

EGU25-5735, updated on 12 Apr 2026

<https://doi.org/10.5194/egusphere-egu25-5735>

EGU General Assembly 2025

© Author(s) 2026. This work is distributed under the Creative Commons Attribution 4.0 License.



Sustainable Development Key to Limiting Climate Change-Driven Wildfire Damages

Yi-Ling Hwong¹, Edward Byers¹, Michaela Werning¹, and Yann Quilcaille²

¹International Institute for Applied Systems Analysis, Austria (yiling.hwong@gmail.com)

²Institute for Atmospheric and Climate Science, Department of Environmental Systems Science, ETH Zurich, Zurich, Switzerland

Climate change is intensifying wildfires, making them more frequent and severe. While significant research has focused on predicting burned areas using bioclimatic and anthropogenic factors, fewer studies have explored the drivers of the economic damages of wildfires. Our study addresses this gap by identifying key factors influencing global economic wildfire damages and projecting future impacts under three Shared Socioeconomic Pathways (SSPs). Using multiple linear regression analyses, we assess country-level predictors of wildfire damages and forecast future trends under SSP1-2.6, SSP2-4.5, and SSP3-7.0. We tested a wide range of predictors, covering climate, land-cover, governance, and socio-economic factors. Our findings highlight the Human Vulnerability Index (HVI), which reflects a country's socio-economic conditions, as the strongest predictor of historical wildfire damages, followed by water vapor pressure deficit during fire seasons and population density near forested areas. These findings contrast with studies on burned areas, where climate factors dominate.

Our model projects that by 2070, global economic wildfire damages could be three times higher under SSP3-7.0 compared to SSP1-2.6. Our analyses suggest that robust socio-economic development can offset wildfire damages associated with climate hazards, though this is less certain under SSP3-7.0. The emphasis of SSP1-2.6 on equitable socio-economic progress and climate action not only reduces wildfire damages but also mitigates inequalities in their distribution across countries. For developed countries, SSP1-2.6 offers modest economic damage reductions, but the growing impact of climate hazard becomes the dominant driver of wildfire damages by century's end if socio-economic conditions remain stable at their current high levels. For least-developed countries, which are disproportionately exposed to anthropogenic climate change, the potential gains of following a sustainable pathway by 2070 are up to nine times greater compared to developed countries. Our work complements existing research on burned areas and underscores the importance of sustainable development in addressing the economic impacts of wildfires.