7.1 Previous Studies

Morphometric analysis of terrain has added a new dimension to the study of landforms. Every landform elements has some definitive attributes. These elements occur in association with other elements which their own attributed also. These attributes may be measured in terms absolute and relative relief, dissection index, drainage density, drainage frequency and slope characteristics and their appraisal may lead to recognition some coherent units of area live from characteristics are know as "morpo units".

Hammond, E.H. (1954, 1964) on the basis of the identification of inherent characteristics of terrain, namely slope relief stream density drainage pattern and surface material devised a systematic method for empirical quantitative classification of landform types. In 1954, W.A. wood and J.B. shell prepared a terrain map on the basin of certain morphometric element including the grain of the country (spacing of major ridges and valleys) local relief
absolute and average elevation relief ratio (Proportion of highland and lowland) average slope and slope directions. Similarly 'W' eaver, (G.D. 1965) has suggested the method of landforms assemblages to delimit landform regions. Recently, Asthan V.K. (1967) has made an attempt the morpho units by superimposing the standard isopleths of each morphometric element over the other.

Analysis of absolute and relative relief dissection index drainage density and average slope may help in distinguishes a hierarchy of morphological units is area under study. In fact this idea of analysing landforms is not new but with the recognition of regional geography as the ultimate goal and the highest expression of geographical research which has come with modern developments. In the subject these has been marked increase in attention devoted it this branch, Initially this type of investigation was made by Powell, J.W. (1896), Gannett H. (1896), Bowman, I (1926) Herpason (1905), Hattner (1908) Gallious (1908), Passerge (1908), Blackwelder E. (1942) Joerge W.L.G. (1914), Fenneman, N.M. (1914:1916) and unstead J.F. (1933).

In the present study also the various morpho attributes have been superimposed on a single frame and most
conceding boundaries have been selected to delimit the landform categories. Where this coincidence is not very striking morpho-attribute on (Fig 7.1) various terrain profiles indicating inclination of topographic forms including major breaks, have been later checked in the field, particularly along major stream, spurs and escarps where erosion is most intense. Thus the entire terrain has been classified into 2 first order 5 second order 12 third order and 31 fourth order morpho units or regions (Fig 7.2, 7.3 and 7.4) The morphometric characteristics of these morpho-units of various orders has been given is the Table VII-1 and their frequency distribution is each region has been showed by composite for diagrams (Fig 7.2 & 7.3).

7.2 **Hierarchy of Morphological Units**

Identification of 2 first order morpho-units have been made on the basis of Physiographic variation in the area, namely (I) The Escarpment zone (II) The Mor trough. These units have been sub divided into a number of sub-units according to variations in morphometric elements. However, the morphometric attributes namely absolute and relative relief, dissection index drainage density drainage frequency and average slope show a great range of variation from one morpho-unit to the other as also within the same
unit. Thus making the classification more complex. Lack of detailed topographical and geological maps have also made the job difficult Nonetheless it has been possible to identify the hierarchy of morpho-units on the basis of recurring terrain types and their most striking surface characteristics.

The second order hierarchy of morpho-units are generally diagnostic in nature and have been named after topographic forms, such as valleys, Plateaus, hills or hill complex, divides plains and peneplains. Thus 5 second order region have been recognized. These care (A) North eastern Mar Basin upland (B) The southwestern Mor Basin upland (C) The upper Mor Trough of Mor basin (D) The middle trough of Mor Basin. (E) The lower trough of Mor Basin on the basis of variations is their morphometric elements, these have been further subdivided into a number of third fourth order sub units (Table VII. 1 & Fig. 7.4)

A detailed description of the various morpho units is provided as under.

7.2.1 The Mor Basin Upland

Mor basin upland is situated on the outer side of the basin occupies an area of about 1904.64 Km² of the study area. It forms a gently undulating with peneplain with done-
shaped hills and ridges projecting over is surface more than 42.76% the area of this basin lies between <100m to 500>m. The aeal percentage distributions of various morphometric attributes in this region are Relative relief 2.32% Rel, 36.52% Rl, 39.52% Rml, 15.89 Rm and 5.28 Rh Dissection index Di 63.12%, Dm 23.02%, Dmh 11.43%, Dvh 0.51% and Dh 1.87% Drainage Density Tec 4.00%, Tvc 12.50%, Tc 40.52%, Tm 27.98% and Tf 15.00%, Drainage frequency. Fp 77.33%, Fm 15.94% and Fh 6.73%; Average Slope Sl 15.16%, Sg 30.34% Sm 56%, Sms 7.15% and Ss 1.35% Thus it is largely Characterized by low relative relief low dissection index very coarse drainage density medium drainage frequency and level slopes. These attributes suggest that the basin area still maintains some base mature stage variations -

The first order morpho-units can be sub divided into 2 second order morpho-units (Fig 7.2) based on the morphological reactions-

7.I.A. The North Eastern Mor basin upland
7.II.A. The South Western Mor basin upland
7.1 A The North Eastern Mor Basin Upland

