

ASSESSMENT OF SOIL EROSION

India's rivers constitute 5% of the world's river but they carry 35% of the sediments. We loose about 6000 million metric tons of topsoil annually due to water and wind erosion. This erosion in terms of fertilizer is equivalent of losing 6 million tons of soil nutrients every year, which is approximately equal to the fertilizer we import every year. Eventually, a substantial portion of the eroded soil deposits in reservoirs and reduce valuable live storage and also make the reservoirs eutrophic. It is always economical to increase the life span of any reservoir by reducing the sedimentation by adopting appropriate soil conservation measures than constructing new reservoirs. Further, construction of new reservoirs is becoming technologically more complex, economically less attractive and less environment-friendly compared to earlier generation of completed projects.

TECHNOLOGY

The Universal Soil Loss Equation (USLE) developed by Agriculture Research Services, USA can be applied for quantification of sediment yield from the catchment area of a reservoir. The USLE states that the field soil loss 'A' is the product of six causative factors:

$$A = R.K.L.S.C.P \quad \dots(1)$$

where A is computed soil loss in tons/hectare/year, R is the rainfall erosivity factor, K is a soil erodibility factor, L is the slope length factor, S is the slope steepness factor, C is a cover-

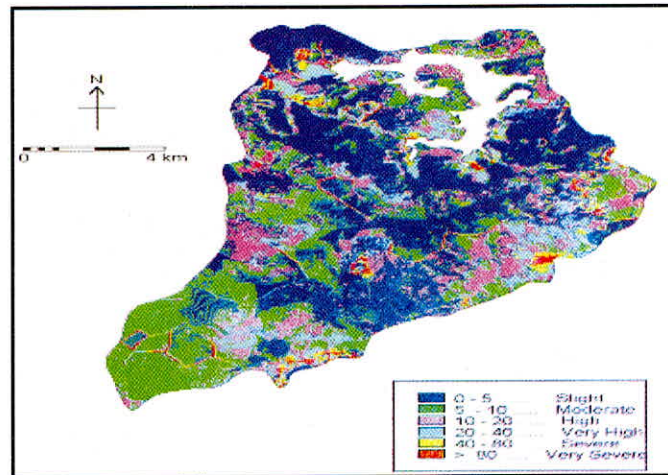


Figure - 1 Expected soil loss in Bila catchment

management factor, and P is a supporting practices factor. This empirically based equation, derived from large field data, computes sheet and rill erosion.

The methodology for generation of information about the catchment area of a reservoir prone to excessive siltation with respect to various attributes of USLE is given here. The digital data of remote sensing satellites can be used for the generation of land use map. The slope map can be prepared from the contour lines given in Survey of India toposheets and by preparing Digital Elevation Model (DEM). The information

pertaining to rainfall and soils can be collected from IMD and State agencies. The data storage and analysis can be done by using a Geographic Information System (GIS) such as ILWIS 3.0 and the information related to all six factors of the USLE can be stored in different thematic map layers. Then, all the six factor-maps are multiplied together in GIS to obtain resultant map showing intensity of soil loss in tons/hectare per year. One such output raster map indicating soil erosion class is shown in Figure - 1. The intensity of soil loss is multiplied with corresponding area to get the total soil loss per year.

Next, the map of the catchment depicting spatial variation of total soil loss can be classified as different sub-zones representing different categories of severity of erosion, e.g. slight erosion, moderate erosion, high erosion, severe erosion, very severe erosion etc. The map provides the intensity of soil erosion and area of the catchment under each sub-zone. Appropriate soil conservation measures can then be taken up in the areas of catchment susceptible to high, severe or very severe erosion in order to check/reduce the soil erosion which is getting deposited in the reservoir and reducing its live storage capacity.

ENVIRONMENTAL IMPACT

As this technology is used to determine soil erosion from watersheds/

catchments to take necessary measures for reducing soil erosion, it will have positive effect on the environment.

ECONOMICS

Using this technology, a specific study on Bila reservoir having catchment area of about 140 sq. km was carried out. It is estimated that afforestation in the 50% of the barren land, which is about 1280 ha of the catchment, will increase the life of the reservoir by about 35%.

An amount of Rs. One lakh was incurred for studying the Bila reservoir catchment including the cost of the remote sensing data, but excluding the cost of ILWIS-GIS software. However, the benefit that is estimated to be accrued by controlling the soil erosion, including reduction of reservoir sedimentation, is expected to be much more.

BENEFICIARIES

The government agencies dealing with the maintenance and operation of reservoirs and soil conservation/ watershed management agencies in a catchment will be direct beneficiaries. The savings of precious live storage of the reservoirs will ensure larger storage in the reservoir for various uses.

INTELLECTUAL PROPERTY RIGHTS

No element of Intellectual Property Rights is involved in the use of this technology.