Environment & Society Portal

Multimedia Library Collection: Periodicals

"Earth Beyond Six of Nine Planetary Boundaries"

Richardson, Katherine, Will Steffen, Wolfgang Lucht, et al.

Richardson, Katherine, Will Steffen, Wolfgang Lucht, et al. "Earth Beyond Six of Nine Planetary Boundaries." *Science Advances* 9 (13 September 2023): eadh2458. doi:10.1126/sciadv.adh2458.

This planetary boundaries framework update finds that six of the nine boundaries are transgressed, suggesting that Earth is now well outside of the safe operating space for humanity. Ocean acidification is close to being breached, while aerosol loading regionally exceeds the boundary. Stratospheric ozone levels have slightly recovered. The transgression level has increased for all boundaries earlier identified as overstepped. As primary production drives Earth system biosphere functions, human appropriation of net primary production is proposed as a control variable for functional biosphere integrity. This boundary is also transgressed. Earth system modeling of different levels of the transgression of the climate and land system change boundaries illustrates that these anthropogenic impacts on Earth system must be considered in a systemic context. (Abstract)

© 2023 The authors

This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License .

Download:
PDF:
https://www.environmentandsociety.org/sites/default/files/key_docs/earth_beyond_six_of_nine_planetary_boundaries.pdf

Related links:

- Full *Science Advances* issue
  https://www.science.org/toc/sciadv/9/37

Periodicals Collection, Multimedia Library, Environment & Society Portal
"Earth Beyond Six of Nine Planetary Boundaries"
Source URL: http://www.environmentandsociety.org/node/9685
Print date: 07 November 2026 00:21:12