2. PHYSIOGRAPHY

The Aravali hills of Rajasthan are considered to be the oldest Precambrian mountain chain of India. It traverses the State in a NNE-SSW direction almost from end to end dividing Rajasthan into two unequal parts, three-fifths of which constitutes the western Rajasthan occurring to the north-west leaving two-fifths on the south-east constituting the eastern Rajasthan. Physiographically Rajasthan is divided into four regions bearing a close relationship with the geological history of the State, namely, (i) Western desert plains, (ii) Aravali mountain range, (iii) Eastern plains, and (iv) Vindhyan plateau to the south-east.

The Western desert plain is a sandy desert waste of ill-watered unproductive area. The Luni and Sukri rivers form the main drainage of the area and flow in a south-western direction. A large part of western Rajasthan is characterised by its inland drainage and carries some of the largest salt-lakes, viz., Sambhar, Didwana, Kuchaman & Talchhapur.

The Aravali mountain range, composed principally of rocks of the Delhi Supergroup, comprises hill ranges and valleys extending from near Delhi on the north-east to the plains of north Gujarat on the south-west, distance of about 650 km. The highest peak called Guru Sikhar, 1700 m above MSL, is situated on the Mount Abu. The Aravali range partly forms one of the main watersheds of India, which divides drainage to the Bay of Bengal from the Arabian Sea. Ajmer City, lying almost at the centre of the range, is in fact on a tri-junction of the watershed. The watershed passes along the centre of the range from Ajmer to the southwest up to Kumbalgarh, where it swings to the southeast for some distance to pass ultimately through Udaipur City. To
the south of Udaipur City, the drainage of the range is to the south into the Gulf of Cambay through the Jamnagar River. The stream entering from the north and northeast of Udaipur City, flow into the Banas through its tributaries. The Sabi River drains the northern parts and flows ultimately into the Yamuna at Delhi. The Banganga drains the areas lying in Alwar and Jaipur districts, flows through a large part of Bharatpur district, and reaches the Yamuna by indefinite channels.

The Eastern plains to the east of the Aravali range constitute a vast undulating plain country occupied by the pre-Aravali gneisses and schists as well as the phyllites and rocks of Aravali Supergroup. The terrain of the pre-Aravali Banded Gneissic Complex is covered by a thick mantle of alluvium and wind-blown sand.

The Vindhyan plateau in southeastern Rajasthan is an elevated hilly and plateau country constituted by sandstones, shales and limestones forming the western extremity of the main Vindhyan basin. The Vindhyans in this area comprise three plateaux - the Bhandari plateau forming the uppermost group to the northeast, followed by the Rewa plateau surrounding the former to south and west, and the Kaimur plateau encircling the Rewa and Bhandari plateaux. The Deccan Trap plateau further south is continuous with the plateau of Madhya Pradesh. The junction between the Vindhyan plateau and the eastern plains of Rajasthan is marked by the Great Boundary Fault. Vindhyans here are continuous to the north east upto Dholpur marked by number of narrow, disconnected hill ranges, separated from the main Vindhyans in Gwalior by deeply dissected valleys of the Chambal river. The drainage in this part of Rajasthan is generally to the north and northeast. The Beas River which drains the southwestern parts of the Vindhyan plateau runs towards, turns to the north-east and flows parallel to and on the northern side the Great Boundary Fault. Elsewhere in the Vindhyan plateau of south Rajasthan, the rivers and
streams flow in different directions and Join Chambal river which flows in a north-easterly direction parallel to the same fault through Kota city. The Berach River flows into the Banas, which joins Chambal River in Dholpur area. The Chambal drains into the Yamuna in adjacent parts of Uttar Pradesh and is the only river in the whole Rajasthan (GSI, 1977).

2.1 GEOLOGY

Geologically, the State of Rajasthan is made up of diverse rock types ranging from the oldest Archean metamorphites to sub-Recent to Recent alluvium and wind-blown sand. Even though three fourth the State is covered by blown sand and alluvium, the remaining area exposes a wide variety of rocks comprising crystalline and sedimentary rocks. The crystalline include various types of metamorphic schists, quartzites, marbles and gneisses of Precambrian age with associated acid and basic intrusive rocks. The sedimentaries include the rocks of Upper Precambrian Vindhyan Supergroup and of Permo-Carboniferous to Jurassic, Cretaceous and Tertiary ages. The southeastern extremity of the State is occupied by a pile of basaltic flows of Deccan Traps of Cretaceous (Eocene) age.

Ajmer district occupies an area of 8480 km², and is located between 25°38' and 26°58' north latitude and 73°54' and 75°22' east longitude. The annual rainfall is 760 mm and having a semi-arid climate. The northwestern part is covered with sand dunes and rest of the area is generally flat. Hydrogeologically, the major part of the region is occupied by crystalline rocks comprising of Banded Gneissic Complex, phyllites and schist's of aravali super group and calschist, cale-gneiss and biotite schist of Delhi super group. Limestone, sandstone and shales of vindhyan system are other important formations (GSI, 1963 and 1977). Quaternary alluvium also forms good aquifers in part of Ajmer. The geology of the area is shown in the Figure 1.
Figure 1: Geological Map of Ajmer District, Rajasthan
2.2 CLIMATE

The climate of Rajasthan is arid to semi-arid. It is dry for most part of the year with wide variation in temperature. June is the hottest month. In western Rajasthan, the temperature sometimes shoots up to 52°C while during winter the temperature goes even below freezing. The high temperatures in summer are frequently followed by severe dust storms.

Rainfall in the State varies from 920 mm in the southeast to just 100 mm in the extreme west in Jaisalmer district (Khan, 1999). Climatically, 57% of the total area of the State is arid, 37% semi-arid and 6% sub-humid. Rajasthan suffers from a general paucity of rainfall. Besides the low quantum, the rainfall in the region is characterised by large annual variation. The coefficient of variation in different arid districts is 40 to 70%. Incidence of drought is common.

2.3 VEGETATION

Consistent with the amplitude of rainfall, the region has a large diversity of vegetation. Even the arid zone has as many as 700 species of trees, shrubs, herbs and grasses. The semiarid tract is dominated by Acacia catechu and Anogeissus pendula in the arid zone Prosopis, Capparis and Ziziphus spp. predominate, whereas in the most desert part Calligonum polygonoides is the main species. All these vegetation types are associated with a large variety of annual and perennial grasses and shrubs. However, because of large incidence of arable farming and grazing, the natural ecosystem has been greatly modified or even changed.

2.4 SOIL

The State is endowed with a large diversity in soil cover. The sediments on which the soils are developed have originated from rock formation of varied lithological composition the past history of landscape evolution and age of soil are the other contributing factors to the local
and regional variability. No less important is the present and past gradient of climate and associated vegetation.

Brown soils of old alluvial plains in the semi-arid region covers Bhilwara, Tonk and Ajmer districts and sizeable part of Udaipur, Chittorgarh and Jaipur districts. These soils together with other minor associated soils occupy 20.2% area of the State. The colour of soils ranges from greyish brown to yellowish brown. These are sandy loams to clay loam in texture. Characteristic feature of these soils is that the B-horizon is appreciably rich in clay. Minor associates are soils of younger alluvium, black clay soils and lithosols. Clay minerals in order of dominance show smectite, illite (mica), vermiculite, chlorite and kaolinite. The cation capacity of the soils shows between 8 to 19 meq/100g soil. Soil fertility of Ajmer district shows low nitrogen and medium phosphorous and potassium (Dhir and Singh, 1985).