CHAPTER IV

LAND DEGRADATION AND EVALUATION

4.0 Introduction

The present chapter deals with main two aspects of land resources assessment in the study area. First aspect being focused on land degradation due to soil loss which has been estimated using USLE, another aspect devoted to evaluation of land of land resources in the study area employing land capability, suitability and productivity assessment.

This exercise is thought to be very essential component of the present study which will form the basis for the soil suitability for rehabilitation of the people in the native area. As mentioned earlier, exploratory land resource field studies have been carried out, this gives a rapid general appraisal of an area. Normally this is either to determine what further studies are required or to locate suitable sites for specified development.

4.1 Land degradation

Land degradation in the study area has been assessed applying Universal Soil Loss Equation (USLE) which has been elaborated in length in the following lines.

4.1.1 Estimation of soil erosion using USLE

The universal soil loss equation (USLE) is a quantitative method of predicting soil erosion losses from rainfall, soil and other factors. The factors in the equation and its applicability to some situation in India have been used by Ram Babu et al (1970).

Since the present evaluates only the physical factor in order to arrive at the maximum potential loss, therefore the values of cropping management and erosion control practice factors have been taken as a unity.

The universal soil loss equation (USLE)

\[ A = RKLSCP \]

Where,

\[ A = \text{ Soil loss in short tons (2000lb)/acre/year (converted to kg/m}^2/\text{yr}) \]
R = Rainfall erosivity factor,
K = Soil erodibility factor = Slope length factor
S = Slope gradient factor,
C = Crop management factor,
P = Conservation practice factor.

4.1.1.1 Computation of basic inputs parameters in USLE

a. **Estimating R factor (Erosivity factor)**

The rainfall erosivity factor ‘R’ in the USLE is the number of rainfall erosion index units (El₃₀) for a particular location. It is defined (Wischmeier 1959) as one hundredths of the product of the kinetic energy of the storm (KE) & the 30min intensity (I₃₀) as the most reliable single estimate of rainfall erosion potential & was termed as (El₃₀).

The R factor has been computed applying three methods, Roose (1975 a) Morgan (19740 foster, Lane, Nowlin, Laflen & Young (1981)

The mean of these three methods have been given appropriate estimates of erosivity factor, (El₃₀) range from 300 to 800 mm in the study area.

b. **Estimating K factor (soil erodibility factor)**

This factor relates the rate at which different soil erode due to inherent soil properties. Soil erodibility defines the resistance of soil to both detachment & transport depending upon the physical & the chemical properties of soil. The factor is defined as mean annual soil loss per unit of erosivity for a standard condition of bare soil. ‘K’ factor i.e. erodibility factor varies in the study area to range from 0.20 to 0.29.

c. **Estimating LS factor (slope length steepness factor)**

The factor of slope length (L) & slope steepness (S) is combined in a single index. The high relative relief exhibits a significant variation in the LS factor in the study area ranges from 06 to 58 m. LS factor seems to be the dominant factor in accentuating soil loss in the area. The appropriate values are obtained from the equation.

\[
LS = L/22.13 (0.065+0.0455+0.0065S^2)
\]
Where ‘L’ is in m & ‘S’ in percent

The high relative relief exhibits a significant variation in the LS factor in the study area ranges from 0.98 to 21.28 m.

According to Wischmeier the magnitude of the above values (0.01-0.9) is a function of soil characteristics, vegetal cover, crop residues & other factors.

d. **Estimating C factor (Crop factor):**

It represents the ratio of soil loss under a given crop to that from bare soil. In the present study this factor is taken as a unity & based on the % vegetation cover as estimated from FCC image for the Google image 2006.

e. **Estimating P factor (conservation practice factor):**

As like ‘C’ factor ‘P’ factor has also been considered as unity in the present study.

