INTRODUCTION

The Department of Urban Development and Housing is the main body for preparing development plans for all urban centres in Bhutan. It has been noticed that in the last few years there has been rapid growth in the main cities of Thimphu and Phuentsholing. To regulate this growth, it was crucial for the Department to come up with appropriate mechanisms of improved legal frameworks for Urban Land Administration, Environmental management and Development Planning.

To meet these shortcomings the project “Strengthening Capacities for Urban Management and Human Settlement Sector Planning” was formulated. The Components of this project consisted of:

1. Town planning
2. A computerized Urban Land Registration System
3. Geographic Information System
4. Municipal Finance Management
5. Legislation on:
   - Municipal Act
   - Urban Land Registration Act
   - Town and Country Planning act

The Urban GIS Unit was initially set up to assist in the plan preparation of the two cities. It was only after the establishment of this unit, the need for indispensable input of this information system was realized for further planning and decision-making process in the department. It was then decided that the system be first setup in Thimphu as the Pilot area of Study before expanding into Phuentsholing and others developing urban centres in Bhutan.

WHY GIS?

It has been observed in the past that the capacity and efficiency of infrastructure services provided has not always been fully attained. This was mainly due to the non-availability of spatial and non-spatial data during project preparation to foresee or project the direction and magnitude of future growth.

GIS has been identified as the appropriate instrument, which has the flexibility and ability to model according to the changing trends.
AIMS AND OBJECTIVES

GIS being identified as a vital instrument for effective planning and management across the different sub-sectors within the Department, it was necessary to identify the aims and objectives to give it proper direction towards a complete setup. These were identified as:

- Integrated Information Technology Setup: GIS/LIS/MIS
- Up-to-date Datasets
- A Concrete information Base
- Centralized Data Storage
- Setting Urban Standards in line with the Rural Standards
- Introduce GIS Concepts, Methods and Processes.

CURRENT ACTIVITIES

To meet the aims and objectives and to achieve the full fledged setup of the unit the current activities pertaining to that consists of:

- Ground Truthing Exercises
- Generation of GIS Datasets and Maps
- Development of Topographic Data Dictionary
- Data re-engineering
- Integrated Cadastral & Field Survey with GIS Database
- Assisting in Local Area Plan Preparations
- Assisting in Infrastructure Network Service Projects

These activities are not an end to themselves but a continuous process evolving to the change in environment for achieving an efficient, co-operative and a systematic development guide.

Ground Truthing Exercises

Ground truthing was carried out as soon as the vector datasets arrived from the company generating them. These field verifications were done using Total Stations taking pocket areas evenly spread out throughout Thimphu.

Generation of GIS Datasets and Maps

These are generated and provided according to the user specified needs and also incorporate their data if available.

Development of Topographic Data Dictionary

The Topographic Data dictionary was developed to ease the data sharing. This will not only act as a common language between the different agencies but also act as an inventory of the data available with support information of the accuracy, source and the updation status of the information.

Data Re-Engineering

The information was re-engineered according to the Data Dictionary. This ensures the consistency of the information available.
Integration of Cadastral & Field Survey with GIS Database

The Urban GIS Unit is in the process of Updating Data through interaction with the various other Divisions and the Thimphu City Corporation. Integration is currently achieved through a convoluted and time-consuming process. The data flow Diagram below gives a brief perspective of the Integration:

There are four major components of a DFD:

- **Process nodes** showing part of system that transforms inputs into outputs. The process is shown graphically as a circle and is labeled with abstract of what a process does.
- **Terminators** showing external entities with which the system communicates. It is graphically shown as a rectangle and is labeled with name of the external entity.
- **Data flows** showing movement of information from one part of the system to another. Graphically a flow is shown as arrows with direction into or out of a process.
- **Data stores** showing collection of data packets at rest. Graphically a data store is shown as two parallel lines.
Local Area Plan Preparation

These are plans made for areas with potential for additional absorption of development density which are identified in and around Thimphu to achieve target densities. During the plan preparation, the role of GIS is:

- identify these areas
- identify trend of growth
- indication of how much land area is involved
- Physical constraints due to land use, slope and infrastructure availability etc.

Local Area Plan for Phendey Lam Area
Infrastructure Network Services Projects

Areas where service facilities are inadequate or unavailable are identified after which projects are formulated and prioritized for further improvement or extension.

Area identification for extension of Sewerage Network
CONCLUSION

GIS being involved in so many planning activities, the future prospect of GIS in the Department is to integrate it into a broader scale as shown below:

To channelize the information flow, the department has made a proposal of linking all the divisions with a network for which the Urban GIS will be the centre to cater information to all divisions. The nodal points responsible for information updation at each end will be identified depending on the accuracy of data stored.