The northern Mor basin upland is situated in the northern east part of the study area. It covers an area of about 962.56Km$^2$. This terrain consists of a steeply dissected surface with hills and ridges projecting over it. More than 21.62% of the area has lies on 100m to 500m. It has the following percentage distributions of various grades of Relative relief Rel 36.30%, Rl 42.93%, Rml 16.55%, Rm 1.95%, Rmh 1.61%, Rh 0.66%; Dissection index Dl 66.88%, Dm 17.55%, Dmh 14.52%, Dh 1.10% and Dvh 0.75%; Drainage Density Tec 19.00% Tvc 30.30%, Tc 42.72%, Tm 8.00% Drainage Frequency Fp 92.26%, Fm 7.74% and Average slope Sl 25.43%, Sg 64.75%, Sm 6.65%, Sms 2.02% and Ss 1.15%. This it is generally characterized by low relative relief low dissection index very coarse drainage density, Medium Drainage frequency and level slope suggest that the Mor upliftment during Tertiary times, still maintains of its former peneplained characteristics.

This second order morpho-units can be subdivided in 3 third order morpho-units based on variation is morphometric attributes as follows (Fig 7.3)
7.2I.A.(i) The lower Northeastern Mor basin upland

7.2I.A.(ii) The Middle Northeastern Mor basin upland

7.2I.A.(iii) The Upper Northeastern Mor basin upland

7.2 I A (i) The lower Northeastern Mor Basin Upland

The lower northeastern zone has covers as area of about 307.20Km$^2$ and its elevation varies from 100m-200m. The areal percentage distributions of various morphometric attributes in this zone are; Relative relief Rel 8.96%, Rl 53.72%, Rml 35.98%, Rm 1.34; Dissection index Dl 28.19%, Dm 32.69%, Drainage Density Tec 5.26%, Tvc 80.74%, Tc 6.00%, Tm 8.00%; Drainage frequency Fp 84.52%, Fm 15.48% Average slope Sl 41.00% Sg 52.56 and Sm 6.44%.

The dominance of low relative relief, low dissection index, very coarse drainage density medium drainage frequency and gentle slope suggest that this region is characterized by stage of landform development. This region has been subdivided into 2 forth order of morpho-units on the basis of variations in morphometric attributes as follows (Fig 7.4)

7.2.I.(i)01 The Sanakpur peneplain

7.2.I(i) 02 The Makhdum Nagar upland
7.2.I(i) 01 The Sanakpur Peneplain

The Sanakpur peneplain is situated is north easter part of the study area. It has overs an area of about 133.10Km². Its total elevation consists between 100m-200m. The areal percentage distributions of various morphometric attributes in this morpho-unit are: Relative relief Rel 3.50%, Rl 45.00%, Rml 51.50%; Dissection Index: Dl 20.43%, Dm 18.19%, Dmh 61.38%; Drainage Density Tec 80.37%, Tvc 11.63%, Tc 8.00% Drainage Frequency Fp 100%; Average slope Sl 30.28% and Sg 69.72%.

7.2.I(i) 02 The Makhdum Nagar Upland

The Makhdum Nagar upland has covers an area of 174.08Km². Its elevation varies from 200m. The percentage distributions of various morphometric attributes in this region are: Relative relief Rl 70.67%, Rml 25.28%, Rm 4.05%; Dissection Index Dl 17.56%, Dm 26.44%, Dh 49.33%, Dh 6.67%; Drainage Density Tvc 90.54%, Tc 9.46; Drainage frequency Fp 100.00% and Average slope Sg 100.00%.

7.2.I.A(ii) The Middle Northeastern Mor Basin Upland

The middle north eastern Mor basin upland situated in the south eastern part of the study area. It measures an area
about 296.96Km$^2$. The percentage distributions of various morphometric attributes in this morpho-unit are Relative relief-Rel 54.32%, Rl 45.17%; Rml 0.51%; Dissection index-Dmh 93.46%, Dh 6.54%; Drainage Density-Tec 85.00%, Tvc 8.90%, Tc 6.10%; Drainage Frequency-Fp 100% and Average slope-Sl 15.14, Sg 84.86.

This morpho-unit can be sub divided into 3 fourth order morpho units, based on variations in morphology as follows (Fig 7.4)

7.2.I(ii) 03 Batihar Gorge

7.2.I.(ii) 04 Kathjuriya scarp

7.2.I.(ii) 05 Nakti Pahar

7.2.I(ii) 03 Batihar Gorge

It has covers an area of about 153.60Km$^2$. The elevation of Batihar gorge is ranges from 200m. The areal percentage distribution of this morpho-unit is relative relief Rel 12.28%, Rl 87.72%; Dissection Index Dmh 100%, Drainage Density Tec 93.89%, Tvc 6.11% Drainage Frequency Fp 100.00% and Average Slope Sl 11.72%, Sg 88.20%.
7.2.I.(ii) 04 Kathjuriya Scarp

The Kathjuriya scarp has covers on area of about 92.16 Km² in altitudinal zone 200m. The areal percentage distributions of other morphometric attributes in this morpho-unit area Relative relief Rl 10.00%, Dissection Index Dmh 100.00%. Drainage Density Tec 95.24%, Tvc 4.76%, Drainage frequency Fp 100.00% and Average slope Sg 100.00%.