**4.1.1.2 Results**

**4.1.1.2.1 Grid wise estimation of soil loss**

In order to understand spatial patterns of variations in soil loss of the entire area. An attempt has also been made to classify the entire catchment into 9000 cells. It can be observed from the figure 4.1 that, middle portion of the Temghar lake catchment area is subjected to very high soil loss and estimated soil loss varies between 0.11 to 21.98 Kg./m²/year. This part mainly consists of the areas of both the flanks of the reservoir. The middle part of the northern as well as southern flanks heavy soil loss is subjected to summital convexities of hill slopes and gullied ravenous topography of the area (Photo plates10, 11, 12, 13 and 14). Reduction in the soil loss is observed to the areas where dense forest cover patches are in existence. Plateau summits, plateau fringe slopes are subjected to severe soil loss and accounts to about 1.3871% of the land surface area.

The area comprised of four major geomorphic units viz; plateau summits surface, plateau fringe surface, rolling pediment & valley floor (plain) surface. The information thus generated & results obtained are discussed according to type of geomorphic units in the study area.
Plateau summit surface comprises about 5.05 area in km$^2$ (15.42\%) of total land surface mostly cut as runoff zones along the marginal area of the study area. Mean soil loss estimated along this geomorphic unit is of varying magnitude and range between 5 to 10 Kg/m$^2$/yr$^{-1}$. Some pockets of the higher soil loss above 15 Kg/m$^2$/yr$^{-1}$ are noticed in southern part of this geomorphic units (Table 4.1).

Plateau fringe surface is a skirt zone of plateau summit surfaces marked by sharp to blunt crests with rugged appearance indicating that the surface runoff at the upper reaches of the surfaces has caused rill erosion, & characterized by gully heads & ravenous land. Higher mean soil loss is to the order of 13.89169 Kg/m$^2$/yr$^{-1}$, has been observed along this geomorphic units.

Pediment surfaces have moderate mean soil loss ranges between below 5 to 10 Kg/m$^2$/yr$^{-1}$. Mean soil losses in the plain surface is below 0.117587 Kg/m$^2$/yr$^{-1}$.

4.1.1.2.2 Prioritization of sub watersheds for conservation planning based on soil loss estimation studies

Natural resource development programmes are applied generally on watershed basis and thus prioritization is essential for proper planning and management for sustainable development. Watershed deterioration is a common phenomenon in most parts of the world. Amongst several causes, the major ones are improper utilization of watershed resources without any proper vision. Therefore, drainage basins, catchments and sub-catchments are the fundamental units of the management of land and water resources. The watershed management concept recognizes the inter-relationships among the linkages between uplands and low lands. Soil and water conservation is key issue in watershed management. While considering watershed conservation work, it is not feasible to take the whole area at once. Thus, the entire basin is divided into several units as a watershed and sub-basins. In the study area (Temghar lake catchment) prioritization of sub watersheds for conservation planning based on soil loss estimation studies has been planned in the following manners.

4.1.1.2.2.1 Sub basin wise estimation of soil loss

In all five priority levels for conservation planning has been determined (Fig 4.2).
4.1.1.2.2.1.1 Priority level I: Very severe soil loss (Above 20 kg/m$^2$/year)

About three sub basins are noticed to be in this category. Three fourth order basins namely TEM 4.2.7, TEM 4.2.9, TEM 4.2.12 comes under this category. Percentage slope variation is between 20 to 35.5%. Soils are mainly of Sandy Loam and Sandy clay Loam soil in this area. Main characteristics of this area fall under wasteland category of Land use/ Land cover class. This category covers 0.45371 km$^2$ (1.38371% areas).

4.1.1.2.2.1.2 Priority level II: Severe soil loss (Between 15 to 20 kg/m$^2$/year)

This category between 15 to 20 kg/m$^2$/year covers about 3.30481 km$^2$ (10.103% area) of the total land surface area and covers first order basin, viz TEM -1.33, TEM -2.5 TEM -2.6 TEM -2.7 TEM -2.17, total four are sub basins of second order basins whereas TEM -4.2.10 and TEM -4.2.13 are fourth order sub basins. Very steep valley side slopes with numerous formations of gullies and typical ravenous topography of these basins mainly noticed to fall under wasteland category of land use type.

