Imperial College London

Climate Change

Ralf Toumi

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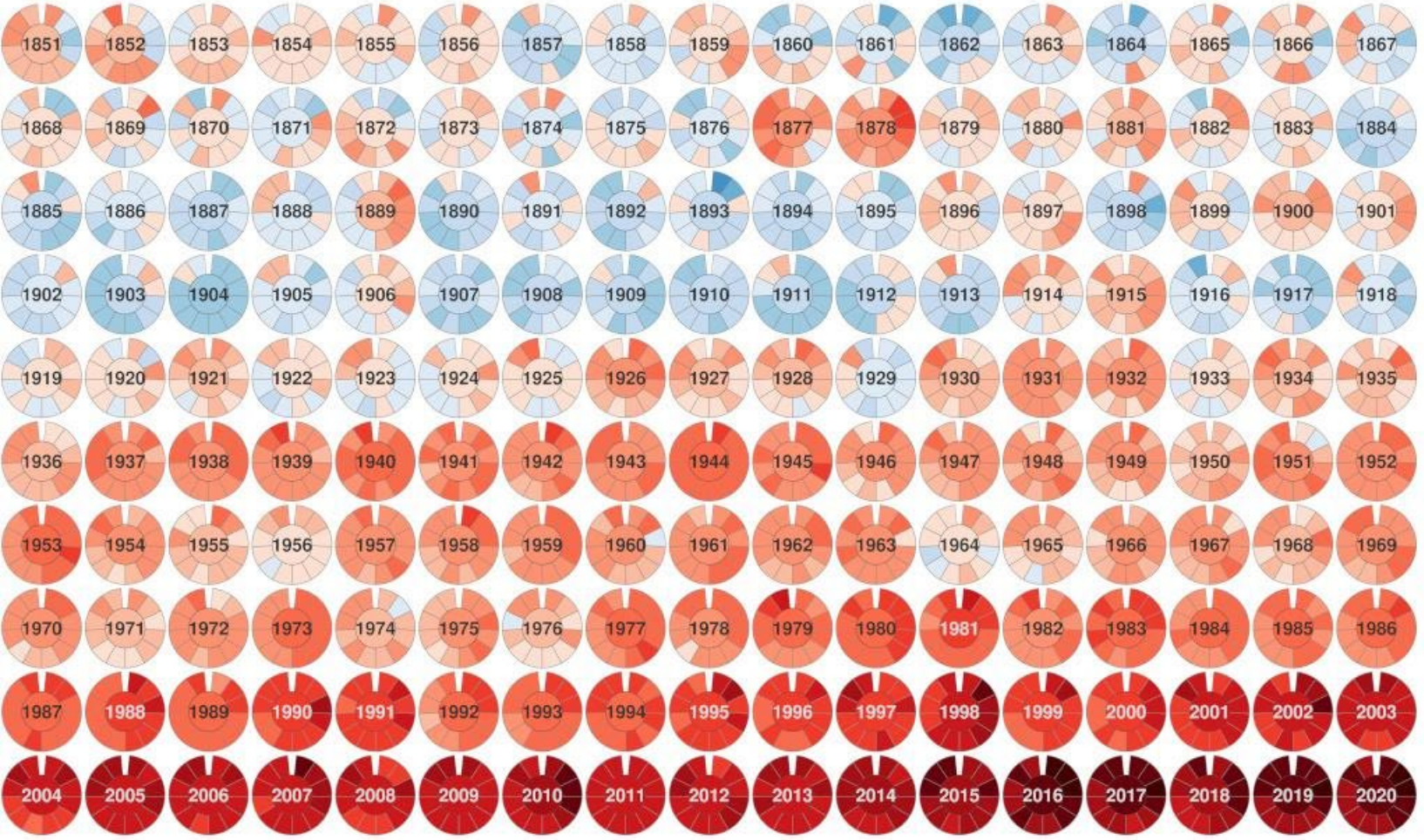
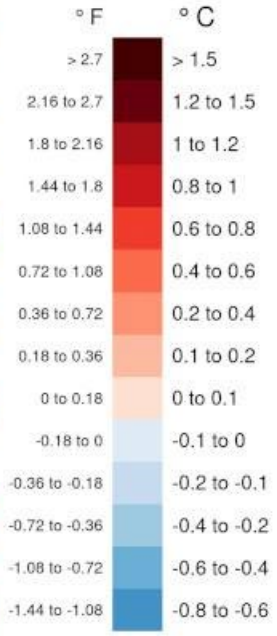
Monthly global mean temperature 1851 to 2020 (compared to 1850-1900 averages)





