land for development, land where there is little doubt over much of its area about its urban oriented functions and ultimate conversion to urban uses. *Outer fringe* is an area where although rural land uses dominate the landscape, the penetration of urban oriented elements is clear (Often single family housing). The outer fringe, together with inner fringe, form the urban fringe." (Bryant et al., 1982). Urban shadow is an area where physical evidence of urban influences on the landscape is minimal. Finally it merges into the rural hinterland; even there, metropolitan and urban influences do not stop (Rana, 2008).

In context of Kathmandu valley, urban fringe can be defined as an area which is in contact and contiguous with the central city exhibiting a sprawl development of occupied dwellings where land use conversion is very dominant. It is an area which is very dynamic and complex where the activities and processes are very diverse. Therefore it is not easy to delineate the spatial extent of urban fringe by a crisp boundary in Kathmandu valley.

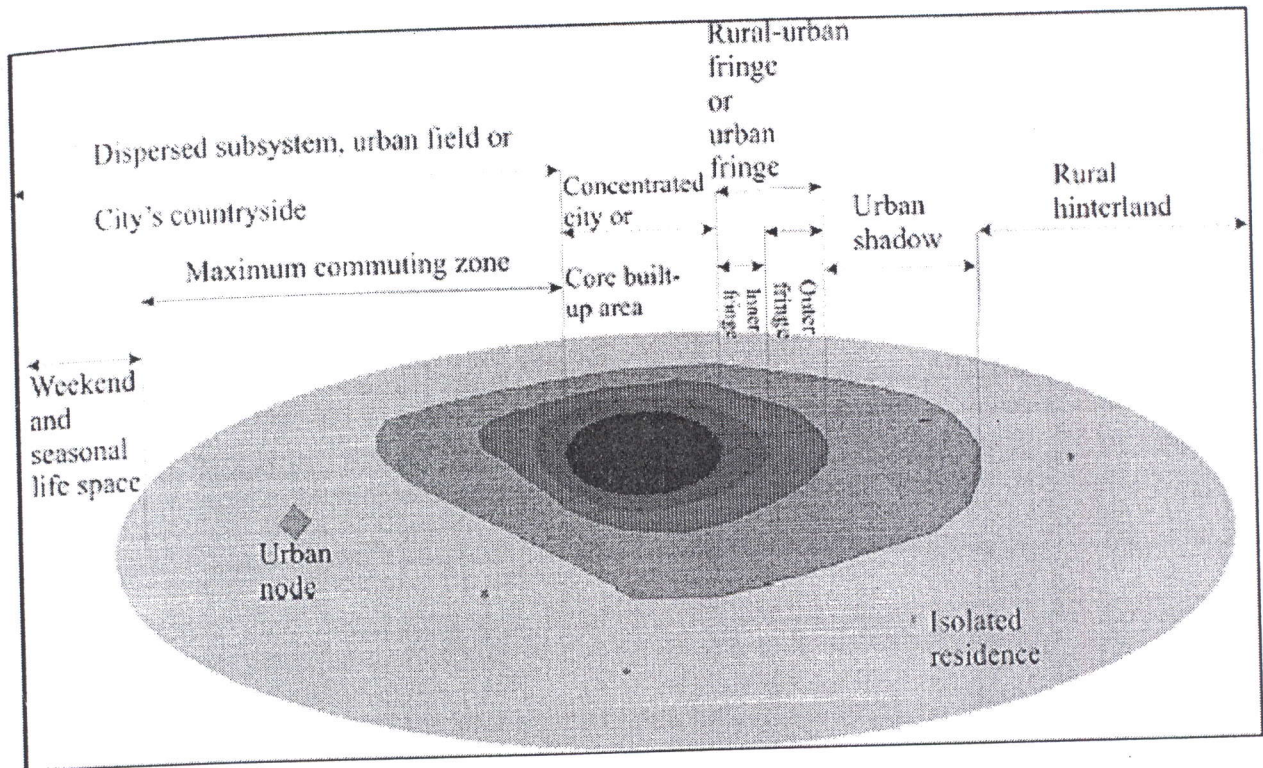


Figure 3 Rural-urban fringe scheme (source: Bryant-1991, p.12)

2.1.2 Physical characteristics of urban fringe

The urban fringe is an area characterized by a mixture of urban and rural features. As a result of the influence of the expanding city, the rural character of the fringe is replaced by a more urban profile in terms of land use, employment, income, and culture (Audirac, Furuseth, & Lapping, 1999). According to (Audirac et al., 1999) and (Bryant et al., 1982) the general characteristics of urban fringe are as follows:

1. Conflicting land uses, (residential and non-residential)
2. Rapidly residential expansion, (new and more spacious housing)
3. The population is mobile and low or moderate density,
4. Speculative building and subdivision of land,
5. The provision of services and public utilities is incomplete,
6. Changing pattern of land occupancy,
7. Poor network of public transport,
8. Crop production is intensive.

Space use in the urban fringe can be characterized as a continuously changing pattern where we observe a rapid residential growth with low to average densities. One of the reasons that gain "fringe" a transitional characteristic is these land uses which withdraw from the city center and orient to rural areas. Old town houses and new housing areas, warehouses, shopping centres and agricultural areas all taking place close to each other, give this area distinctive character with its disjointed land use structure.

In urban fringe there are many complex forces affecting rural to urban conversion of land uses. Besides macro scale social, economic and political diagnosis, there are other meso and micro scale factors such as housing and land market, planning decisions, ownership patterns, land characteristics, infrastructure and transportation structure and roles of actors within this process (Kivell, 1993). For example, the desires, benefits and policies about future of the private actors (developers, landowners, farmers, original residents, and new settlers) and government actors (public institutions, government policy and planning regulations) that take place at urban fringe area direct the development (Bentinck, 2000).

Behaviour of land owners who are having the same quality of land may differ. Land owner's control over his land may change according to his choice of living on his land, size of the land, whether the land is owned by one person or more, to its rentability. According to some other, developer, another actor during the process, is the starting point of the change. Developers who decide on buying the land, parcelation, construction of infrastructure and quality of houses directly affect the land-use decisions at urban fringe (Velibeyo lu, 2004).

2.2 Urban Sprawl: Form of Fringe development

Urban sprawl is defined in several ways by different authors. For example (Altshuler, 1993) defined it as "a continuous low density residential development on the metropolitan fringe, ribbon low density development along major suburban highways, and development that leapfrogs past undeveloped land to leave a patchwork of developed and undeveloped tracts".

Similarly, (Club, 1998) defined it as "a low-density development beyond the edge of service and employment, which separates where people live from where they shop, work, recreate, and educate - thus requiring cars to move between zones". Duncan defines Sprawl as a development pattern characterized by scattered, unplanned, low-density development that is not functionally related to adjacent land uses (Velibeyo lu, 2004).

The above definitions have some similarities and on the other hand there are significant differences between them. Some of the similarities are scattered development, the similar leapfrog development and low-density development. The generic definition of the sprawl is "to spread out in an irregular or disordered manner" which is evident from many newly developed areas in Kathmandu valley where land conversion from agriculture to residential is dominant.

2.2.1 Driving Forces for Urban Sprawl

As a process, sprawl is based fundamentally on land development, converting agricultural or vacant land to other uses, often residential. Even though low land prices at urban fringe area may be effective in their transformation. It is possible to summarize the orienting powers affecting the development of sprawling as below:

1. Urban growth

Urban growth has pushed cities further and further out. While rural people moved into urban areas, the dense populations of central cities emptied out into the surrounding countryside. Moreover growing population and changing household characteristics have influenced on demand for land.

2. Increased Mobility, Transportation and Technology

Increased mobility of populations in last three decades is recognized as an important factor for sprawling development occurring at the urban fringe. The most significant component has been increased the car ownership which has changed the household's range of locational choice for a residence. Public investment in roads and associated infrastructure have played significant role in relation to the urban sprawl (Heimlich).

The other driving force is information and communication technology. Technology is changing very rapidly and it has an impact upon almost every aspect of urban life. New information and communication technologies (such as internet, local and wide-area networks, fibre optics, portable computers and so on) are indirectly reshaping today cities. Changing patterns of employment and manufacturing process, changing fortunes for urban locations and changing land use demands are associated with new information and communications technologies (Kivell, 1993).

3. Economic Development

The traditional role of the city, as the centre of the economic activity, has been challenged both by the changing locational preferences shown by established activities and by the emergence of new economic activities with new land use and locational requirements (Kivell, 1993). New Economy or high-technology company's developments have grown up on spacious sites around small towns, university campuses and urban fringes in the newly favoured locations.

4. Consumer Demand

Rather than economic factors, it is much more difficult to define the social factors and understand their effects on land-use pattern, because, these are personal and diverse. Choices of every actor playing role in the transformation of land use at urban fringe area affect the development as mentioned before. For instance, the developments of housing areas which are the main issues in the development of sprawl are closely related with the households' choices and demand. Demands on housing environment in secure and natural amenities, with low density, larger houses increase and this is closely related with increase in income and changes in life style.

5. Public Policy

The regulatory and policy framework, including land-use planning, transportation policy, development control, fiscal policy, and the policies followed by various national or local government on location of their services (such as housing, health and education).

2.2.2 Impacts of Urban Sprawl

Urban sprawl has been frequently viewed as a source of the problems, which arise from unplanned, scattered and piecemeal residential and commercial development. Conflicting land uses, pressures on agricultural and open space, high costs of service provision, adverse consequences on traffic and public transport, and social disparities are among the more noticeable problems. Municipal fragmentation frequently associated with urban sprawl is likely to intensify these problems (Velibeyo lu, 2004).

Table 2. Impacts of Urban Sprawl Development

Substantive concern	Negative impacts	Positive impacts
Economic costs	Higher infrastructure costs under sprawl than compact development Higher public operating costs More expensive private residential and non-residential development costs More adverse public fiscal impacts	Lower public operating costs Less expensive private residential and non-residential development Fosters efficient infill development
Transportation and Travel Costs	More vehicle miles travelled Longer travel times More automobile trips Higher household transportation spending Less cost efficient and effective transit Higher social costs of travel	Shorter commuting times Less congestion Lower governmental costs for transportation Automobile most efficient mode of transportation
Quality of Life	Aesthetically displeasing Weakened sense of community Greater stress Higher energy consumption More air pollution Lessened historic preservation	Preference for low-density living Lower crime rates Enhanced value or reduced costs of public and private goods Fosters greater economic well being
Social Issues	Fosters suburban exclusion Fosters spatial mismatch Fosters residential segregation Worsens fiscal stress Worsens inner city deterioration	Foster localized land use decisions Enhanced municipal diversity and choice
Environmental cost	Loss of agricultural land Reduced farmland productivity Reduced farmland viability (Water Constraints) Loss of fragile environmental lands Reduced regional open space	Enhanced personal and public open space

Source: (Velibeyo lu, 2004).

2.3 Urban growth management (UGM)

Growth of city is unavoidable since city is dynamic in nature. The fringe area developed as a result of gradual expansion of city in its peripheral area. There is huge influx of people and built up area into the large areas of cities peripheries. The urban functions and housing development is much higher than expectation. Therefore it is difficult to keep up with regular boundaries on the fringe. This has caused problems of changes in aspiration of former inhabitants, extensive increase in residence, deteriorating agricultural output, new hopes of inhabitants, substitutions of land uses etc. Thus, growth needs to be managed in a way that achieves the most cost-effective outcomes and social benefits. And urban growth management aims to achieve equilibrium between development and conservation,

According to Wikipedia "**Growth management** is a set of techniques used by government to ensure that as the population grows that there are services available to meet their demands. These are not necessarily only government services. Other demands such as the protection of natural spaces, sufficient and affordable housing, delivery of utilities, preservation of buildings and places of historical value, and sufficient places for the conduct of business are also considered."

Porter Douglas R, -1996 in his Profiles in Growth Management: An Assessment of Current Programs and Guidelines for Effective Management has defined Growth management as "A dynamic process for anticipating and accommodating development needs through vision and observation that balances competing land use goals and coordinates local with regional interests."(Porter, 1996).

2.3.1 Objectives of Growth management

- Ensure that growth is planned and directed in a way that minimizes sprawl and creates a functional and pleasing community.
- Ensure that development occurs only when adequate public facilities and infrastructure are available and/or financially guaranteed.
- Assure that regional growth is addressed through cooperative planning and actions with local governments and public agencies.

2.3.2 Urban containment policy as tool for UGM

A growth management movement and Smart Growth initiatives emerged in United states during the late 1960s in response to destructive development pattern associated with urban sprawl, loss of prime agricultural land, an inefficient provision of public facilities, escalating housing prices, environmental degradation and loss of community character (Reilly, 1973). Growth management became an advance avenue for addressing these ills associated with future growth and its accompanying land development (Zovanyi, 2005). Today, most of the countries around the world have responded the problem of sprawling development patterns through a wide range policy instruments. Out of the array of growth management techniques, urban containment policies are considered as a promising approach (Bengston & Yeo-Chang, 2005).

(Pendall, Martin, & Fulton, 2002) distinguishes three types of urban containment policies: Green belts, urban growth boundaries and urban service boundaries. A *greenbelt* refers to a

physical area of open space—farmland, forest, or other green space—that surrounds a city or metropolitan area and is intended to be a permanent barrier to urban expansion. Development is strictly regulated or prohibited on greenbelt land. Greenbelts may be created through public or nonprofits acquisition of open space or development rights or they may be created and enforced by regulation of private property. Greenbelts have rarely been used in the United States but have been used much more extensively in large cities in Europe and Asia (Bengston & Yeo-Chang, 2005).

In contrast to greenbelts, an *urban growth boundary* (UGB) is not a physical space but a dividing line drawn around an urban area to separate it from surrounding rural areas. Zoning and other regulatory tools are used to implement a UGB. Areas outside the boundary are zoned for rural uses and the area inside is zoned for urban use. A key distinction between UGBs and greenbelts is that the former are not intended to be permanent. A UGB is typically drawn to accommodate expected growth for some period of time, and the boundary is reassessed and expanded as needed (Pendall et al., 2002).

Urban service boundaries, the third type of urban containment policy, are even more flexible than UGBs. An urban service boundary delineates the area beyond which certain urban services such as sewer and water will not be provided. They are often linked with adequate public facilities ordinances that prohibit development in areas not served by specific public services and facilities. Assessments of urban service boundaries have generally found them to be of limited effectiveness in containing sprawl, in part because they tend to be easily and frequently amended in the face of political pressure to accommodate growth (Bengston & Yeo-Chang, 2005; Pendall et al., 2002).

2.3.3 Urban growth boundary

The objectives of UGB are:

- Preserve open spaces and farmland
- Minimize land use by reducing lot sizes and increasing residential densities
- Reduce infrastructure cost by encouraging urban revitalization, infill and compact development
- Clearly separate urban and rural areas
- Ensure orderly transitions of land form from rural to urban uses
- Promote the sense of unified community

Benefits of UGB

- Promote compact and contiguous development patterns that can be effectively served by public services
- Manage leapfrog or sprawling development
- Protect open space, agricultural land and environmentally sensitive areas
- Manage expenditures for the urban services including road maintenance, water and sewer service provision and police and fire protection

Limitations of UGB

Size of UGB is critical to maintain economic viability of community. If the boundary does not include enough land the cost of residential and other development can be driven up or development can be forced to other nearby communities. If boundary contains too much land it will not be effective tool for achieving community goals including growth management.

Additionally, without cooperation of private utility services providers (particularly water and sewer) in communities without publicly owned utilities, an urban service boundary is impossible to implement successfully.

2.3.4 Urban growth boundary in international context

Portland urban growth boundary

The Portland urban growth boundary was established in 1970's under the Oregon law in order to prevent sprawl and to protect agricultural and forest area of the state. According to Oregon law, Metro has the responsibility for maintaining a 20 year supply of residential land to accommodate urban activities and urban growth for the Portland Metropolitan area. The Portland UGB covers 24 cities that contained 369 sq. miles with 1.3 million residents in 2000 (Jun, 2004).

The evaluation of Oregon's boundary program in 1990 revealed that it had achieved some success. The extensive urban sprawl outside the boundaries of Portland metro area had been considerably reduced (Nortrup, 1995). However the issue of infrastructure does exist. According to Nortrup (1995), vacant land in outlying areas within the boundary is easy to develop. But, it is hard to serve with infrastructure because costly urban services cannot

keep up with the demand. Moreover redevelopment is generally harder than new construction because of the difficulties in assembling adequate land and higher land prices in more urbanized areas. There are also practical difficulties in construction when the surrounding properties are built-up. However, the overall effect of UGB is very effective to control the haphazard urban sprawl.

Jun (2004) investigated the effects of Portland's urban growth boundary on development patterns and mobility. He found that Portland's UGB has been effective in slowing down sub-urbanization and enhancing infill development. However, a significant level of spill over took place from the counties in the Oregon to Clark County of Washington during 1990s indicating that the UGB diverted population growth into Clark County. Further the author gave an argument on why Portland's UGB did not bring about the intended results as follows- firstly, Clark County in Washington State played a role as a safety valve for growth outside the UGB because Clark County introduced a UGB much later in 1995 than in Portland County. Therefore instead of phase development inside the Portland's UGB the population was diverted to the Clark. Secondly, the measures to encourage phase development inside the UGB are not so strong enough to make UGB an obligatory constraint. Only a tight UGB policy can encourage compact development. But restrictive land use regulation is constitutionally impossible and politically beyond the reality in the US.

