

# Chapter 1 Introduction

## Background

Nepal has undergone rapid urbanisation in the last two decades with the urban population growing at an average rate of 6.5% per annum – the highest growth rate in South Asia (UNEP 2001). About 15% of the country's population now lives in towns. As a result of this rapid urban growth, the Government of Nepal created an additional 22 municipalities in 1997 in accordance with the Municipality Act 1983. Although many smaller municipalities continue to be settlements with rural characteristics, urbanisation in Nepal is often characterised by unplanned and haphazard growth. This situation has resulted in a lack of basic infrastructure such as quality roads, sanitation, and drinking water. In addition, this unplanned growth can cause environmental problems such as air and water pollution, public space and riverbank encroachment, and unmanaged solid waste disposal. Unless timely development interventions are made, many municipalities are destined to grow into large, crowded cities with poor quality of life for the inhabitants who will be faced with inadequate infrastructure and amenities.

In accordance with the decentralisation policy of Nepal, the Local Self-Governance Act 1999 gives municipalities complete responsibility for local-level planning and decision-making. Planning and management of resources and infrastructure at the local level need to be based on accurate and up-to-date information and to use modern techniques that enable complex analysis and assessment. Geographic information systems (GIS) are increasingly being seen as versatile tools in urban applications and decision support systems. The study presented here demonstrates how GIS can help in integrating and analysing various types of information that are important for municipal-level planning. Kirtipur Municipality, which is close to Nepal's two largest municipalities of Kathmandu and Lalitpur and has all the characteristics of rapid and haphazard growth, was chosen as an example for the study (Maps 1-3).

Municipal applications need databases at a large scale for micro-level planning. In this study an attempt was made to compile and develop basic data layers at a scale of up to 1:2000 using aerial photographs, digital data, and high-resolution satellite images. Data on social infrastructure were collected from primary and secondary sources and verified in the field to obtain a picture of the development scenario. The study also looked at changes in the municipality over the last 10 years based on a time-series database. Close consultations were held with Kirtipur Municipality at various stages of this study to obtain their inputs and ensure that their views were reflected. Some municipality staff members were also trained in GIS techniques and helped carry out the field verification. Besides presenting the development scenario of the municipality, it is hoped that the databases generated will make an important contribution to initiating the development of a spatial data infrastructure for the municipality.

## Overview of Kirtipur

Kirtipur is an old settlement situated on a double hillock in the southwest of the Kathmandu Valley (Figure 1); it is one of five municipalities in the Valley. It is located at 27° 38' 37" to 27° 41' 36" N and 85° 14' 64" to 85° 18' 00" E, and at present has 19 wards and covers 1787 ha. It is bordered by the Bagmati river to the east, Machhengaun Village Development Committee (VDC) to the west, Kathmandu Metropolitan City (KMC) to the north, and Chainakhel VDC to the south.



**Figure 1: Kirtipur – a hillock covered with houses**

Kirtipur was established in the twelfth century as an outpost of Patan. It later became an independent kingdom for a short period. The town was built initially within a wall surrounded strategically by dense vegetation and then open ground as outer rings. Until 1950, the settlement was confined within the outer wall built during the Malla period (1168–1768 A.D.) (Manandhar and Shrestha 1990). Kirtipur was identified as a 'town' or urban locality in the 1952/54 and 1961 censuses of Nepal. It was declassified as a town in the 1971

census when the criteria for designating urban localities were changed. Kirtipur Municipality was formed in 1997 by combining eight VDCs, namely Palifal, Layaku, Bahirigaun, Chithubihar, Champa Devi, Bishnudevi, Balkumari, and Chobhar. The total population of these VDCs in the 1991 census was 31,338. The 2001 census gives a total population of 40,835 in 9487 households, equivalent to an overall average population density in the municipality of 2.3 persons per hectare.