7.2.I.(ii) 05 Nakti Pahar

The Nakti Pahar has covers an area of about 51.20 Km² in altitudinal zone 200m. The areal percentage distribution of other morphometric attributes in this morpho-unit area: Relative relief Rl 100.00%, Dissection Index Dmh 80.00%, Dh 20.00% Drainage Density Tc 100.00% Drainage frequency Fp 100.00% and average slope Sl 10.90%, Sg 89.10%.

7.2.I.A(iii) The Upper Northeastern Mor Basin Upland

It has measures an area of about 358.40 Km². Its elevation ranges from 100m – 400m but 67.92% of its area lies between altitudinal zones of 200m-300m.

The areal percentage of various morphometirc attributes of this region area: Relative relief Rl 45.61%,
Rml 29.89%, Rm 13.17%, Rh 4.50% Dissection Index Dl 76.59%, Dm 13.41%, Dmh 6.67%, Dh 1.08% Dvh 2.25% Drainage Density Tec 54.97%, Tvc 41.77, Tc 1.93%, Tm 0.83%, Tf 0.50% Drainage Frequency Fp 90.08%, Fm 6.92% Fh 3.00% Average slope Sg 56.84%, Sm 20.16%, Sms 15.52%, Sl 7.48%. This morpho-units can be subdivided into 3 fourth order morpho-units based on variation is morphology as follows (Fig 7.4)

7.2.I.A.(iii)(06) The Karbind upland

7.2.I.A.iii (07) The Mohanpur scarp

7.2.I.A.iii(08) The Hansdiha gorge

7.2.I.A.iii(06) The Karbind Upland

This upland has covers an area of about 174.08 Km$^2$. This area lies between the altitudinal zone of 100m-300m.

The areal percentage distribution of various morphometric attributes of this region are: Relative relief Rl 30.32%, Rml 40.59%, Rm 29.09% Dissection Index: Dl 80.25%, Dm 19.75% Drainage Density Tvc 80.00%, Tc 20.00% Drainage frequency Fp 100.00%, Average slope Sg 40.22%, Sm 59.78%.
7.2.I.A.iii(07) The Mohanpur Scarp

It has covers an area of about 133.12 Km$^2$ its area lies between 100m-300m altitudinal zone. The areal percentage distributions of various morphometric attributes of this region are relative relief Rl 90.06% Rml 9.94%, Dissection Index Dm 100.00%; Drainage Density Tc 100.00% Drainage Frequency Fp 80.20%, Fm 19.80% and Average slope Sm 100.00%.

7.2.I.A.iii(08) The Hansdiha Gorge

This gorge zone has covers an area of about 51.20 Km$^2$ that elevation from 200m-300. The areal percentage distributions of various morphometric attributes in this morpho-unit are Relative relief Rml 100.00%, Dissection Index Dm 100.00%, Drainage Density Tm 100.00%, Drainage Frequency Fm 100.00% and average slope Sms 100.00%.

7.2.I.B. The Southwestern Mor Basin Upland

The south western Mor basin zone has covered an area of about 1857.20 Km$^2$ and it lies between the altitudinal ranges 100m – 500m. It has following percentage of various grades are: Relative relief Rel 36.74%, Rl 36.11%, Rml 15.23%, Rm 8.60%, Rmh 3.04%, Rh 0.28%, Dissection
Index Dl 60.26%, Dm 28.49%, Dmh 8.33%, Dh 8.29%, Dvh 0.29%, Drainage Density Tec 30.29%, Tvc 34.39%, Tc 14.48%, Tm 10.29%, Tf 10.75% Drainage Frequency Fp 62.39%, Fm 24.15%, Fh 13.46% Average slope Sl 30.24%, Sg 47.25%, Sm 9.66%, Sms 8.29%, Ss 7.48%.

Thus this region is largely characterized with low relative relief low dissection Index very coarse drainage density medium drainage frequency and gentle average slope suggests that region in characterized by the old stages of landform development.

This morpho-unit can be sub-divided into 3 fourth order morpho units-based on variation in Morphology as follows (Fig 7.4)

7.2.I.B(iv) The Upper Southwestern Mor Basin upland
7.2.I.B(v) The Middle Southwestern Mor Basin upland
7.2.I.B(vi) The Lower Southwestern Mor Basin upland

7.2.I.B(iv) The Upper Southwestern Mor Basin Upland

It has measures an area of about 665.60 Km². Its 29.84% area lies on 100m – 200m Attitudinal zone. The areal percentage of other morphometric attributes is this morpho-unit area: Relative Relief Rel 34.48%, RI 19.27%, Rml 15.49%, Rm 20.79%, Rmh 9.13%, rh 0.84% Dissection
index Dl 44.47%, Dm 28.29%, Dmh 18.49%, Dh 7.89%, Dvh 0.80% Drainage Density Tec 6.11%, Tvc 30.41%, Tc 30.94%, Tm 28.26%, Tf 3.88% Drainage frequency Fp 37.57, Fm 22.05% Fh 40.38% Average slope Sg 27.67%, Sm 24.87% Sms 14.95% and Ss 32.51%.

