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## Responses of chemical weathering and gully erosion causing land degradation in the extended part of Chotanagpur plateau in India

**Subodh Chandra Pal** and Rabin Chakraborty

The University of Burdwan, Geography, India (geo.subodh@gmail.com)

Whether the hot and humid subtropical plateau region could leads to land degradation in the form of weathering and gully erosion. In this study, chemical weathering, gully erosion and cohesiveness are investigated together to bring out a new comprehensive idea with a view to understand their controlling factors. This study aimed to address potential land degradation in the extended part of Chotanagpur plateau region. The layers of controlling factors of gully erosion were developed and prioritized considering advanced decision tree, decision tree and random forest algorithms in the R software and the results of these methods were also validated using receiver operating characteristic (ROC) curves. Degree of chemical weathering and cohesiveness were measured through the chemical, physical and spectroscopic analysis of the randomly collected 412 soil samples. Apart from this, the climatic elements like temperature and rainfall were considered for estimating the chemical weathering. The results of the gully erosion models have superb accuracy, i.e. ROC values were 0.970, 0.960 and 0.955 respectively. Therefore, advanced decision tree model has been integrated with the results of degree of chemical weathering and cohesiveness in GIS platform end eventually the land degradation map has been developed. The land degradation map shown that 15% of the study area is highly affected by land degradation whereas 18% area is moderately affected by land degradation and rest of the 67% area is less affected by land degradation. This study provides essential information to the policy makers in order to taking decision for minimizing and controlling the land degradation. This innovative comprehensive approach is significant to assess degradation of existing land to a large scale.

**Keywords:** Land degradation; weathering; cohesiveness; gully erosion; spectroscopic analysis