The ancient layout of open and built-up areas on the hilltop has survived with little change in recent years, most expansion has been concentrated at the southern base of the hill (Figure 1). The establishment in Kirtipur of the Tribhuvan University campus, and the proximity of the municipality to the Ring Road, has made the area attractive as residential land for the people of Kathmandu. This has brought about significant changes in land-use patterns and the occupational structure of the municipality in recent years.

## Development trends

Being a new municipality with a comparatively low population density, the problems of unplanned growth are not yet severe; however, they are beginning to appear. A study conducted by the Kirtipur Environmental Mapping Project (conducted by the National Society for Earthquake Technology (NSET) with the support of the USAID Urban Environment Programme in 2000) identified solid-waste management, river water pollution, and air pollution as growing problems (NSET 2000) (Figure 2). The report noted dumping of solid waste in and around settlement areas, historical ponds, and heritage sites; direct discharge of sewage and untreated industrial waste into surface water drainage systems; air pollution resulting from industries and unpaved roads, among others; poor maintenance of temples, shrines and historical structures; and inadequate financial resources and technical manpower to deal with the environmental problems.

Services such as solid-waste management, drinking-water supply, and roads need the immediate attention of planners. Despite having panoramic views of Kathmandu valley and the mountains beyond, this historic and culturally significant town has not been able to promote itself as a quality tourist destination. Instead, with its poor infrastructure and preponderance of low-income families in the core area, it is seen by tourists as an example of



**Figure 2: Waste dumped in a pond**

picturesque poverty. It is imperative that the development activities of the municipality are managed and coordinated before the situation becomes worse.

## Rationale and objectives of the study

GIS technologies are capable of handling large volumes of data from multiple sources, integrating them to produce information in a spatial context in the form of maps, and modelling the impact of management decisions. Thus GIS can be an extremely useful tool for municipal planning and decision-making that involves analysis of needs assessment and resource allocation. In most parts of Nepal, however, municipalities do not yet have the resources to start using GIS technology, and in many cases are not aware of how powerful a tool it can be to support and facilitate planning and decision-making at the municipal level.

ICIMOD has a long experience of introducing GIS approaches in the HKH region in general, and Nepal in particular, including applications development in many different fields and hands on training. Over the years, ICIMOD has concentrated on, and developed training materials for, application of GIS to improve planning of basic infrastructure and location of facilities in mountain towns (see, for example, Shrestha et al. 2001). A series of training events have been held for relevant organisations in the HKH region, including one in urban planning for participants from Nepal. Kirtipur

municipality was used as a case study and model, and field visits were made to the municipality to demonstrate how GIS can be used to support municipal planning processes. Kirtipur was chosen both because of its convenient location close to Kathmandu, which facilitated information exchange and ground-truthing of data, and because it typified the problems faced by growing urban districts across Nepal. In recent years, the Urban Development Through Local Efforts (UDLE) programme, supported by the German Government through the Department of Housing and Urban Development of His Majesty's Government of Nepal (HMGN), has implemented integrated action planning (IAP – see Chapter 2) for physical and environmental planning in a number of municipalities. In the Kirtipur study, we attempted to integrate GIS within the IAP framework as a model case study for potential users.

For new municipalities like Kirtipur, there is an urgent need for rational planning before urban expansion becomes unmanageable, and it is an ideal location to test approaches using GIS.

The specific objectives of the study were:

- to build a comprehensive geographically referenced database of Kirtipur Municipality that will be a building block in the municipal GIS database development process, and
- to demonstrate how GIS can be used in the municipal planning process through application of integrated action planning (IAP) to improve the level of services to the community

With these objectives, the study attempted the following.

- To collect and collate primary and secondary information from various available sources
- To illustrate the design and development of a municipal GIS database, and demonstrate its usefulness for planning activities such as IAP
- To prepare a spatial profile of Kirtipur Municipality, and analyse its urban development trends

IAP has not yet been done in Kirtipur Municipality. It is expected that the results of the study will provide substantial support in terms of information input if and when such an exercise is carried out in the future.