This morpho-unit can be sub-divided into 4 fourth order morpho-units based an variation in morphometric attributes as follows (Fig 7.4)

7.2.I.B(iv) (9) Trikut Pahar

7.2.I.B(iv) (10) Taljhari scarp

7.2.I.B(iv) (11) Amba Pahar

7.2.I.B(iv) (12) Gara Pahar

7.2.I.B(iv) (09) Trikut Pahar

The Trikut Pahar is situated in upper southwestern escarpment zone. It has covers an area of about 112.64 Km². It lies in the height group above 500m. It has the following percentage distributions of various grades of Relative relief Rel 2.35%, Rl 40.05%, Rml 4.31%, Rm 3.29%, Rmh 30.74%, Rh 0.84% Dissection Index Dh 80.00%, Dvh 20.00% Drainage Density Tf 100.00%, Drainage frequency 100.00% and Average slope Ss 100.00%. 
7.2.I.B(iv) (10) Taljhari Scarp

The Taljhari scarp is a part of upper southwestern escarpment zone. It has covers an area of 163.84 Km\(^2\) lies in height group above 500m. It has following percentage distributions of various grades of Relative relief Rh 100.00%, Dissection Index Dvh 100.00%, Drainage Density Tf 100.00%, Drainage Frequency Fh 100.00% and average slope Ss 100.00%

7.2.I.B(iv) (11) Amba Pahar

The Amba Pahar is situated in the upper south western escarpment zone. It has covers an area of 174.08 Km\(^2\) its 42.61% of the area lies in the height group 300m-500m. It has the following distributions of various grades of Relative relief Rmh 80.89%, Rh 19.11%; Dissection Index Dh 100.00% Drainage Density Tm 100.00% Drainage frequency Fp 20.28%, Fm 28.49%, Fh 51.25%, Average slope Sm 3.48 Sms 96.52%.

7.2.I.B(iv) (12) Gara Pahar

The Gara pahar is situated in the upperwestern escarpment zone. It has covers an area of about 215.04 Km\(^2\). It lies on the height group 500m. It has following percentage distributions of various grades of Relative relief
Rmh 100.00% Dissection Index Dmh 100.00%. Drainage Density Tc 20.24%, Tm 79.76%, drainage frequency Fm 100.00% and Average slope Sm 100.00.

7.2.I.B.v The middle South western Mor Basin Upland

The middle south western Mor upland is a part of southwestern escarpment zone of Mor basin. It measures an area of about 614.40 Km$^2$ about 85.89% of its area lies in the absolute relief category of 100m – 200m. The percentage areal distribution of various morphometric attributes in the region are as follows: Relative relief Rel 39.44%, Rl 46.85%, Rml 13.17; Dissection Index, Dl 81.40%, Dm 18.60%, drainage Density Tec 60.76%, Tvc 17.24%, Tc 12.00%, Drainage Frequency Fp 97.09%, Fm 2.91%, Average slope Sm 49.10% Sms 50.90%. Thus it is generally characterized by low relative relief low dissection index very coarse drainage density. Medium drainage frequency and level slopes suggests that the landscape is consist under. Late mature stage of land forms development.

This morpho-unit can be sub-divided into 3 fourth order morpho-units, based on variation in relative relief, dissection index and slope as follows (Fig 7.4)
7.2.I.Bv(13) Naubil Siddheshwari water divid area

7.2.I.Bv (14) The Katri Pahar

7.2.I.B.v(15) Siuri upland

7.2.I.Bv(13) Naubil Siddheshwari Water Divid Area

Naubil- Siddheshwari water divid area is apart of Middle Southwestern part of Mor basin. It has covers an area of about 245.76 Km$^2$. Its 100% of the area has in the height group of 100m – 200m. the percentage areal distribution of various grades of Relative relief Rel 38.56%, Rl 45.14%, Rml 16.30%, Dissection Index Dl 92.26%, Dm 7.74%, drainage Density Tec 70.27%, Tvc 22.73%, Tc 7.00%, Drainage Frequency Fp 96.18, Fm 3.82, Agerage slopes Sm 85.35%, Sms 14.65%.

7.2.I.Bv (14) The Katri Pahar

The Katri Pahar is a part of The middle south western zone. It has covers an area of about 256.00 Km$^2$. It lies on 100m – 200m. It has the following percentage distributions of various grades of Relative relief Rel 40.32%, Rl 48.56%, Rml 11.12% Dissection index Dl 70.53%, Dm 29.47%, Drainage density Tvc 20.80%, Tc 79.20%, Drainage frequency Fp 98.00% Fm 2.00% Average slope Sm 12.85%, sms 87.15%.
7.2.I.B.v(15) Siuri Upland

The Siuri upland is a part of the middle southwestern part of the Mor basin. It covers an area of about 112.64 Km². Its 80.24% of the area lies in the height group of 100m – 200m. It has the following percentage of various grades of relative relief Ri 100.00% Dissection index Dm 100.00%, Drainage Density Tvc 100.00%, Drainage frequency Fp 100.00% and Average slope Sm 100.00%.

