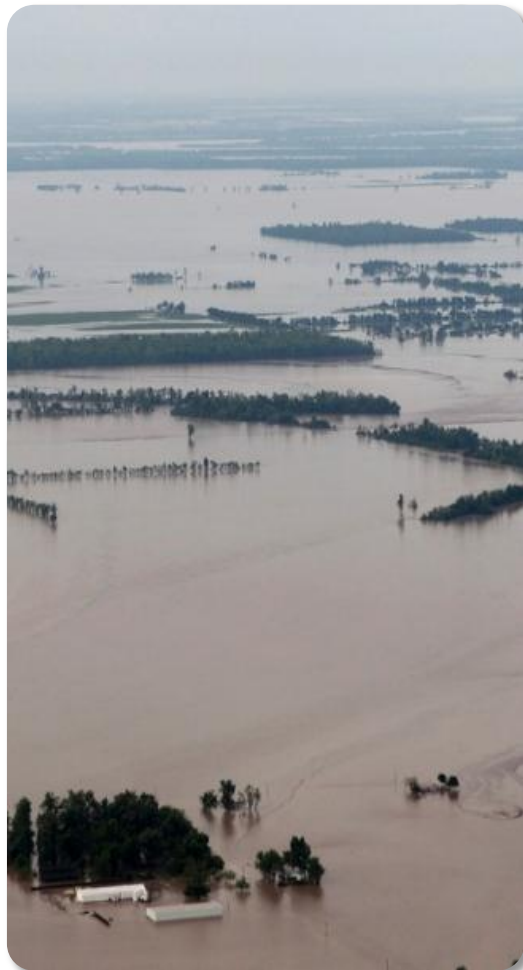




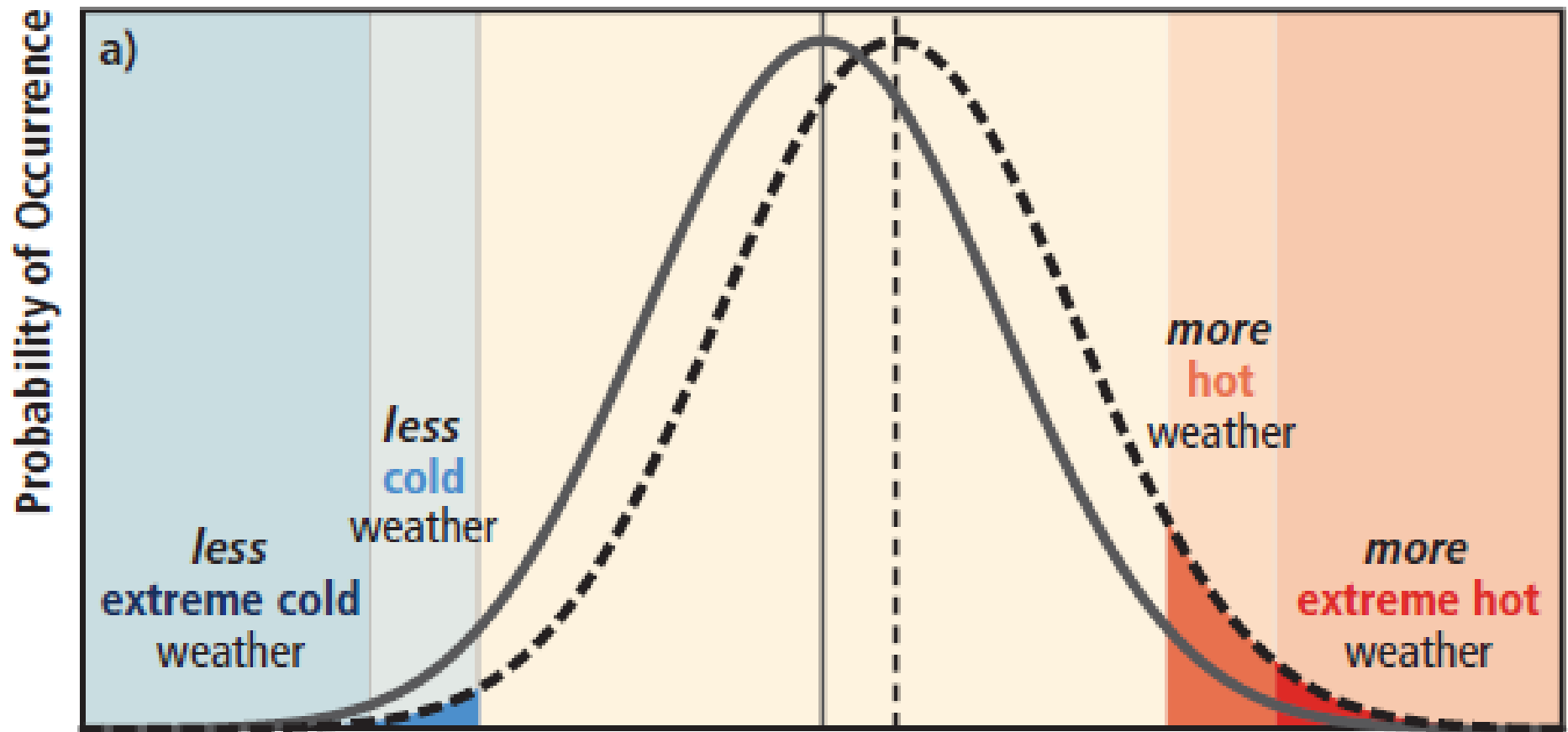
The IPCC Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation

