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Title:	Towards evaluating gully erosion volume and erosion rates in the Chambal badlands, Central India
Authors:	Yunus, Ali P. (/jspui/browse?type=author&value=Yunus%2C+Ali+P.)
Keywords:	Gully erosion volume Chambal badlands Digital elevation model (DEM)
Issue Date:	2022
Publisher:	Wiley
Citation:	Land Degradation and Development, 33(9), 1495-1510
Abstract:	High-resolution multi-temporal digital elevation model (DEM) are key to accurate mapping of gully erosion volume change studies. Owing to the lack of multi-temporal DEM at a high spatial resolution, gully development rate, and gully erosion-fill volume change estimates in the Indian badlands are poorly studied. Our study explored the use of multi-temporal TerraSAR-X add-on for digital elevation measurement (TanDEM-X) derived elevation models to quantify the erosion volume and gully susceptibility mapping in the Chambal badlands, Central India. The average volume of gully erosion based on the DEM subtraction method in the study area was found to be $135 \times 105 \text{ m}^3$, and the estimated annual rate of soil erosion was $\sim 284 \text{ t hr}^{-1} \text{ yr}^{-1}$. Using machine learning models, we trained these data for gully erosion susceptibilities and volume prediction for a larger study region; and validated the results with independent samples. The accuracy of the model in terms of area under the receiver operating curve (AUC) values has reached 0.85 for training and 0.87 for validation, indicating satisfactory model performance. After validation, the best fit model was implemented onto a testing site (no multi-temporal DEM available) in order to predict erosion zones and erosion volume estimation. The model predicted that about 40% of the area is highly affected by gully erosion, with the maximum gullying process in the north-Central and lowest in the southwest parts of the testing area. The research framework presented in this study can be useful in estimating the erosion rate in the badlands of the Chambal Valley and can be used effectively in ravine reclamation projects.
Description:	Only IISER Mohali authors are available in the record.
URI:	https://doi.org/10.1002/ldr.4250 (https://doi.org/10.1002/ldr.4250) http://hdl.handle.net/123456789/4883 (http://hdl.handle.net/123456789/4883)
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