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Determining carbon abatement cost through the integration of remotely sensed land cover observations and biogeochemical model

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Forests and soils are major sinks of carbon. Changes in land use can affect the magnitude of the above and below-ground carbon stores and the net flux of carbon between the land and the atmosphere. This paper estimates the economic returns of carbon abatement through biological sequestration in the forests of Nepal under future REDD policy. Using sequential remotely sensed land cover observations and a biogeochemical model, this paper attempts to estimate the contemporary and future ecosystem carbon trends. The paper applies the General Ensemble Biogeochemical Modeling System (GEMS) and examines how effective carbon sequestration can be through a sustainable forest management approach. This study uses a case example of the Bara district of Nepal for the period of 1970-2010. The land cover changes, especially forest stand replacing events, are detected on 30 randomly located 10 km x 10 km sample blocks laid on the remotely sensed images and are assimilated by GEMS for biogeochemical simulations. For a forest simulation unit, a Monte Carlo process is used to determine forest types, forest age, forest biomass, and soil C based on forest inventory and data analysis and general soil data. Preliminary results suggest that forest may be one of the least cost methods to abate carbon with a breakeven price range from $0.55 to $3.70 per ton of CO2. If local communities are paid this price to protect forest cover, it will provide good incentives to people for sustainable management of forest resources of Nepal.