7.2.I.B.vi The Lower Southwestern Mor Basin Upland

The lower southwestern Mor basin upland is part of southwestern escarpment zone of Mor basin. It measures an area of about 307.20 Km². Its 80.00% of the area lies in the height group below 100m. The percentage areal distributions of various morphometric attributes in this region follows relative relief Rel 80.00%, Ri 15.80%, Rml 4.20% Dissection index Di 20.48%, Dm 79.52%, Drainage Density Tec 27.98%, Tvc 55.52%, Tc 12.50%, Tm 4.00% Drainage frequency Fp 52.5% Fm 47.50% Average slope Sl 60.14%, Sg 39.86%, Thus this region is largely characterized by low relative relief, low dissection index very coarse density, medium drainage frequency and level
slopes suggests that the area exhibits topography which is the late mature stage.

This morpho-units be sub-divided into 3 fourth order morpho-units based on variation in morphology as follows (Fig 7.4)

7.2.I.B.vi(16) The Chandan Nagar upland

7.2.I.B.vi(17) The Naudih Tableland

7.2.I.B.vi(18) The Manbazar Peneplain

7.2.I.B.vi(16) The Chandan Nagar Upland

The Chandan Nagar upland is a part of the lower southwestern escarpment zone. It covers an area of about 81.92 Km². Its 100% area in 100m – 200m height group. It has the following percentage distributions of various grades of Relative relief Rl 100.00% Dissection index Dm 100.00%, Drainage Density Tec 50.70%, Tvc 30.30%, Tc 19.00% Drainage frequency Fp 74.24%, Fm 25.75% Average slope sl 100.00%.

7.2.I.B.vi(17) The Naudih Tableland

The Naudihtable land covers an area of about 122.88 Km². Its total area in below 100m height group. It has the following percentage distributions of various grades
Relative Relief Rl 100.00% Dissection index Dm 100.00% drainage Density Tec 80.74%, Tvc 6.00%, Tc 8.00%, Tm 5.26%, Drainage frequency Fp 30.74%, Fm 69.26% Average slope Sl 100.00.

7.2.I.B.vi(18) The Manbazar Penep lain

It has covers an area of about 102.40 Km\(^2\). Its 89.11% of the area lies in below 100m hight group. It has the following percentage distributions of various grades of Relative relief Rel 70.50%, Rl 20.88%, Rml 8.62% Dissection index Di 100.00%, Drainage Density Tec 100.00%, Drainage Frequency Fp 83.34%, Fm 16.66% Average slope Sl 89.10% Sg 10.90%.

7.2.II The Mor Basin Trough

The Mor basin trough is the second part of Mor basin. It covers an area of about 1904.64 Km\(^2\). Area height analysis shows that less than 100m, 100m-200, 200m-300, 300m-400m, 400m-500m absolute relief covers 30.82%, 10.64%, 12.89%, 35.46%, 10.19% area of the Mor trough this morpho unit reveals the following morphometric attributes Relative relief Rel 34.53%, Rl 30.97%, Rml 20.97%, Rm 4.97%, Rmh 1.53%, Rh 8.00%; Drainage Density Tec 3.36%, Tvc 0.14%, Tc 11.15%, Tm 49.54%, Tf
35.81 Drainage frequency Fp 80.20%, Fm 19.80% Average slope S1 50.83%, Sg 26.42%, Sm 22.00%, Sms 0.75%. Thus this region is largely characterized by low relative relief, low dissection index, very coarse drainage density medium drainage frequency and level slopes suggests that the area is exhibit in the late mature stage of landform development.

This morpho-unit can be sub divided into 3 second order morpho units based on variations in physiography as follows (Fig 7.4)

7.2.II.C The Upper Mor Trough
7.2.II.D The Middle Mor Trough
7.2.II.E The Lower Mor Trough

7.2.II.C The Upper Mor Trough

The upper Mor trough is about 788.48 Km². about 71.21% of this area lies is the attitudinal zone of 400m – 500m. The percentage distributions of other morphometric attributes in this morpho-unit are Relative relief Rml 36.80%, Rm 32.68%, Rmh 30.52%, Dissection index Dl 98.12%, Dm 1.88%, Drainage Density Tec 41.67%, Tvc 56.08%, Tc 2.25% drainage frequency Fp 80.01%, Fm 19.99%, average slope Sm 5.94% Sms 96.14%. Dominance of low relative relief, low dissection index, very coarse
drainage density, medium drainage frequency and gentle slopes suggest that the area exhibits is late mature stage of landform development.