A changing climate leads to changes in extreme weather and climate events

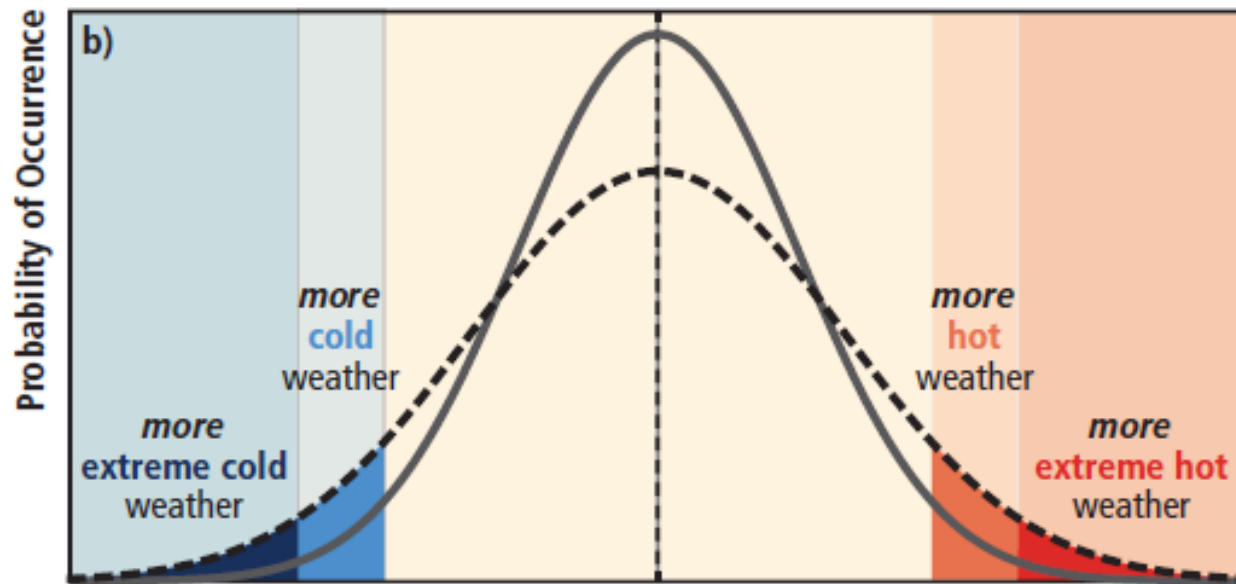


How do changes in the **extremes** scale with changes in the **mean**?

