

The compound effects of highway reconstruction and climate change on vegetation activity over the Qinghai Tibet Plateau: a case study as G318 highway

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Abstract

The Qinghai-Tibet Plateau (QTP) is among the most sensitive regions to global environmental change worldwide. Although the climate change and engineering construction on the QTP have jointly modified the regional vegetation activity, little is known about how vegetation variation responds. Using Moderate Resolution Imaging Spectroradiometer (MODIS) enhanced vegetation index (EVI) data during 2000-2021, this study investigated the spatiotemporal variation of vegetation activity and the compound effects of climate change and construction along the G318 highway on the QTP (TG318) through the integration of trend, residual, and partial correlation analyses, as well as structural equation modeling. The results showed that the growing season EVI increased significantly at a rate of about 0.0020/year in the western QTP after reconstruction, but fluctuated in the east. Reconstruction generally had a significant effect on the growing season EVI, with contributions of 7.67%, 19.12%, 18.24%, and -4.15% in different sections of TG318, whereas climate change contributed -10.14% to 8.84% of the total variation. The growing season EVI negatively correlated with snow cover and minimum temperature in humid and sub-humid regions, whereas positively related to vapor pressure in semi-arid regions. Moreover, there existed an obvious lag effect of climate change on the growing season EVI, with lag time generally decreasing from west to east and apparent heterogeneity among different months and regions. These findings would help better understand the environmental impacts along the engineering corridors and provide a scientific basis for ecological conservation in the QTP region.

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