Common regional changes

Mean temperatures and hot extremes have emerged above natural variability, relative to 1850–1900, in all land regions in Africa (high confidence).

The rate of surface temperature increase has generally been more rapid in Africa than the global average, with human-induced climate change being the dominant driver (high confidence).

Observed increases in hot extremes (including heatwaves) and decreases in cold extremes (including cold waves) are projected to continue throughout the 21st century with additional global warming (high confidence).

Marine heatwaves have become more frequent since the 20th century and are projected to increase around Africa (high confidence).

Relative sea level has increased at a higher rate than global mean sea level around Africa over the last 3 decades. Relative sea level rise is likely to virtually certain to continue around Africa, contributing to increases in the frequency and severity of coastal flooding in low-lying areas and to coastal erosion and along most sandy coasts (high confidence).

The frequency and intensity of heavy precipitation events are projected to increase almost everywhere in Africa with additional global warming (high confidence).

With additional increases in global warming, changes in hot and cold temperature extremes, mean and maximum one-day precipitation get larger.

Projected changes in annual maximum temperature (TXx), annual minimum temperature (TNn), annual mean precipitation and annual maximum daily precipitation (RX1day) at 1.5°C, 2°C, and 4°C of global warming (in rows) compared to 1851–1900. Results are based on simulations from the CMIP6 multi-model ensemble mean.

Results expanded in the Interactive Atlas (active links)

Links for further details

Common regional change: TS.4.3, Figure TS.23, Atlas 4.2, 12.4.1; Table TS.5
Regions-specific changes: TS.4.3.2.1, 8.3.2.4.3, Box TS.13, 11.9, Tables 11.4-11.6,12.4.1, Atlas.4, TXx and TNn: 11.3.5, Figure 11.11
Total Precipitation: 4.6.1.2, Figure 4.32, TS.1.3.2, Figure TS.5
RX1day: 11.4.5, Figure 11.16
Challenges are presented for the mid-21st century for a global warming of at least 2°C because the signal emerges from natural variability for a wider range of climatic impact-drivers at this higher warming level. All statements are related to changes with least medium and high confidence.

**Mediterranean (North Africa)**
- **Projected** decreases in mean precipitation, increases in fire weather conditions and decreases in mean wind speed;
- **Observed** and **projected** increases in aridity, meteorological, hydrological and agricultural and ecological droughts.

**West Africa (WAF)**
- **Observed** increase in river flooding;
- **Observed** increase in drying and agricultural and ecological droughts;
- Projected increase in meteorological droughts at 4°C GWL, mostly in seasonal timescales;
- **Projected** increases in mean wind speed; increase in heavy precipitation and pluvial flooding.

**Central Africa (CAF)**
- **Observed** decreases in mean precipitation;
- **Observed** decrease in standardized precipitation index (i.e., deficit of precipitation);
- **Observed** increase in agricultural and ecological droughts;
- **Projected** increases in heavy precipitation and pluvial flooding;
- Increases in river flooding.

**West Southern Africa (WSAF)**
- **Observed** decrease in mean precipitation;
- **Observed** increase in heavy precipitation and pluvial flooding;
- **Observed** and **projected** increase in aridity, agricultural and ecological droughts;
- **Projected** increase in dryness from 1.5°C, higher confidence with increasing global warming;
- **Projected** increases in mean wind speed; increases in fire weather conditions.

**Sahara including parts of the Sahel (SAH)**
- **Projected** increases in heavy precipitation and pluvial flooding.

**North Eastern Africa (NEAF)**
- **Observed** decreases in mean precipitation;
- **Observed** and **projected** decreases in snow and glaciers;
- **Projected** increases in heavy precipitation and pluvial flooding;
- **Projected** decrease in meteorological drought at 4°C global warming.

**South Eastern Africa (SEAF)**
- **Projected** increases in frequency and/or the intensity of heavy precipitation and pluvial flooding;
- **Observed** and **projected** decreases in snow and glaciers;
- **Projected** increase of average tropical cyclone wind speeds and associated heavy precipitation and of the proportion of Category 4-5 tropical cyclones.

**East Southern Africa (ESAF)**
- **Observed** decreases in mean precipitation;
- **Observed** and **projected** increases in heavy precipitation and pluvial flooding;
- **Observed** and **projected** increase in aridity, agricultural and ecological droughts;
- **Observed** increase in meteorological drought, **projected** increase in meteorological droughts from 1.5°C, higher confidence at higher GWLs;
- **Projected** increases in fire weather conditions; increases in mean wind speed; increase of average tropical cyclone wind speeds and associated heavy precipitation and of the proportion of Category 4-5 tropical cyclones.

**Madagascar (MDG)**
- **Observed** increases in aridity;
- **Projected** increase in meteorological droughts from 1.5°C, higher confidence at higher GWLs; increases in agricultural and ecological droughts types particularly at higher warming levels;
- **Projected** increases in heavy precipitation and pluvial flooding;
- **Projected** increase in average tropical cyclone wind speeds and associated heavy precipitation and in the proportion of Category 4-5 tropical cyclones.

**West African Monsoon (WAfriM)**
- Monsoon precipitation is **projected** to increase over the Central Sahel and decrease over the far western Sahel. The monsoon season is **projected** to have a delayed onset and a delayed retreat.
- **Observed** increase in monsoon precipitation during the 20th century due to warming from greenhouse gas emissions masked by the decrease due to cooling from human-caused aerosol emissions (**high confidence**). **Observed** increases since the 1980s are partly due to the growing influence of greenhouse gases and reductions in the cooling effect of human-caused aerosol emissions over Europe and North America.