Another study made by (Nelson & Moore, 1993) analyzed residential building permits, residential land divisions and density of residential development inside and outside Portland's UGB between 1985 and 1989. They conclude that though a considerable low-density development pattern continues outside the UGB, most regional development has been directed within the UGB.

Therefore such major policy can direct the future urban growth by designating the urban rural boundary and enhancing the centre areas. It can promote the planned rural to urban transition and diminish the level of haphazard development in the fringe area.

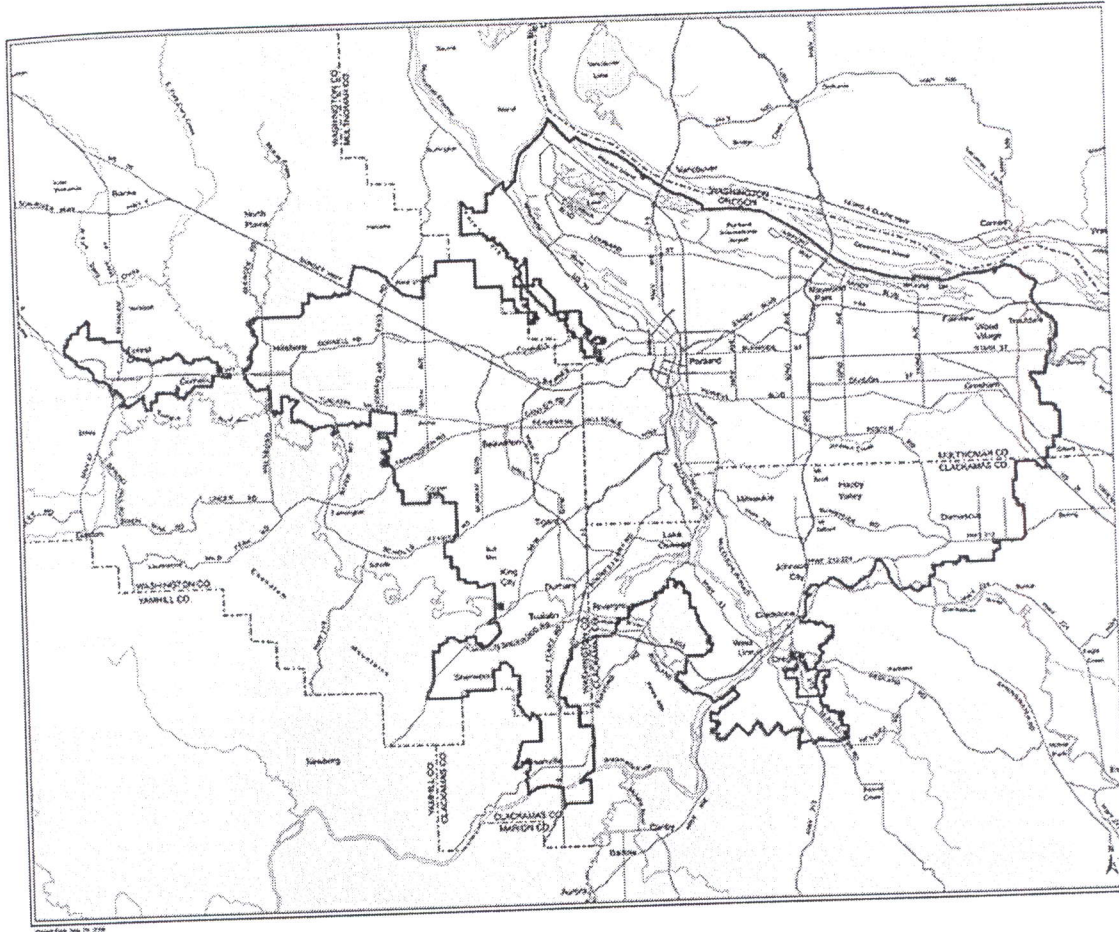


Figure 4 Portland's urban growth boundary which limits the urbanization and increase densification within already urbanized area, Source: SPUR newsletter (www.spur.org)



Figure 5 Edge of Portland's urban growth boundary, Source: www.google.com

2.4 Planning Initiatives in Kathmandu valley

2.4.1 Kathmandu valley physical development plan (1969)

A first physical development plan of Kathmandu valley was published in 1969 to manage the urban development process of the valley. The plan aimed to preserve the historical and cultural heritage, guide urban development through land use planning and enhance population densification in fringe areas (Thapa, Murayama, & Ale, 2008). Though the plan appears to be sketchy so far, the document is considered as a valuable contribution towards the urban development policies at regional level.

However, the policy measures specified in this document was not implemented at all though it was considered as the official guidelines for the urban development in the valley.

2.4.2 Kathmandu valley town development plan (1976)

In 1972 the government formulated a Town Development Implementation Act to implement the above plan. The Kathmandu valley town development Committee was prepared under this act in 1976 in order to assign overall responsibility of planning and regulating urban growth in the Kathmandu valley. In the same year Kathmandu Valley Town Development Plan (KVTDP) was formulated that constitutes three broad components- Zoning, Policy components, and Land use regulation. This was largely based on previous plan prepared in 1969 and 1973.

The Zoning proposal prepared by KVTDP has conceptualized three thematic zones in the valley: Zone A as the City core (Kathmandu and Lalitpur), Zone B as the fringe areas and Zone C as planned settlements in rural villages of the valley. The plan prepared led to the construction of a ring road (27.8 km) around the Kathmandu and Lalitpur municipalities in the late 1970s which significantly assisted the urbanization process in the rural areas of the city periphery.

However, the plan lacks precise zoning demarcations, which are not sufficiently defined in terms of permitted or restricted activity, with little or no reference to infrastructure provision, standards or programming. This led to the haphazard urbanization of the valley with unsystematic conversion of arable land onto the built-up areas (Shrestha, 2003).

2.4.3 Kathmandu Valley Physical Development Concept (1984)

In order to cope with the rising issues and problems caused by rapid urbanization trend in the valley, the KVTDP was revised in 1984 and was renamed as the Kathmandu Valley Physical Development Concept (KVPDC). This document includes proposed zoning regulations that are almost identical to the 1976 instructions. The main improvement by this latest effort is the preparation of zoning map called Proposed Land use Zones covering the area within the ring road. The map contains some inconsistencies. However it represents the first attempt to think through spatial distribution of desired land use in Kathmandu valley (Shrestha, 2003).

This document address some of the main issues affecting land use in the valley, including open acknowledgement of the current system of ad-hoc development by both government and private sectors; the importance of transportation in governing the land use; the need to keep in mind a vision of the economic role of the Kathmandu valley mainly as an administrative, cultural, touristic and agricultural area and not as a major industrial area; and the reality that financial resources are limited restricting what can realistically achieved in the short to medium run.

2.4.4 Kathmandu urban development project (1994-1999):

The concept of Kathmandu urban development project (KVUDP) was derived from ADB's Kathmandu valley urban development plan and programmes. In March 1992, ADB has proposed a loan fund to implement the KVUDP to address high priority infrastructure needs of Kathmandu valley. Subsequently HMG accepted the loan proposal of ADB and signed a loan agreement of \$12 millions on September 1993.

The plan has determined the guideline for the urban land use in urban expansion of valley considering the following factors as constraints and influential points (Shrestha, 2003):

- The topography should be reasonably flat and preferably well drain.
- Prime agricultural land should be avoided for residential development.
- Areas should be easily accessed and serviced by extensions of infrastructure services of provision of new.
- Area should reflect prevailing development and economic trends, providing that no other condition is prejudiced.
- Attention should be given to the existing pattern of land values where relevant.

2.4.5 Kathmandu valley long term development concept (2002)

The long term development plan is the latest planning document prepared by KVTDC and DUDBC in the year 2002. The development plan of Kathmandu valley tends to provide guidelines to minimize the external influence in the process of urban expansion and development (Rana, 2008). It spells out some aspects in urban growth management in Kathmandu valley through orderly rural-urban transition, rural-urban land delineation, agricultural land preservation and functional hierarchy of development nodes.

In order to achieve this, it has proposed two strategies: firstly decentralization of the economic opportunities and capital investment within the valley to other parts of the nation; and secondly it has tried to classify the extent of urban growth and development in the valley based on potential increase in population. Based on the two strategies the 2020 plan mainly focuses in the growth control through the demarcation of the urban and rural boundary as well as the preservation of agricultural land. This will make land management easier and effective in the urban and rural context. These will also end the unmanaged and uncontrolled land management system. Taking certain factors into consideration like the environmental management, habitable community and a good living condition for the people various concept plan have been prepared for urban growth (Rana, 2008).

2.5 Urban scene in Kathmandu valley

The growth of settlements in the valley is generally spontaneous, and there is very little planning intervention on the part of the government. Unlike in neighbouring countries, the government does not have financial resources to acquire huge parcels of land where planned urban development can be promoted. The current constitutional provision does not allow the government to impose any kind of restriction on the use of private property. Hence the government has only one legal tool to regulate and use, e.g., provision of infrastructure. However, this tool has been grossly misused in Kathmandu, mainly because of political patronage. As a result of political pressure, basic services such as roads, electricity, and telephones are provided in those areas in which the land-use plan has declared the area unfit for development. This tendency has made all kinds of planning norms redundant or irrelevant and promoted adoption of illegal and irrational practices, rather than following standard practices of urban development.

Whereas the government is unable to acquire land because of financial constraints, private developers face difficulties in assembling land parcels due to land ceiling provisions laid down by the Land Reform Act of 1964. Developers also face difficulties in procuring land parcels from speculative landowners who either demand exorbitant prices or simply refuse to sell the land. There is no legal tool that can be used to acquire isolated land parcels from uncompromising landowners. Notwithstanding, developers cannot buy sufficient land in Kathmandu and other major cities due to the land ceiling.

Kathmandu Valley Town Development Committee (KVTDC), which is responsible for overall planning and regulation of urban development, is operating with a land-use plan adopted in 1976. Several efforts to revise the land-use plan after that were not successful. KVTDC is involved in several land pooling projects and guided land development programmes. It also looks after court cases involved in violation of building byelaws and other issues related to planning. Local bodies like municipalities and village development committees that are authorised by the Local Self Governance Act (LSGA) 1998 are issuing building permits mainly for revenue generation rather than regulating urban development. The technical capability of local authorities to deliver basic urban services is relatively low and people look upon central government agencies for such services.

2.5.1 Process of land use change

The urban area in the valley increased from 11% in 1990 to 33% in 2012 whereas the agricultural lands decreased from 58% to 47% (Table 3). Over 20 years period, urban area mainly expanded over agricultural land indicating that agricultural land is likely to fade away in near future if the trend of urbanization continue without proper management. The development of a ring road around Kathmandu and Lalitpur municipalities in the mid-1970s significantly accelerated the urbanization process in the valley floor and rural periphery (Thapa et al., 2008).

Interestingly forest area was increased by 5% in 2000 which slightly decreased afterwards. The increase of 5% is probably due to prevalence of community forest which discourages the exploitation of forest area all over the valley. Water bodies and open spaces which constitute the lowest percentage of valley floor are also in decreasing trend which is evident from the open space and river bank encroachment for development purposes.

From the maps, we could observe multiple-nuclei pattern of urban development in Kathmandu Valley. The urban expansion trend is mostly confined in the existing built-up periphery.

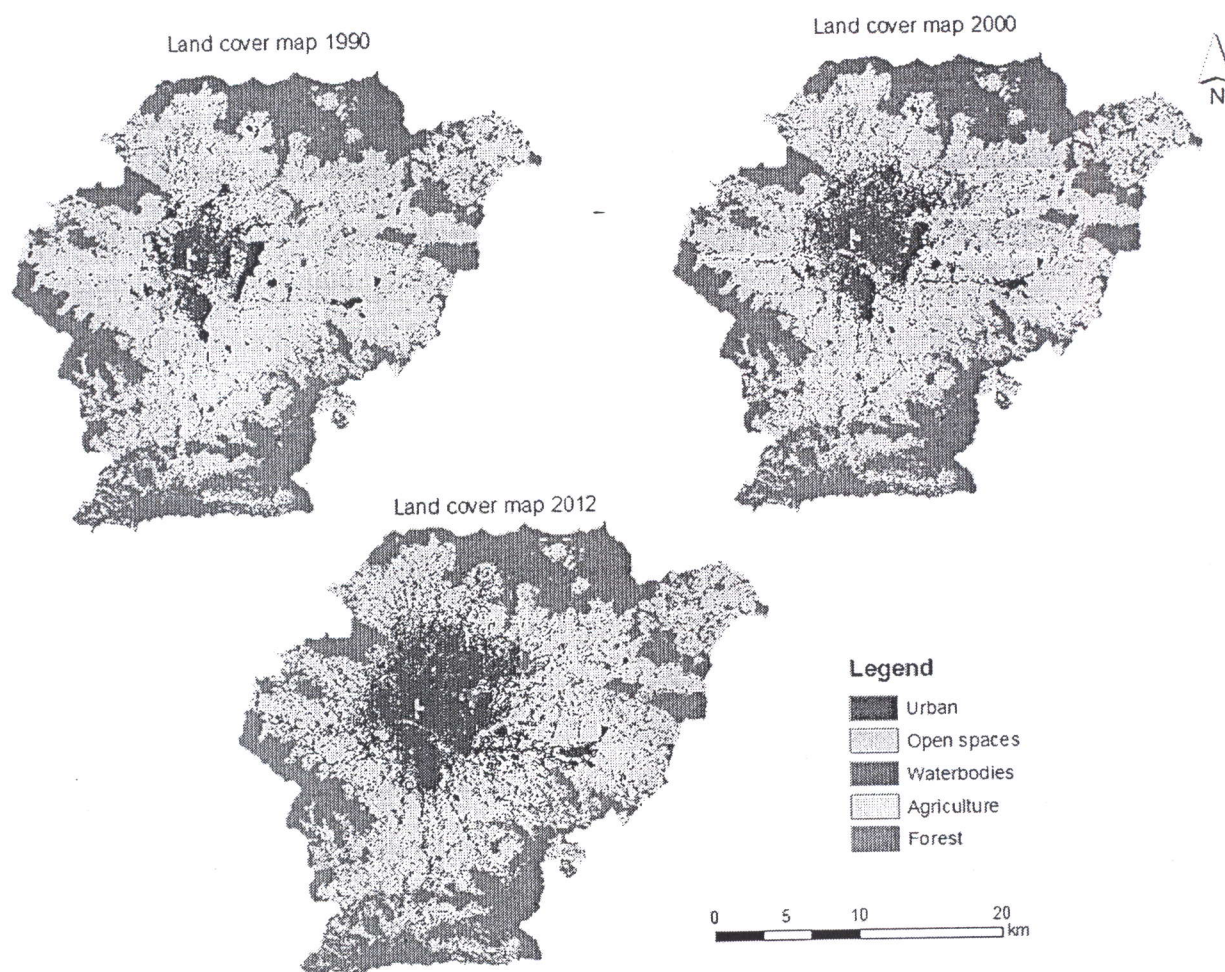


Figure 6 Land cover maps of Kathmandu valley, 1990-2012, Source: (UNDP, 2012)

Table 3 Land use statistics in Sq.km and percentage, 1990-2012

Land Use Type	1990		2000		2012	
	Area	%	Area	%	Area	%
Urban	75.92	10.52	132.77	18.39	236.99	32.83
Open Space	2.65	0.37	2.33	0.32	2.31	0.32
Waterbodies	3.5	0.48	2.14	0.30	1.98	0.27
Agriculture	421.6	58.40	394.12	54.60	342.08	47.39
Forest	218.2	30.23	253.56	35.13	251.08	34.78

Source: Comprehensive Study of Urban Growth Trend and Forecasting of Land Use in the Kathmandu Valley (UNDP, 2012)

2.5.2 Land Use Management in Kathmandu valley

Land management in Nepal is centralized and Kathmandu Municipality has no land to develop. Land is either privately owned or belongs to the central government. Water and sewerage are the responsibility of the national government. Since 1956, Nepal has implemented periodic development plans (five-year national plan), and currently the tenth national plan is in effect. The five-year national plan provides the only basis for land use and urbanization policies in Nepal. The Kathmandu Valley Development Plan of 1976 is the statutory plan for Greater Kathmandu, and was approved by His Majesty's Government (HMG). The plan covers the areas lying within the Ring Road with provisions for areas beyond the Ring Road (Ha, van den Bosch, Quang, & Zuidgeest, 2011)

Unfortunately, clear land use plans and regulations were not prepared. As a result, the lack of proper planning has contributed to the haphazard pattern of rapid urban growth which has occurred in the Valley since the 1970s. The urban area of Kathmandu has expanded from 24% of the total area in 1971 to 67% in 1991.

Presently, new public and private construction occurs with no advance planning, consultation, or review. Even if land use regulations were enacted into law, there would still be formidable problems with implementation and enforcement due to a lack of a workable institutional structure and planning capacity.

The absence of public investment planning and coordination in the Valley is also a major cause of land use problems. Land use regulations cannot be effective if major public facilities continue to be constructed without prior planning and interagency cooperation.

Additional relevant legislation is noted here:

- Town Development Act, 1988
- Kathmandu Valley Development Authority Act, 1988
- Municipality Act, 1991
- District Development Committee Act, 1991
- Village Development Act, 1991

2.5.3 Responsible agents and their relationship

The Ministry of Physical Planning and Works implements urban development plans and programs in Nepal through the Department of Urban Development and Building

construction (DUBDC). The Ministry of Local Development (MLD) is responsible to administer the programs of local governments, such as municipalities and Village Development Committees. However, the MLD handles only the administrative and personnel management function of the local government and does not have the capacity to assist in preparing physical development plans, for which it has to rely on the DUBDC. The exchange of cooperation between the two agencies is very weak.