4.1.1.2.2.1.3 Priority level III: High soil loss (Between 10 to 15 kg/m$^2$/year)

Around sixteen sub basins comprise this category and covering 05.83911km$^2$ (17.851% area) of the total land surface area. Hill slopes with devoid of vegetation, sandy loam dominant soil type with very less infiltration capacities contributes maximum soil loss along with high erodibility index. Slopes in this category range from 15% 30%. In this category in all sixteen sub basins have been noticed out of, i.e. seven are the first order sub basins, TEM -1.14, TEM -1.19, TEM -1.24, TEM -1.41 TEM -1.42 TEM -1.43 TEM -1.44. Seven second order basins TEM -2.2, TEM -2.3, TEM -2.8, TEM -2.14, TEM -2.16, TEM -2.18, TEM -2.19, Two are fourth order basins, TEM -4.2.11, 4.2.14 covers this entire category.

4.1.1.2.2.1.4 Priority level IV: Medium soil loss (Between 05 to 10 kg/m$^2$/year)

Soil loss in this category range to vary between 05 to 10 kg/m$^2$/year comprises 31 sub basins out of which seventeen are first order basin, viz TEM- 1.12, TEM -
1.13, TEM - 1.20, TEM - 1.21, TEM - 1.22, TEM - 1.23, TEM - 1.25, TEM - 1.29, TEM - 1.32 TEM - 1.34 TEM - 1.35, TEM - 1.36, TEM - 1.39, TEM - 1.40, TEM - 1.45, TEM - 1.47, TEM - 1.50. Four second order basin, TEM - 2.1, TEM - 2.13, TEM - 2.15, TEM - 2.20. Three third order basin i.e. TEM -3.1, TEM -3.2, TEM - 3.3. and seven fourth order basins TEM -4.1, TEM -4.2.1 TEM -4.2.2, TEM -4.2.4, TEM -4.2.5, TEM -4.2.6, TEM -4.2.8. This category covers maximum area about 16.01381 km$^2$ (48.957% area) of the total land surface area. In this category it is noticed to be high seems to be due to the bare hill slopes of mainly scrubland, elongated depressions along hill slopes.

4.1.1.2.2.1.5 Priority level V: Low soil loss (Below 05 kg/m$^2$/year)

This category covers maximum area about 07.09856 km$^2$ (21.701% area) of the total land surface area and comprises 32 sub basins out of which 25 are first order basins viz, TEM-1 TEM-1.2, TEM-1.3, TEM-1.4, TEM-1.5, TEM-1.6, TEM-1.7, TEM-1.8, TEM-1.9, TEM-1.10, TEM-1.11, TEM-1.15, TEM-1.16, TEM-1.17, TEM-1.18, TEM-1.26, TEM-1.28, TEM-1.30, TEM-1.31, TEM-1.37 TEM-1.38, TEM-1.46, TEM-1.48, TEM-1.49, 05 second order basins TEM-2.4 TEM-2.9, TEM-2.10, TEM-2.11, TEM-2.12, and two are fourth order basins TEM-4.2.3, TEM-4.2.15. The spread up of these basins mainly noticed along the pediment zone with sandy clay loam soil environment. This favours high infiltration and well marked with medium to dense vegetation cover. Slope is ranging between 5% to 10%.

In view of the site suitability for rehabilitation of the project affected people in the native area itself, a detailed study of land and soil resources is much essential therefore, land evaluation of the study area has been performed and land capability, suitability and productivity assessment has been worked out. The details of each component are outlined in the following lines.

4.2 Land capability classification

The concept of land capability was developed during the 1930s in the USA, but the widespread adoption of land capability schemes only began after 1960s. The assessment of land capability involves an evaluation of the degree of limitation, imposed by permanent or semi permanent attributes of land to one or more land uses.
The land capability classification of Temghar lake catchment has been performed by adopting USDA classification system and the method developed by soil survey department of Maharashtra state. The system of soil survey department more or less is similar to that of USDA system of classification. USDA system is widely used in Indian environment.

The broadest categories of the system which have been worked out for the present study area indicating degree of their limitation on a broadest level. Various soil properties and village level soil survey data from soil survey department has been incorporated in the preparation of land capability map. In the present analysis, topographic aspect (slope rock outcrops), erosional aspect (signs of erosion), hydrological characteristic (soil drainage), physical soil condition (stoniness, depth, texture, soil stoniness, available water capacity, chemical properties of soil (CaCO₃, pH and organic carbon and organic matter), etc have been considered for each of the soil sample location along with soil profile characteristics.

