



Recognizing distinctiveness of SSP3-7.0 for use in impact assessments

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Because recent mitigation efforts have made the upper-end scenario of the future GHG concentration (SSP5-8.5) highly unlikely, SSP3-7.0 has received attention as an alternative high-end scenario for impacts, adaptation, and vulnerability (IAV) studies. However, the ‘distinctiveness’ of SSP3-7.0 may not be well-recognized by the IAV community. When the integrated assessment model (IAM) community developed the SSP-RCPs, they did not anticipate the limelight on SSP3-7.0 for IAV studies because SSP3-7.0 was the ‘distinctive’ scenario regarding to aerosol emissions (and land-use land cover changes). Aerosol emissions increase or change little in SSP3-7.0 due to the assumption of a lenient air quality policy, while they decrease in the other SSP-RCPs of CMIP6 and all the RCPs of CMIP5. This distinctive high-aerosol-emission design of SSP3-7.0 was intended to enable climate model (CM) researchers to investigate influences of extreme aerosol emissions on climate. Here we show that large aerosol emissions in SSP3-7.0 significantly suppress future increases in precipitation. We recommend IAV researchers to compare impact simulations at the same warming level between SSP3-7.0 and SSP5-8.5 to examine the effects of aerosols in the case that such analyses are adequate. We also recommend ScenarioMIP for CMIP7 to exclude scenarios with extreme policies of aerosols (and land-use land-cover changes) from Tier 1 experiments and instead include them in Tier 2.

Reference: Shiogama, H., et al. *Nat. Clim. Chang.* 13, 1276–1278 (2023).
<https://doi.org/10.1038/s41558-023-01883-2>