The Kathmandu Valley Town Development Committee (KVTDC), chaired by the Minister for Physical Planning and Works is the agency in charge of planning for all of Kathmandu valley. At present, KVTDC is confined to the enforcement of building bylaws, implementation of land pooling (readjustment) projects, and guided land development (GLD) programs. So far, 11 land pooling projects have been implemented and 280 kilometres of GLD roads have been opened in the Kathmandu Valley. Also the road extension programme is undergoing in different parts of the valley to accommodate the increasing volume of traffic.

The Town Development Act of 1988 provides the legal basis for implementing town development plans, empowering central and local government agencies to carry out land pooling projects. The Local Self Governance Act provides the Municipalities and the Village Development Committees the authority to plan and execute development projects locally, but it is not as comprehensive as the Town Development Act for town planning. There are many cases of conflicts between the Government of Nepal and KMC in coordinating several operational matters. As a local government, the KMC is a municipal service provider engaged in public welfare, service, and infrastructure development activities. For the running and maintaining of these services, municipal governments are assigned a number of taxes and other sources of revenues, such as property tax, business tax, advertisement tax, vehicle tax, and rent tax.

The Kathmandu Valley Town Development Committee is currently updating a 20-year development plan of the Valley. In its original document, the Committee has proposed a two-pronged strategy: first, to spread the overconcentration of capital investment and economic opportunities in the Valley to other growth regions of the country; and second to provide a development framework as to where and how much the future growth of the Valley should channelled, so that various growth externalities are reduced.

2.6 Findings from literature review

A review of the literature presented in this chapter reveals that urban fringe is an important element of a fast growing city like Kathmandu where its boundary is continuously changing. The urban fringe has become a no man zone as it is termed a rural area by the urban municipalities and rural authorities consider it urban because of change in physical setup. The town planning regulation which is responsible for development control in urban areas does not consider it as urban and it is also falls outside the administrative boundaries of the municipality.

The literature review reveals that urban fringe area has potential for growth of the city. Hence the existing fringe area will definitely turn out to be a core city in the future. And, ultimately the outer fringe area will be developed into inner fringe area. Then this will cause problem of infrastructure services and public facilities. Therefore, to develop the city and to stop the possible hazards in the later time, the urban fringe areas have to be managed in a proper way to make a planned city for future.

The literature review has recognized that urban growth management is a fairly process of seeking effective management of urban land. It is to a great extent a complex process and incorporates interdependent approaches like land use planning, land administration and land policy. It does have neither any concrete definition nor any specific goal. It varies from country to country; therefore, the scope of urban growth management is quite wide.

The case study of Portland UGB indicates that for the successful control of urban growth, it is essential that the participating towns and cities develop co-operative planning, zoning, infrastructure and other mechanisms to guide development. Local bodies must plan and provide the services within the coordinated and established regional framework. Moreover, local plans must be consistent with regional goals and policies.

Finally, the review has clearly pointed out that there are lots of transformations in the urban fringe landscape in the last two decades due to large agglomeration of people and economic activities in this area. Lack of dependable institutions and inefficient role of government has caused problems on management of these urban hinterlands. Because of proximity to the city, it experiences much of urbanization processes and serves as buffer for urban development.

CHAPTER III RESEARCH METHODOLOGY

3.1 Introduction

This chapter introduces the study area and provides the information about data sources and their metadata. It also narrates the methods and tools used to conduct the research including quantifying the urban growth, determining driving factors and way to collect data that was used in this research.

3.2 Selection of case study area

The two different fringes Dhapasi and Bhainsipati area; located adjoining to Kathmandu municipality and Lalitpur municipality are taken as case study areas. The study areas are selected adjacent to the arterial road since the growth trend of Kathmandu valley shows quicker growth along arterial road. These areas are recently developed but rapidly transforming into urban form. The built up area is very high and urban activities are growing in massive way. So these two sites are selected with a goal to obtain the development pattern of fringe areas in Kathmandu valley.

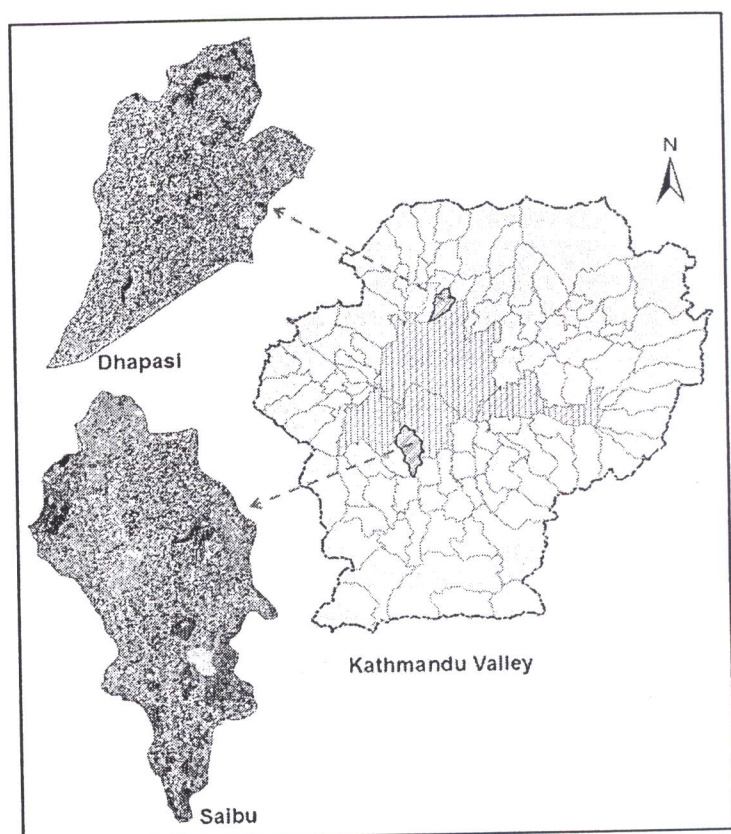


Figure 7 Location plan of case study area

The two sites have different pattern of development in term of land development as Dhapasi is unplanned and Bhainsipati area is planned to some extent. So it gives the clear picture of development pattern of urban fringe of Kathmandu valley. The study of these areas also foretells the vivid scenario of other similar areas also.

3.3 A research paradigm

Ontological position with positivist/constructivist paradigm

The study of the real and existing scenario in the study areas were base on the positivism in Ontological position. This method provide the idea and concept of urban sprawl in term of land use and housing expansion, infrastructure and services, road networks, street patterns and transportation and socio economic status. Constructivist paradigm was used to study real and existing scenario of social behaviours of the study areas. Here the social observations were treated as entities and real cause of social outcomes were determined reliable.

Epistemological position with positivist/constructivist paradigm

Constructivist paradigm was used to gather knowledge of the urban fringe development trend in epistemological position. It helped to increase general understanding of real situation of urbanization and its effects on urban peripheries of cities. This paradigm was used because the explanations were generated inductively from the data that was observed rather than deduced from ideal theory. So the research was based on descriptive method that incorporated stakeholders' perspective as well.

3.4 Research Strategy

The research strategy was based on both **deductive** and **inductive** thinking.

- a) **Qualitative research strategy:** *Case study* is inductive in nature where results were presented qualitatively, using words and pictures rather than numbers. It cannot identify important variables alone so it was accompanied by *Survey* which is deductive in nature because the variable selected for investigation were derived from theory or conceptual model before the study. And then results presented by this approach are quantitative in nature.
- b) **Co-relational research:** The main goal of this strategy is to establish the relationship between two variables. The two variables were measured and reviewed to identify patterns of relationship that exist between them and it ultimately measures the strength of the relationship.

Here, *Descriptive statistics* was used for gathering both qualitative and quantitative data for inductive explanation. And *Causal-comparison* was done between the dependent and independent variables to find casual relationship between them.

3.5 Strategic methods

3.5.1 Pre-field study

a. Literature Review

First of all literature review was done to get theoretical understanding of the research topic. It includes collection of relevant maps, thesis, scientific papers, journals, reports, acts, manuals and other internet searching. It helps to collect wide range of data on the subject matter like-urbanization process, urban land management process, definition of urban fringe and its structures, characteristics of urban sprawl etc.

b. Designing of interview questionnaire

The questionnaire used during this research is to obtain socio-economic data for the urban fringe area. This data was used to guide planning interventions for the development control in the fringe area which will lead to managed and organised growth of fringe area. Some of the key themes of the questionnaire are as follows:

Household composition: this provided the information on the household demographics like-size and status of the household, which can be used to estimate the population of the area and the growth rate of the population.

Place of origin: responses from this question determine the point of origin of the residents of the fringe area. it also determine the direction of flow if it is from urban to fringe of rural to fringe.

Reason of migration: responses from this theme provided the information on some of the causes of peri-urban growth and pull and push factors of the fringe area.

Income status: This theme provided information on the major source of income which determines the affordability of these households which in turn guide decisions on what kind of infrastructure could be planned for the settlers of the fringe area.

Land and building information: Response from this question shows information about housing situation in the fringe area. It provides information on the size of plot, building typology, year of construction and size of each house occupied by the family.

Infrastructure and services: Questionnaire under this theme determined what kind of infrastructure and services are available to fringe area households. Such type of data guides planners to decide on the type and level of infrastructure and services that are required and can be afforded by the households in the fringe area.

c. Stratifying study area

The two study areas were stratified into numbers of stratum in order to guide sample size to be taken from each stratum. Bhainsipati area was divided into 14 strata while Dhapasi was divided into 9 strata. These strata were based on arbitrary size to incorporate into A4 size paper. Due to limited time for the study, this research could not cover entire study area. Some of the remote strata with very few numbers of households were not taken into considerations.

d. Sampling Strategy

Stratified random sampling was used to draw respondents' interview. This technique was used for the study because it reduces the chance of having unrepresentative sampling (Burt, Barber, & Rigby, 2009). In each stratum the desired minimum sample was 5 to 15 households based upon the total number of households in each stratum. Respondents were randomly selected from each stratum and interviewed.

Sample size of the study areas were determined according to the total number of households stated in CBS 2011. According to (CBS, 2011a), number of houses in Bhainsipati VDC and Dhapasi VDC are 2964 and 3842 respectively. So with reference to known population size, sample size were determined from Equation 1 (Trek, 2013).

$$n = [(z^2 * p * q) + ME^2] / [ME^2 + z^2 * p * q / N] \quad (1)$$

Where,

ME = Margin of error

z = Critical standard score

N = Population size

p = Population proportion

$q = 1 - p$

The desired margin of error ME is taken $\pm 8\%$ or 0.08 with a confidence level of 95% or 0.95. The value of population proportion is assumed as 0.5 since the right value for p is unsure (Trek, 2013). From this approach, the sample size for Bhainsipati VDC and Dhapasi VDC were obtained i.e. 140 and 145 respectively.

3.5.2 Field survey

a. Primary data collection

Primary data was gathered through following approaches:

- *Field observation*: Field observation was done to know the pattern of current urban development and land use types. At the same time, physical infrastructures and area of deficiencies were also observed.
- *Questionnaire survey*: According to sample size determined from Equation (1) and the questionnaire prepared for guiding research questions the household survey was conducted. The respondents selected for the survey were basically house owner themselves. Stratified random sampling method was adopted to select the respondents.
- *Interview of local experts and key informants*
Interview was conducted with VDC officers, private developers and planners in Ministry of urban planning and building constructions. The purpose of this activity was to understand the key driving factors of urban growth in the fringe area of Kathmandu valley. Further it was also meant to discover the issues related to planning policies regarding the growth of urban fringe areas.

b. Secondary Data Collection

Secondary data required for the study were obtained from various sources. According to the type, these data were grouped into three categories- Remotely sensed data, Vector dataset and Statistical data as shown in Table 4, Table 5 and Table 6 respectively below:

Remotely sensed data

High resolution imageries for 2000s and 2010 with were acquired from Nepal Comprehensive Disaster Risk Management Program, UNDP (2012) which was projected to WGS 84, UTM Zone 45.

Vector data set

Vector datasets were obtained from Department of Survey (DOS) and KVTDC for the year 1995 and 2008 respectively. Dataset from Department of survey were prepared from topographic map of scale 1:25000 and dataset from KVTDC were digitized from topographic map of scale 1:10000. The coordinates in vector data set were based on the Modified UTM Projection on Everest Spheroid 1830 (semi major axis, $a = 6\,377\,276.345$ m. and semi minor axis, $b = 6\,356\,075.413$ m.) having zone width of 3 degrees East-west with Central Meridian 84 degree longitude. The unit of measurement is metre.

Statistical data

Statistical data consist of population data for the year 2001 and 2011 which were at ward level. These data were collected from Central Bureau of Statistics (CBS), Nepal.

Table 4 Remotely sensed data

Dataset	Acquisition year	Scale/Resolution	Source	Projection	Purpose
Geo-eye image	2000	1 meter	UNDP, 2012	UTM zone 45(WGS 84)	These images were used for preparing land cover maps
Geo-eye image	2012	0.5 meter			

Table 5 Vector data set

Data	Year	Scale	Source	Description	Purpose
Administrative boundary	1995	1:25,000	Survey department	Valley, District, Municipality, Ward, VDC	Delineating study area extent
Road network	1995	1:25,000	Survey department	Road centrelines categorised as national highway, ring road, feeder road, urban road and district road	
	2008	1:10,000	KVTDC		
Land use	1995	1:25,000	Survey department	Land use map with categories-airport, waterbodies, ponds, builtup, etc.	It was used as a reference for preparing land cover categories.

Table 6 Statistical data for population and land value

Data	Year	Source	Description	Purpose
Population	1991, 2001& 2011	CBS, Nepal	Population per ward and VDC	To analyse population distribution in the study area.

c. Tactics, instruments and analysis of data:

Questionnaire data were converted into digital format by coding and entering the information into SPSS software. This software has been used for statistical analysis of surveyed data. Similarly ArcGIS 10.1 and Erdas imagine 11 were used for image interpretation and land cover change analysis during 2000s and 2010.

3.6 Units of analysis and study variables

Units of analysis of the research will be based on following aspects-

- a. Physical and environmental aspect
 - Road networks
 - Building details
 - Solid waste management
 - Water supply
 - Sewer disposal
 - Electricity
 - Urban form
- b. Social and demographic aspect
 - Family structure
 - Education
 - Income
 - Occupation
 - Vehicle ownership
 - Migration pattern
- c. Development aspects
 - Land cover change analysis
 - Settlement and land form analysis

3.7 Identifying spatial growth pattern

Using Erdas Imagine Version 11, aerial images with high resolution were processed to identify the changes in the land cover pattern of the study area for the years 2000 and 2012. These data were classified separately using a supervised classification technique. Five general land cover classes-urban, water, forest, arable lands and bare lands were used to analyze the changes in land cover pattern as shown in Table 7. Maximum likelihood supervised classification was employed in the production of land cover maps for the study area.

Table 7 Land use classification scheme

Code	Land use classes	Description
1	Arable land	This land cover class comprises of irrigated lands along with grass lands.
2	Forest	It consists of different types of forest and cluster of trees such as-deciduous forest, evergreen forests, mixed forest <i>etc.</i>
3	Others	This consists of non irrigated lands along with sandy river banks.
4	Residential	This class consists of settlements and other built-up areas.
5	Transportation	It consists of road networks.
6	Waterbodies	It consists of water related features such as river.
7	Open spaces	This consists of recreational and public open spaces.
8	Industries	It consist of industrial areas

3.8 Change detection

Land cover change was determined by using results of land cover classification by using post-classification approach. The 'from-to' change information was calculated in ArcGIS environment for each land cover and the rate of change was quantified.

In order to examine the urban growth intensity, an indicator called annual urban growth rate (AGR) was adapted for evaluating the rate of growth per unit area. The formula for AGR is expressed as follows:

$$AGR = \frac{U_{An+i} - U_{Ai}}{nT_{An+i}} \times 100\% \quad (2)$$

Where, U_{An+i} and U_{Ai} are urban areas in target unit at time $i+n$ and i respectively, n is number of year and T_{An+i} is the total land area of the target unit to be calculated at the time of $i+n$ (Xiao et al., 2006).

CHAPTER IV DEVELOPMENT PATTERN AND ANALYSIS

4.1 Introduction

This chapter deals with spatial pattern of urban fringe development including existing socio-economic profile of the study areas. The general objective of the profile is to provide the general picture about the trends that are found inside the urban fringe area. This chapter also explores some factors that led population of the study area to locate in where they are settled.

4.2 An overview of study areas

Saibu VDC

Saibu VDC lies in southern fringe of Lalitpur sub-metropolitan city and is just 1.02 kilometer away from the ring road. The VDC is around 1350 m from the mean sea level. According to VDC profile of 2013, it has an area of 4.12 Sq.km. To the west it has the traditional settlement Khokana, to the south is Bungamati, while there is Sunakothi VDC on the south-east, Kirtipur on the north-west and Lalitpur sub-metropolitan city on the north-east respectively. Just at the gateway of the VDC, there is Nakhu jail beside the Nakhu River. The VDC is situated in between Nakhu river on the east and Bagmati river on the west. There are two private school, one private college and one TU affiliated college. The public building in the village consists of one police station, one sub-health post and one VDC building. It also comprised of one radio-station and one noodle factory. *Maharjans, Shrestha, Thapa* and *ThapaMagar* are the main sub-caste groups of indigenous castes in the VDC.

