

CHAPTER II

PREVIOUS WORK

The study area has been investigated in past by geologists from Geological Survey of India, Department of Geology and Mining, and Public Works Department, Government of Gujarat.

Fedden (1884) was the first to describe the geology of the Kathiawar Peninsula in Gujarat and published a geological map of the area on a scale of 1 inch to 16 miles. According to him Dhrangadhra Sandstone - the oldest formation exposed in Saurashtra - is equivalent to Umia beds of the upper Gondwana period. Dhrangadhra Sandstone is mostly open, imperfectly cemented and unevenly stratified with coarse and gritty layers. This sandstone is intercalated with arenaceous shale, carbonaceous shale with plant fossils and coalseams at places. The lower part of this formation is white or yellow and friable, while the upper part is grey, highly ferruginous and often quartzitic. It is nearly horizontal but at places shows varying dips. It is difficult to demarcate Dhrangadhra Formation from Wadhwan Sandstone which overlies it. Wadhwan Sandstone is brick red to dull reddish brown and indifferently cemented. Isolated hillocks of gritty and slightly calcareous Wadhwan Sandstone occur as inlier in Wadhwan district.

The Deccan trap formation in Kathiawar is an extension of that in Kutch and Gujarat and resembles in every respect Deccan and Malva trap of Peninsular India. The trap is thinly bedded, having an average thickness of less than 40 feet for each flow. Basalts and dolerites are the common rock types. Most flows are porphyritic, aphinitic or amygdaloidal. Zeolites are abundant in the amygdaloidal trap. The nature of the floor, wherever the trap rests on Dhrangadhra Formation is often irregular and uneven. Trap dykes are numerous and large, often forming prominent features in the landscape. Many dykes are traceable for long distances. Their general trend is E-W. Some N-S and NW-SE cross dykes are considered to be later than E-W dykes. In the neighbourhood of Than, Dhrangadhra sandstone is closely intersected by trap dykes. The youngest formation is Recent or Sub-Recent in age. Soils are very shallow and vary from black cotton soil to light sandy type.

Gupta et al. (1938) have described the Deccan trap of Gujarat. It is post-Cretaceous in age, generally massive or finely crystalline and almost non-vesicular. It weathers into rounded dark boulders and gravels and finally yields black fertile soil. It occurs as outliers at many places. The mineralogical composition of trap consists of plagioclase feldspar, augite and opaque grains of iron ore.

Roy (1953) has written a book on 'The Economic Geology and Mineral Resources of Saurashtra' in which he has fully dealt with chapters on physiography, general geology, geology in engineering and agriculture, water supply and occurrences of economic minerals in Saurashtra.

Jathal et al. (1960) have published the test results of the crushed aggregates of quartzite, basalt (Trap), granite, limestone, sandstone and phyllite quarried from various parts of Gujarat.

Dave et al. (1966) have compiled the test results of crushed aggregates of rocks quarried from different districts of Gujarat. The test results of crushed aggregates of basalt and sandstone from Rajkot and Surendranagar districts are given in Appendix II.1 p. 244.

Kulkarni (1969) has published the test results of basalt, granite, sandstone, Porbandarstone and limestone used as buildingstones from various localities of Gujarat.

Dikshit (1970) has published 'Geography of Gujarat' which gives information on climate, soil, vegetation, irrigation, physiography, geology, mineral resources, and mineral based industries of Gujarat. The soils of Surendranagar and Rajkot districts are residual or

transported. The sandy soils are often shallow and unproductive. The residual black soils on plateau, are shallow having depth upto 60 cm. They are coarse in texture and show free drainage. It is suitable for irrigation. Medium black soils found on basaltic rocks, are low in clay content. The soils of Gujarat are mainly alluvial soils, desert soils, and lateritic soils (Appendix II.2 p.245).

Kathiara et al. (1970) have published a report on coal exploration of upper Gondwana of Saurashtra. Dhrangadhra Formation contains sandstone, shale, carbonaceous shale, fireclay and coalseams. The lower sandstone is friable while the upper sandstone is often quartzitic.

Kathiara et al. (1971) have published the sedimentological aspect of Dhrangadhra Formation of Khakhrathal area in Surendranagar district. The lithology of Dhrangadhra Formation is as follows:

Dhrangadhra Formation	Upper ferruginous and white sandstone
	Upper sandy grey shale
	Upper carbonaceous clay and coalseam
	Lower carbonaceous clay
	Lower sandy clay with shale partings
	Lower white and ferruginous sandstone

The total thickness of Dhrangadhra Formation is more than 1600 feet (500 meters). Dhrangadhra Sandstone shows structures like parallel lamination, wavy lamination, cross bedding and distorted bedding.

Kanzaria (1972) has contributed a full chapter on Soils of Gujarat in the book on 'Soils of India'. According to All India Soil and Land use Survey, the soils of Gujarat are classified into seven groups as given in Appendix II.2 p. 245. Medium black soils of Saurashtra are characterised by shallow to medium depth ranging from 40 to 60 cm. It is clayey loam in texture and is a residual type. Lime nodules increases with depth. This soil contains dominant clay minerals - montmorillonite. In Surendranagar district, alluvial sandy soil is formed in situ or is an admixture of wind blown sand. Sandy nature of the original soil is due to physical weathering of the parent material, low rainfall and absence of vegetation. It is low in clay content and organic matter, Lime is generally absent in upper horizon. It is mildly alkaline (pH upto 8) and has a good drainage. The permeability of this soil increases from surface downwards. Hilly soil occurs at shallow depth as isolated patches in Surendranagar district.

Shrivastava (1973) has published a note on the Stratigraphy of Mesozoic sediments of Saurashtra. According to him, the Mesozoic sequence is subdivided into (a) Dhrangadhra Formation and (b) Wadhwan Formation. The sediments of the Dhrangadhra Formation were deposited under fluvial and deltaic environments. These were derived from the Archean, Aravalli, and Delhi rocks exposed across the Cambay basin and deposited by a westerly flowing river system. The carbonaceous shales near Than yield various varieties of ptilophylum flora. Dhrangadhra Formation is conformably overlain by the Wadhwan Formation. In Wadhwan Formation some marine megafossils have been described from the cherty limestone bands. The sandstone of the lower member of this formation is a fluvial deposit. The source of these sediments is the same as the underlying Dhrangadhra sediments. Middle member is formed during marine transgression. The upper member was again deposited under fluvial condition. Deccan trap lavafloes unconformably overlies and post-volcanic trap dykes intrude the Dhrangadhra and the Wadhwan Formations.

The Director of Geological Survey of India, Gujarat Circle (1976) has published pamphlets on 'Know your District' which include the salient features regarding physiography, geology, mineral resources, engineering geology projects and

ground water conditions. The geology of Rajkot and Surendranagar district has been worked out in detail by the officers of Geological Survey of India. According to them, Dhrangadhra and Wadhwan Groups have been further subdivided into three sub-divisions. The Stratigraphy of these districts is as follows:

<u>FORMATION</u>			<u>AGE</u>
Blown sand, soil, alluvium etc.			Holocene
Miliolite limestone			Pleistocene
Deccan Trap with dykes and Inter- Trappean beds			Eocene to Upper cretaceous
Wadhwan Group	Khamisana Formation	Upper	Lower
	Malechimata Formation	Middle	to
	Kukda Formation	Lower	Middle creta- ceous
Dhrangadhra Group	Ranipat Formation	Upper	Lower
	Surajdeval Formation	Middle	cretaceous
	Than Formation	Lower	to Upper Jurassic