Abstract

Tarbela dam is a major resource of Pakistan that provides 50% of the total irrigation water and 30% of the total energy needs of Pakistan, is being threatened by the menace of sedimentation. The underwater delta is advancing at a rapid pace towards the main embankment dam, being at a distance of 5.25 miles from M.E.D. in 2012. This study focused on delta pivot point forecast mapping, which presented a terrible picture, that by the year 2032, the pivot point would be only 0.4 miles away from the M.E.D. Numerous studies have been carried out for pivot point advancement forecasts, however mapping it had been a neglected area. This research has filled that gap. This study tried to establish seasonal patterns of Tarbela's sediment transport and relating them to changing climatic patterns of its catchment area. The MLR model proved inflow coming in the reservoir to be the most important independent variable, other two being temperature and rainfall in the catchment area, by proving that a unit increase in inflow can lead to a 0.4% increase in sedimentation of the reservoir. The linear relationship of the model was y= -0.146 + 0.007 – 0.001 + 0.004, where y is the dependent variable sedimentation, independent variables were temperature, rainfall and inflow. The coefficient of correlation R square was 0.497.

In order to monitor and assess the sedimentation trends of Tarbela reservoir, this study focused on two important factors that have an impact on it, i.e. snow cover and climatological variables. Since snow cover and sedimentation have a strong negative correlation, i.e. as one increases the other decreases, thus in this study the snow cover of Passu glacier for 1992 and 2000 was mapped, using NDSI index. The decrease of snow area proved a retreat of the glaciers of UIB. Decrease in snow cover was proved to be linked with increased inflows and increased sedimentation rates in Tarbela reservoir. The meteorological variables were proved to be presenting different trends in the three decades under study, with 1991-2000 being slightly less warm than 1981-1990 and 2001-2010. Rainfall decadal difference mapping presented minimum decrease in northern UIB and maximum decrease in southern UIB. The fluctuations in climate trends of UIB provide a warning that a warming phase is approaching. This warming will definitely aggravate glacial melting which would lead to more runoff and sediment generation which in turn would lead to sediment accumulation in Tarbela, thus leading to its rapid intake clogging.