Dhapasi VDC

Dhapasi is situated on the northern fringe of Kathmandu Metropolitan city and is just beside the inner ring road. According to VDC profile of 2013, it has the total area of 2.04 sq.km. The VDC is surrounded by KMC on the south, Tokha Saraswati in the north, Gongabu on the west and Khadka Bhadrakali in the east. The village has four higher secondary college (3 private and 1 community) and two private boarding schools. The public building in the village consists of one city hospital, one sub-health post and one VDC building.

4.3 Socio-economic profile of study areas

1. Population

According to CBS 2001, the total population of Bhainsipati VDC was 8337 and Dhapasi VDC was 11618 which were increased by three fold in both VDC in 2011 with growth rate of 9.6% and 10.1% respectively. Table 8 shows the population growth rate during 2001 and 2011 in different wards of VDC. From the table it can be observed that the maximum population growth rate is 12.5% in Bhainsipati VDC while in Dhapasi the maximum growth rate is 16.2%. It means Dhapasi is growing comparatively faster than Bhainsipati VDC which is probably because of the proximity to the ring road, Gongabu bus park and other opportunities.

Table 8 Population growth rate of VDCs in %

Ward	Bhainsipati			Dhapasi		
	2001	2011	Rate	2001	2011	Rate
1	1068	2,553	8.7	1060	2,968	10.3
2	670	1,609	8.8	527	956	6.0
3	862	2,640	11.2	937	2,066	7.9
4	1781	5,436	11.2	775	3,903	16.2
5	1481	3,142	7.5	674	2,580	13.4
6	728	2,530	12.5	1017	3,731	13.0
7	425	567	2.9	2348	5,779	9.0
8	1024	2,564	9.2	1978	4,597	8.4
9	298	665	8.0	2302	5,409	8.5
Total	8337	21,706	9.6	11618	31989	10.1

2. Education

According to survey data, in both VDC around 80% of the respondents are literate which shows the awareness of people towards education. The chart below shows proportion of households according to the education level. It can be observed that most of the people in both VDC have acquired basic education. However percentage of people having intermediate and bachelor degree is comparatively lower with approx. 26% and 20% respectively in Bhainsipati VDC and Dhapasi VDC.

The finding from this study indicates that number of educated people is increasing in urban fringe because in recent days almost all children goes to school for education.

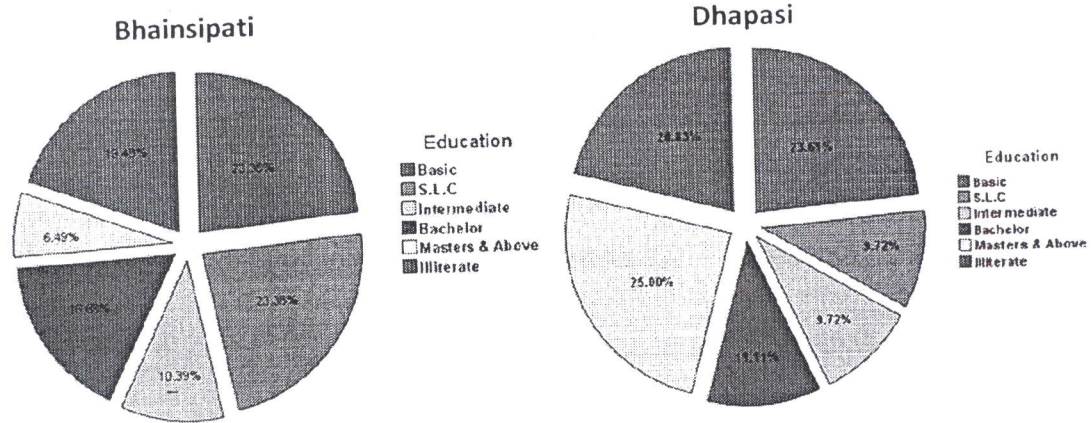


Figure 8 Proportion of inhabitants with different level of education

3. Occupation

The major occupation of most of the households in Bhainsipati fringe area is Government service followed by Business and Private Service. As shown in the pie-chart below 97.4% of the interviewed households are engaged in private service, agriculture and business. However around 2.6% households are still unemployed. Similarly in Dhapasi fringe area, the major occupation of the interviewed household is Business (30.5%) followed by Government service (19.5%). Only 2.8% of respondents in this VDC are engaged in agricultural sector.

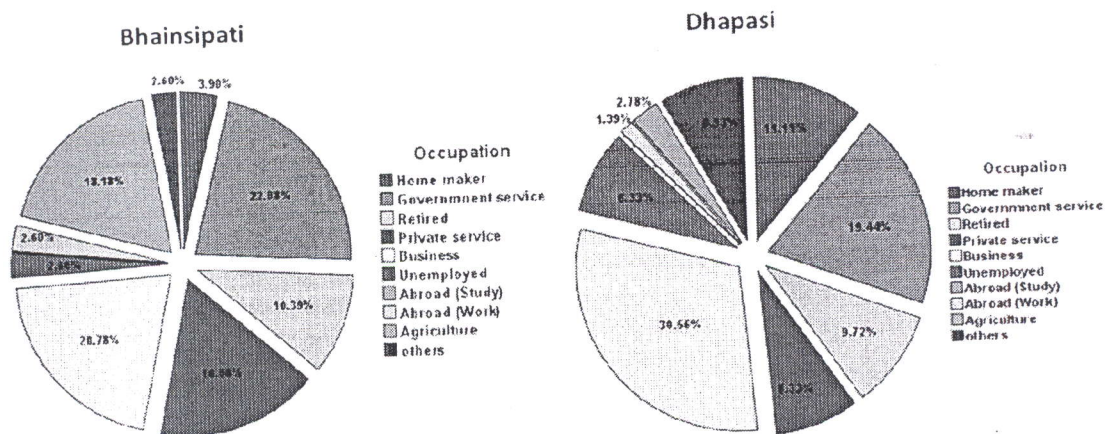


Figure 9 Proportion of households and occupation

The findings from occupational profile suggest two aspects of urban fringe: first as indicated in preceding literatures, fringe areas are widely considered to be important centres for micro-industries and a cottage industry which is brought into question by this survey finding because only few respondents (around 2%) are involved in industrial works, handicraft or pottery sectors. Second, the widespread view that many fringe area settlers are informally employed also do not agree with the survey result. It is observed that more than two-thirds

of the working people receive a regular salaries and wages which is a trademark of formal sector employment. This is probably because of increasing mobility between fringe area and metropolitan area that leads to unclear economic distinction between two.

4. Family structure and size

From the survey data it is seen that most of the households in Bhainsipati VDC are nuclear families (58%) which consist of two parents and their children. The average family size of this VDC is 5 persons (5.1). Whereas in Dhapasi VDC 61.1% are nuclear families and average family size is 5.3. The reason for the downsizing of family in these VDC is probably because of the less socio-cultural elements and heterogeneous society that emphasize on nuclear family type.

5. Migration

The growth of Kathmandu valley consists of two types of flows- from outside valley and inside valley. In Bhainsipati VDC most of the interviewed urban fringe settlers came from urban areas than from rural areas which can be observed from table below. Almost 45.5% of the interviewed households claimed to be native settlers. 10.4% of respondents were migrated from rural area outside of the valley while only 6.5% were migrated from rural area inside the valley. An interesting observation is that highest proportion of migrated respondents came from urban areas both inside and outside of the valley such as- Patan, Kupondole, Dillibazaar, Bhaktapur, Ramechap, Nepalgunj, Dharan, Hetauda, etc.

Table 9 Proportion of respondents for previous location

Previous location	(% of Respondent)	
	Bhainsipati	Dhapasi
City centre inside valley	18.2	11.5
Rural area inside valley	6.5	5.2
City centre outside valley	19.5	13.5
Rural area outside valley	10.4	22.9
Indigenous	45.5	21.9
Total	100	100

In contrast, a different picture can be observed in Dhapasi VDC. Around 22% are the native settlers while 22.9% of the migrants came from rural areas outside of the valley which is almost twice as much as Bhainsipati VDC. And only 5.2% of the respondents migrated from rural areas inside the valley. The previous location of these migrants are- Bhairawa, Gorkha,

Sindhupalchowk, Birantnagar, Chitwan, Panauti, Hetauda, Dhankuta, Nuwakot, Morang, Shyanja, Kailai, Dhangadi, Trisuli, Palpa and so on outside valley and Naxal, Baneshowr, Maharajgunj, Asan, Bhaktapur and Kamalpokhari inside valley. The general picture obtained from the findings of the study is that both inter-migration and intra-migration is common activity in the fringe area which is related to socio-economic and land factors like job opportunities, educational facilities and affordable land or cheap housing. 52.6% and 56.2% of the respondents in Bhainsipati and Dhapasi VDC migrated to their present location for the employment opportunity while 18.4% and 2.1% of the respondents are attracted due to affordable land and housing. Similarly, 7.9% and 20.8% of the respondents migrated to Bhainsipati and Dhapasi VDC for the educational purpose. This shows that availability of employment opportunity, land and housing affordability and educational facilities are the main reasons of migration for the fringe area settlers.

Table 10 Reasons for migration

Reason for migration	(% of Respondent)	
	Bhainsipati	Dhapasi
Job opportunity	52.6	56.2
Cheaper land price	18.4	2.1
Education	7.9	20.8
Political freedom	5.3	0
Hope for new life	10.5	2.1
Others	5.3	18.8
Total	100	100

6. Rent

Around 59.7% of surveyed houses in Bhainsipati VDC have rental units with number of tenants varying from 1 to 13. The rented accommodation is even higher in Dhapasi VDC with more than 72% buildings with rental units. Most of these units are found near the main road corridor and market places. The findings from this study indicates that urban fringe have very high demands for rented accommodation as migrants seek accommodation close to work opportunities.

7. Income source and income level

The major source of income of the fringe area settler is service which is followed by business, rent and agriculture. This finding oppose with (Browder, Bohland, & Scarpaci, 1995) who says that fringe areas are functionally integrated with rural areas. In most of the

cases this integration is observed in the form of rural oriented activities especially agriculture that are occurring in the peri-urban environment. In both case study areas, around 90% of the households are well integrated into the service and business sectors of urban economy rather than rural economy. This does not mean that the fringe area is not a zone of interaction between the urban and the rural. 10.3% and 2% of the respondents in Bhainsipati and Dhapasi VDC are still engaged in agriculture to support their family (see Figure 8).

Fig 9 shows the level of income in the study area. From the table it can be observed that most of the urban fringe settlers have high income level¹ and middle income level. Previous studies of (Timothy, 1995) suggest that a large proportion of residents that are found in peri-urban are low income migrants. (Browder et al., 1995) opposes this theory that says that in the peri-urban interface there are households from the low income category as well as households with high income per month. The finding from this survey is in agreement to Browder's findings, which were the results of a survey of peri-urban households in Jakarta, Indonesia and Santiago in Latin America. The increase in number of luxurious properties in the fringe area is also an indication of some high income and middle income settlements in the fringe area. Therefore, it is not principally the poor who are being "pushed onto the metropolitan fringe, but rather middle-income groups and high income groups who are connected to the formal metropolitan economy such as Service and Business.

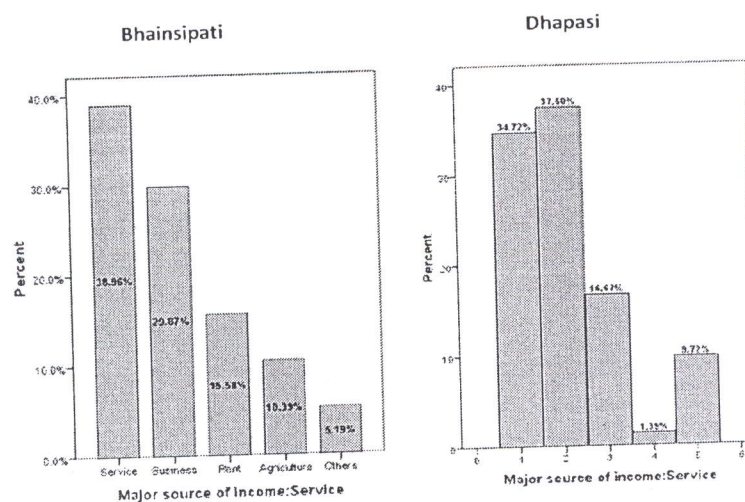


Figure 10 Sources of income

¹ Level of income is determined from (CBS, 2011b), where it is stated that the richest 20% have income level greater than Rs.90,000 and poorest 20% have income level around Rs.16,000 in Kathmandu valley. That means middle income lies in between Rs.16,000 to Rs. 90,000. Accordingly, for the sake of ease of response from the interviewee, the income level is delimited as follows: <Rs.20,000 (Low income), Rs.20,000-Rs.40,000 (middle income) and >Rs.40,000 (High income).

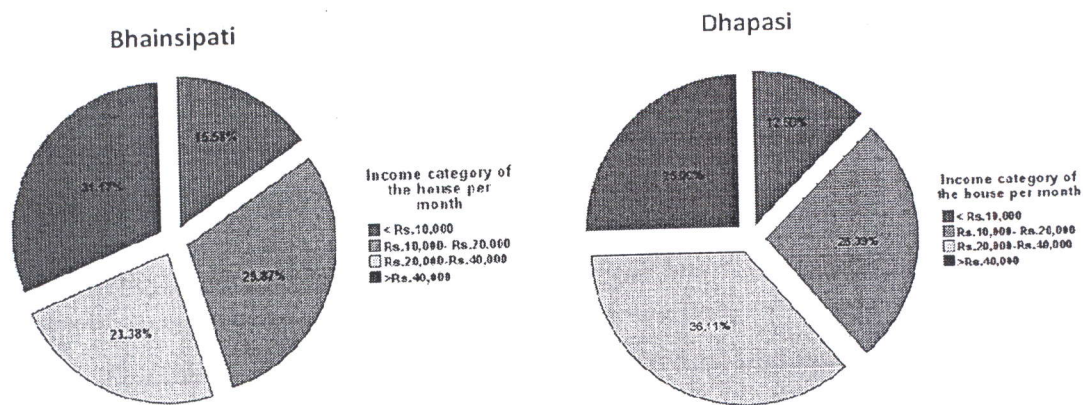


Figure 11 Income level per month

8. Infrastructure and services

a. Road

Bhainsipati VDC is externally accessible through a ring road by a connector road which is one of the major roads leading to Bungamati. This road is one of the old route passing throughout the VDC from which other roads of the VDC have emerged. It has 25.3km of metalled road, 19.1km of gravelled road, 25.6 km of gravelled road, 0.43 km of stone paved road and 21.86 km of track road. In contrast, Dhapasi area is directly accessible through the ring road in the south through which many roads have emerged. One of the main roads passing through the VDC is Tokha road on the west which connects the VDC to Tokha Saraswoti on the north. It has 22km of black topped road, 15.2km of earthen road, 23.4km of gravel road and 0.4 km of track road.

In both VDCs, many roads are opened recently without any planning leading to inconvenient mobility. The figure below shows the proportion of road according to the surface type. According to the chart, around 72% of roads in Bhainsipati and 64% in Dhapasi VDC are unpaved which are sometimes very uncomfortable to use especially during rainy season. Most of these roads are less than 5m or having just single lane and often they have dead ends. Therefore internal accessibility within these VDCs is severely limited by the absence of planned and well maintained local roads.

However, it is interesting to know that most of the households in these fringes have owned either two wheeler or four wheeler. Around 77.9% of the respondents in Bhainsipati Fringe area and 61.1% in Dhapasi fringe area have private cars or motorbike as a form of transport which means only 22.1% and 38.9% of the respondents in these VDC depends upon public

transport. This may be because of limited public transport facility in the VDC which force the resident to use private vehicle to reach their destination.

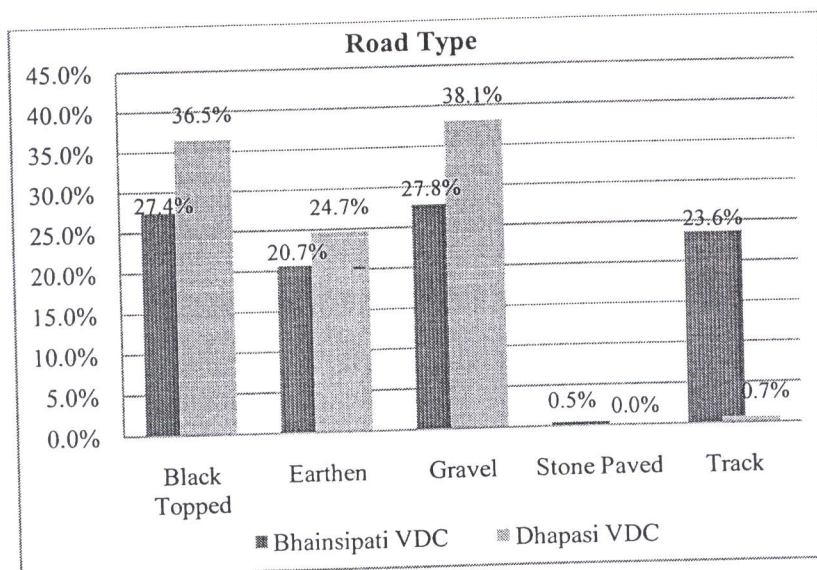


Figure 12 Proportion of different road type

b. Water supply system

Approximately 97% of respondent in Bhainsipati VDC have pipe water connection. The main water supply source is from Pharping area from where water is distributed to other neighbouring VDC as well. The remaining 3% depends upon well and tankers (see table 11).