Data: HadCRUT5 - Created by: @neilrkaye

Physical Basis of Climate Hazard

Rules of thumb of climate change:

- **Hotter everywhere**
- **Warmer = more moisture= wetter= flood**
- **Wet regions → wetter , Dry regions→ drier**
- **The uncommon becomes common**

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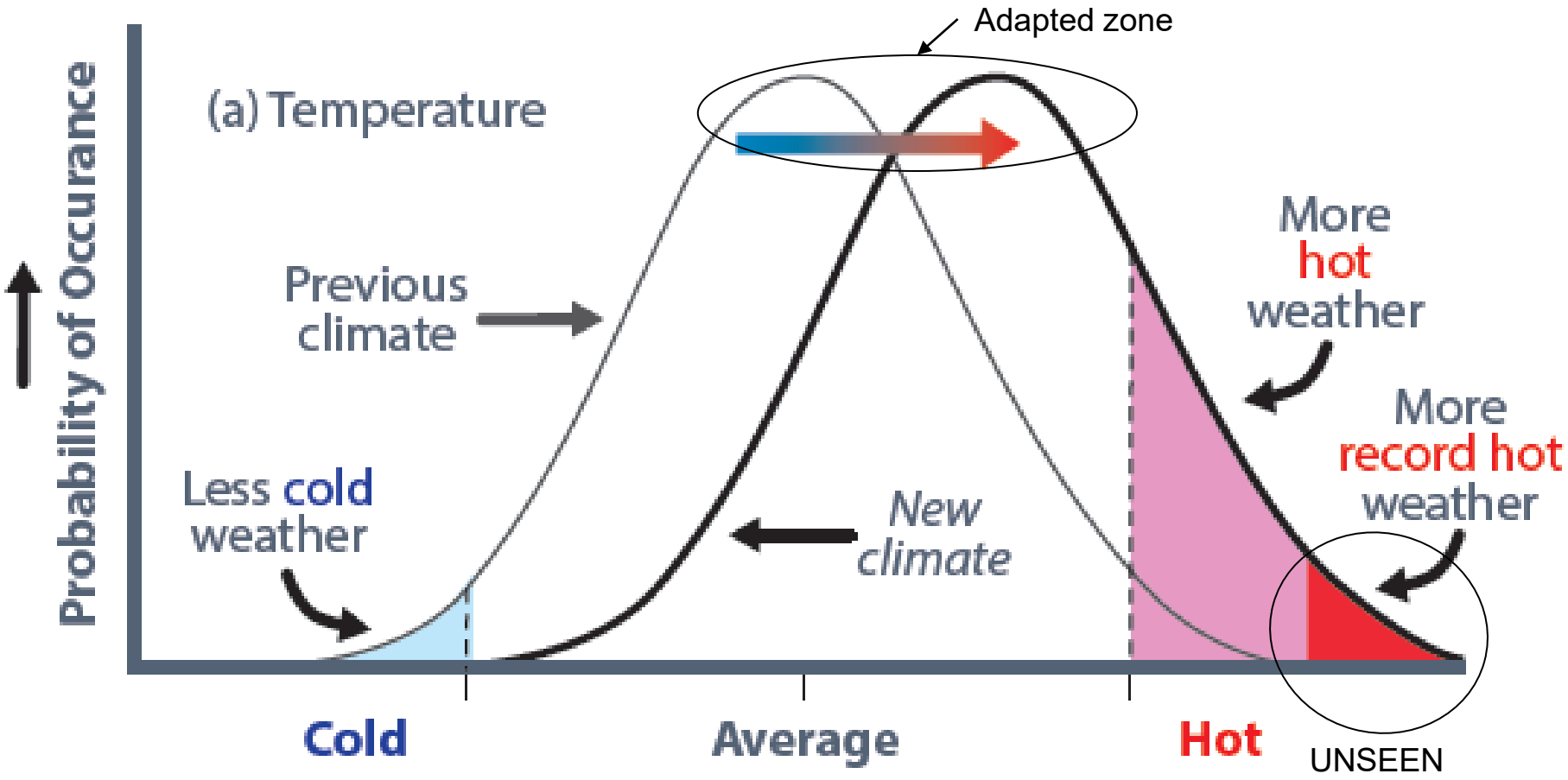
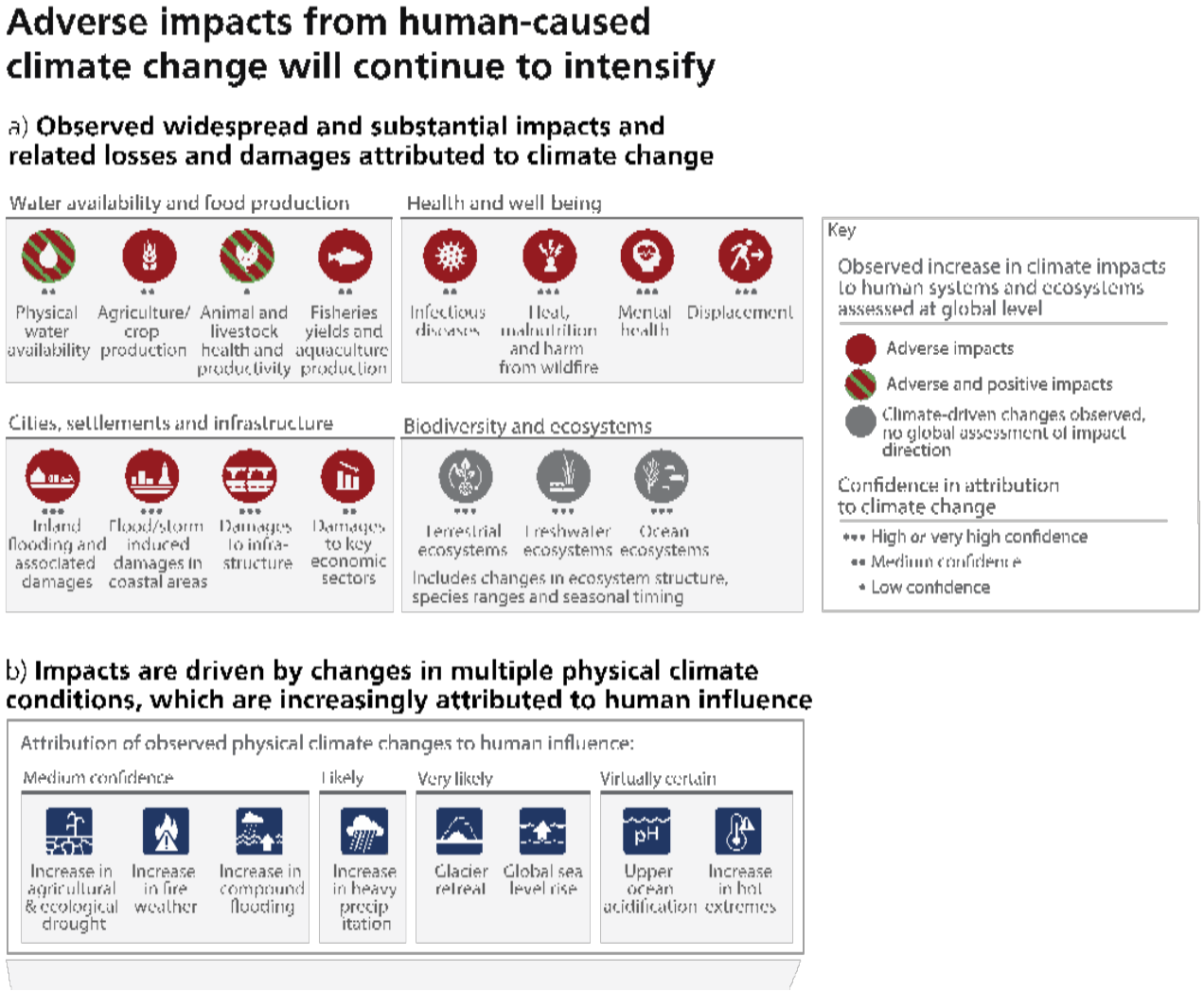
Extreme Events: Uncommon becomes common



