Study of Silt Load Assessment at Hinganghat GD Station at Vena River.

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ABSTRACT:*Soil is the most important component of the reservoir because it links together the soil, vegetation, drainage streams & reservoirs. Soil erosion by water is one of the major threats to soils in the hinganghat catchment area; soil erosion not only decreases agricultural productivity, but also reduces the life of reservoir. There have been developed various soil erosion / soil loss predictive models/ equations by several investigators but they have own limitation, hence do not provide suitable means for assessing the soil erosion/soil loss from all the area.The objective of the present study is to estimate the annual soil loss using USLE model for hinganghat catchment area. And to reduce entry of silt in reservoir.*

Keywords: Land Use, Soil erosion, Watershed, USLE.

INTRODUCTION

Soil is the most important component of the environment because it links together the atmosphere, soil, vegetation, drainage, streams & reservoirs. Silt or Sediment in a stream is considered to be its greatest pollutant. It flows into the streams from Point sources and non-point (non-measurable) sources of the land mass along with runoff. Nonpoint source pollution cannot be traced back to a single origin or source such as storm-water runoff, water runoff from urban areas or failed septic systems. This sediment in runoff water, after settlement, fills the bed of rivers, and reservoirs, contaminate the water bodies and reduces their storage capacities. Suspended sediment degrades the quality of water in streams and reservoirs because it is not palatable and along with it. Effective control of soil losses requires implementation of the best management practices in critical erosion prone areas of the watershed.

STUDY AREA

The study area, named Hinganghat watershed, is located at Wardha city.

Watershed area having a geographical area of 4109 square kilometer on Vena River, Elevation in the watershed ranges from 550 to 820 m above mean sea level. Hinganghat is location at latitude of 200 32’58"N and longitude780 48' 00" E. The extent of Catchment Lat 21.0320 N, Lon.78.2990E left to 20.6500N, 79.3670E, right &Lat.21.2080N, Lon 78.7360 E top to20.5450 N 78.8090E bottom. The average annual precipitation at Hinganghat area for the last five years is approximately 1314.56mm.The major land use/land cover categories in the watershed are: Forest area, agricultural area, and mixed area (Data obtained from Hydrology project division, Nagpur).