According to the table below, in Dhapasi VDC, drinking water seems to be major problem. Only 50% of the respondent have pipe water supply which forced others 43.1% to dig a private well inside their house and 4.2% depend upon tanker. Remaining 2.8% depends upon the traditional water supply system such as-dhunge dhara and well.

Table 11 Source of water supply

Water supply source	% of respondent	
	Bhainsipati	Dhapasi
Public supply	97.0%	50.0%
Well	1.7%	43.0%
Tanker	1.3%	4.2%
others	0.0%	2.8%
Total	100%	100%

c. Electricity

The entire household in both VDC have electricity connection. The problem of load shedding exists but the problem relating to electricity is not found. This may be due to the fact that electricity cables are airborne and do not require underground services all the time.

d. Drainage and sewer

There is very limited drainage facility in the form of surface drain in the Bhainsipati area. In most parts of VDC water flows along natural gradient. Wastewater from domestic use is freely discharged on the surface drain without any concern. Consequently it may result into health hazards for the population living in the settlement. There is also a problem of sewer system as most of the inhabitants have their own septic tank. Around 75.3% of the respondents have septic tank in their building premises due to lack of direct sewer connection.

In contrast, around 89% of respondents of Dhapasi VDC have direct sewer connection. In most parts of VDC, drainage facility is merged with sewer connection. So surface drainage is not as problematic as Bhainsipati VDC. However 11% of people do not have direct sewer connection and they have constructed septic tank in their building premises.

e. Solid waste management

The condition of the solid waste management in Bhainsipati VDC seems to be a problematic as only 58.4% of respondents claimed that they have door to door service or house collection service to collect their waste. About 26% of the respondents disposed their waste in the container laid on the street while 15.6% dispose the waste in their own compound either by burning or burying.

In Dhapasi area, around 94.4% of respondent claimed that they have house collection service for the solid waste. The remaining 5.6% disposed their waste either in container or within their own compound.

4.4 Type of land occupied by study areas

4.4.1 Saibu VDC

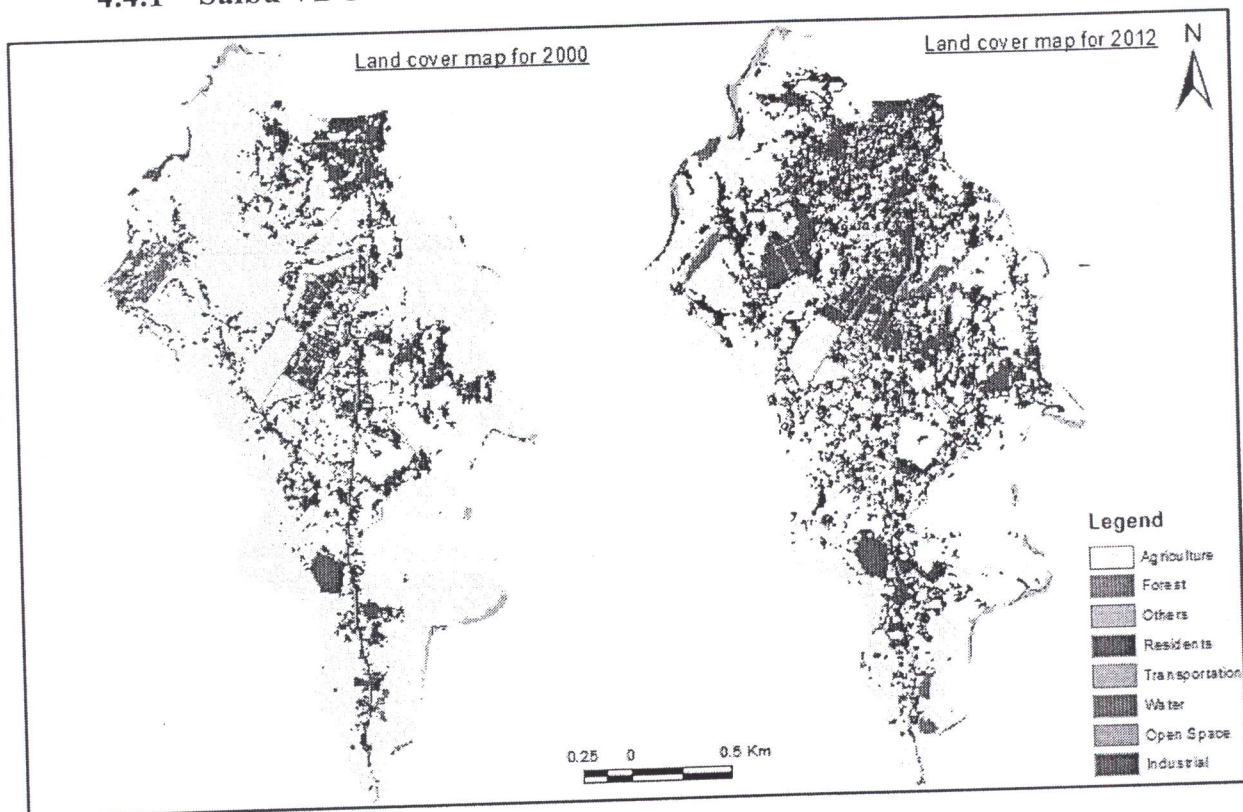


Figure 13 Land cover maps Saibu VDC during 2000 and 2012

Figure 13 shows the land use/cover maps of Saibu VDC for the years 2000 and 2012. The map shows that significant urban expansion has occurred during this period. Most of the arable land of the VDC was transformed into built-form. Table 12 demonstrate that the residential area of Saibu VDC which was 16% in 2000 was increased by 29% in 2012 at an average annual rate of 1.1 hectare.

Figure 14 is the bar chart which visually quantifies the area of land use classes in different years. According to the chart, the study area is dominated by arable land and residential areas. There is a slight increment in water bodies which is probably due to seasonal variation of image acquisition (in dry season the amount of water flow is normally lower than the wet season). Similarly, transportation network has been increased by 1 hectare in 2012 which is obvious as lots of roads were constructed by private and public agents for housing and colonies development.

It can be observed that during the period of 2000-2012, a significant amount of agricultural land was converted into urban areas with the urbanization pattern following by the road

networks and the existing built-up peripheries (see Figure 15, Figure 16 and Figure 17). The annual urban gain of 1.2% came at the expense of arable land.

Table 12 Area of different land cover types in hectare and Rate of land cover change in %

Land use	Area (Ha)				Rate of change %
	2000	%	2012	%	2000-2012
Agricultural	329.5	80	267.1	64	-1.3
Forest	5.4	1	6.4	2	0.0
Others	2.9	1	5.8	1	0.1
Residential	65.1	16	122.1	29	1.2
Transportation	6.4	2	7.4	2	0.0
Water bodies	2.3	1	2.9	1	0.0
Open Space	0.005	0	0.005	0	0.0
Industrial	2.6	1	2.6	1	0.0
Total	414.2	100	414.2	100	

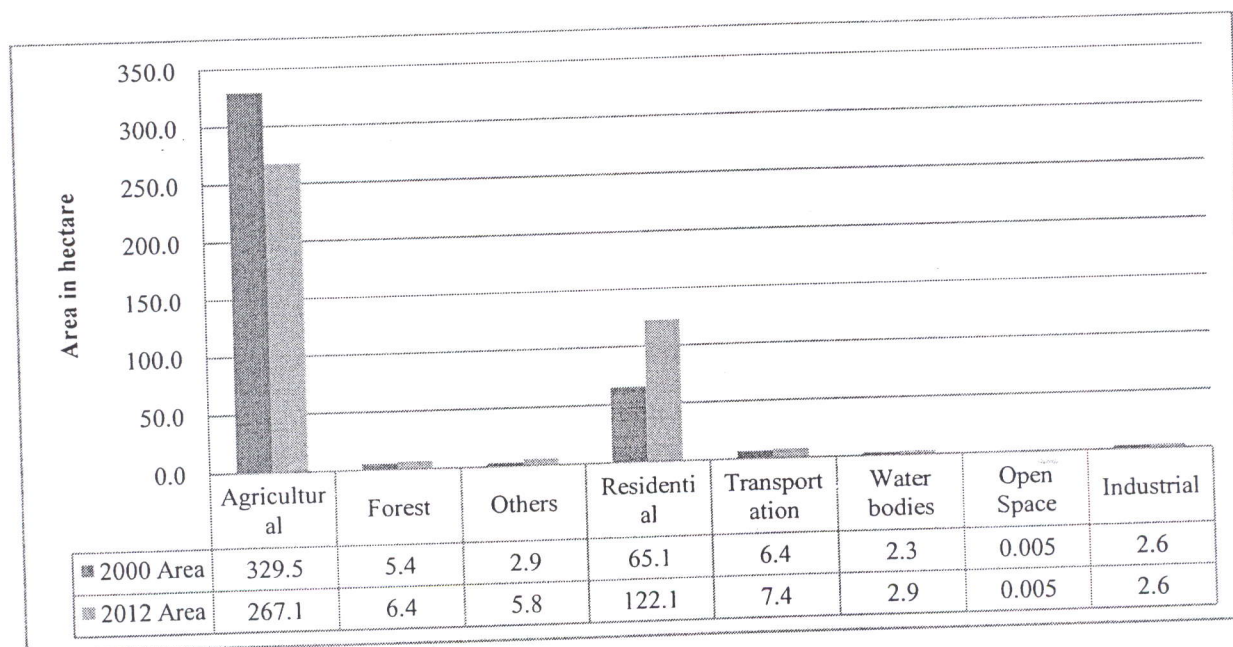


Figure 14 Area of land cover classes in hectare

Figure 15, Figure 16 and Figure 17 visualize the spatial pattern of urban growth during 1990, 2000 and 2012. The total residential area of the VDC increased from 65.1 ha in 2000 to 122.1 ha in 2012 with an annual expansion rate of 1.1%, which also means that the expanded area is almost two times of area in 2000. Also, most of the growth is occurring at the proximity of road networks and existing built-up peripheries.



Figure 15 Saibu VDC in 1990s



Figure 16 Saibu VDC in 2000s



Figure 17 Saibu VDC in 2012

4.4.2 Dhapasi VDC

Figure 18 shows the spatial distribution of settlement and major land use of Dhapasi VDC in 2000 and 2012. The land use map reveals that there were few settlements in the VDC in 2000 which increases dramatically during 2012. Most of agricultural land has been transformed into built-up area. Table 13 demonstrate that the residential area of Saibu VDC which was 30% in 2000 was increased by 74% in 2012 at an average annual rate of 3.7%. It can also be observed that during the period of 2000-2012, a significant amount of agricultural land was converted into urban areas which are generally followed by the road networks and the existing built-up peripheries (see Figure 20, Figure 21 and Figure 22).

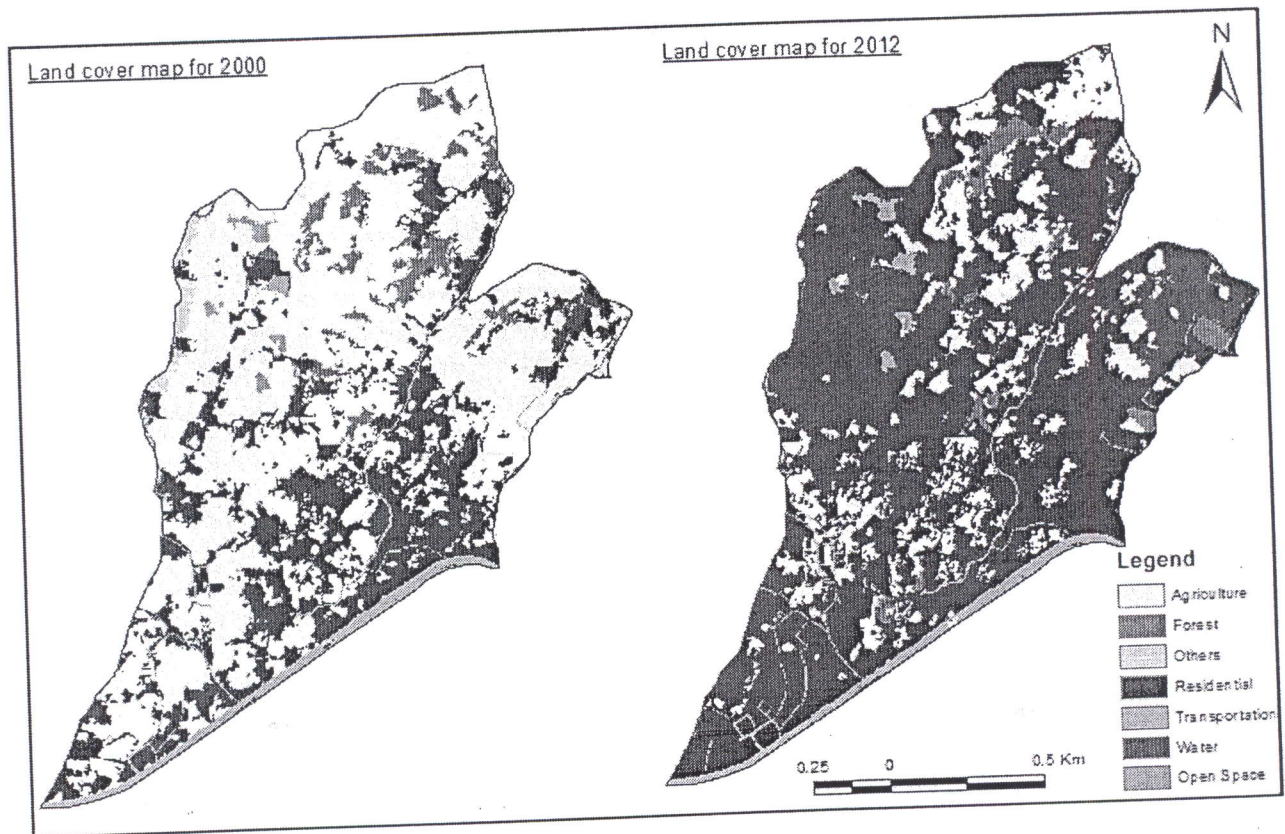


Figure 18 Land Cover maps of 2000 and 2012

Figure 19 is the bar chart which visually quantifies the area of land use classes in different years. According to the chart, the study area is dominated by residential areas. Forest area has drastically decreased from 9.4 hectare to 5.5 hectare. Similarly, transportation network has been increased by 0.4 hectare in 2012 which is relatively lower than in Saibu. This is probably because of absence of land development by private and public agents except few apartments and colonies. Therefore the growth in Dhapasi VDC is comparatively haphazard without any define pattern. Water bodies have slight increment around 0.1 hectares because of seasonal variation as stated in earlier section.

Table 13 Area of different land cover types in hectare and Rate of land cover change in %

Land use	Area (Hectare)			Rate of change %	
	2000	%	2012	%	2000-2012
Agricultural	131.3	61	40.2	19	-3.5
Forest	9.4	4	5.5	3	-0.1
Others	2.2	1	0.2	0	-0.1
Residential	64.6	30	161.0	74	3.7
Transportation	7.2	3	7.6	3	0.0
Water bodies	0.5	0	0.6	0	0.0
Open Space	1.5	1	1.5	1	0.0
Total Area	216.8	100	216.8	100	

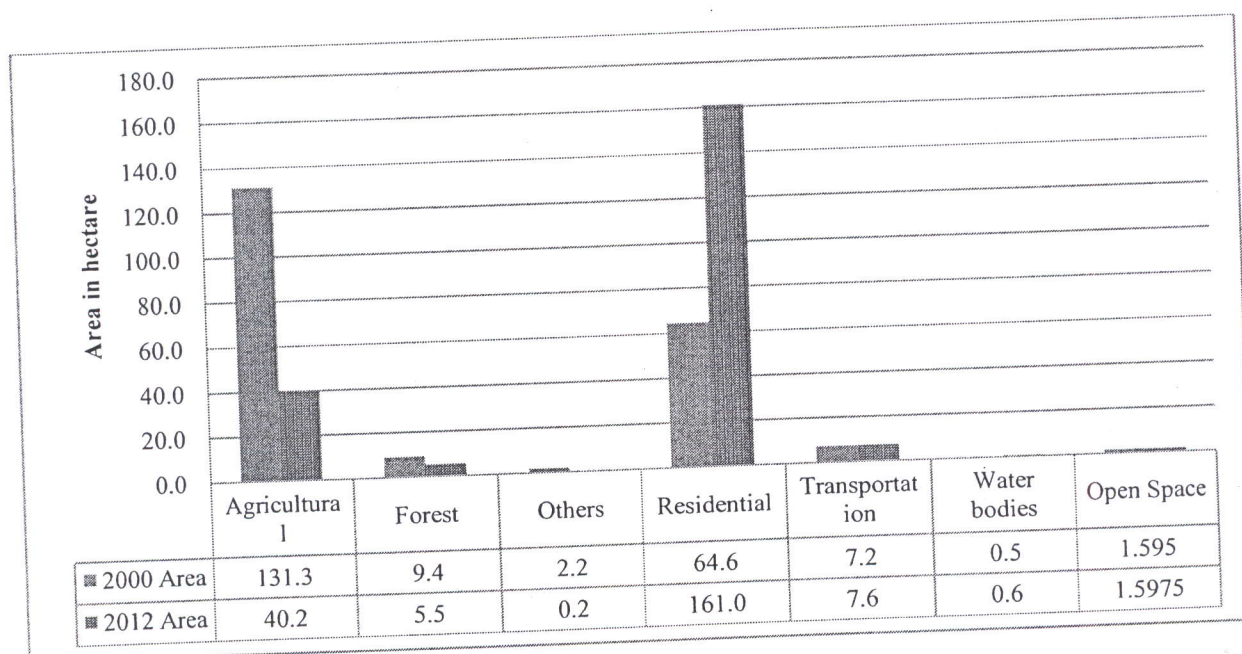


Figure 19 Area of land cover classes in hectare

Figure 20, Figure 21 and Figure 22 visualizes the spatial pattern of urban growth during 2000 and 2012. The total residential area of the VDC increased from 64.6 ha in 2000 to 161.0 ha in 2012 with an annual expansion rate of 3.7%, which also means that the expanded area is almost three times of area in 2000. The residential development in this VDC is far greater than Saibu VDC which is probably due to factors that are explained in section 4.7.