4.2.1 Land capability classification of Temghar lake catchment

Land capability classification performed for the Temghar lake catchment following the USDA method, demonstrated very good results. As mentioned earlier the study area is characterized by hilly terrain with considerable higher slopes, have pronounced effect on the land capability classification of the study area. The village wise information of soil environment of the study area has been obtained from soil survey department and field observations in the study area led to prepare a rating table (table no 4.4) for the capability classification. According to this, when entire area has been classified, it is observed that, class I (very intensive cultivation) and II (intensive cultivation) are totally absent in the study area, and rest of the classes present are III, IV, V, VI have been described and displayed in table no 4.2 and Fig.4.3 and 4.4, and elaborated in the following lines.

Class III Moderate cultivation: This class measures about 20.13 % (7.59 km² (75.90 ha.) of the total land surface area and mainly confined to the pediment surfaces with insignificant gullied topography. The extent of this class is noticed to the southern part on a wider scale and covers maximum undulating, rolling pediments of Temghar and Vede villages. In the northern part it is noticeably delineated along pediments and follows the general shape of villages, and some north eastern part of the village Vegre.
**Class IV Limited cultivation:** Almost entire catchment in the back water area of reservoir is delineated by this class. The area under this class admeasures about 62.60% (23.60 km$^2$ or 236.00 ha.) of the total land surface area. Degrees of limitations have been increased in this class. Exclusive part which occupied by these classes are III, V and VI along with water body of four villages mainly comprising Temghar, Vegre, Vede and Lavarde.

**Class V Intensive grazing:** Followed by the class IV, upper part of the water body mainly marginal portion of the catchment has occupied by this class. The area under this class is 1.33% (0.50 km$^2$ or 50 ha.) of the total land surface area. The extent of this class is noticed to the southern part of village Temghar, southern part of the village Lavarde and western part of the village Vegre.

**Class VI Moderate grazing and forestry:** This class mainly covers the portions of waste lands, forest lands and degraded forests in both sides of Temghar lake catchment confined mainly to plateau summit and fringe areas. The area under this class is about 2.71% (1.02 km$^2$ or 10ha) of the total land surface area.

Land capability classification performed for Temghar lake catchment indicates that, terrain in the lake catchment is not suitable for intensive farming. Moreover moderate cultivation can be adopted only for 20% of the total land surface area. Very high extent accounted for class IV seems to be the potential land surface area for horticulture and is a significant part of land surface area. Area under class III and class IV covers around 82% of total land surface area which is a amenable portion of the terrain for various kind of uses.

### 4.3 Land suitability classification

#### 4.3.1 Introduction

In the present study an attempt has also been made to identify land suitability classes on existing resource conditions. Broad level classification of land suitability is attempted using FAO framework. Land suitability classification promotes more specific about the fitness of the land for a given use, this being implied by the word ‘suitability’ rather than ‘capability’. Thus, for instance, it is possible to map land suitability for specific use of land.
4.3.2 The FAO framework

The framework for land evaluation (FAO 1976 a) is a standard set of principles and concepts on which national or regional land evaluation systems can be constructed. It emphasizes in particular the importance of explicitly stating the intended land use and the level of management envisaged, and that land evaluation may be either on current suitability or, as for irrigation / drainage schemes, on potential suitability. It should be emphasized that, the system is only a framework, and for most projects it will need quantifying with detailed specifications as discussed in FAO (1979 a) and Smyth et al. (1979).

The frameworks structure is compatible with other systems but allows with great flexibility. There are two orders, termed suitable (S) and not suitable (N), conditionally suitable land (Sc) is a ‘phase’ of the order suitable, and approximates to classes 4 and 5 of USBR, but its extent must be small with respect to the total study area; Definitions of FAO land classes are given in table 4.3 The framework employs several terms to define or describe land features in particular ‘land quality’ and ‘land characteristics’.