Human-caused climate change is already affecting weather and climate extremes in every region. This has led to widespread adverse impacts and related losses and damages to nature and people (*high confidence*).



IPCC, AR6 SYR SPM

Climate change is already affecting every region across the globe with human influence contributing to many observed changes in weather and climate extremes

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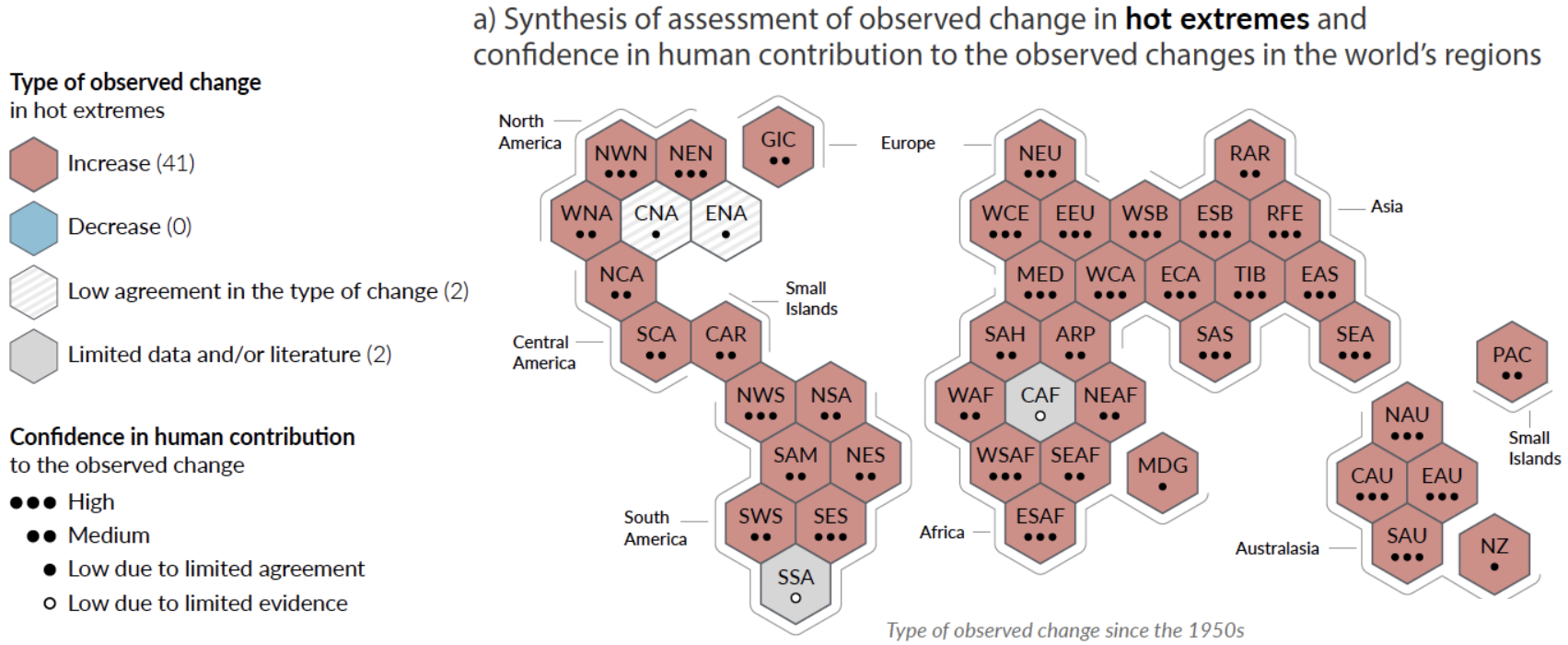
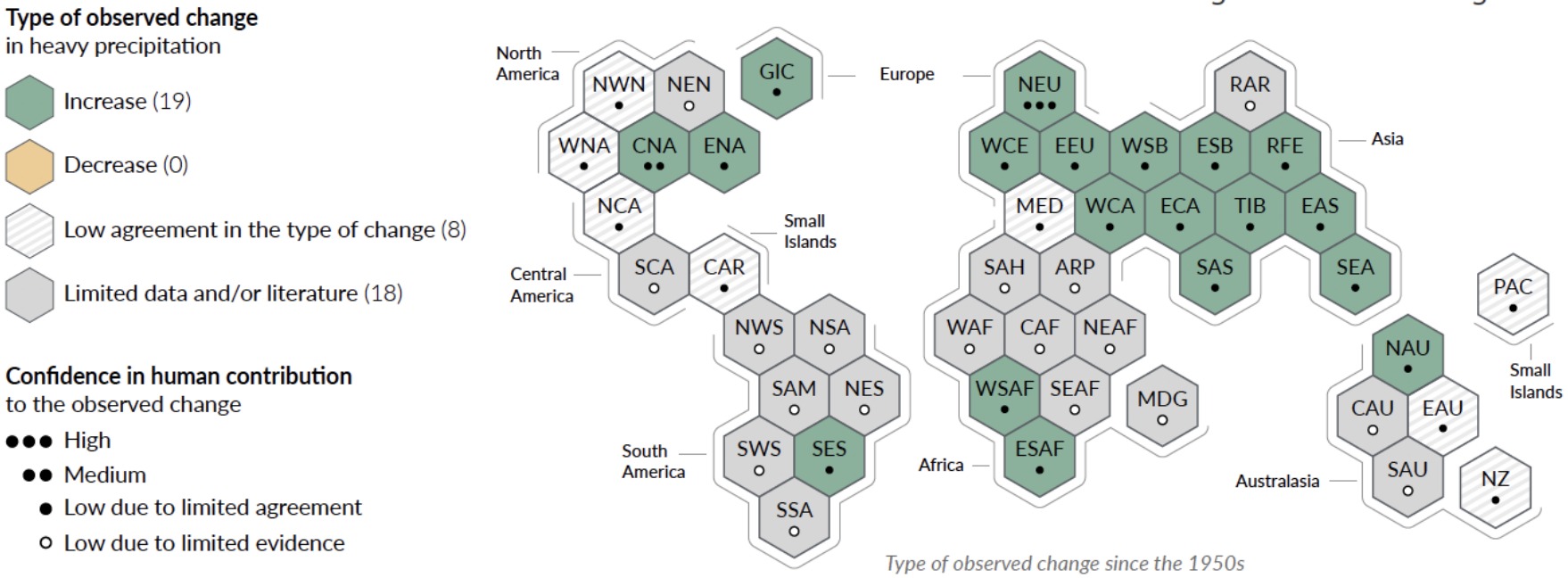


