

Developing soil erosion indices in Nepal using distributed modeling

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Repeated subductive actions of the Indian and Tibetan plates coupled with deforestation, high intensity strong monsoon rainfall, steep topography, and extensive farming system contribute to the losses of precious soils from Nepal. The loss of precious soil not only creates problems for Nepal to restore her ecosystems and food security, but it also affects the ecosystems in India and Bangladesh. Very often, too much muddy water enters the Bay of Bengal, over fertilizing and suffocating sensitive organisms and destroying coastal biodiversity. The Nepali agricultural base is under serious threat due to soil erosion, so much in fact, she may not be able to feed her 27 million people in the years to come. Past trends show that Nepal's population doubles every 35 years. The increasing population needs to expand farmlands to meet its food need, which causes the losses of precious soil. Deteriorating land fertility puts enormous stresses on the remaining resources.

This research is an attempt to develop soil erosion index maps of Nepal by integrating biophysical and socioeconomic-demographic information. Areas exhibiting high erosion caused by biophysical and socioeconomic-demographic factors are identified for all the three ecological regions of Nepal – mountains, mid hills, and Tarai – covering 147,181 square kilometers. The terrain attributes derived from 30 x 30 m², 60 x 60 m² and 90 x 90 m² grids resolutions are used to compare soil erodibility in different places. A soil erosion index map helps to differentiate productive areas from non-productive ones, and such a map becomes instrumental to examine food security. Research in the past decades has advanced our understanding of these processes, leading to mathematical relationships that can be incorporated into mechanistic, process-based models. Further research advances are necessary to study the intertwined effects of surface flow, seepage, vegetation, slopes, aspects, precipitation, and solar insolation on soil erosion. A multidisciplinary approach is essential to fully understand the impacts of soil erosion processes on economy and food security.

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