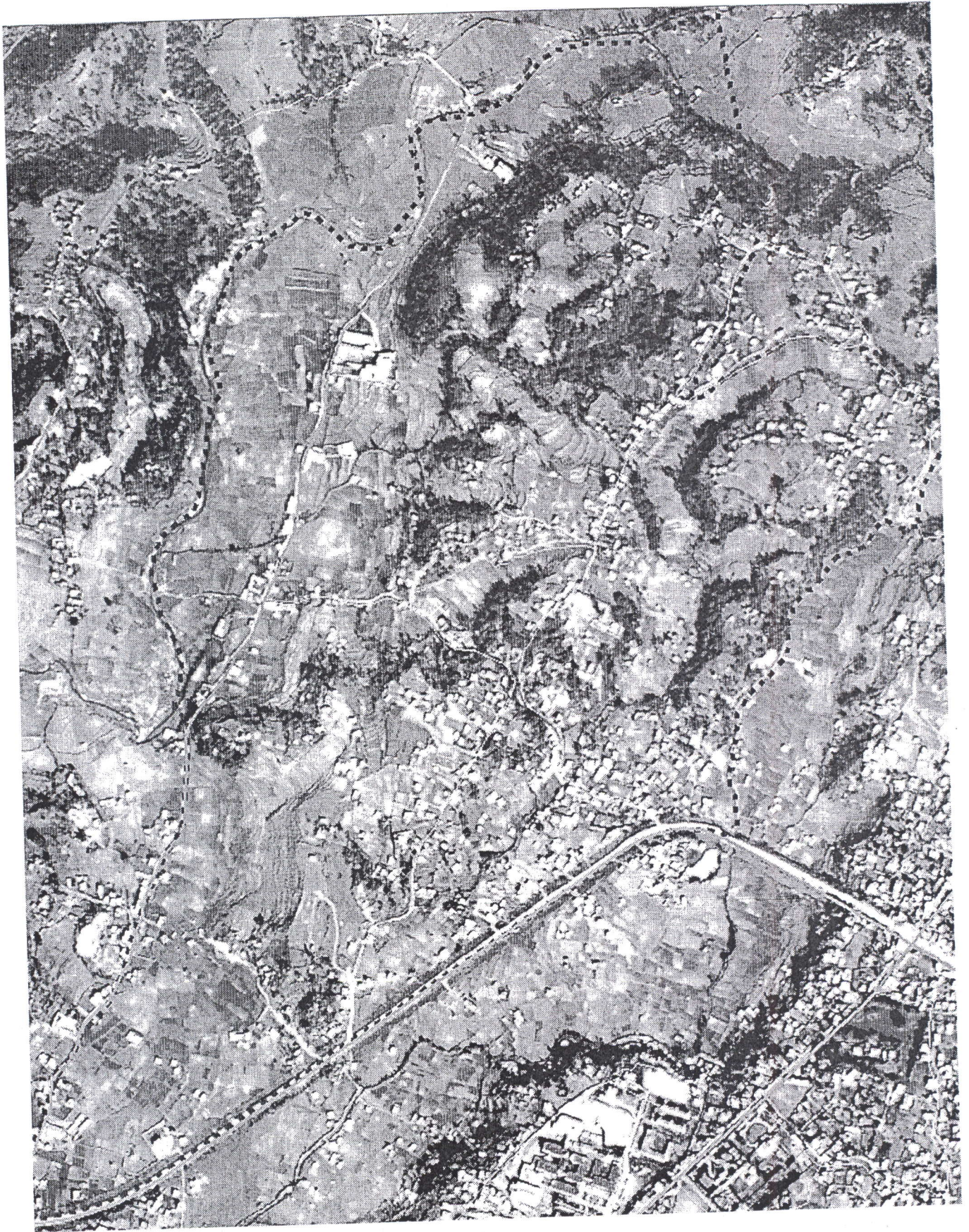


Figure 20 Dhapasi VDC in 1990s



Figure 21 Dhapasi VDC in 2000s



Figure 22 Dhapasi VDC in 2012

4.5 Impact of distance from the city centre

City center mainly Kathmandu and Patan are the core areas of the valley that have been performing as centre of business, commerce, administrative and political centers. Many services are delivered through these centres and thus they are centres of attraction for people. So it is expected that these urban centers will have significant influence on urban growth which holds true in Kathmandu valley. The amount of built-up clustered around the city centre is significantly higher than area which is farther away from the city centre. This demonstrates that with increased distance from the city boundary the number of settlements decreases.

The findings of this study indicates that the amount of land covered by settlements is high closer to the city boundary and with increased distance from the city boundary the amount of land covered by settlements decreases.

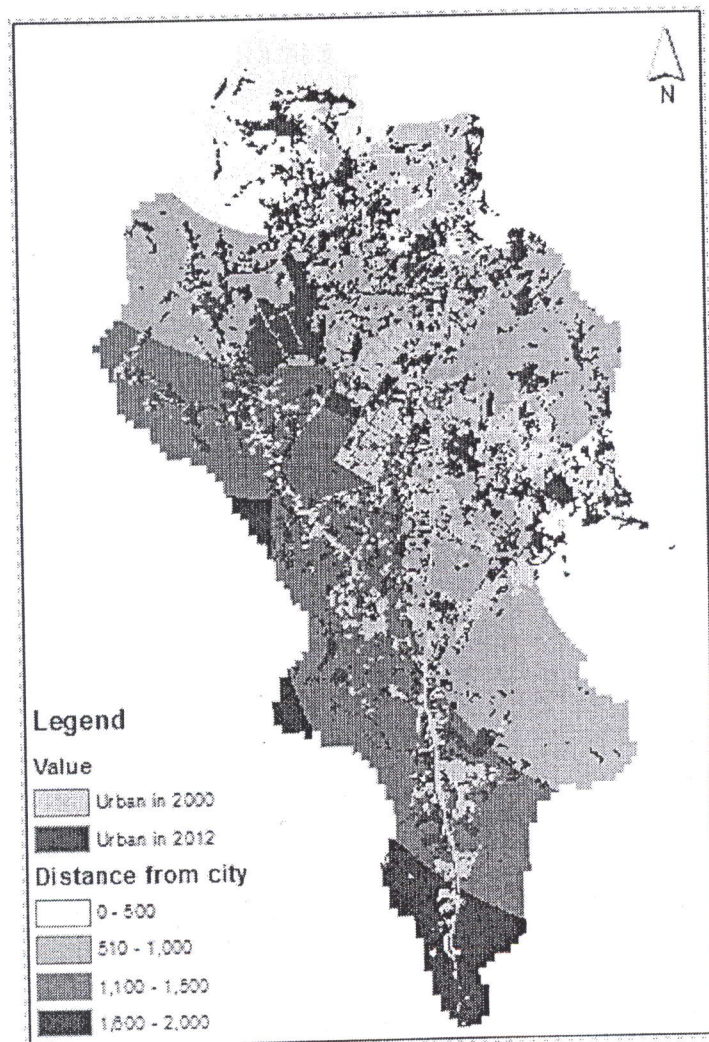


Figure 23 Settlement and distance from the city

4.6 Impact of road on urban fringe settlement

Figure 8 and Figure 11 reveals that the distribution of settlements in 2000 is mainly concentrated along the road networks. There are more settlements situated around roads and there no settlements or very few settlements in area where there are no roads. Settlements were more clustered in areas where there is the presence of local roads, service roads and access roads. This means probability of urban growth is higher at closer proximity of road networks. As distance from the road networks increases urban growth probability decreases. This findings is similar to the findings of (Timothy, 1995) about the growth of peri-urban areas in Dar es Salaam.

According to Timothy (1995), transport networks contributes to the growth of settlements particularly in low-income settlements. Public transportation takes an advantage of road networks to provide service to low-income settlements and thus influencing locational decision of the settlers. However its not always the public transportation which influence the growth of the settlements. Travel cost minimization is also an important factor which should be taken into consideration. Households select location that reduce their travel time, hence the concerntration of settlements is seen along the roads.

However this kind of spatial distribution changes dramatically in 2012 mainly in Dhapai VDC. New settlements developed in areas where there are no transport routes. This is due to the fact that there is no more land available along or next to roads to cater for the increase in the number of households seeking residential plots in the VDCs.

4.7 Settlement and landform analysis

Saibu VDC has a gentle slope while Dhapasi VDC is found on relatively steep terrain. In Dhapasi VDC the slope is facing towards south direction while in Saibu VDC it is facing towards north. Despite the larger area of Saibu VDC, Dhapasi VDC has relatively more number of households which indicates that it is urbanizing faster than Saibu area. This is probably because of better accessibility to Central Business district located in Kathmandu Metropolitan city, better services and proximity to central bus park (Gongabu Bus Park). In addition, Dhapasi VDC contains the natural water reservoir from where large proportion of water can be used for drinking purposes. As the valley has been suffering from a shortage of drinking water since a long time, this type of location becomes an attraction point for the new settlers. Therefore the rate of urbanization is comparatively greater in this VDC.

In Saibu VDC, Nakhu River flows from northeast to south east direction separating the VDC from Lalitpur Sub-Metropolitan City and Sunakothi VDC. Although the VDC has lots of private and public involvement for land development, the urbanization is comparatively lower than Dhapasi VDC. One of the reasons behind this is the greater distance to Central Business Districts and lesser opportunities to urban services.

4.8 Characteristics of Urban fringe areas

The urban fringe interface is the place where a process of urbanization is very intense and where some of the most obvious environmental impacts of urbanization are located. This study identified the following characteristics in the Kathmandu valley fringe area.

Change in land use

Land conversion takes place mainly in the form of agricultural land and vacant land converted to settlement. In Dhapasi area the rate of conversion is higher than in Bhainsipati area. This is probably because of proximity to ringroad, natural sceneries, proximity to Central bus terminal in Gongabu and other national and international institutions such as TU teaching hospital, Indian embassy etc. In Bhainsipati VDC the involvement of public and private developers is the main reason for urbanization.

Change in traditional settlement pattern

The effect of urbanization can be observed in settlement pattern too. During 1990s there were very few settlements along the main road of the Bhainsipati VDC which might have been developed because the road connects to the two traditional settlements ie. Khokana and Bungamati. During 2000s settlement start to expand away from the main road as the result of private and public developers such as Sainbu Awas Chetra, Civil Homes, etc. Between 2000-2010 the settlements start to grow at the proximity of other road-networks as well. With an increase in plotting of land by private builders, there was also an increase in rate of growth of new settlements.

Similarly in Dhapasi area there were very few settlements at the proximity to ring road and main road connecting to Tokha Saraswoti in early 90s. During 2000s many new roads were constructed and settlements start to grow along those road-networks. Between 2000-2010 almost 80% of land has been urbanised in a scattered manner and many private housings and apartments have been constructed. This type of scattered development in urban fringe is

mainly due to unregulated land transaction and lack of proper policy for land use development in the valley. According to Chief of Dhapasi VDC the haphazard growth of urban fringe is also the result of absence of representative body in local bodies.

Changing demands for infrastructure

The increasing number of housing units and rental units in VDCs is also an indication of increasing demand for infrastructure and services. According to an official from the electricity authority claim that the electricity transformers have to be upgraded since there are more electricity connections made to supply electricity to the rental units. Similarly there is an increase in educational institutions, health centres, co-operatives, clubs, shopping complexes in both VDCs to meet the demand of increasing population.

Increase in number of infrastructure and services plays a vital role in development processes. But if they are not well organized beforehand, they can create zoning problem in later phase which results to the unsustainable growth of the fringe area.

Change in livelihood

Change in livelihood is characterised by change in occupation and change in life style. In both study areas there is decrease in agricultural land and increase in other occupation. The change in occupation is mainly due to increase in educational standard of the people and various other opportunities arising due to the urbanization in the valley. Most importantly plenty of the agricultural profession are lost due to opportunity cost of the land. For eg- people would prefer to construct a house and provide it for rent from which they can earn better than by selling agricultural products. Other farmers sell their land for changing demand for basic needs such as- educating their children. Majority of the farmers sell their land for income generating activities such as setting up grocery stores, constructing a house and funding other businesses in order to acquire more luxurious lifestyles.

High level of urbanization

In fringe area higher level of urbanization is characterised by higher level of service provision. Findings from this research indicate that there is high level of accessibility to urban services such as- piped water and electricity. Areas which are closer to municipal boundary are in the process of being turned into the urban because their physical set up has greatly adapted to urban area itself.

Disordered urban fabric and built environment

The existing building bylaws of the VDCs are neither sufficient to perform as a design guide nor it is sufficient as a legal document for government to provide a pleasant townscape. Although different bylaws and regulations such as plot ratio, setbacks, FAR, building height are stated in the bylaws, urban design aspects such as space between buildings, view angles, street alignment, architectural style, definition of space, city skyline, is not considered in the bylaws. Due to this, the outcome of the newly developed areas is the fragmented buildings with different individual character without relating with each other.

4.9 Causes of urban growth in urban fringe area of Kathmandu valley

The trend towards the dispersal of population to the urban fringe is becoming a phenomenon in Kathmandu valley. Urban fringes are generally attractive to private developers and investors for two reasons- first they offer larger and relatively inexpensive land plots. At the same time these areas are usually easily accessible from the city centre that offers several benefits for the developers.

Another reason of urban fringe growth is migration of people from poor rural areas seeking employment opportunities. Basically it offers relatively inexpensive labour force and leads to higher urbanization. Residential development is also an important factor of urban growth in Kathmandu valley. Generally middle and higher income groups seeking more space at an affordable price purchase and live in residences in urban fringe areas even though they do not work in the area. This driver is important in those areas which are relatively close to the core city of the valley.

Factor such as- climate, land availability, proximity to infrastructure and services are also the key factors for urbanization of VDCs. According to the local expert's interview, the major causes of urban fringe growth are as follows:

Lack of administrative control and limited resource

For a long time, the urban fringes have been without rightful representative bodies. Because of this, there is lack of administrative control over development of the fringe areas which results into unplanned urban growth. Similarly the government does not have the financial resources to acquire huge parcels of land where planned urban development can be

policy and priority which is the main reason for hindering planned development through efficient land management in Kathmandu valley.

Concentration of political and economic activities

High concentration of population in the valley is mainly due to centralization of economic activities, infrastructure facilities and concentration of government services. It is also the hub for tourism, finance, industry, education and sports etc. The survey conducted by (NepalRastraBank, 2012) estimates that about one-third of the country's economic activities are concentrated in Kathmandu valley alone. Similarly, Nepal Labour Force Survey (NLFS) estimates that Kathmandu valley accounts for 25% of nonfarm employment mainly Services and Manufacturing (CBS, 2008) which exceeds over cluster around Eastern Terai and Central Terai surrounding Biratnagar and Birgunj which accounts for 18% and 19% of non farm employment. This shows that Kathmandu valley is the centre of economic opportunities which has been pulling huge proportion of migrants from different parts of the country. Compared with other urban areas, the Valley exhibits a larger share of migrants who are pulled by economic reasons. NLFS estimates that more than 25 percent of lifetime migration to the Kathmandu Valley is for job-related reasons (Muzzini & Aparicio, 2013) which is in agreement with the survey result of this research.

Poverty and conflict as a push factor in rural areas

Less economic opportunities, extreme poverty and more recently, the insurgency in the rural areas has pushed lots of people to migrate to the cities in search of opportunities and security (Unknown, 2010). A decade long conflict has triggered increasing inequalities and exclusion of the poor in rural areas. During this period, economic activities were disrupted adversely due to closure of many industries and business due to threats. Therefore there has been a huge influx of internally displaced people to the valley due to insurgency in different parts of the country.

CHAPTER V INFERENCES AND ISSUES

5.1 Introduction

This chapter deals with the major findings from the research by adopting the methods and strategies that was explained in Chapter III to answer all research questions. It contains two sections- first section presents the inferences of the study after the extensive study and the extent of the discussion in the earlier chapters and the section presents the main problems and issues.

5.2 Inferences

5.2.1 Physical aspect

- The urban peripheries of both case study areas have enormous urban expansion within the recent decade. Basically the growth can be seen along the major and minor roads alignment. It shows that the growth of valley is heavily dependent on transport related variables.
- From the land cover maps of 2000 and 2012 it can be observed that urban growth is occurring as diffusion growth extending from already built up areas in an infilled and expansion manner. The results suggest that an important part of city's future growth may occur in area adjacent to already consolidated urban areas, thereby mitigating sprawl development. The driving factor of this type of growth is good accessibility and connectivity, especially in relation to the services and amenities located in the central areas.
- The current growth trend of fringe area shows that the urban planning policies have largely been over ruled by private interest of people. As a result, the valley sprawl has occurred in a diffused manner. Although the local authorities are aware of the unsustainable nature of the growth, they have limited tools and resources to generate strategies that can control the current tendencies of growth.
- A large proportion of surveyed HH have access to some urban services like- drinking water and electricity supply. However there is general lack of sanitation systems like

sewer systems and solid waste disposal mechanism. This results in unsustainable nature of disposal of solid waste making the environment ugly and polluted.