IPCC AR6 WG1, SPM.3

Human influence, in particular greenhouse gas emissions, is *likely* the main driver of the observed global scale intensification of heavy precipitation in land regions

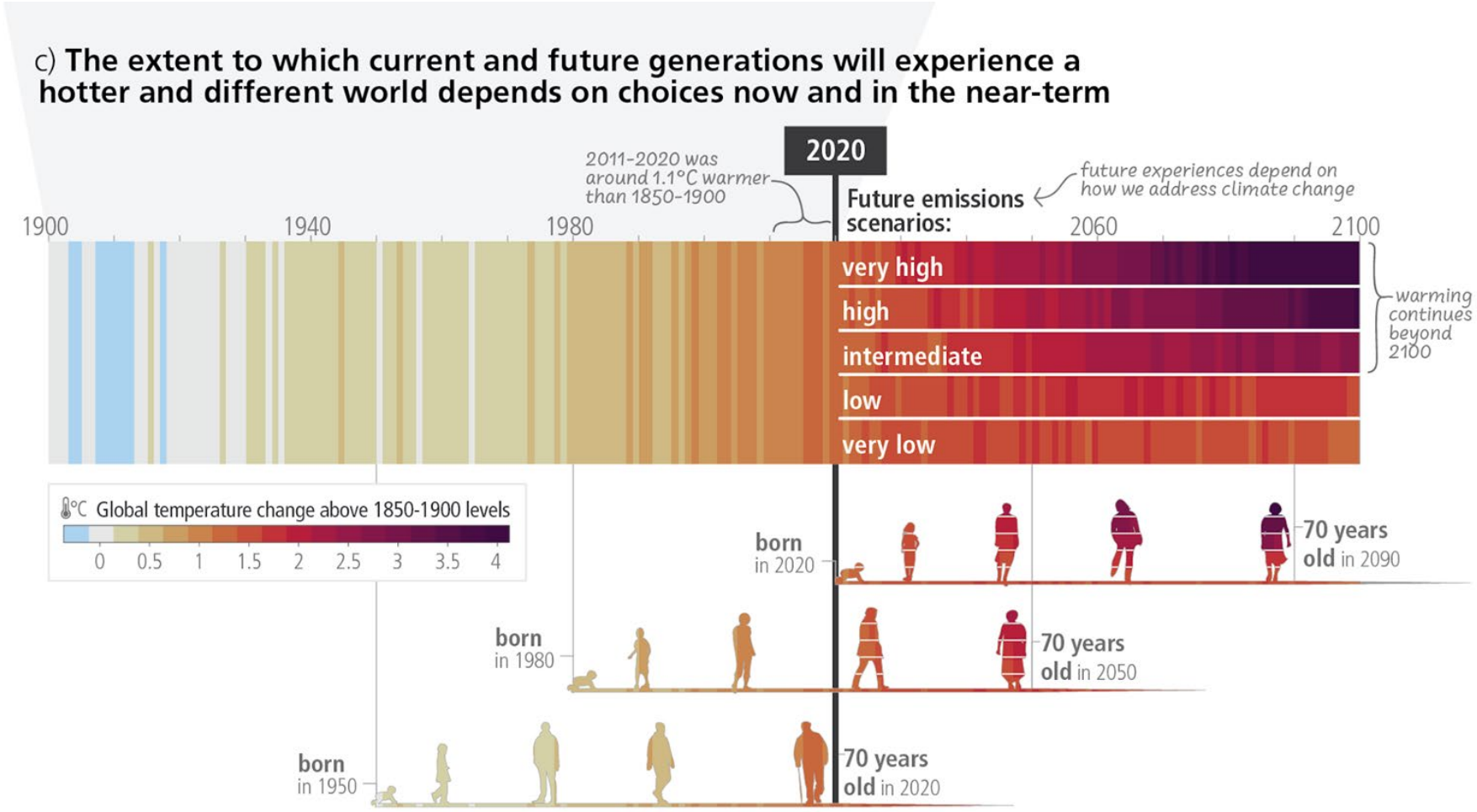
b) Synthesis of assessment of observed change in **heavy precipitation** and confidence in human contribution to the observed changes in the world's regions



