CHAPTER I

GENERAL INTRODUCTION

The term 'environment' is defined as the factors which influence a receiving object and determine its behaviour. For a particular region, it may be defined as the factors that govern the behaviour of the living and non-living objects of the region. In a broad sense, it is the air, water and soil that make the physical environment of the living bodies.

Various meteorological or climatological parameters are interlinked with the elements of physical environment through various physical and chemical processes. The 'Hydrologic' and the 'Nitrogen' cycles are the best examples of these processes. So, to understand the physical environment of a region, a detailed study of these parameters is essential.

The major climatological or meteorological parameters are precipitation, air temperature, humidity, evaporation, wind velocity and direction, solar radiation, atmospheric pressure, sunshine and cloudiness etc. The study of the variations of these parameters with respect to space and time is important from academic as well as from practical point of view. Abnormal

(1)
... variations in any of these parameters due to natural or man-made causes, may have far reaching effect on the environmental balance.

1. Statement of the Problem

The Brahmaputra Valley is an integral part of the South-East Asiatic Monsoon regime, having a typical climatic personality in comparison to any other part of India. In Köppen's climatic classification, the region belongs to the type 'Cwg' or Humid Mesothermal Gangetic type of climate. But local observations show that the climate of the region varies conspicuously from the normal 'Cwg' climate. The climatic differences between different locations in the valley may be influenced by orography which requires detailed investigation.

Secondly, the valley is famous for agricultural, forest and mineral resources. Since independence (that is, after 1947), due to slow industrialisation and abnormal growth of population, a large scale exploitation of natural resources, change in land use pattern and urbanization etc. are taking place. It is suspected that all these factors might have some impact on the physical environment of the valley, which might be reflected in the variations of climatological (or meteorological) parameters of the region. Any abnormal variations in any of the climatological parameters might produce some
adverse effects on the ecological balance of the region. So, a detailed knowledge about the variations of climatological parameters is necessary for environmental protection, better utilisation of resources and better economic planning for the benefit of the people of this region.

2. Review of Relevant Work

Literature does not show much qualitative as well as quantitative study done on the climatology of the Brahmaputra Valley. Mukherjee and Ghosh (1965) have studied the wind flow pattern in the valley. Sen and Basu (1961), Choudhuri (1961) and Pant et al. (1970) have studied the thunderstorms and rainstorms of the region. Sarmah (1969, 1971, 1973, 1976) has investigated the areal distribution, seasonal variation and trends of rainfall in the valley. Many other workers have also studied the climatology of India as a whole in which North-East India forms a part (Parthasarathy, 1958; Rao and Jagannathan, 1958; Subrahmanyan, 1958; Choudhury et al., 1976; Nathan, 1976; Rao et al., 1972; Parthasarathy and Mooly, 1978).

3. Objectives of the Study

The objectives of this study are -

(1) To study the spatial and temporal variations of the major climatological parameters, such as - rainfall, temperature and wind in the Brahmaputra Valley by
using simple statistics. Major emphasis is given on the study of rainfall.

(ii) To study some features of hourly and daily rainfall.

(iii) To study probable effects of human activities on rainfall and rainfall-earthquake relationship, if there is any, in the valley.

(iv) To study water balance in the valley, since it is related to rainfall and other climatological parameters and having a great bearing on the agriculture of the region.

(v) To find different climatic zones in the valley and classify them.

4. Working Hypothesis of the Study

The study is based on the following hypothesis.

(A) The physiography of the Brahmaputra Valley and its surrounding have great influence on the physical environment of the valley. This should results in -

(1) complex spatial and temporal variations of rainfall, wind flow pattern, temperature field and water balance in the valley; and

(2) variations in the statistical characteristics of the climatological parameters from place to place. This may show the existence of different
types of climate in the valley.

(B) Human activities, such as deforestation, influences rainfall in the valley.

(C) There is some relation between rainfall and earthquake occurrences in the valley.

5. Methods of Investigation

Daily, monthly and annual data series of some of the parameters are subjected to simple statistical analysis. Trends of rainfall and surface air temperature at various locations are found out. Power spectrum analysis is applied to find if there is any periodicity in the series. Both spatial and temporal distributions of pre-monsoon, monsoon and annual rainfall are studied. Persistency of daily rainfall and the durations of dry and wet spells at various locations in the valley are also investigated. First-order Markov Chain model is fitted to the daily rainfall series and its adequacy is discussed for different series.

Water balance at some selected stations in the valley is studied with the help of Thornthwaite's book keeping procedure (Thornthwaite, 1948). In water balance analysis, potential evapotranspiration is calculated out with the help of Penman's equation. Lastly, climatic classification of the valley is made on the basis of moisture index, thermal efficiency index, aridity index and summer concentration. All the
results are presented in tables and diagrams.

Although this thesis is concerned with the study of some climatological parameters of the Brahmaputra Valley only, the computations had to be extended to the Mikir and the North Cachar Hills of the region and beyond, for completeness.

6. Organisation of the Study

The whole study is incorporated into seven chapters. The first chapter gives the introduction of the whole work. In the second chapter, a general description of the Valley is given. This general description includes the river Brahmaputra and the physiography of the valley which may have great influence on the general climatology of the valley. Since wind flow, rainfall and temperature are related to one another, they are arranged in Chapters III, IV and V respectively. Chapter IV also includes the probable effect of human activities on rainfall and also the study of rainfall-earthquake relationship. Water balance computation requires temperature, wind and rainfall data among others. So, it is placed in Chapter VI. General conclusions are given in Chapter VII.