This morpho-unit can be sub divided into 2 third order morpho-units, based on variations in morphology as follows (Fig 7.2)

7.2.II.C.VII. The Southwestern Mor Trough

This part of Mor trough. It has covers an area of about 450.56 Km². More than 75.40% of this area lies in the altitudinal zone of 300m – 400m and remaining 21.60% in the altitudinal zone of 400-500m The percentage distributions of other morphometric attributes in this morpho-units are Relative Relief Rml 20.00%, Rm 80.00%, Dissection index Dl 96.24%, Dm 3.76%; Drainage Density Tec 55.56%, Tvc 39.94%, Tc 4.50%, Drainage frequency Fp 80.01%, Fm 19.99%; Average Slope Sm 3.86% Sms 96.14%. Thus this region is generally characterized by low relative relief low dissection index very coarse drainage density. Medium drainage frequency and gentle slopes suggests that the landscape of this area experiencing is late mature stage.
This morpho-unit can be sub divided into 3 fourth order morpho-unit based on variation in morphometric attributes as follows (Fig 7.4)

7.2.II.C.vii(19) The Matihara Valley

7.2.II.C.vii(20) The Dhanadih ravine area

7.2.II.C.vii(21) The Dumka Peneplain

7.2.II.C.vii(19) The Matihara Valley

It has covers an area of about 112.64 Km\(^2\). its total area in 200m – 300m height group. It has following percentage distributions of various grades of Relative relief Rm 100.00%, Dissection Index Dl 92.47%, Dm 7.53%, Drainage density Tvc 20.00%, Tc 80.00%; Drainage frequency Fp 96.28%, Fm 3.72% Average slope Sm 100.00%

7.2.II.C.vii(20) The Dhanadih Ravine Area

It has covers an area of about 133.12 Km\(^2\) its total area in 200m – 300m height group. It has following percentage distribution of various grade of Relative relief Rml 23.20%, Rm 76.80%, Dissection index Dm 100.00%, Drainage Density Tc 100.00% Drainage Frequency Fp 59.75%, Fm 40.25% Average slope Sm 19.80% Sms 80.20%

7.2.II.C.vii(21) The Dumka Peneplain
It has covers an area of about 204.80 Km$^2$. Its total area is 200m – 300m height group. It has following percentage distribution of various grades Relative relief Rml 100.00%, Dissection Index Di 100.00%, Drainage Density Tec 82.00%, Tvc 18.00% Drainage frequency Fp 100.00%, Average slope Sm 82.80% Sms 17.20%.

7.2.II.C.viii The North Eastern Mor Basin Trough

The north eastern Mor Trough is a part of upper Mor trough. It measures an area of about 337.92 Km$^2$ about 80.00% in this region lies in 300m – 400m height group. The percentage areal distributions of morphometric attributes in this region are as Relative relief Ri 60.98%, Rml 37.52%, Rm 0.66%, Rmh 0.84%, Dissection Index Dmh 92.48%, Dh 7.52%, Drainage Density Tec 30.74%, Tvc 60.26%, Tc 9.00% Drainage Frequency Fp 98.20%, Fm 1.80%, Average slope Sm 96.22%, Sms 3.78%. Thus this region is largely characterized by low relative relief, Low dissection index, Medium drainage Frequency coarse drainage Density suggests the landscape is consists under the late mature stage.
This morpho-unit can be sub-divided into 2 fourth order morpho-unit based on variation in morphology as follows (Fig 7.4)

7.2.II.C.viii(22) The Raja Pathar upland

7.2.II.C.viii(23) The Sadhudih Pahar

7.2.II.C.viii(22) The Raja Pathar Upland

The Raja Pathar upland is a part of North eastern part of Mor basin. It covers an area of about 163.84 Km\(^2\). Its 78.80% of the area lies in the height group 300m-400m. It has following percentage distribution of various grades of Relative relief Rl 100.00%, Dissection Index Dmh 100.00% Drainage Density Tvc 80.20%, Tc 19.80%, Drainage Frequency Fp 100.00% Average slope Sm 100.00%

7.2.II.C.viii(23) The Sadhudih Pahar

It has covers an area of 174.08 Km\(^2\) total area in height group 300m-400m. It has following distributions of various grades of Relative Relief Rml 100.00%, Dissection index Dmh 84.10%, Dh 15.90 Drainage density Tc 100.00%, Drainage Frequency Fp 96.00% Fm 4.00% Average slope Sm 93.44%, Sms 6.56%.

7.2.II.D The MiddleTrough of Mor Baisn
The area of the middle trough of Mor is about 552.96 Km\(^2\). total area in 200m-300m height group. The percentage distributions of other morphometric attributes in this morpho unit are Relative relief Rel 3.50\%, Rl 55.07\%, Rml 41.23\%; Dissection index Di 78.13\%, Dm 21.87\%, Drainage Density Tec 52.70\%, Tvc 47.30\%, Drainage Frequency Fp 94.72\%, Fm 5.28\%; Average slope Sl 27.06\%, Sg 22.94\% Sm 30.00\%, Sms 20.00\%, Thus it is generally characterized by low relative relief, low dissection index, very coarse drainage density, level slope, medium drainage frequency suggests that the landscape is late mature age of landform development.

