



## Rapidly Increasing Hazardous Humid-Heat Exposure Across Africa's Great Green Wall

**Cascade Tuholske**<sup>1</sup>, Catherine Ivanovich<sup>2</sup>, Emily Williams<sup>3</sup>, Radley Horton<sup>4</sup>, Shraddhanand Shukla<sup>5</sup>, Chris Funk<sup>5</sup>, Kwaw Andam<sup>6</sup>, Christopher Kibler<sup>7</sup>, Edmund Yamba<sup>8</sup>, Andrew Zimmer<sup>1</sup>, and Nina Brooks<sup>9</sup>

<sup>1</sup>Department of Earth Sciences, Montana State University, Bozeman, MT, United States of America

<sup>2</sup>NASA Goddard Institute for Space Studies, New York City, NY, United States of America

<sup>3</sup>Sierra Nevada Research Institute and Climatology Lab, University of California Merced, Merced, CA, United States of America

<sup>4</sup>Columbia Climate School, Columbia University, New York City, NY, United States of America

<sup>5</sup>Climate Hazards Center, University of California, Santa Barbara, Santa Barbara, CA, United States of America

<sup>6</sup>International Food Policy Research Institute, Washington, DC, United States of America

<sup>7</sup>Department of Geography, University of California, Santa Barbara, Santa Barbara, CA, United States of America

<sup>8</sup>Department of Meteorology and Climate Science, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana

<sup>9</sup>School for Environment and Sustainability, University of Michigan, Ann Arbor, MI, United States of America

The African Sahel—home to 180 million people—faces escalating risks from the convergence of poverty, food insecurity, political instability, and climate change. While the African Union's Great Green Wall (GGW) initiative aims to restore 100 million hectares of degraded land to alleviate these challenges, we find that greening coincides with a rapid rise in hazardous humid-heat days (HHDs), threatening human health and livelihoods. Using high-resolution (5 km) datasets from 1983–2016, we map where greening is coinciding with increasing HHDs, and we project 2050 exposure by age cohorts. We find that areas with increased short vegetation experienced a 158% faster rise in HHDs compared to non-greening regions, driven primarily by higher atmospheric moisture rather than air temperature. By 2050, nearly all Sahel residents will experience at least 30 HHDs per year, with children born in the past decade facing the greatest future impacts. Our findings suggest that climate-driven greening may intensify heat-health risks, underscoring the need for GGW and other climate adaptation policies to factor in humid-heat exposure.