4.3.3 Land suitability classification of Temghar lake catchment

The soil survey being at exploratory and reconnaissance level owing to prefeasibility level. Land suitability of the study area has been attempted following FAO framework. (Table 4.3 and Fig.4.5 and 4.6)

**S1 Highly suitable** This class is absent in the Temghar lake catchment.

**S2 Moderately suitable** Low lying pediment surfaces and plain surfaces of the study area is a potential zone of moderately suitable land for cash crops as well as food grains, for both Rabbi and Kharif seasons. The area is exclusively suitable for paddy cultivation provided; dependable water supply is made available and even for rain fed conditions also. This category covers about 0.36% (0.95km²) of the total land surface area.

The main villages comprising this area are Lavharde and Vede

**S3 Marginally suitable** This category covers the area to about 7.19% (2.71km²) of the total area and mainly covers the extensive pediments up to the base of plateau fringe surface zone. The relative relief varies between 40 to 60 m with % dissection
index which varies between to 4 to 6 %. This category may be amenable by erecting anti erosion structures in the area. The potential use of land may be attributed to growing of medicinal plants and horticulture. Horticulture practicing in this part no doubt be initiated by innovative technology of irrigation through sprinkler and drip irrigation. Lift irrigation schemes should be undertaken as there is a plenty of water supply in the form of water body of Temghar reservoir in this area.

Afforestation through horticulture and growing of native plant species may be certainly helpful in multipurpose conservation of the land resources in the study area. Moreover basin treatment should be given in the form of gully plugging and Gabion structures which will help to enrich the ground water resources in the study area.

**N1 Currently not suitable** This category covers about 18.75% (7.07km² area) of the total land surface area and rank second in terms of its extent in the area. The plateau fringe surface area is a characteristic of this category and appeared to be highly dissected with high range of relative relief from 80 m to 120 m. The soils are good enough to support native tree plantations in the study area.

Recently the trend of construction of farm houses and an afforestation of the lands by their owners at a elevation has been introduced in the area. This is a welcome trend of land utilization in these remote areas, may provide employment opportunities to the local people as well as restoration of scare species is possible, however this has led to unprecedented runoff and soil loss in the study area. The bare nature of hill slopes in this area may be covered by introduced plantation with limited inputs. Water supply may be made available through lift irrigation scheme from Temghar reservoir in the area.

**N2 Permanently not suitable** This category covers about 59.87% (22.57km²) of the total land surface area and is characterized by summital convex parts of the plateau surfaces with thin soil cover and mainly having sandy to sandy clayey soils. The moisture conditions are optimum in this class area but are a good recharge zone to enrich the ground water storage.

Land suitability thus provides potentiality of the land resource development in the study area. This is ascertain through linked potential utilization from N 2 – recharging of ground water – N 2 – check to soil erosion by introduced plantation and based on dependable water supply, S 3 – horticulture and extensive afforestation – S 2 – grazing of cash crops and food grains – S 1 –which will certainly achieve the socio-economic upliftment – wildlife conservation – restoration of species through forest
conservation and enrichment of socio-economic status of the village poor accordingly. This exercise will certainly focus on sustainable development and potential land resource management in the study area.

4.4 Land productivity assessment of Temghar lake catchment

4.4.1 Storie index method of soil rating

This method of soil rating known as the Storie index is based on the soil characteristics that govern the land's potential utilization and productive capacity. It depends on other physical and economical factors that might determine the desirability of growing certain plants in a given location.

The percentage values are assigned to the characteristics of the soil itself, including the soil profile (Factor A), the texture of the surface soil (Factor B), the slope (Factor C) and the condition of the soil exclusive of profile, surface texture and slope, for example drainage, alkali content, nutrient level, erosion and micro relief (factor X). The most favorable or ideal conditions with respect to each factor are rated at 100%. The percentage values or ratings for the four factors are then multiplied, the result being the Storie index method of rating of soil. (Table 4.4)

The characteristics of soil profile (factor A) - are essentially the features of the surface layers. Soils that are deep and readily pervious to roots and water are rated at 100%. Profiles with dense clay sub soil are rated lower. Primary or residual soils are rated in accordance with the depth of bedrock.

Next, the soils are rated on the basis of the texture of the surface soils. Medium textured soils such as the loams and silt loams are rated highest.