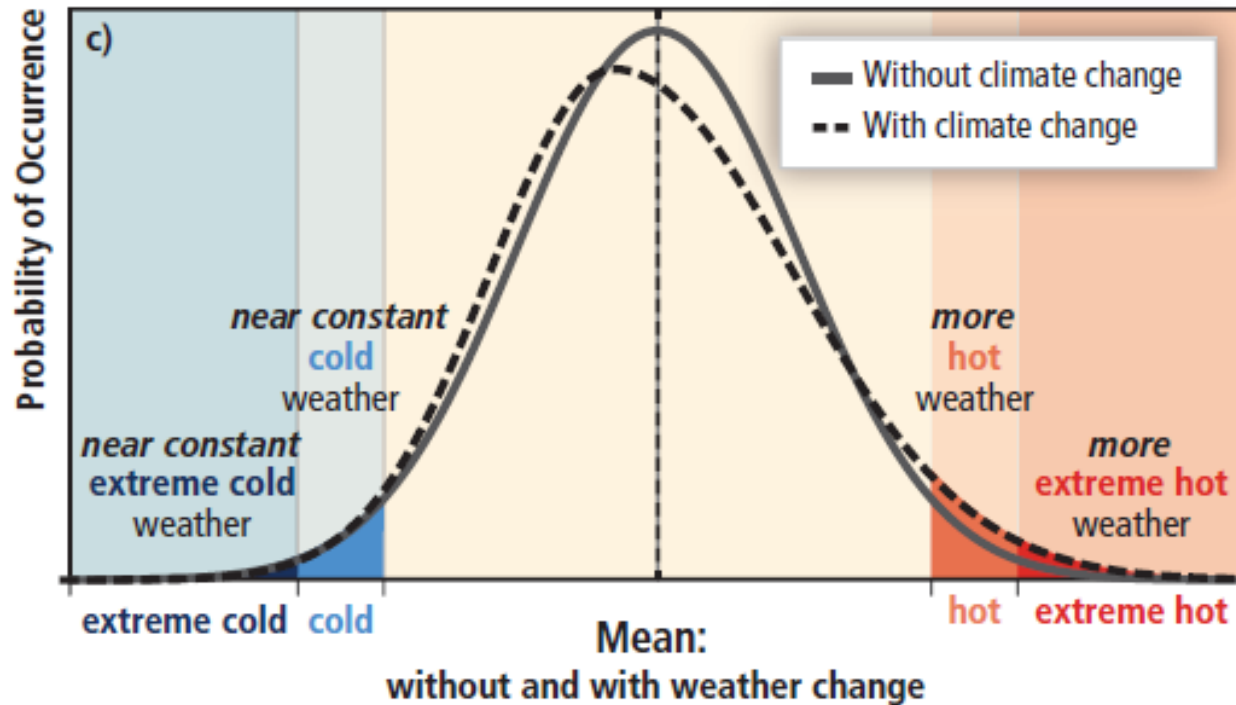
Shifted Mean



Increased Variability



Changed Symmetry



Impacts from weather and climate events depend on:



nature and severity of event

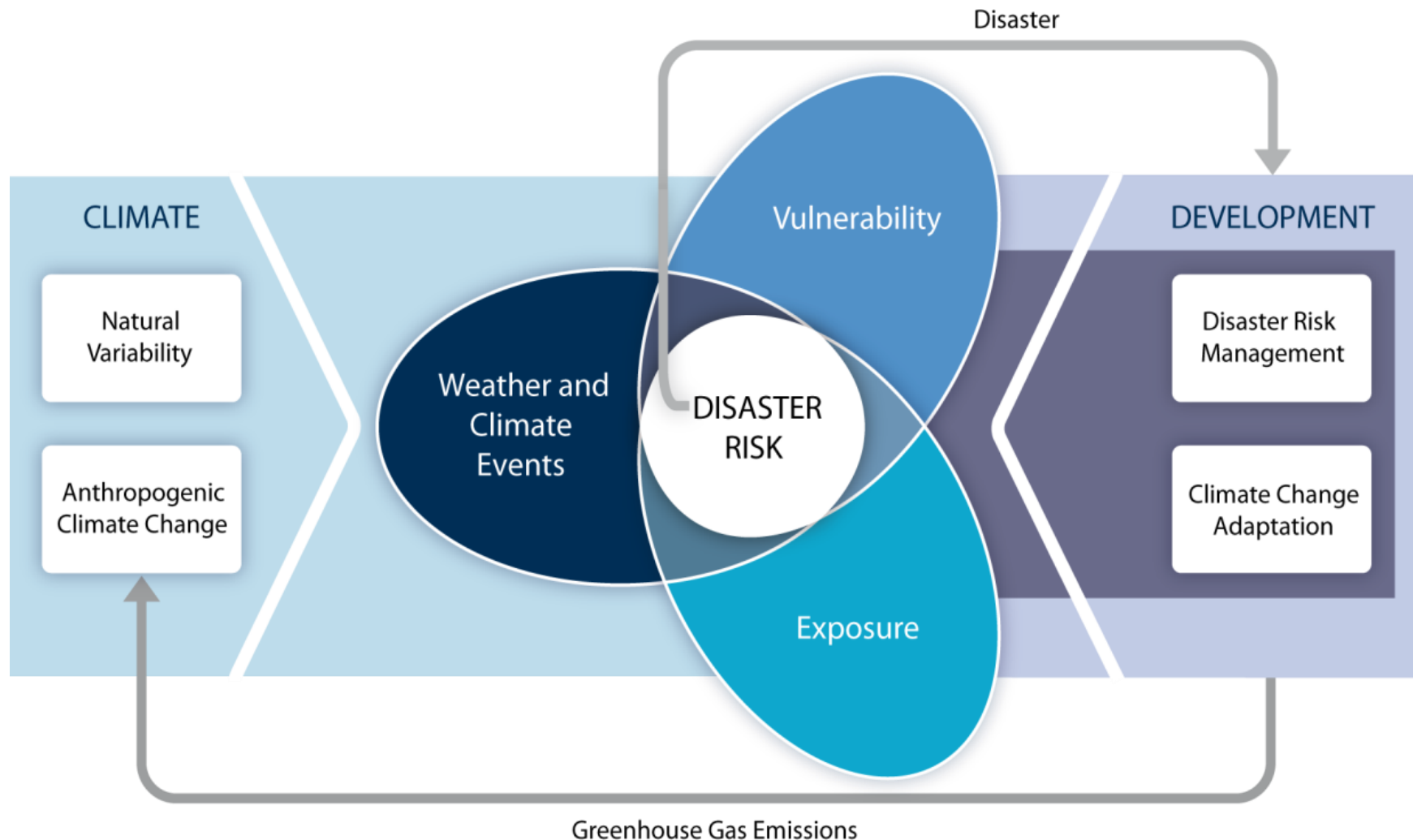


vulnerability



exposure

Increasing vulnerability, exposure, or severity and frequency of climate events increases **disaster risk**



*Disaster risk management and climate change adaptation can influence the degree to which **extreme events translate into impacts and disasters***

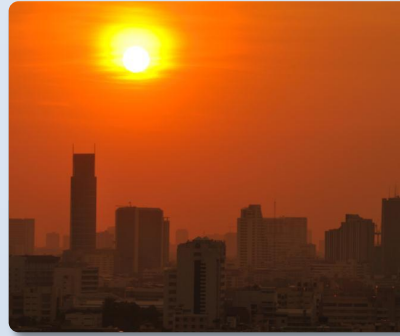
For exposed and vulnerable communities, even non-extreme weather and climate events can have **extreme impacts**

- Africa's largest recorded cholera outbreak
- over 90,000 affected
- over 4,000 killed
- began following onset of seasonal rains
- vulnerability and exposure increased risk



Observed and projected changes in weather and climate extremes

Heat



Heavy precipitation



Drought



Storm surge



Projected:

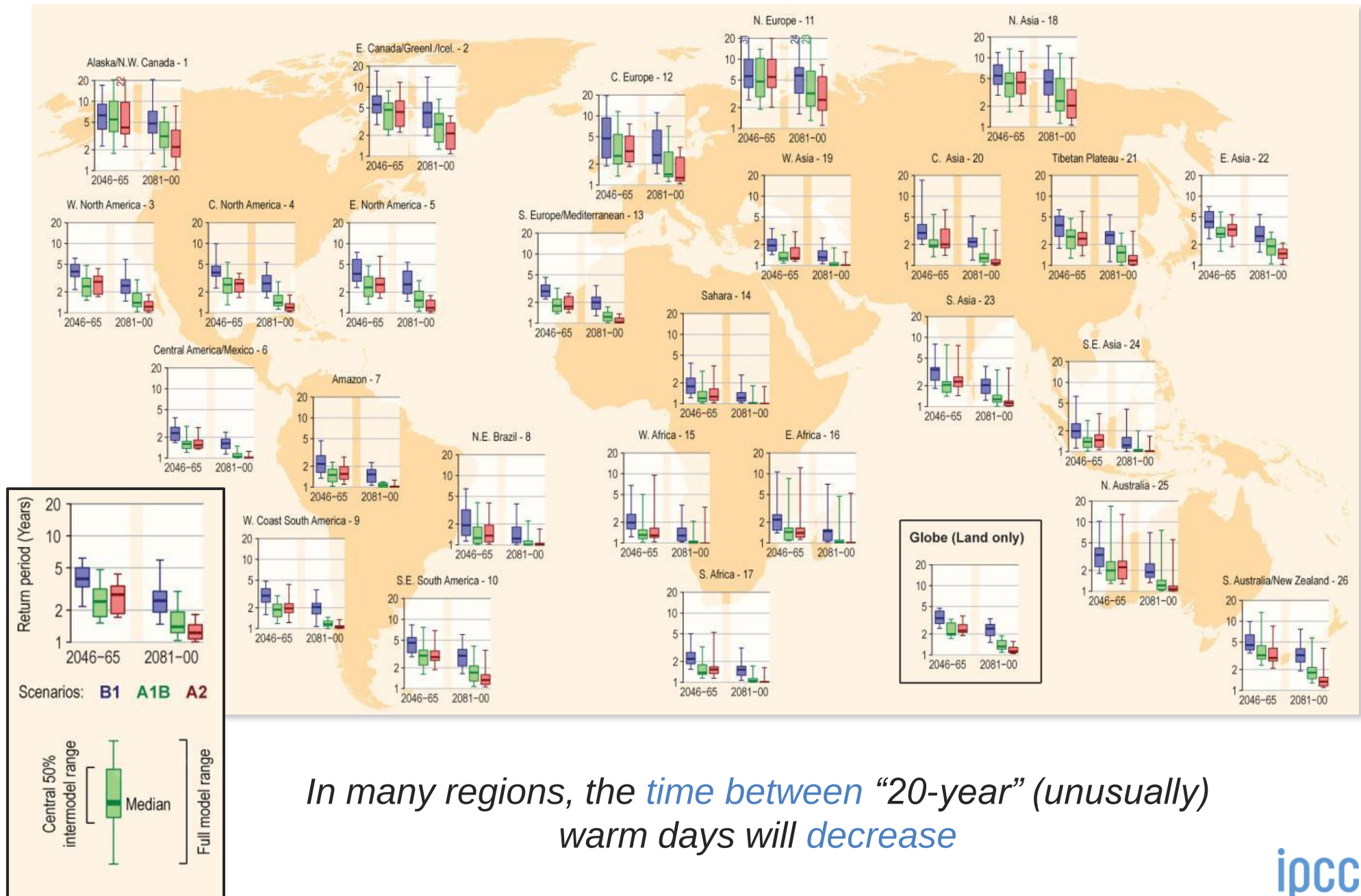
10-fold increase in frequency of extreme heat events later this century

Since 1950, **extreme hot days** and **heavy precipitation** have become more common