Global trends $\neq$ **Local change**

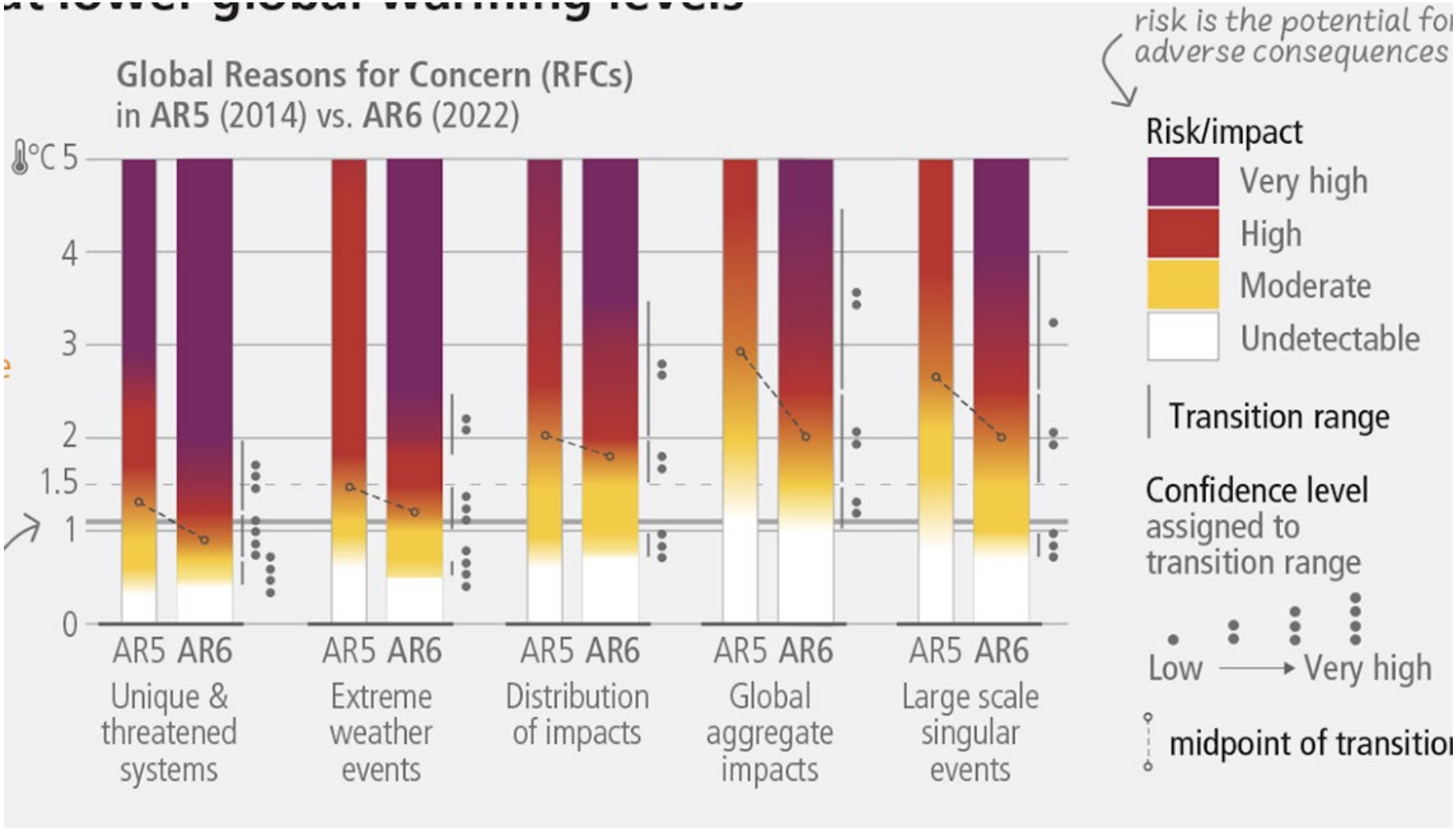
IPCC AR6 WG1, SPM.3

With every increment of global warming, regional changes in mean climate and extremes become more widespread and pronounced



