

Predicted declines in suitable habitat for greater one-horned rhinoceros (*Rhinoceros unicornis*) under future climate and land use change scenarios

Ganesh Pant¹, Tek Maraseni², Armando Apan², and Benjamin Allen²

¹Government of Nepal Ministry of Forests and Environment

²University of Southern Queensland

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Abstract

Aim Rapidly changing climate is likely to modify the spatial distribution of both flora and fauna. Land use change continues to alter the availability and quality of habitat and further intensifies the effects of climate change on wildlife species. We used an ensemble modelling approach to predict changes in habitat suitability for an iconic wildlife species, greater one-horned rhinoceros due to the combined effects of climate and land use changes. **Location** Nepal. **Methods** We compiled an extensive database on current rhinoceros distribution and selected nine ecologically meaningful environmental variables for developing ensemble models of habitat suitability using seven different species distribution modelling techniques in the BIOMOD2 R package; and we did this under current climatic conditions and then projected them onto two possible climate scenarios (SSP1-2.6 and SSP5-8.5) and two different time frames (2050 and 2070). **Results** Out of seven algorithms, random forest performed the best, and four environmental variables — distance from grasslands, distance from wetlands, annual precipitation, and slope, contributed the most in the model. The ensemble model estimated the current suitable habitat of rhinoceros to be 1,875 km², about 1.3% of the total area of Nepal. The future habitat suitability under the lowest and highest emission scenarios was estimated to be: (1) 1,637 km² and 1,417 km² in 2050; and (2) 1,562 km² and 1,301 km² in 2070, respectively. **Main conclusions** Our results suggest that nearly one-third of the current rhinoceros habitat would become unsuitable within a period of 50 years, with the predicted declines being influenced to a greater degree by climatic changes than land use changes. We have recommended several measures to moderate these impacts, including relocation of the proposed Nijgad International Airport given that a considerable portion of potential rhinoceros habitat will be lost if the airport is constructed on the currently proposed site.

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