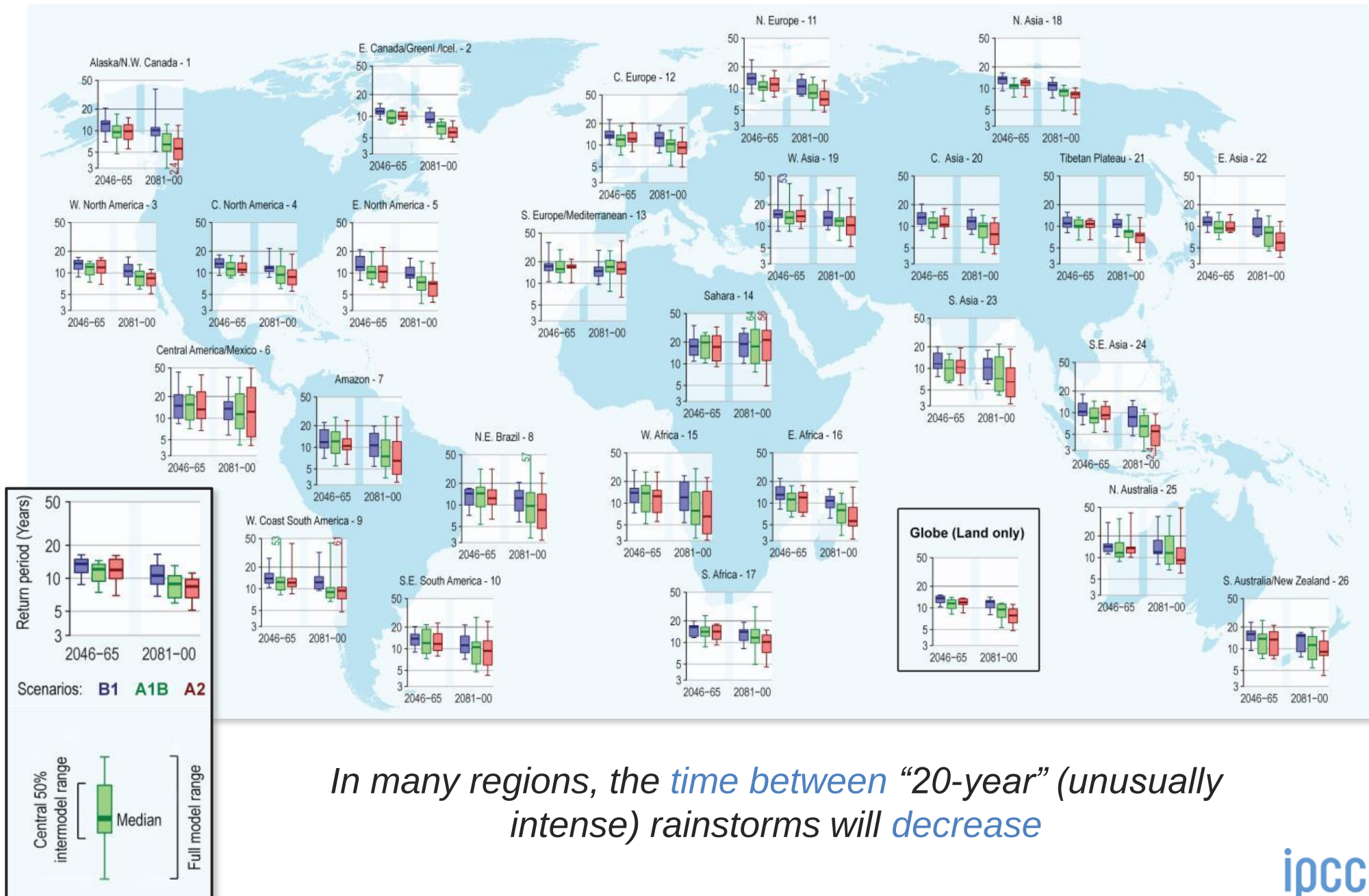
There is evidence that anthropogenic influences, including increasing atmospheric **greenhouse gas concentrations**, have changed these extremes

