PREFACE

Water is the lifeblood of every living creature on the earth. Through the wonders of nature, water can take different forms. Although about 72 percent of the earth's surface is covered with water, the fresh water including groundwater occupies a small portion of it. It is easy to understand the significance of water in our lives however; it is difficult to understand the characteristics and movement of water within the earth's surface - the groundwater.

In India, more than 90% of rural and nearly 30% of urban population depends on groundwater for meeting their drinking and domestic requirements. In addition, it accounts for nearly 60% of the irrigation potential created in the country. The spatio-temporal variation in rainfall and regional/local differences in geology and geomorphology has led to an uneven distribution of groundwater in different regions across the country. So an attempt has been made to develop a scientific database on the Muvattupuzha river basin, Kerala, spreading over an area of 1488 km² (latitudes, 9° 40' - 10° 10' N and longitudes, 76° 20' - 77° 00' E).

The present investigation deals with the hydrogeological characteristics of the Muvattupuzha river basin. Geologically this basin is characterised by Precambrian crystalline rocks overlain by laterites. Groundwater occurs under water table conditions in laterites and semi-confined to confined conditions in fractured crystalline rocks. In weathered crystallines, the depth and intensity of weathering controls the occurrence and movement of groundwater. But in hard crystallines with negligible weathering and
lateritisation, the presence of lineaments and joints are the controlling factors. The lateritic clay materials also reduce hydraulic conductivity to some extent in this basin. The occurrence of dykes and veins in the area may at times acts as barriers to groundwater movement. Studies relating to hydrogeology, hydrometeorology, hydrochemistry, geophysics and remote sensing are essential for a scientific management and sustainable development of groundwater resources.

Muvattupuzha river basin experiences serious water shortage during April and May every year. Except a preliminary study by the Muvattupuzha Valley Irrigation Project (MVIP) and Central Ground Water Board (CGWB) in the eighties, no serious attempt has been made to study the behaviour of groundwater characteristics, aquifer parameters, groundwater chemistry, demarcation of potential groundwater zones etc. Hence the groundwater of the Muvattupuzha river basin has been studied by conventional survey (hydrological characteristics, geophysical analysis and groundwater chemistry) and remote sensing techniques. Geographic information system, being the best tool to create scientific groundwater database, has also been employed.

The thesis has been addressed in 7 chapters with further subdivisions. The first chapter is introductory, stating the necessity of an integrated study and drawing it from a careful review of literature relevant to the present study. It also provides a description about the study area, geology, drainage, physiography, climate and landuse. It also contains the major objectives of the present study.
Chapter 2 deals with the methodology adopted in this work. The collection of groundwater samples, processing techniques, various laboratory methods adopted in the analysis of water samples, pumping test analysis, resistivity data analysis, satellite data collection, image processing techniques and Geographic Information System are presented in detail.

The hydrogeology of the basin is discussed in chapter 3. The systematic description of water level study, water fluctuation study, pumping tests etc. and their results are covered in this chapter.

Chapter 4 deals with the hydrogeophysical characteristics based on resistivity analysis. The layer parameters and probable phreatic potential zone are identified.

Chapter 5 examines the groundwater quality of the basin for the pre and post monsoon seasons. The suitability of the groundwater for various purposes like domestic, irrigation and industries are evaluated.

Chapter 6 integrates the remotely sensed data (hydrogeomorphology, lineament, landuse etc.), terrain parameters (slope, drainage etc.) and geophysical data with the help of Geographic Information System to demarcate the groundwater potential zones of the basin. By in putting hydrogeological, geophysical and hydrogeochemical data in GIS a strong database of this basin has been generated.

A summary of the work and the major conclusions drawn thereof are given in Chapter 7.