- Two major factors of unplanned sprawl development in both VDCs are- rural to urban or urban to peri-urban migration and unsystematic land and building transaction. Increasing number of migrants demands more land and housing needs for the shelter. Therefore rise in land transaction along with the high population influx is the main reason for the rapid urbanization of VDCs. Other contributing factors of rapid growth are the failure of local bodies to provide serviced plots at affordable rates especially for poor, the poor co-ordination between different development initiatives and the conflict of interest between different organizations that are responsible for urban development.
- Most of built up area are concentrated around road networks which are serving as major roads or service/ local roads. This is probably due to the fact that the area which is at closer proximity to transport related variables have greater tendency to grow in future due to potential benefits such as ease of access, economic opportunities, social services etc.
- The urban fringe is characterised by larger number of migrants than indigenous people. Therefore in both case study areas there are higher proportion of rented accommodation. Interestingly most of these rented units are found near the main road corridor and market places which is probably due to economic opportunities.

5.2.2 Socio-economic aspects

- The general picture obtained from the migration information indicates that both inter-migration and intra-migration is common activity in the fringe area which is related to socio-economic and land factors like job opportunities, educational facilities and affordable land or cheap housing.
- A larger proportion of urban fringe settlers have high income level and middle income level. Therefore, it is not principally poor who are being pushed onto the metropolitan fringe but rather the middle-income and high income groups who are connected to the formal metropolitan economy.

- Unlike traditional settlements of Kathmandu valley, the newly developed settlements lack strong socio-cultural bond due to heterogeneous society. However, people are trying to make a new community by initiating different social organizations like youth club, Red Cross society and social welfare centres.
- Rapid growth at the fringe has resulted in increased commercial development along arterial roads. As the distance decrease from the ring road and other major roads the commercial development as well as the built-up area decreases.
- In both study areas, the new services like the restaurants, club and commercial complexes are developing which suggest that there is gradual change in lifestyle of people in fringe areas. Moreover the emerging high rise structures suggest that people prefer a simple and convenient way to acquire a flat rather than tedious and additional burden to construct a house in new plot. Moreover the higher proportion of single family dwelling indicates that the fringe area settlers prefer a nuclear family than extended or joint family.
- Land affordability and land value are the major influential factor for the emerging unplanned peri-urban growth. Generally people would prefer a cheaper land with minimum accessibility for the residential development (both private and public builders including peri-urban settlers). So inspite of absence of basic services like drainage and sewerage they would rather choose a relatively cheaper plot. This has resulted into haphazard and unmanaged growth of the fringe area.

5.2.3 Policy aspects

- In both VDCs, the weaknesses of local bodies' management have let settlements constructed wildly without proper maintenance of road networks and haphazard rubbish disposal.
- No effective policies have been implemented to regulate the growth of fringe area. Due to lack of comprehensive policy guidelines including land use zoning, the fringe area is facing the problem of haphazard urban expansion.

- Presently, building byelaw is only a single policy that is applied to control the building construction processes. Apart from this there are no further individual plans and policies to manage the growth.
- Although the Long term development concept plan for 2020, provides some guidelines for the sustainable growth of the valley such as compact settlement development through efficient land use plan and transport linkages; delineating rural-urban boundary to preserve the agricultural area; and decentralization of socio-economic activities, the plan has rather remained more conceptual and abstract. There is no comprehensive study made to present a real and detail procedure on urban growth management of the valley under this plan.

5.3 Problems and issues

From the study of both VDCs through field observation, household survey and its analysis, some of the existing problems and issues are identified which are described below:

Road network and transportation problem:

In both VDCs, road is found to be most problematic due to lack of maintenance and proper planning. Majority of roads are unpaved and gravelled which cause difficulty in walking and driving especially during rainy season. During dry season and windy season the area is severely affected due to dust pollution from these roads. Moreover the narrow widths of road cause traffic jam making the area nuisance to live.

Sewerage and drainage problem:

Issues of drainage and sewer management are the major problems of both VDCs. In Bhainsipati VDC, sewage and septic of every house is directly being drained into the Nakhu river. Moreover the open drain in Bhainsipati VDC along with waste lines has resulted in risk of health hazards. In Dhapasi VDC, though majority of household have direct sewer connection, the problem of drainage still persists in most parts of the VDC.



Figure 24 Open drain system in Saibu VDC

Water supply:

Insufficient water supply is the major problem in both VDCs. Most of the households lack pipe drinking water and have to depend on surface water such as well, boring and tanker. During dry season the supply of water is almost nil making compel to drink water from other sources which can cause health hazards for the settlers of the fringe areas.

Haphazard building construction

According to the Chief of Kathmandu Metropolitan City's (KMC) Urban Development Division, urban fringes of the valley underwent rapid urbanization and unplanned development due to improper planning and lack of implementation of urban development programs. This has resulted into haphazard, unplanned and unregulated land developments. Moreover lack of proper legal authority for monitoring of building construction is also a major cause for unregulated growth of urban fringe. The byelaws are also not followed by people who construct their building in the fringe area. For instance in Kathmandu Valley, National Building Code and the building codes devised by International Civil Aviation Organization (ICAO) is followed. According to the National Building Code, construction of high-rise apartments at world heritage sites and old settlements should be restricted but it has no specific statement for newly developing residential areas. Due to lack of specific laws and codes, there are many cases where residential areas are highly affected by the high-rise apartments. This type of ineffective and haphazard growth in the urban fringe areas will leads to unmanaged development scenarios in future.

Inappropriate land use pattern

The process of land use change is very common in both VDCs which are taking place with different magnitude and pace. The land use pattern is a resultant of the interaction of various factors such as physical, socio-economic, environmental and political factors. Among these factors, economic factor seemed as the most prominent one. According to (UNDP, 2009), human being seeks to maximize their gains by obtaining the highest possible return for any given resources or to economize using the smallest quantity of resource to obtain certain benefits. Therefore natural land is manipulated by a human agent resulting into different land use pattern. In both study areas, the residential and commercial development is replacing undeveloped land around them. If the current rate of land use change is left

unchecked it will leads to many problems for instance-resource depletion, degradation of the urban environment, unhealthy living condition and risk to multiple hazards.

Loss of traditional heritage

Traditional heritages including cultural, religious and social elements are in deteriorating conditions without any concern. The social bond which used to be strong enough in the past is now lacking due to lack of interaction and co-ordination between the locals and the migrants. Similarly physical elements such as-dhunge dharas and patis including other cultural elements are being neglected by the modern constructions. Importantly, due to rapid urbanization the traditional sustainable way of living pattern are changing in fast pace to adjust in modern style of living.

Environmental degradation

Due to haphazard building construction and inappropriate land use pattern there is growing problems of loss of natural vegetation, open spaces and fertile arable lands. The conversion of natural land into an agricultural and other use has resulted into the fragmentation of landscape which may lead to loss of bio-diversity.

CHAPTER VI RECCOMENDATIONS

6.1 Introduction

This chapter gives some possible planning interventions to regulate the haphazard growth of the fringe area in Kathmandu valley. It has two sections- first section presents some specific recommendations with respect to two case study areas and second section presents general recommendation with respect to Kathmandu valley. The general recommendations are provided with regards to Kathmandu valley as a whole since growth management at city scale can guide the local area development plan.

6.2 Specific recommendations

The lesson from the case study areas suggests that the uncontrolled and unplanned growth of fringe area has resulted in lack of proper infrastructure, sub-standard living environment and loss of prime agricultural land. Therefore it calls for the strong *Policy act* or an *Urban growth act* to achieve a sustainable growth of the valley. Some specific recommendations to minimize the haphazard growth of these areas are as follows:

- A guided development of the city is possible only in the presence of land use plan and land use zoning. Although the framework for land use plan and land use zoning is already provided earlier it has never been implemented in both study areas. Therefore these plans should be enforced to regulate the growth of the valley.
- The major node such as- Bhaishipati chowk and Nakhu chowk in Saibu and Basundhara chowk in Dhapasi should be categorised as commercial zone so that all the commercial activities are concentrated in one or two nodal points. It will generate employment opportunities for people around the surrounding VDCs such as- Bungamati, Khokana and Tokha Saraswoti and reduce number of trips to Kathmandu Metropolitan city and Lalitpur Sub-metropolitan city.
- On the either side of primary roads mixed residential zoning should be emphasized with certain set back for probable future extension of the road. The existing industrial areas should be located away from the residential area to reduce pollution. River flowing along the study areas should be kept away from the encroachment by

categorizing the river set back as ecologically sensitive area so that any kind of development is prohibited in these areas.

- Dhapasi area is environmentally sensitive area as it consists of water recharge zones. Therefore location of these zones should be identified and development activities should be prohibited in those areas.
- Private developers should have provision of land development permit before starting any development projects. This will help to safeguard against the present malpractices and regulate the haphazard land transactions.
- Public spaces which are present in both study areas should be maintained and develop as community spaces or public open spaces for recreational activities. This will help to promote social interaction and reduce encroachment problem.

6.3 General recommendations

The existing development pattern of the case study areas is not only the problem of Lalitpur and Kathmandu district but the whole Kathmandu valley is facing the problem of haphazard fringe development. Therefore if it calls for strong policy response and urban growth acts to achieve planned future development. Following sub-sections provides some general recommendations for sustainable growth of urban fringes in Kathmandu valley.

6.3.1 Land use and land development plan

- Kathmandu valley lies in the seismic prone zone. Therefore, a risk sensitive land use plan should be prepared to minimize the seismic vulnerability of the region. It can be done by providing enough open spaces in the form of small or big parks in the fringe areas which may be used for humanitarian purpose during disaster. Furthermore, the disaster prone areas should have special building codes and the existing byelaws should be updated on the basis of risk sensitive land use plan.
- As per international context, urban growth management through strong controlling mechanism such as *green-belt* or *urban growth boundary* may not be possible in our context. However if there is strong political commitment, UGB in combination with

urban service area can play an important role to control urban sprawl of the valley. It may sound absurd but it can be a promising way of controlling haphazard growth of the valley. The pre-requisite for this technique is to delineate the UGB and develop co-operative planning, zoning, infrastructure and other mechanisms to guide development. Comprehensive zoning can be a particularly strong tool for the creation of UGB in the region. The zoning ordinance must limit development in areas lying beyond the UGB. This may be done by enacting restrictive agricultural or conservation zoning to prevent major development beyond the boundary in combination with techniques to attract the growth to appropriate areas and prohibiting public services and other infrastructures beyond the boundary. It means local bodies must plan and provide the services within the coordinated and established regional framework of UGB.

- Using GIS (Geographic Information System) and Remote Sensing technologies can provide computer aided tools for mapping, monitoring, and analyzing urban dynamics to incorporate the acquired information for the urban growth management purposes in Kathmandu valley. A comprehensive study on urban growth trend of Kathmandu valley and its driving factors should be done with the help of these techniques. It will help the urban planner and decision makers to get an idea of magnitude, direction and spatial location of urban growth and their possible causes. Moreover, it will help to make a possible intervention to manage the growth by establishing effective land management technique.

6.3.2 Infrastructure development plan

- From the findings of the study, the major problem of the fringe area settlement is the deficiency of infrastructure services and their maintenance. Therefore preparing local area plan and evaluating the problems with priority basis, the infrastructure should be provided. Moreover, there should be a regular maintenance of these services for achieving better environmental and liveable city. The valley can regain its old reputation of nature's paradise if the local authority provide an emphasis more on road maintenance, environmental awareness, vehicles testing, traffic management, water quality, solid waste management, waste water treatment, etc. If these strategies are followed, the valley may become a clean, green and healthy city in upcoming years.

- Create different specification for sizing of the roads, schools and other infrastructure. This will help to provide services in orderly and economic manner and also maximize the efficiency of services. It will also control misuse of building for other purposes other than specified in building permit for instance- the development of hospital or school building on a residential building.
- The environmental sensitive areas such as- forest, river, prime agricultural area and location and extent of deep aquifers² should be taken as restricted areas for urban development and should be kept away from encroachment and from pollution. Such areas should be explored and should be used for ecological development of the fringe area.
- Water supply system may not be adequate for the rapid growth of population. Therefore efficient water supply system must be planned and managed.
- In newly developed residential zone, the provision of Guided Land Development (GLD) and land pooling can be a best way to stop haphazard growth along the road networks. But these tools should be implemented in co-ordination with land use zoning and other regional frameworks of urban growth management.

6.3.3 Policies and Strategies

- The haphazard growth of the valley fringe area must be solved politically and also by developing the strategies of plans. If the problems are not solved, then the Kathmandu valley will become a Valley of nightmare in the environment sense. Therefore local authorities should take an adequate effort in enforcing the exiting by-laws and regulations. Strong monitoring system is necessary for the proper development of the fringe area.
- Urban-rural boundary or UGB should be clearly demarcated and the statutory authority for the urban growth management inside and outside the boundary should

² Aquifer is an underground layer of unconsolidated rock or soil that is saturated with usable amounts of water.

be set-up under the municipalities to monitor the unauthorized development and violations of development plans both inside and outside the boundary.

- Planned housing development projects should be launched in the urban fringe areas at large scale which shall be harmonious to the built-environment of the locality.
- The existing land use plans and policies should be revisited again and analyze the reasons of their failure so that they can be improved and updated accordingly.
- There is lack of urban design vision in urban development process of the fringe area, therefore, there should be a centralized institution to carry out urban design guidelines which will also coordinate with private sector and government agencies to bring various profession together.

CHAPTER VII CONCLUSIONS

7.1 Introduction

This chapter presents the conclusive remarks of the whole research body on the basis of findings that were achieved in Chapter V. It discusses some key findings and concludes the research by answering each research questions.

7.2 Conclusions

From the findings it can be concluded that the huge amount of prime agricultural land has been lost mainly due to unplanned and unregulated growth of the urban fringe area. Therefore in order control this type of growth, government bodies have to take sincere initiatives in order to improve the existing practices. Existing plans and policies has to be revisit again and understand the reason behind their failure to control the growth.

To achieve the general understanding of physical characteristics of urban fringe and its development pattern, three supporting research questions were set. The following sub sections draw the conclusion over the findings of this study in order to address the research questions to achieve the respective objectives.

7.2.1 Research question 1

What are the physical characteristics of emerging urban fringe development?

Findings from this research indicate that the urban growth in both study areas is occurring as diffusion growth extending from already built up areas in an infilled and expansion manner which suggest that the future growth of the city may occur in area adjacent to already urbanised areas, thereby mitigating sprawl development. It is found that the land conversion mainly took place in the form of agricultural land and vacant land converted to the built-up. Mainly, the areas which are closer to municipal boundary such as Dhapasi are in the process of being turned into the urban because their physical set up has greatly adapted to urban area itself. Moreover, most of the growth is clustered in areas where there is the presence of road networks and existing built-up peripheries indicating that the growth of Kathmandu valley is profoundly directed by accessibility and connectivity.

Distance from city centre and inner ring road also influences the spatial location of fringe area settlements. The amount of built-up area clustered around city centre and ring road is significantly higher which indicates proxy variable plays a major role for the rapid urbanization of the fringe area as city centre is the central hub of business, commerce and administrative centres while ring road connects the major parts of the city.

Both fringe areas are characterised by higher level of urbanization, change in livelihood, changing demand for infrastructure and higher proportion of migrants. The increasing number of housing units, rental units and other social services in the VDCs are the indication of these changes which plays a vital role in development processes. But because of unorganized development, the VDCs are facing the problem of unsustainable nature of growth.

7.2.2 Research question 2

Why does the urban fringe development taking place in haphazard manner?

The findings of the study reveal that the high population influx coupled with centralization of socio-economic and political activities and the hope of employment opportunity and better life has pulled the people towards Kathmandu valley which significantly contributed its growth. Moreover, lack of administrative control, poor coordination of ministerial initiatives and unregulated land transaction are the major influential factor for the emerging unplanned fringe area growth. Both urban fringes have been without rightful representative bodies. Because of this, there is lack of administrative control over development of the fringe areas which results into unplanned urban growth. Moreover lack of proper policy for land use development and lack of strategies to control the present growth has a significant influence on this type of scattered development in urban fringe.

More specifically, Dhapasi VDC is growing comparatively faster than Saibu VDC in an irregular manner mainly because of the proxy variables related to transport i.e. ring road, central bus park and central business district in KMC. Similarly, this VDC has a significant natural water reservoir from where large proportion of water can be used for drinking purposes. As the valley has been suffering from a shortage of drinking water since a long time, this type of location becomes a pulling factor for the new settlers. Therefore the presence of potential water recharge zone is another important factor of the rapid urbanization of Dhapasi VDC.

7.2.3 Research question 3

How could the urban fringe be developed in planned way?

It is found that agricultural land has been converted into residential land at a rapid rate. Therefore an appropriate housing program should aim to safeguard prime agricultural land and shift construction to less fertile areas. For this, the local government should adopt and enforce the improved standards for new development in order to reduce the over exploitation of prime agricultural land. With particular regard to Kathmandu Valley, the government should:

- Revisit and enforce its long term concept designed in 2002.
- Formulate an urban land use management policy, with land categorization for different purposes.
- Develop land zoning, particularly for the zoning of agricultural land.
- Take measures and plan for environmental conservation.
- Formulate urban growth management policy through strong controlling mechanism such as UGB.