Climate models project more frequent hot days throughout the 21st century



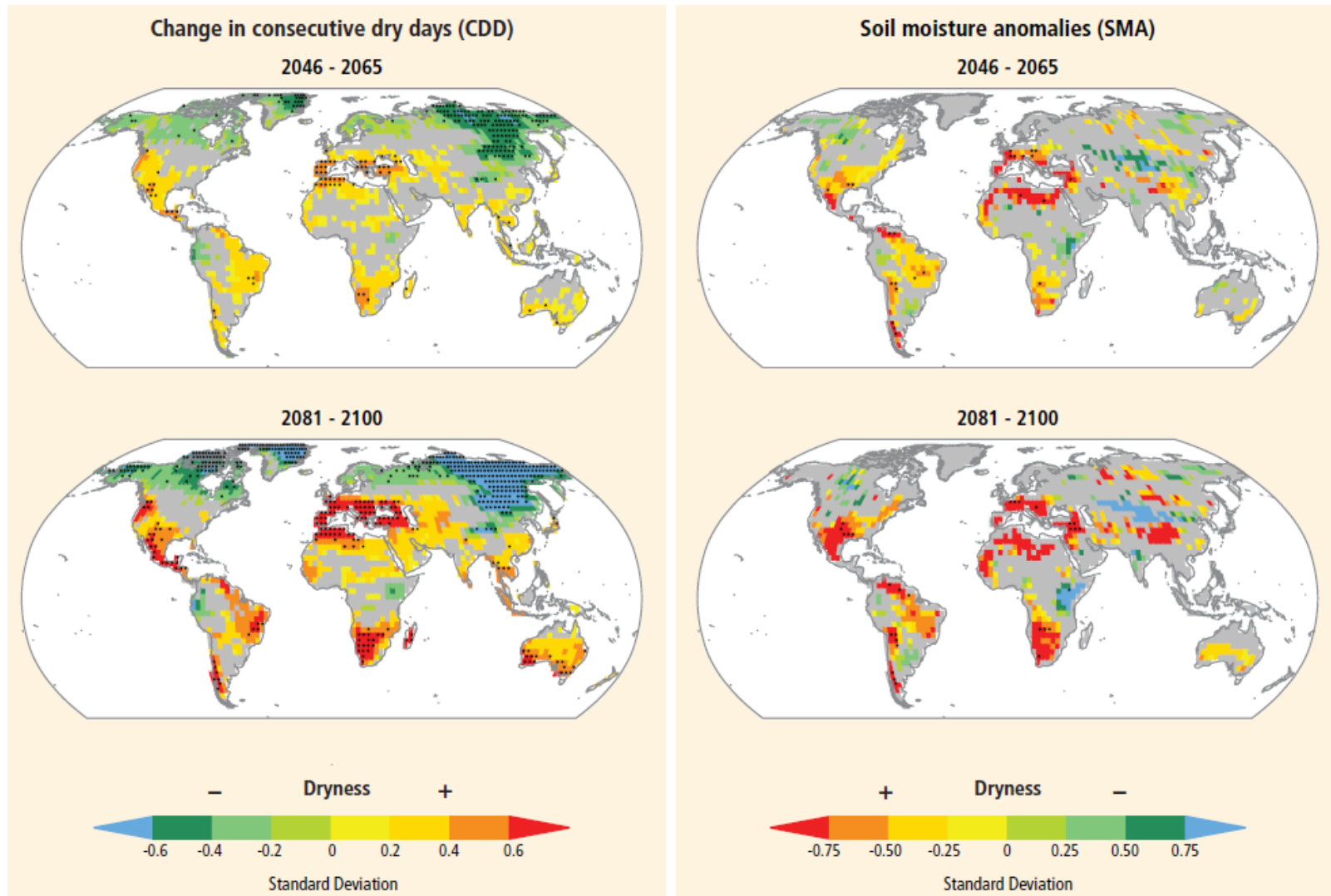
In many regions, the time between “20-year” (unusually) warm days will decrease

Climate models project there will be more heavy rain events throughout the 21st century



In many regions, the time between “20-year” (unusually intense) rainstorms will decrease

Climate models project there will be more **drought** throughout the 21st century



Especially in the sub-tropics

All Africa

Observed changes in **Warm** Days and Nights, and **Cold** Days and Nights since 1950

- ***Low confidence to Medium confidence:***

- Low confidence due to insufficient evidence for all Africa.
- Medium confidence in increase in frequency of **WD** and decrease in frequency of **CD** in southern part of continent and increase in frequency of **WN** in northern and southern part of continent.
- Medium confidence in decrease in frequency of **CN** in southern part of continent

All Africa

Observed changes in **Heatwaves/Warm Spells** since 1950

- ***Low confidence:***

- insufficient evidence, some analyses in localized regions.

Observed Changes in **Heavy Precipitation** Since 1950

- ***Low confidence:***

- Partial lack of data and literature and inconsistent patterns in existing studies

All Africa

Observed changes in **Dryness** since 1950

- ***Medium confidence:*** Overall increase in **dryness** (SMA, PDSI); much regional variability,
 - 1970s prolonged Sahel drought dominates.
 - No apparent continent-wide trends in change in rainfall over the 20th century.
 - Wet season arrives 9–21 days later,
 - large interannual variability of wet season start, local scale geographical variability

East Africa

Observed changes in **Warm** Days and Nights, and **Cold** Days and Nights since 1950

- **Warm Days, Cold Days: Low confidence:**

- Lack of evidence due to lack of literature and spatially non-uniform trends.
- Over time period 1939–1992 spatially non-uniform trends in daytime temperature, some areas with cooling.
- In southern tip of domain increases in **WD**, decreases in **CD**

- **Warm Nights, Cold Nights: Medium confidence:**

- Over time period 1939-1992, spatially non-uniform trends, rise of nighttime temperature at several locations, but with many coastal areas and stations near large water bodies showing a significant decrease.
- In southern tip of domain, decreases in **CN**, increases in **WN**.