Rating of the slope of the land is considered as factor C. nearly level or gently sloping land is rated at 100%. As the slope increases, the rating for this factor decreases. As shown in the soil rating chart, single letters are used to indicate simple slopes and double letters to indicate compound slopes. The percent slope expresses the number of feet rise or fall for 100 feet horizontal distance.

Conditions exclusive of profile, soil texture, and slope are considered in factor X on the soil rating chart these conditions consist of drainage, alkali, or salt content, general nutrient level, acidity, erosion and micro relief. if two or more condition
exists that are listed under factor X, the rating for each are treated independently, that is, they are multiplied in order to secure the factor X rating.

4.4.2 Soil grading

For simplification six soil grades have been set up in by combining soils having ranges in index rating as follows;

Grade 1 (excellent): soils that rate between 80 and 100% and which are suitable for a wide range of crops. This grade is absent in the study area.

Grade 2 (good): soils that rate between 60-79% and which are suitable for most crops. Yields are generally good to excellent. This grade is absent in the study area.

Grade 3 (fair): soils that rate between 40-59% and which are generally of fair quality. With less wide range of suitability than grade 1 and 2. Soils in this grade may give good results with certain specialized crops. About 10.48% total land surface area of Temghar lake catchment fall under this grade i.e. 3.95 km$^2$

Grade 4 (poor): soils that rate between 20-39% and which have a narrow range in their agricultural possibilities. For example, a few soils in this grade may be good for rice, but not good for many other uses. 63.26% of total land surface area of the study area comes under this grade i.e. 23.85 km$^2$

Grade 5 (very poor): soils that are rated between 10-19% are of very limited use except for pasture, because of adverse condition such as shallowness, roughness and alkali content. About 11.72% of Temghar lake catchment fall under this grade i.e. 4.42 km$^2$

Grade 6 (nonagricultural): soils that rate less than 10% include. For example, tidelands, river wash, soils of high alkali content and steep broken land. 1.30% of total land surface area of Temghar catchment comes under this grade i.e. 0.49 km$^2$

4.4.3 Soil productivity assessment of Temghar lake catchment

Soil productivity assessment exercised for Temghar lake catchment has produced very good results. Several parameters in each and every factors of Storie Index have been computed in GIS environment which almost covers soil as well as terrain parameters. Entire area divided into more than 7000 grid cells each covering
about 77.2 m². The output map displayed in fig no 4.7 and 4.8 and productivity classes displayed in table no 4.4.

It can be observed from above fig no 4.7 and 4.8 and table no 4.4 that productivity classes of grade 1 and 2 are almost absent in the study area and productivity from fair to non agricultural land does exist in the study area. Grade 3 and 4 of fair and poor productivity almost comprises 73.74% of the entire catchment area and 84.99% of the total land surface area. Very poor of the grade of 5 accounts to 13.51% of the total land surface area. Thus the spread of the grade 3, 4, 5 almost comprises 98.50% of the total land surface area. It can be therefore said that, soil productivity in the study area is not at all good however some of the land facets are amenable and can be regenerated for optimum potential desired land use.

Land capability classes, suitability classes almost match with the productivity classes, indicating that, there is a high influence of physical determinants’ in terms of relative relief, absolute relief, dissection index and percentage of slope on the soil environment.
TEMGHAR LAKE CATCHMENT
SOIL LOSS ESTIMATION USING USLE

Fig. no. 4.1
TEMGĦAR LAKE CATCHMENT
PRIORITYIZATION OF SUB BASINS FOR CONSERVATION PLANNING

Fig. no. 4.2
Fig. no. 4.4

PIE DIAGRAM SHOWING PERCENTAGE OF LAND CAPABILITY CLASSES

- Class III: 20.13%
- Class IV: 62.60%
- Class V: 13.24%
- Class VI: 2.71%
- Water Body: 1.33%
TEMGHAR LAKE CATCHMENT
LAND SUITABILITY MAP

Fig. no. 4.5
GRAPH SHOWING PERCENTAGE OF AREA UNDER LAND SUITABILITY CLASSES

Fig. no. 4.6
TEMGHAR LAKE CATCHMENT
SOIL PRODUCTIVITY MAP
(STORIE INDEX METHOD)