The deficiency of infrastructure services and their maintenance are the major problem of study areas. Therefore local area plan should be prepared on the basis of evaluation and prioritization of the problem. The local authority should provide an emphasis more on road maintenance, environmental awareness, traffic management, water quality, solid waste management, waste water treatment, etc to achieve clean, green and healthy city in upcoming years.

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DEVELOPMENT PATTERNS OF URBAN FRINGE IN KATHMANDU VALLEY

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ANNEX

I. Relationship between socio-economic variables

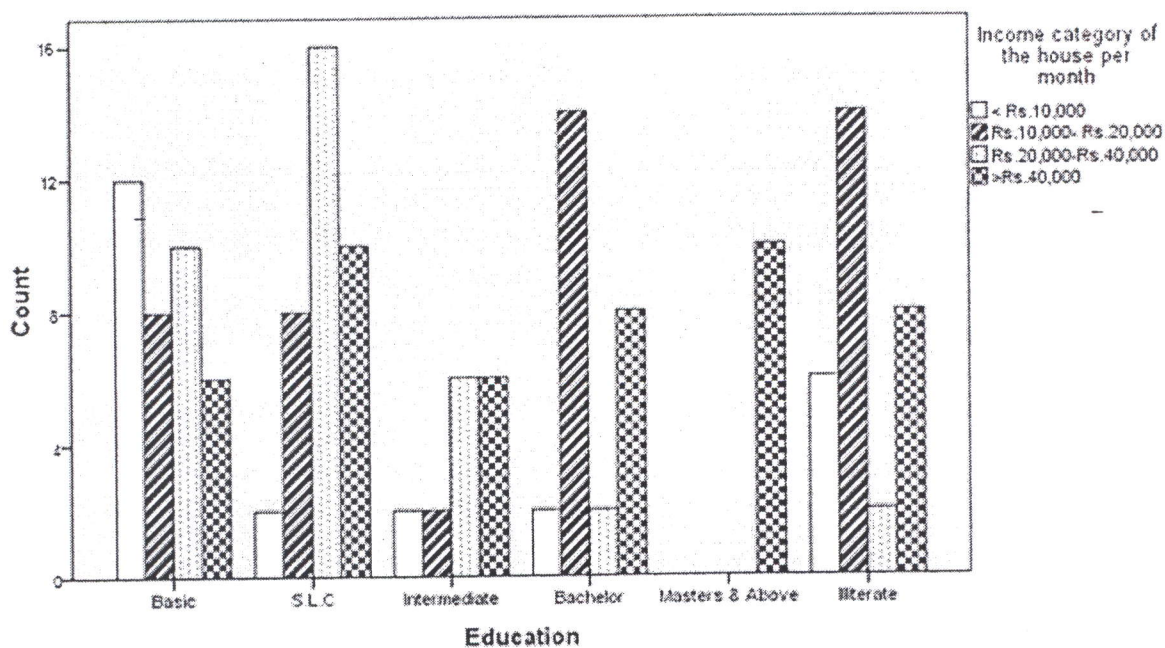


Figure 25 Education level vs. Income level in Saibu

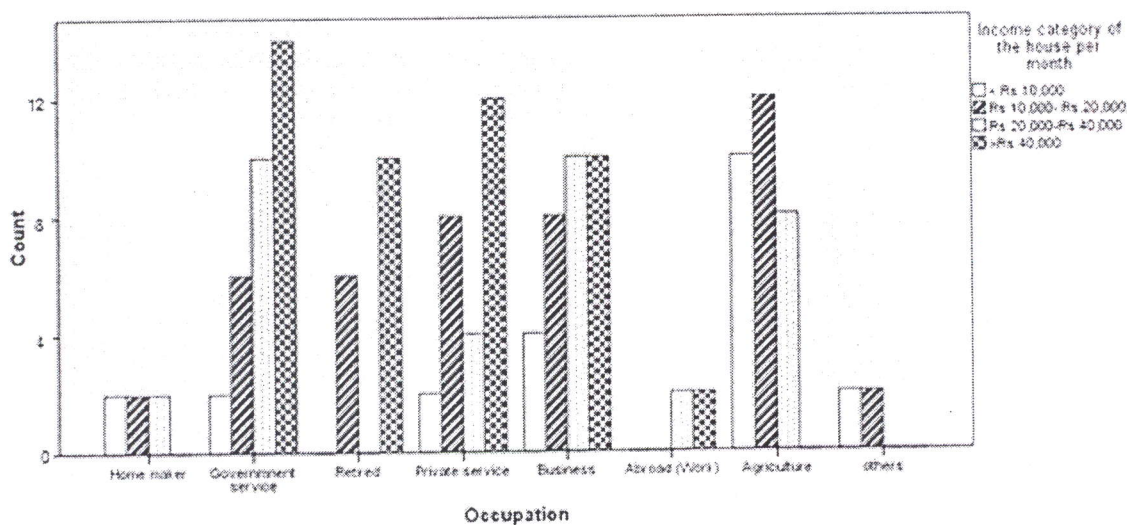


Figure 26 Occupation vs. Income level in Saibu

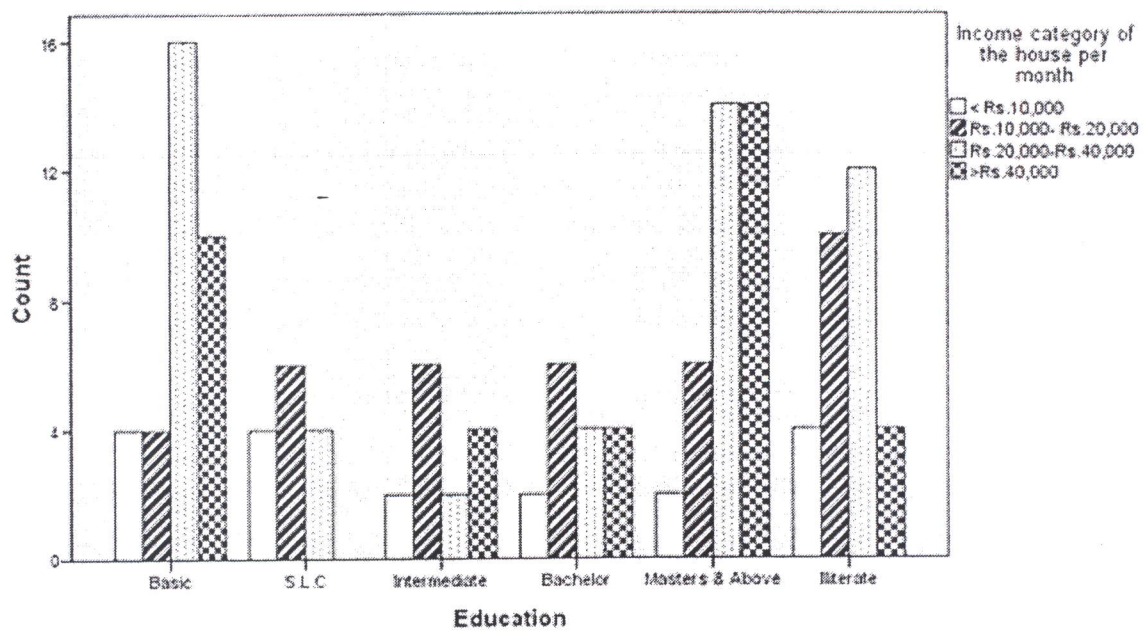


Figure 27 Education level vs. Income level in Dhapasi

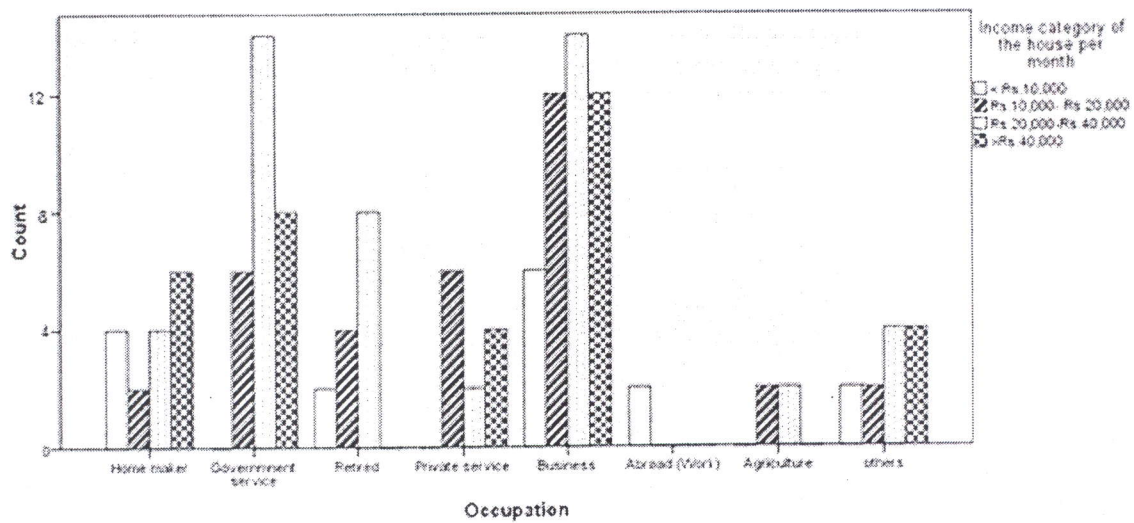


Figure 28 Occupation vs. Income level in Dhapasi

II. Advertisement for selling developed plots in Saibu

नव वर्ष २०७० सालको शुभकामना सहित सैबु भैसेपाटी स्थित गोकुल आवासमा सुबिधायुक्त सस्तो घडेरी खासिदमा विशेष छुट !!!

सिमीत घडेरी मात्र बाँकी रहेकोले पूर्व निर्धारित मूल्यलाई समेत घटाइएको ।
(सिमीत अवधिको लागी मात्र)



सडक कालोपत्रे गर्ने कार्य भइरहेको



**गन्धर्व पनि खुल्ना रहने छ !
घाहुरको चाहना अनुसार
३ आना भन्दा माथिका घडेरी
तुरन्त पाउन गर्न सकिने ।**

भरुपम एकान्तकुनाबाट मात्र २.५ कि.मि. दक्षिणमा अवस्थित ।

घडेरीका विशेषताहरू

- नगर विकासबाट स्विकृत प्राप्त आवसीय घडेरीहरू ।
- नगर विकासको मापदण्ड अनुसार २३ फिट, १८ फिट, १६ फिट र १३ फिटका बाटोहरू मोहडा २८ फिट देखि ३६ फिट सम्म रहेको ।
- सबै प्लटहरू घर निर्माणका दृष्टिले उपयुक्त ।
- वास्तुशास्त्र अनुसार घडेरी तयार पारिएको ।

पुरा भैसकेका कार्यहरू

- टिन बोरिङ गरी पानी निकाल्ने कार्य ।
- खानिपानीका पाइपहरू सबै प्लटहरूमा बिच्छ्याई सकिएको ।
- विजुकीका पोल्हरू सबै प्लटहरूमा गाड्ने कार्य ।

हाल भइरहेका कार्यहरू

- आवास भित्रका बाटोहरूमा धमाधम कामोपशे गर्ने कार्य ।
- आवास भित्र छिन्न रुम्मा घर निर्माण कार्य ।



Gokul Awas co. Pvt. Ltd.
Sainbu, Bhaisepati, Lalitpur
Tel : 5590765 Mob.: 9841851895, 9803841542

भैसेपाटी स्थित
रेडियो नेपाल टावरबाट
मात्र १ मिनेट पूर्व नुर्फ

III. Questionnaire for Field work

Pulchowk Campus
Department of Architecture and Urban
planning
Msc Urban Planning and Management
Household Survey Sheet

Date :

	House no.	<input style="width: 100%;" type="text"/>		
Q. 1.1	Location	<input style="width: 100%;" type="text"/>		
Q. 1.2	Street	<input style="width: 100%;" type="text"/>		
Q. 2	Family Details			
Q. 2.1	Name of the family head:	<input style="width: 100%;" type="text"/>		
Q. 2.2	Birth Year	<input style="width: 100%;" type="text"/>		
Q. 2.3	Gender	<input style="width: 100%;" type="text"/>	1. Male	2. Female
Q. 2.4	Education	<input style="width: 100%;" type="text"/>	1. Basic	2. S.L.C.
			4. Bachelor	5. Masters & above
				3. Intermediate
				6. Illiterate
Q. 2.5	Occupation	<input style="width: 100%;" type="text"/>	1. Home Maker	2. Government Service
			4. Private Service	5. Business
			7. Abroad (Study)	8. Abroad (Work)
			10. Others	3. Retired
				6. Unemployed
				9. Agriculture
Q. 3	Caste	<input style="width: 100%;" type="text"/>	1. Newar	2. Brahmin
			4. Madhesi	5. Gurung/Tamang
				3. Chettri
				6. Others
Q. 4	Religion	<input style="width: 100%;" type="text"/>	1. Hindu	2. Christian
			4. Buddhist	5. Others
Q. 5.1	Family Type	<input style="width: 100%;" type="text"/>	1. Nuclear	2. Joint
Q. 5.2	Family Size	<input style="width: 100%;" type="text"/>		
Q. 7	Migration information			
Q. 7.1	Place of Origin	<input style="width: 100%;" type="text"/>	1. Inside valley	2. Outside valley
			a. City centre	a. City centre
			b. Rural area	b. Rural area
Q. 7.2	Name of the Place from where Migrated	<input style="width: 100%;" type="text"/>		
Q. 7.3	Reason for Migration	<input style="width: 100%;" type="text"/>	1. Job & opportunity	2. Cheaper land price
			4. Political freedom	5. Hope for a new life
				3. Education
				6. Others
Q. 7.4	Duration of stay in current place	<input style="width: 100%;" type="text"/>		
Q. 8	Land and building information			
Q. 8.1	Land Area	<input style="width: 100%;" type="text"/>	Anna	
Q. 8.2	Plinth Area	<input style="width: 100%;" type="text"/>	Anna	

Q. 8.3	No. of storey	<input type="text"/>	1. 1 4. 4	2. 2 5.. More than 4	3. 3
Q. 8.4	Type of Building	<input type="text"/>	1. Load Bearing	2. Frame Structure	
Q. 8.5	Year of construction	<input type="text"/>			
Q. 8.6	House on Rent	<input type="text"/>	1. Yes	2. No	
Q. 8.7	If Yes, number of Tenants	<input type="text"/> Family			
Q.8.8	Aware of building permit?	<input type="text"/>	1. Yes	2. No	-
Q.8.9	Have you taken building permit?	<input type="text"/>	1. Yes	2. No	
Q.8.10	If not, why?	<input type="text"/>			
Q. 9	Infrastructure and Services:				
Q. 9.1.1	Access Road Type	<input type="text"/>	1. Blacktopped 4. Brick Paved	2. Stone Paved 5. Earthen	3. Gravel 6. P.c.c
Q. 9.1.2	Road Width:	<input type="text"/> meters			
Q. 9.1.3	Travel time to workplace	<input type="text"/> minutes			
Q. 9.1.4	Travel time to market place	<input type="text"/> minutes			
Q. 9.2.1	Water Supply	<input type="text"/>	1. Public supply 4. Tanker	2. Well 5. Others	3. Rain Water H
	Sewer System				
Q. 9.3.1	Sewerage System:	<input type="text"/>	1. Septic Tank	2. Direct Connection	3. Others
	Solid Waste disposal				
Q. 9.3.2	Mode of disposal:	<input type="text"/>	1. House collection	2. Container	3. Within compound
Q. 9.3.3	If house collection	<input type="text"/>	1. Private	2. Public	3. Others
	Other Services				
Q. 9.4	Electricity:	<input type="text"/>	1. Single Phase	2. Three Phase	3. Both
Q. 9.5	Socio-economic Data:				
Q. 9.5.1	Major source of income	<input type="text"/>	1. Service 4. Agriculture	2. Business 5. Others	3. Rent
Q. 9.5.2	Income category of the house per month	<input type="text"/>	1. Below 10,000 3. 20,000-40,000	2. 10,000-20,000 4. More than 40,000	
Q. 9.4.1	Vehicle:	<input type="text"/>	1. Yes	2. No	
Q. 9.4.2	If yes, How many?	<input type="text"/>	1. Two Wheeler		

2. Four Wheeler

Q. 10 Culture

Q. 10.1 Guthi

1. Yes

2. No

Q. 10.2 Any special Jatra
Name of the Jatra

1. Yes

2. No

Q. 11 Main Problems:
Specify major problem
if any

Q. 12 Any suggestion for the
betterment of VDC

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Msc Urban Planning and Management
Questionnaire for Private developers

1. What is the main cause for developing land in fringe area?

- a. Cheaper land value
- b. Accessibility
- c. Topography (slope, soil, etc.)
- d. Easy for acquiring land
- e. No option to acquire land in city core area.

2. What is the general response from the local people?

- a. Positive
- b. Negative

3. What is the general comment from buyers?

- a. Expensive
- b. Improper location
- c. Cheaper to get property than in city core area.

4. Have you considered land use planning or zoning regulation in the developing plots? If no why?

5. What do you think about the effects of this development afterwards?

6. Have you taken the planning permit from KVDA?

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Questionnaire for experts

1. What are the main factors of urban growth in fringe area?

2. Are there any planning provisions for managing haphazard growth in the fringe area?

3. In your opinion how can the growth of fringe be managed for sustainable future urban growth?

4. What is the major problem in fringe in term of planning?

5. What do you expect from local government?