Identifying sensitivity of factor cluster based gully erosion susceptibility models

Research Article | Published: 26 July 2022

Volume 29, pages 90964–90983, (2022) Cite this article

Swades Pal, Satyajit Paul & Sandipta Debanshi

Abstract

The present study has attempted to address the issue of sensitivity of different clusters of factors towards gully erosion in the Mayurakshi river basin. Firstly, the gully erosion susceptibility of the basin area has been mapped by integrating using 18 parameters divided into four factor-cluster, viz. erodibility, erosivity, resistance, and topographical cluster, with the help of four machine learning (ML) models such as random forest (RF), gradient boost (GBM), extreme gradient boost (XGB), and support vector machine (SVM). Results show that almost 20% and 25% of the upper catchment of the basin belongs to extreme and high gully erosion susceptibility. Among the applied algorithms, RF is appeared as the best performing model. The spatial association of factor cluster-based models with the final susceptibility model is found the highest for the erosivity cluster, followed by the erodibility cluster. From the sensitivity analysis, it becomes clear that geology and soil texture are dominant contributing factors to gully erosion susceptibility. The geological formation of unclassified granite gneiss and geomorphological formation of denudational origin pediment-pediplain complex is dominant over the entire upper catchment of the basin, and therefore, can be considered regional factors of importance. Since the study has figured out the different grades of susceptible areas with dominant factors and factor cluster, it would be useful for devising planning for gully erosion check measures. From economic particularly food security purpose, it is very essential since it is concerned with precious soil loss and negative effects on agriculture.