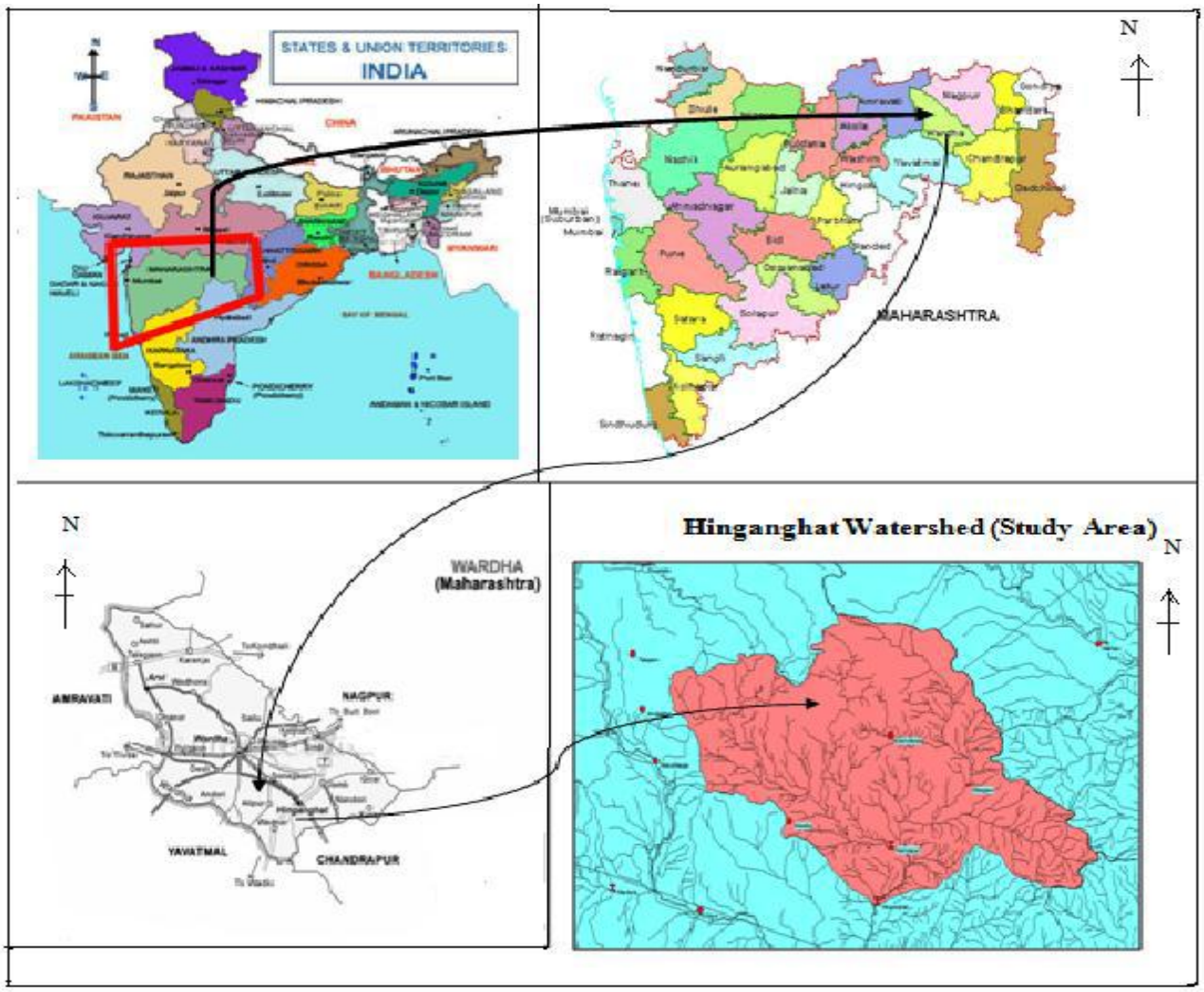

Fig.:1 Location of the Study Area (Hinganghat Watershed)

For the calculation of soil loss from the reservoir. There are many estimating models such as USLE, MUSLE, FAO PROVISIONAL MODEL, STEHLIK MODEL, etc.

1. Silt Load Assessment Using Universal Soil Loss Equation (USLE):

The USLE was developed in the U.S. based on soil erosion data collected beginning in the 1930s by the U.S. Department of Agriculture (USDA) Soil Conservation Service). The Universal Soil Loss Equation (USLE) provides a convenient way to estimate the rate of soil loss on land so that the loss of soil rate is compares with district's standards. The USLE takes into account the major factors that influence soil erosion by rainfall: rainfall patterns, soil types, slope steepness, and management and conservation practices. The equation is simple to use. Once determined the values for each of the five factors, and multiply them then annual soil loss for the catchment is calculated by using following equation:

$$A=R\times K\times LS\times C\times P$$

Where,

R =rainfall factor,

K = soil erodibility factor,

LS = length and steepness of slope factor,

C = cropping and management factor,

P = conservation practices factor,

A = the computed average annual soil erosion loss in tons per acre. After determined 'A' by USLE comparison is made with actual annual soil loss in the Vena catchment. 'A' should be within a range of plus or minus 20 percent of your actual average annual erosion on the field sediment.

2. Modified Universal Soil Loss Equation (MUSLE):

The formula of Modified Universal Soil Loss Equation is given as:

$$Y=95(Qq_p)^{0.56}x\ KxLxSxCxP$$

Where,

Y= sediment yield for an individual (tons)

Q= volume of runoff (acre-feet)

Q_p= peak flow rate (cfs)

K, L, S, C, and P are the factors of universal soil loss equation.

3. F.A. O. provisional model:

F.A. O. erosion prediction model is given below:

T=f (C.S.T.K)

Where,

D=soil degradation i.e. soil erosion (t/ha/y)

C= climatic factor i.e. rainfall in terms of yearly total

S=soil factor

T= topographic factor

K=constant, which represents standard conditions of natural vegetation, land use & management practices

4. STEHLIK model:

This model is represented by following equation:

X=D.G.P.S.L.O.

Where,

X=mean annual soil loss (mm/yr.)

D=climatic factor (mm/yr.)

G= petrological factor

P= soil erodibility factor (dimensionless)

S=steep slope factor (dimensionless)

L= slope length factor (dimensionless)

O=vegetation factor (dimensionless)

5. RUSLE model:

The updated USLE is referred as a revised universal soil loss equation (RUSLE. This update form of USLE is based on more than12000 gauging stations.

CONCLUSION

From the above comparisons of various silt loads assessment empirical models we can say that none of the above equations cannot be used universallyfor all the types of catchment. The Universal Soil Loss Equation is develop for predicting annual soil loss. USLE is a simple tool and easy to use the data required for calculation of parameter which is use in the USLE equation can be efficiently obtained and estimated.

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