This morpho-unit can be sub divided into 2 third under morpho-units based on variation in morphology as follows (Fig 7.3)

7.2.II.D.ix The South western Middle Mor Basin Trough
7.2.II.D.x The Noth eastern Middle Mor Basin Trough

7.2.II.D.ix The South western Middle Mor Basin Trough

This region is a part of Mor Trough. It covers an area of about 307.20Km\(^2\) total area below 100m height group. The percentage distributions of other morphometric attributes in this morpho unit are Relative relief Rel 41.23\%, Rl 55.27\%,
Rml 3.50%, Dissection index Dl 71.02%, Dm 28.28%, Drainage Density Tec 61.13%, Tvc 38.87%, Drainage frequency Fp 98.63% Fm 1.37% Average slope Sl 70.13%, Sg 29.87%

This morpho-unit can be divided into 2 fourth order morpho units based on variation in morphometric characteristics as follows (Fig 7.4)

7.2.II.D.ix(24) The Kolahar Tableland

7.2.II.D.ix(25) The Laberia Peneplain

7.2.II.D.ix(24) The Kolahar Tableland

The Kalahar Tableland is a part of south western middle Mor trough. It measures an area of 184.32 Km². Total area of this area lies in the absolute relief below 100m. the percentage areal distributions of various morphometric attributes as follows relative relief Rel 65.65%, Rl 68.01%, Rml 7.00%, Dissection index Dl 65.65%, Dm 35.35%; Drainage Density Tec 91.72%, Tvc 8.28%, drainage Frequency Fp 97.25%, Fm 2.75% Average slope Sl 80.25%, Sg 14.75% Sm 5.00%

7.2.II.D.ix(25) The Laberia Peneplain

It measures an area of about 122.88 Km² total area in this relief categories in below 100m. The percentage areal
distribution of various morphometric attributes in this region are as follows relative relief Rel 27.53%, Rl 70.47%, Rml 2.00%, Dissection index Dl 76.39%, Dm 23.61%, Drainage Density Tec 30.35% Tvc 69.45%, Drainage Frequency Fp 100.00% Average slope Sg 100.00%.

7.2.II.D.x The North Eastern Middle Mor Basin Trough

It covers an area of about 256.00 Km². Total area is absolute relief category 100m-200m. The percentage distributions of morphometric attributes in this morpho-unit are Relative relief Rel 22.46%, Rl 65.54%, Rml 12.00%, Dissection index Dl 85.23%, Dm 14.77%, Drainage density Tec 44.27%, Tvc 55.73%; Drainage frequency Fp 98.18%, Fm 9.19%, Average slope Sl 55.75%, Sg 24.25%, Sm 20.00%. The dominance of low relative relief low dissection index very coarse drainage density medium drainage frequency and level slope suggest that the area exhibit a topography which is typical of a late mature stage.

This morpho-unit can be sub divided into 2 fourth order morpho-units based on variation in morphometric characteristics as follows (Fig 7.4)

7.2.II.D.x(26) The Mayurakshi Reservoir area

7.2.II.D.x(27) The Ranishwar peneplain
7.2.II.D.x(26) The Mayurakshi Reservoir Area

It measures an area of about 143.36 Km\(^2\) total area of this absolute relief in 100m-200m. The percentage areal distributions of various morphometric attributes in morpho region are Relative relief Rel 57.48\%, Rel 42.52\%, Dissection index Dl 96.10\%, Dm 3.90\% Drainage Density Tec 48.35\%, Tvc 51.65 Drainage Frequency Fp 19.80\%, Fm 80.20\%; Average slope Sl 79.15\%, Sg 10.85\%, Sm 10.00\%.

7.2.II.D.x(27) The Ranishwar Peneplain

It measures an area of about 112.64 Km\(^2\) absolute relief in category 100m-200m total area has lied on. The percentage areal distributions of various morphometric attributes in morpho region are relative relief Rel 100.00\%, Dissection index Dl 100.00\%, Drainage Density Tec 100.00\%, Drainage Frequency Fp 100.00\%, Average slope Sl 72.36\%, Sg 27.64\%.

7.2.II.E. The Lower Trough of Mor Basin

The lower Mor trough has covers on area of about 563.20 Km\(^2\). About 90.98\% of this area is lies in relief category less than 100m and remaining 9.02\% area lies in the attitudinal zone 100m-200m. The following percentage distributions of other morphometric attributes have been
obtained for the region relative relief Rel 47.93%, Rl 36.82%, Rml 11.10%, Rm 4.16%, Dissection index Dl 55.94%, Dm 40.64%, Dmh 3.42%; Drainage Density Tec 53.75%, Tvc 31.19%, Tc 15.06%, Drainage Frequency Fp 63.30%, Fm 32.70 Average Slope Sl 50.42% Sg 49.58%. Thus this region is generally characterized by low relative relief, low dissection index very coarse drainage density, Medium drainage frequency and level slope suggest that landscape is late mature stage.

