CHAPTER 7

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Detailed assessment of morphological and morphometric characteristics have confirmed the ‘role of neotectonism’ in the evolution of Tema River basin. The relative degree of tectonic activity is also manifested by the ‘anomalous behaviour of the streams’ such as right angled turn of the streams, convergence and divergence of stream, streams flowing parallel to main river for a considerable distance and offset drainage. All the parameters in general, suggest an increasing degree of tectonic activity from lower reaches towards the upland source region. The alignments of the significant morphological features and stream orientations have provided information about the linear tectonic elements. The anomalous behaviour of streams indicates that subsurface faulting may be controlling the drainage patterns of the basin.

The orientations of the stream channels in the upland zone and in the middle reaches of the Tema River basin have been guided by lineaments, which are the indicators of recent tectonic activity. Higher order stream channels reflect the general NW-SE and E-W trend. These trends have been reactivated in recent times as shown by displaced Quaternary deposits (Rajendran and Rajendran, 1999). The offset (10-15 cm) in the sedimentary section at Ter (Fig. 7) reflects only a fraction of movement in the basement fault below the basalt flows. On the basis of seismogenic features exposed in the sedimentary sections including flexures, warps, buckle fold and vertical offsets. Rajendran (1997) marked the signatures of pre-existing earthquake (~1500 year ago). These deformational features may be the result of reactivation of NW-SE trending fault. These older tectonic directions, although active until very recent times, had conditioned the drainage network
in an earlier period. The TSI values indicate rejuvenation of the area leading to the dominating effect of topography on the sinuosity of the river channels. The break in slope in the long profile and reduced values of Vf are indications of the Quaternary tectonic uplift of the area. Additional support for the neotectonic activity in the upland zone and middle zone of the Terna River basin is provided by valley floor ratios and longitudinal profile. Morphometric analysis has thus been useful in delineating areas with differing levels of tectonic activity in the basin.

Oldest lithotype in the area comprise Deccan basalts. Nine lava flows are recorded in the area in Latur district. Amongst the basalt flow both the ‘aa’ and the ‘compound pahoehoe’ flows are recorded, the earlier being dominant in the basin. Lithostratigraphically the Quaternary deposits of the Terna basin have been divided into three formations. These units are comparable to three Quaternary geomorphic units which have been identified on the basis of break in slope, soil type, constituting material and nature of erosion in the landform. These are:

i) Present floodplain (To)
ii) Older floodplain (T1)
iii) Pediplain (T2)

Morphometric parameters of Terna river basin indicate that the basin shape/geometry is controlled by the physiography and structure. Occurrence of anomalous drainage pattern, abnormally high bifurcation ratio and length ratio of higher orders indicate structural control on drainage development.

The geomorphic surfaces of the study area were classified into seven morphounits on the basis of physiographic characteristics, morphological features, relief, slope, drainage density and lithology. These are:
i. Present Floodplain
ii. Older Alluvial plain
iii. Pediments
iv. Pediplains
v. Highly Dissected plateau
vi. Denudational Hills
vii. Lateritic upland

Considering the foregoing discussion it is concluded that:

♦ Occurrence of dominant compact basalt flows (aa type) along with vesicular – amygdaloidal basalt flows (compound pahoehoe) in the hilly terrain and in the other gently sloping to flat terrain reflects the lithological control on physiography and geomorphology of the area.

♦ Structural control on drainage in the basin is visible with reference to anomalous behaviour of streams such as straight courses of stream, sharp bend in the stream path, off-set drainage and abrupt and localised meanders.

♦ The depositional environment of coarse gravel sediment in upper reaches of Terna valley indicate that the streams are of relatively high energy with prevalent bed load transport; whereas fine clay and silt formations in the lower reaches reflect that the streams are of low gradient and high sinuosity.

♦ Drainage pattern of the area is controlled by physiography and structures.

♦ Abnormally high value bifurcation ratio, length ratio and area ratio of 5th and 6th order streams of Terna basin indicate structural control. Similar inference can be drawn from the plot of stream order versus stream number, stream order versus mean stream length and stream
order versus mean basin area in which the point of higher order stream deviates from the regression line.

