

Climate change and extreme weather in Hesse – analysis of 20th century observation data and ensemble projections for the 21st century

Prof. Dr. Jürg Luterbacher, Prof. Dr. Douglas Maraun, Dr. Anne Schindler, Tom Lange

In this project, the occurrence of weather and climate extremes has been investigated, as well as potential changes due to anthropogenic climate change. According to state-of-the-art climate model simulations, it is expected that across Hesse more heat days and tropical nights will occur, heat waves will become longer, extreme precipitation will become stronger in particular during spring and autumn, and summer drought will get longer. In general, changes are expected to be stronger in southern Hesse than in central and northern Hesse.

Below, the most important expected changes (2060-2099 vs. 1960-1999) are listed for different regions. These changes are subject to large uncertainties, often 50% stronger or weaker changes are possible.

Northern Hesse (North of the line Limburg-Gießen-Vogelsberg) and Rhön

Heat days:

7-15 days more, also weaker increase possible

Tropical nights:

7-10 nights more, also weaker increase possible

Extremely hot days:

4-5°C warmer, likely more than 2°C warmer

Extremely warm nights:

3-5°C warmer, likely more than 2°C warmer

Heat waves:

2-4 days longer, also weaker increase possible

Waves of tropical nights:

2-3 days longer

Heavy precipitation (>20mm/day):

Spring: 0,5-1 days more; autumn and winter: 0,5-2 days more
(Westerwald: 1-2 days more), also weaker increase possible

Extreme precipitation (20-year return level):

Autumn: 20-40% increase; spring: 10-40% increase; winter: 5-20% increase

Drought:

Summer: 4-6 days longer, also weaker increase possible

Taunus, Vogelsberg, Wetterau and Odenwald

Heat days:

10-15 days more, also weaker increase possible

Tropical nights:

7-15 nights more, also weaker increase possible

Extremely hot days:

4-5°C warmer (Wetterau >5°C), likely more than 2°C warmer

Extremely warm nights:

3-5°C warmer, likely more than 2°C warmer

Heat waves:

3-5 days longer, also weaker increase possible

Waves of tropical nights:

3-5 days longer

Heavy precipitation (>20mm/day):

Spring: 0,5-1 days more; autumn and winter: 0,5-2 days more, also weaker increase possible

Extreme precipitation (20-year return level):

Autumn: 20-40% increase; spring: 10-40% increase; winter: 5-20% increase

Drought:

Summer: 4-8 days longer, also weaker increase possible

Rhein-Main and Hessisches Ried

Heat days:

10-20 days more, also weaker increase possible

Tropical nights:

10-15 nights more, also weaker increase possible

Extremely hot days:

>4°C warmer, likely more than 2°C warmer

Extremely warm nights:

4-5°C warmer, likely more than 2°C warmer

Heat waves:

3-7 days longer, also weaker increase possible

Waves of tropical nights:

3-5 days longer

Heavy precipitation (>20mm/day):

Winter and spring: 0,5-1 days more; autumn: 1-2 days more, also weaker increase possible

Extreme precipitation (20-year return level):

Autumn: >30% increase; spring: 20-30% increase; winter: 5-15% increase

Drought:

Summer: 6-8 days longer, also weaker increase possible