IPCC, AR6 SYR SPM

High risks are now assessed to occur at lower warming levels



IPCC, AR6 SYR SPM

Climate change likely increased extreme monsoon rainfall, flooding highly vulnerable communities in Pakistan

world weather attribution

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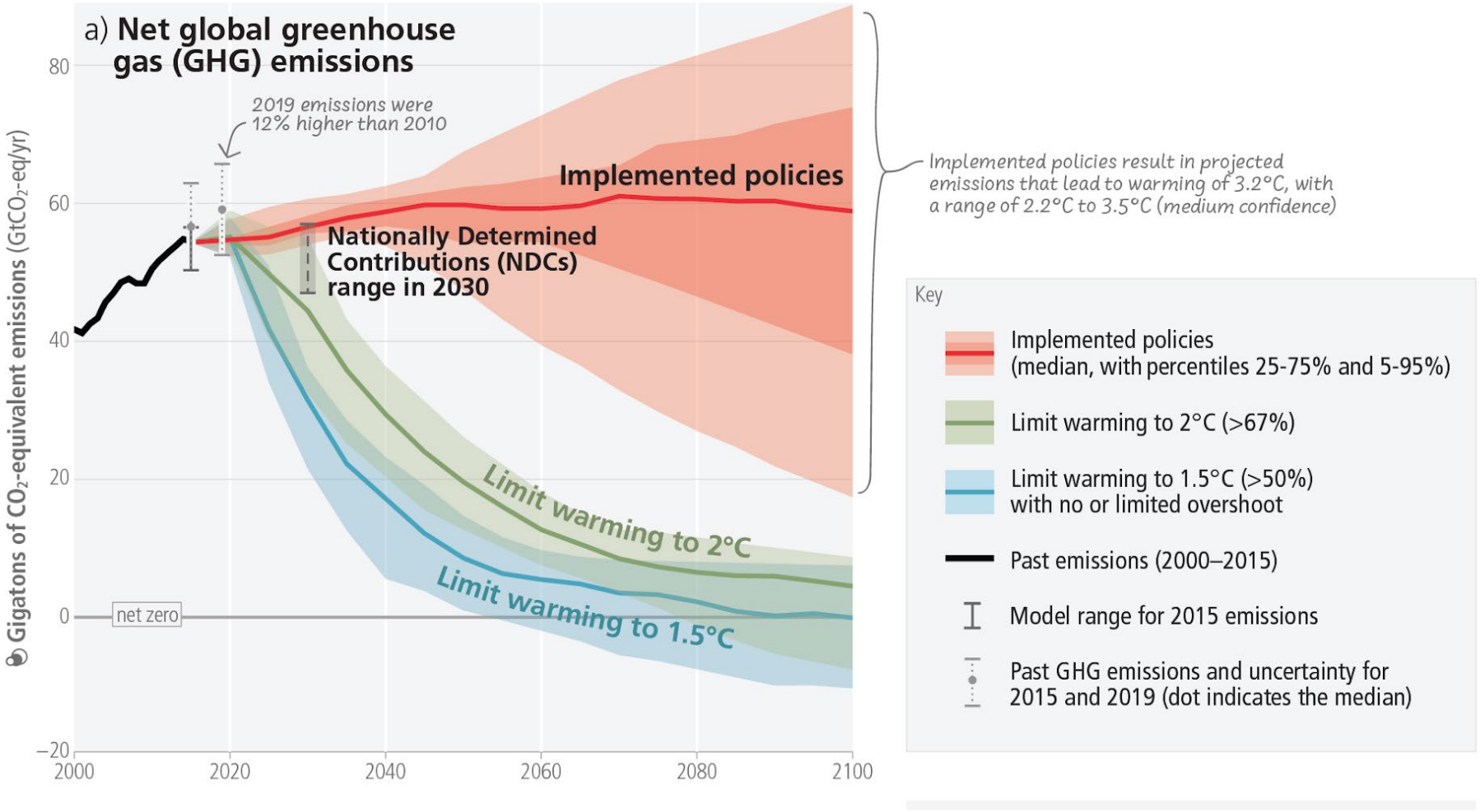
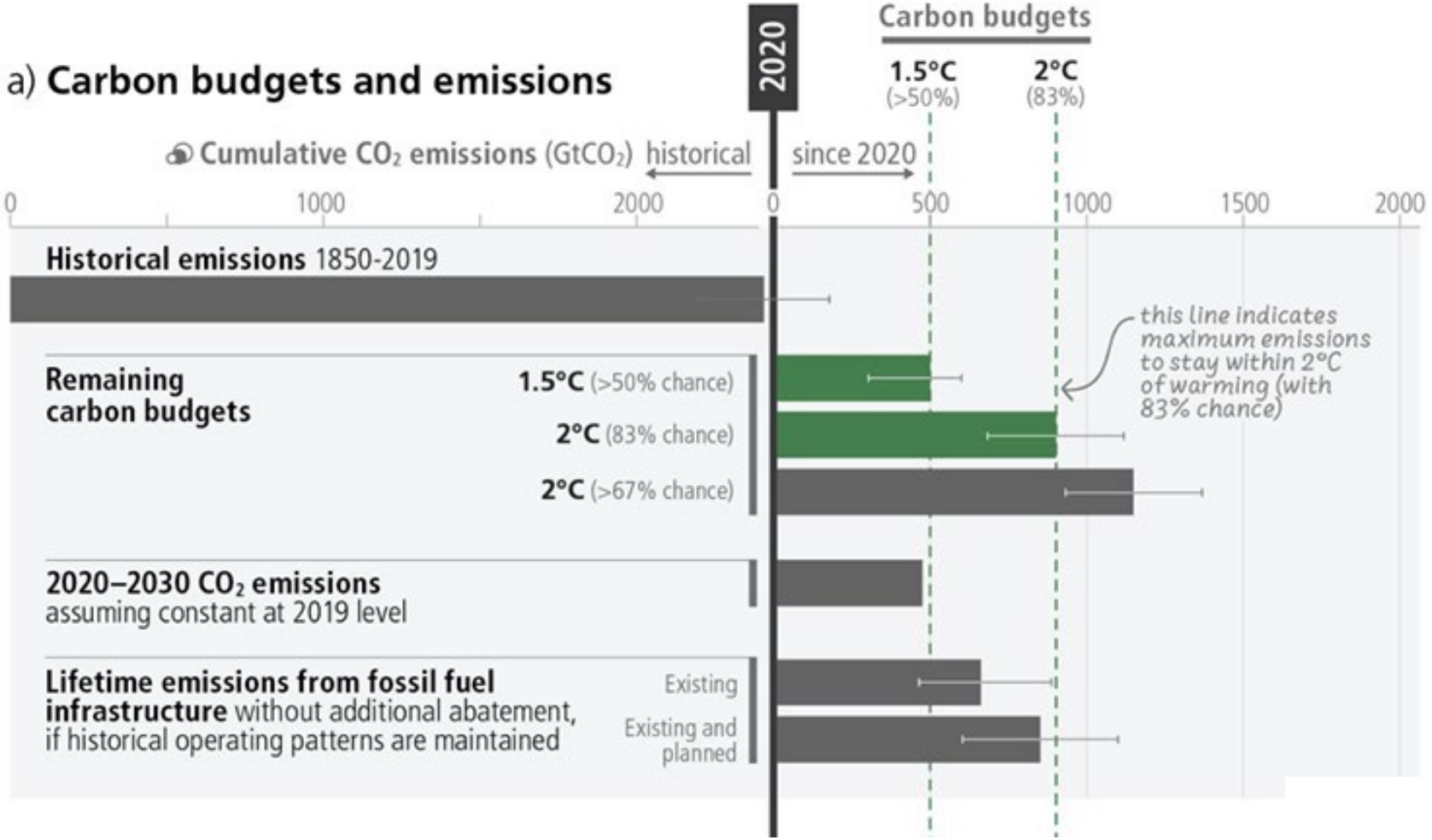
We are very far away from where we need to be



IPCC, AR6 SYR SPM

Remining carbon budgets to limit warming will soon be depleted



IPCC, AR6 SYR longer report

Rapid and far-reaching transitions across all sectors and systems are necessary to achieve deep and sustained emissions reductions and secure a liveable and sustainable future for all.

These system transitions involve a significant upscaling of a wide portfolio of mitigation and adaptation options.

Feasible, effective and low-cost options for mitigation and adaptation are already available, with differences across systems and regions. (high confidence)

IPCC, AR6 SYR longer report

Adaptation and Risk Management

https://youtu.be/LFcUmdcC6zw

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