Severe heat waves in Islamabad and its links with global mitigation benchmarks

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Anthropogenic climate change encompasses shifts in weather and climate patterns that result in more severe extreme weather events such as tropical storms and heat waves. Observations and climate model simulations show that compound heat waves are becoming more frequent and intense with increasing global mean temperatures. Nevertheless, appropriate local and actionable climate information is scarce and may hinder an adequate adaptation response.

Here, we use a reversal of the traditional impact chain methodology to find emissions constraints that avoid severe heat waves in Islamabad, Pakistan. We use high-resolution urban climate simulations from UrbClim, global climate simulations from CMIP6, and climate simulations from the simple climate model FaIR to estimate local risk threshold exceedances for a large set of emission scenarios. By doing so, we can link specific levels of local climatic impact-drivers to global climate trajectories and assess emission constraints that would avoid severe heat events in Islamabad.

Connecting local risk threshold exceedance to global emission benchmarks can clarify the benefits of reduced emissions for society and decision-makers. Furthermore, our modeling framework allows to investigate different combinations of heat thresholds with occurrence frequencies and can easily be used to answer specific questions from various stakeholders.