

CHAPTER - VII

EVOLUTIONARY MODEL - HIMATNAGAR BASIN

The author in the following text, on the basis of surface and sub-surface information available to him, has constructed a evolutionary model for Himatnagar sandstone basin in the regional set up of the rocks of various sedimentary Mesozoic basins in western periphery of Indian subcontinent.

Himatnagar area lies on the southern keel of the Delhi synclinorium comprising mainly the metasedimentaries, quartzites and phyllites, intruded by Erinpura granites. According to Krishnan (1953), the tectonic ranges of Aravallis were formed in Pre-Cambrian (post Aravalli and post Delhi) times and were probably uplifted again in post Vindhyan times. Raju (1968) also considered the Delhi orogeny in Baikal age (700-500 million years), the last orogenic cycle in northwestern India. Since the

close of Pre-Cambrian times the study area has experienced the epierogenic conditions evidenced by non-deposition till Jurassic period.

The southern and southwestern extremity of Aravalli ranges were subjected to erosion and peneplanation during Jurassic period, coinciding with early stage of northward drift of Indian plate from Gondwanaland (Biswas, 1987). The present day flat topped hills of quartzites showing elevation around 300 m resulted due to this peneplanation in NE part of Himatnagar area. The second stage of peneplanation caused the erosion of about 120 m, evidenced by the flat topped Erinpura granite hills of Ghorwada, Wantra etc. (Heron & Ghosh, 1938). The entire region to the west of Aravalli ranges subsided to form an extensive platform with gentle westward slopes due to reactivation along NNW-SSE (Dharwar) lineament during Early Cretaceous period. Prior to the sedimentation of Himatnagar sandstones, the Erinpura granites experienced deep weathering due to humid and tropical climate that caused near complete decomposition of feldspars. Concomittant with regression of sea in Kutch region (Biswas, 1987) the various river systems flowing from NE or E, initiated sedimentation under fluvial environments and culminated into the development of sandstone facies in Himatnagar area.

The deposition of Himatnagar sandstones appears to have taken place atleast by two river systems viz. Hathmati and Meshwo in the two main E-W trending basins; obviously the intervening area is characterised by the shallow thickness of sandstones.

The E-W trend of isopach contours suggests the source of sediments either from east or west. Further the sandstones show paleocurrent direction towards west; the provenance of the rocks being from E and NE i.e. from Aravallis/Delhis and Erinpura granites. This evidently suggests that the deposition of sandstones was mainly from NE & E to SW & W and these sandstones continue in subsurface at progressively deeper levels further W & SW of Himatnagar.

The sedimentation has taken place as channel/point bar deposits with lateral and vertical accretion by meandering river system that has given rise to the repetition in fining upward sequences. The sediments were lithified mostly by simple cementation and also by complex bonding with different stages of diagenesis viz. redoxomorphic, locomorphic and phyllomorphic. The predominant cement is siliceous or ferruginous, the former being derived mostly from silica super saturated pore waters while the latter could be from the ferro-magnesian minerals present in the source rocks. The synsedimentary subsidence is evidenced by increase in thickness of sandstones in the northern flank of Hathmati basin.

During Early Cretaceous period the sandstones of Himatnagar area, Cambay Basin and that of Saurashtra (Dhrangadhra) were deposited in a common platform with gentle dips due west by various river systems flowing mainly from NE & E with common provenance Aravallis/Delhis and Erinpura granites. The

sandstones of Himatnagar and Cambay basins were deposited dominantly under fluvial regime while Dhrangadhra sandstones were deposited under fluvial to deltaic environments.

In the Peninsular India, during Late Cretaceous period, the tensional faults developed parallel to the ancient basement grain mainly along NNW-SSE (Dharwar) alignment and also along NE-SW (Aravalli-Delhi) & ENE-WSW (Satpura) alignments resulting into series of rifts and grabens. This phenomenon was accompanied by the volcanic eruption comprising mainly basalts in the southern, southeastern and southwestern parts of Himatnagar town. These late tectonic activities have resulted into a series of step faults with southwestern downthrow giving rise to present surface and subsurface disposition of the various litho-units in the Himatnagar area.