Fig. no. 4.7
PIE DIAGRAM SHOWING PERCENTAGE OF LAND PRODUCTIVITY CLASSES

- Fair: 10.48%
- Poor: 63.26%
- Very Poor: 11.72%
- Non-agricultural: 13.24%
- Water body: 1.30%

Fig. no. 4.8
Table 4.4: Extent of area under Soil productivity classes and its rating

(Storie Index)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Grade</th>
<th>Productivity Class</th>
<th>Area (Km²)</th>
<th>Area in %</th>
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<tr>
<td>1</td>
<td>Grade 1</td>
<td>Excellent</td>
<td>0</td>
<td>0.00</td>
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<td>2</td>
<td>Grade 2</td>
<td>Good</td>
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<td>Poor</td>
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<td>Very Poor</td>
<td>4.42</td>
<td>11.72</td>
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<td>6</td>
<td>Grade 6</td>
<td>Non-agricultural</td>
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<td>1.30</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>Water body</td>
<td>4.99</td>
<td>13.24</td>
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<td><strong>Total</strong></td>
<td></td>
<td><strong>37.7</strong></td>
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Table No. 4.3: Extent of the area under land suitability classes

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<th>Sr. No.</th>
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<th>Area (%)</th>
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<td>1</td>
<td>S1</td>
<td>Highly Suitable</td>
<td>0</td>
<td>0.00</td>
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<tr>
<td>2</td>
<td>S2</td>
<td>Moderately Suitable</td>
<td>0.36</td>
<td>0.95</td>
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<td>S3</td>
<td>Marginally Suitable</td>
<td>2.71</td>
<td>7.19</td>
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<td>4</td>
<td>N1</td>
<td>Currently Not Suitable</td>
<td>7.07</td>
<td>18.75</td>
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<tr>
<td>5</td>
<td>N2</td>
<td>Permanently Not Suitable</td>
<td>22.57</td>
<td>59.87</td>
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<tr>
<td>6</td>
<td>W</td>
<td>Water body</td>
<td>4.99</td>
<td>13.24</td>
</tr>
<tr>
<td></td>
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<td><strong>Total</strong></td>
<td><strong>37.70</strong></td>
<td><strong>100</strong></td>
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Table No. 4.2: Extent of the area under land capability classes

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<th>Area in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Class I</td>
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<td>0.00</td>
</tr>
<tr>
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<td>Class II</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>Class III</td>
<td>7.59</td>
<td>20.13</td>
</tr>
<tr>
<td>4</td>
<td>Class IV</td>
<td>23.6</td>
<td>62.60</td>
</tr>
<tr>
<td>5</td>
<td>Class V</td>
<td>0.5</td>
<td>1.33</td>
</tr>
<tr>
<td>6</td>
<td>Class VI</td>
<td>1.02</td>
<td>2.71</td>
</tr>
<tr>
<td>7</td>
<td>Water Body</td>
<td>4.99</td>
<td>13.24</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>37.7</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
Table 4.1: Extent of the area under soil loss - Universal Soil Loss Equation  
(Total land surface area)

<table>
<thead>
<tr>
<th>Soil loss in Kg/m²/Y⁻¹</th>
<th>Below 5</th>
<th>5 to 10</th>
<th>10 to 15</th>
<th>15 to 20</th>
<th>Above 20</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area in Km²</td>
<td>07.09856</td>
<td>16.01381</td>
<td>05.83911</td>
<td>3.30481</td>
<td>0.45371</td>
<td>32.71</td>
</tr>
<tr>
<td>Area in %</td>
<td>21.70</td>
<td>48.957</td>
<td>17.851</td>
<td>10.103</td>
<td>1.3871</td>
<td>100</td>
</tr>
</tbody>
</table>
10. GRAVEL BED STREAMS INDICATE HIGH RUNOFF AND THEREBY SOILL LOSS
11. PERMANENT FALLOW LANDS – COVERED WITH GRASSES
12. HUMAN INDUCED EROSION – CUTTING OF HILL SLOPES FOR ROAD CONSTRUCTION
13. SCRUB LAND PRONE TO EROSION
14. STEEP SLOPES SUSCEPTIBLE TO HEAVY SOIL LOSS AND RUNOFF