East Africa

Observed changes in **Heatwaves**, **Heavy Precipitation** and **Dryness** since 1950

- **Heatwave/Warm Spells**: *Low confidence*:
 - Insufficient evidence (lack of literature) for most of region; increase in WSDI in southern tip of domain (New et al., 2006).
- **Heavy Precipitation**: *Low confidence*:
 - Insufficient evidence (lack of literature) to assess trends.
- **Dryness**: *Low confidence*:
 - Spatially varying trends in dryness (SMA, PDSI) (Sheffield and Wood, 2008a; Dai, 2011).

All Africa

Projected Changes in Warm Days and Nights, Cold Days and Nights

- Warm and Cold Days: **High confidence**: WD likely to increase and CD likely to decrease in all regions
- Warm Days: **Medium confidence**: Increase in WD largest in summer and fall.
- Warm and Cold Nights: **High confidence**: WN likely to increase and CN likely to decrease.

All Africa

Projected Changes in Heat Waves, Heavy Precipitation, Dryness

- **Heat Waves**: High confidence: Likely more frequent and/or longer heat waves and warm spells
- **Heavy Precipitation** *Low confidence to High confidence* depending on region:
 - Inconsistent change or no signal in HP indicators across much of continent
 - Strongest and most consistent signal is *likely* increase in HP in E. Africa.
- **Dryness**: *Low confidence to Medium confidence* depending on region:
 - Low confidence in most regions,
 - Medium confidence of increase in dryness (CDD, SMA) in southern Africa except eastern part.

Summary and conclusions

- **SREX: Significantly expanded information compared to AR4 in particular on regional scale**
- **Level of certainty in projection strongly depends on the considered extreme, region and season**



Also assessed changes in phenomena related to weather & climate extremes, and impacts on physical environment:

Monsoons

- *Low confidence* in observed trends and their attribution due to insufficient evidence
- *Low confidence* in projected changes due to insufficient agreement between climate models

Tropical cyclones (typhoons)

- *Low confidence* that any observed long-term (i.e., 40 years or more) increases in tropical cyclone activity are robust, after accounting for past changes in observing capabilities
- *Low confidence* in attribution of any detectable changes to anthropogenic influences
- *Likely* decrease or no change in frequency of tropical cyclones (projections)
- *Likely* increase in mean maximum wind speed, but possibly not in all basins (projections)
- *Likely* increase in heavy rainfall associated with tropical cyclones (projections)

Extreme sea level and coastal impacts

- *Likely* increase in extreme coastal high water worldwide related to increases in mean sea level in the late 20th century
- *Likely* anthropogenic influence on observed changes via mean sea level contributions
- *Very likely* that mean sea level rise will contribute to upward trends in extreme coastal high water levels
- *High confidence* that locations currently experiencing coastal erosion and inundation will continue to do so due to increasing sea level, in the absence of changes in other contributing factors

See Table 3.1. *Very likely* = 90-100% probability.

Taking full advantage of the available information

- Example
- Exposure and Vulnerability at the Scale of Risk Management
- Information on Climate Extremes
 - Global
 - Regional
 - Scale of Risk Management
- Options for Risk Management and Adaptation

- Extreme sea levels in small island developing states
- Flash floods in Nairobi, Kenya
- Heat waves in urban areas of Europe
- Hurricanes in the USA and Caribbean
- Droughts and food security in West Africa

Managing the risks: **flash floods** in Nairobi, Kenya

Risk Factors

- rapid growth of informal settlements
- weak building construction
- settlements built near rivers and blocked drainage areas



Risk Management/Adaptation

- reduce poverty
- strengthen buildings
- improve drainage and sewage
- early warning systems

Projected: *likely* increase in heavy precipitation in East Africa

Managing the risks: **drought** in the context of **food security** in West Africa

Risk Factors

- more variable rain
- population growth
- ecosystem degradation
- poor health and education systems



Risk Management/Adaptation

- improved water management
- sustainable farming practice
- drought-resistant crops
- drought forecasting

Projected: *low confidence* in drought projections for West Africa