◊ Evaluation of dimensionless ratios of basin configuration such as form factor, ellipticity index, circularity ratio and elongation ratio indicate that basin is elongated and in the late mature stage of erosional development, whereas these parameters of Terna basin show that the basin is much elongated and is controlled by structural lineaments.

◊ The values of drainage density and stream frequency are lower in basins suggest the area of permeable soil with high moisture retentive capacity and low relief.

◊ Relief studies including channel gradient, longitudinal profile, relief ratio and ruggedness number reveal that the basin belongs to gently sloping to flat terrain.

◊ Hypsometric integrals indicate that the basin is in the monadnock stage, beyond early mature stage of erosional development and the area of 38.7% occurring below the curve is yet to be removed by erosion.

◊ Geomorphic surfaces like highly dissected plateau and hills have the problems of shallow soil cover, high relief, steep slope, rocky and rugged terrain difficult for agriculture, but have the potential for forestry and wild life preservation.

◊ Younger and older alluvial plain are the most fertile regions of the basin and have the problems of severe bank cutting and seasonal flooding.

• Based on the objectives, given in the first chapter, it is concluded that-

➢ Delineation of Quaternary Stratigraphy and geomorphology of the Terna basin is as follows:
Delineation of the Terna river sediments with the sediments of Manjra and Godavari river suggest the formation and age of the sediments is similar which is illustrated through the correlation.

The lithology of the Terna valley alluvium suggests that the Older Quaternary Alluvial deposits are of Upper Pleistocene age, the similar conclusions were made for the rivers in adjoining area.

The Quaternary deposits of Terna valley, with reference to 'soil stratigraphy', 'morphostratigraphy' and 'lithostratigraphy', are identified and classified as follows:

- Based on Soil Stratigraphy, four soil types have been recognized on the basis of colour, texture, structure, consistency, concretions and nature of soil profiles such as Entisol (I), Inceptisol (II) and Vertisol (III and IV).

- Morphostratigraphy, alluvial plains of the Terna river shows 3 terraces namely, Present floodplain (T0), Older floodplain (T1) and Pediments (T2) in increasing order of elevations.

- Lithostratigraphically, the Quaternary deposits of the Terna river basin have been divided into three informal formations including (i) dark grey silt formation - Late Holocene, (ii) Light grey silt formations - Early Holocene, (iii) Dark grayish brown silt formation - Late Pleistocene.

After detailed study of the terrain characteristics such as 'shape', 'area', 'altitude', 'slope', 'profiles' of the land, the overall evolution of the basin, in brief, is explained as follows:

- The basin is elongated and occurs in the late mature stage of erosional development.

- The basin is much elongated and is found to be controlled by structural lineaments which are proved by various researchers.

- Relief and profile studies indicate that the basin belongs to moderate to steeply sloping in the source region and gently sloping to flat terrain in the lower reaches.

The control of 'structure', 'physiography' and 'lithology' on the drainage pattern is evaluated as:

- The lineaments occur along NE-SW, NW-SE, E-W and WNW-ESE directions, which control the basement structure in the study area.
The sharp sudden changes in the stream courses as well as the reversal in direction of tributaries suggest structural control.

The TSI values indicate rejuvenation of the area leading to the dominating effect of topography on the sinuosity of the river channels.

The break in slope in the long profile is also indication of the Quaternary tectonic uplift of the area.

The deformational structures observed in the sediments are flexures, warps, buckle folds and vertical offset in the sediments.

The problems and potentials of the geomorphic units/surfaces of the Terna basin are identified as below:

- Landforms like pediplains and pediments are characterized by thick black cotton soil and thick colluvial soil. These geomorphic surfaces have good potential for agriculture. Major problems of these surfaces are gully erosion, development of deep and wide cracks, waterlogging and soil salinity.

- The most fertile regions of the basin are floodplains and older alluvial plains along Terna river basin. The problems associated with older alluvial plain are linked mainly with flat relief and gully erosion. The soils have low permeability and with erratic rainfall and conditions of waterlogging are created.

- The highly dissected plateau, lateritic uplands and denudational hills have the shallow soil cover, high relief, steep slope, rocky and rugged terrain, hard and compact basalt bed rock, all of which makes them unsuitable for agriculture.