On the basis of morphometric attributes variations this morpho region can be sub divided into 2 Third order morpho-unit as follows (fig 7.4)

7.2.II.E.xi The South Western Lower Mor Basin Trough
7.2.II.E.xii The North Eastern Lower Mor Basin Trough

**7.2.II.E.xi The South Western Lower Mor Basin Trough**

This region is a part of lower Mor Trough. It has covers an area of about 307.20 Km² about 80.00% of the trough area lies under the absolute relief category of less than 100m and remaining only 20.00% area under the altitudinal zone of 100m-200m. The percentage areal distributions of various morphometric attributes in this region are relative relief Rel 50.41%, Rl 25.59%, Rml
20.16%, Rm 3.84%, Dissection index Dl 48.28%, Dm 47.22%, Dmh 2.90% Dh 1.60%, Drainage density Tec 49.48%, Tvc 26.12%, Tc 24.40%; Drainage frequency Fp 71.83%, Fm 28.17%, Average slope Sl 63.57%, Sg 36.43%. It is a late mature stage landform development.

This trough region can be sub divided into 2 fourth order morpho units.

7.2.II.E.xi(28) The Mayurakshi Nagar Peneplain

7.2.II.E.xi(29) The Lower Mor Balley

7.2.II.E.xi(28) The Mayurakshi Nagar Peneplain

It has covers an area about 122.88 total area in below 100m absolute categories. The percentage distributions various grades of relative relief Rel 100.00%, Dissection index Dl 100.00%, Drainage density Tec 100.00%, Drainage Frequency Fp 100.00%, Average slope Sl 61.75%, Sg 38.35.

7.2.II.E.xi(29) The Lower Mor Valley

It covers an area of about 184.32 Km² total area in below 100m absolute category. The percentage distribution various grades of relative relief Rel 100.00% Dissection index Dl 100.00%; Drainage density Fp 100.00% and Average slope Sl 100.00%.

7.2.II.E.xii The North Eastern Lower Mor Basin Trough
This region is the part of lower Mor Trough. It has covers an area of about 256.00 Km\textsuperscript{2} about 80.20% of the trough area lies below 100m. The percentage areal distribution of various morphometric attributes in this region are relative relief Rel 48.05%, Ri 45.45%, Rml 6.50%; Dissection index Di 70.60%, Dm 29.40%, Drainage Density Tec 100.00%, Drainage Frequency Fp 62.77%, Fm 37.23%, Average slope Sl 100.00%. In general this region has low relative relief, low dissection index, very coarse drainage density medium drainage frequency and level slopes suggest that this region is exhibits in late mature stage of landform development.

This trough region can be sub divided into 2 fourth order morpho-units, based on the basis of variations in morphometric attributes as follows (Fig 7.4)

7.2.II.E.xii(30) The Ardbuni upland

7.2.II.E.xii(31) The Palasi peneplain

7.2.II.E.xii(30) The Ardbuni Upland

It covers an are of about 112.64km\textsuperscript{2} about 54.60% of this area lies under the absolute relief category of less than 100m and 100m-200m. The percentage distribution of various grades of relative relief Rel 80.00%, Ri 20.00%,
Dissection index Del 80.20, Dm 19.80%, Drainage Density Tec 100.00% Drainage frequency Fp 80.20% Fm 19.80% and Average slope Sl 100.00%

7.2.II.E.xii(31) The Palasi Peneplain

It has covers an area of about 143.36km$^2$ total area lies in below 100m absolute relief category. The percentage distributions of various grades of Relative relief Rel 100.00%, Dissection index Dl 100.00% Drainage Density Tec 100.00%, Drainage Frequency Fp 85.83%, Fm 14.17%, Average slope Sl 100.00%.

7.3 Summary and Conclusion

All the foregoing morphological attributes, absolute relief relative relief, dissection index, drainage density, drainage frequency and average slopes have been reassembled in the area and to find out ultimately the morphological units of the area. This method, adopted in this study is superimposing all the above attributes on single frame and more coinciding boundaries gave the morphological landform categories. These boundaries were also checked with first hand information's collected during the field study. On the basis of above observation, it has been concluded that the study-area may be divided into two
first order morpho units has been made on the basis of physiography variations in the area namely (I) The Mor Basin II The Mor Basin Trough. These units have been sub divided into numbers of sub units according to variations in morphometric elements. The second order hierarchy of morpho-units are generally diagnostic in nature and have been named after topographic forms such as valleys plateau hills or hill complex divides plains and peneplains thus five second order regions have been recognized these are (A) The north eastern Mor basin upland (B) The southern Mor Basin upland (C) The upper Trough of Mor Basin (D) The Middle Trough of Mor Basin (E) The Low Trough of Mor Basin on the basis of variations in their morphometric elements, these have been further sub divided into a 12 third order and 31 fourth order sub morpho-units.

7.4 Reference


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