CHAPTER 1

INTRODUCTION

1.1 GENERAL

Landslide is a geological event which is defined as the mass movement of rock, debris or earth down a slope and has come to include a broad range of motions whereby falling, sliding and flowing under the influence of gravity dislodges earth material (Cruden 1991). It is defined as the movement of a mass of rock debris, or earth down the slopes and encompasses events such as ground movement, rock falls, and failures of slopes, topples, slides, spreads, and flows such as debris flows, mudflows or mudslides (Varnes 1978). It often takes place in conjunction with earthquakes, floods and volcanic eruption. In the hilly terrain of India including the Himalayas, landslides have been a major and widely spread natural disaster that often strikes life and property. Slope instability is a geodynamic process that naturally shapes up the geomorphology of the earth. However they are a major concern when those unstable slopes would have an effect on the safety of people and property (Glade et al 2005).

1.2 NEED FOR THE PRESENT STUDY

Landslide is an important natural hazard the world is facing now. It occurs as a result of both man-made as well as natural factors. It causes severe effects on the environment as well as for the mankind. The main triggering factors of landslides are rainfall, tectonic activities and human activities. Landslides are frequent phenomena in the Nilgiri district of Tamil Nadu,
India. It is particularly more frequent in and around Kateri watershed. The unprecedented rains caused more than a hundred landslides within an area of 250 km² in 1978 and in 1979. This incidence of landslide was on a much larger scale and nearly two hundred landslides were recorded in the Nilgiris district. In recent past, major landslide events affecting natural slopes were recorded in 1978, 1979, 1987, 1993, 1996, 2006, and 2009. These events resulted in numerous casualties and loss to properties in the Nilgiri hills (Seshagiri et al 1982, Balachandran et al 1996). In 1993, a debris slide at Marapallam killed more than 50 people, and destroyed 18 houses and one mosque (Balachandran et al 1996). In 2009, rainfall triggered more than 300 landslides in the Nilgiri area, which affected both cut and natural slopes and resulted in 80 casualties and an estimated loss of US$ 6.5 million (Ganapathy et al 2010). Heavy rains in November, 1979 brought in large scale landslides in the Coonoor sector. The devastation due to landslides is even more severe in the recent past.

In this context, remote sensing and GIS techniques play an important role in the landslide vulnerability zonation mapping. Though many studies were carried out to understand the rainfall, groundwater level, geology, geomorphology, land use and land cover changes in different parts of Nilgiri districts, not many studies were carried out in and around Kateri watershed. The study also focuses on the effectiveness of remote sensing data and engineering properties of soil for landslide susceptibility zonation mapping.

1.3 OBJECTIVES

The present study was carried out with the following objectives:

i) To create geodatabase of the study area Kateri watershed using Geographical Information System (GIS).
ii) To carry out morphometric analysis using remote sensing and GIS techniques.

iii) To perform land use / land cover change detection analysis.

iv) To determine the engineering properties of soil

v) To delineate landslide vulnerable zones using remote sensing and GIS

1.4 STRUCTURE OF THE THESIS

The thesis is constituted by nine chapters as follows:

Chapter 1 deals with the need and objectives of the study. The review of literature related to morphometric analysis, remote sensing and GIS, engineering properties of soils, land use/land cover change detection and landslide vulnerability has been discussed in the chapter 2. The detailed methodology adopted throughout the study in achieving the framed objectives has been dealt in chapter 3. The highlights of the study area with climate and rainfall, drainage, geology, geomorphology, slope and soil have been discussed in chapter 4. Morphometric analysis of the watersheds has been carried out in chapter 5 using remote sensing and GIS techniques. Chapter 6 involves land use / land cover change detection analysis. Satellite imageries of 1999 and 2012 have been used to compare the variation in the land use / land cover pattern in the watersheds. Chapter 7 brings out the engineering properties of soil in the study area such as liquid limit, plastic limit, compressive and shear strength. Chapter 8 deals with the mapping of landslide vulnerability zones by integrating various thematic layers and attribute data by assigning ranks and weightages. Finally, chapter 9 highlights the summary and conclusion of the study.