

Highlights from the IPCC's Sixth Assessment – Local Considerations

*Presented to the
City of Hollywood Commission
June 8, 2023*



Intergovernmental Panel on Climate Change (IPCC) Overview

- Created by the UN to provide policymakers with scientific assessments on climate change.
- First report in 1990, underlined the importance of climate change as a challenge with global consequences and requiring international cooperation.
- Evolution in strength of findings over 33 years
 - 1990 - No firm evidence that climate has become more variable...but stronger evidence that most of the warming observed over the last 50 years is attributable to human activities
 - 2023 - It is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred.

6th Assessment Report Highlights

A.1 Human activities, principally through emissions of greenhouse gases, have unequivocally caused global warming, with global surface temperature reaching 1.1°C above 1850–1900 in 2011–2020. Global greenhouse gas emissions have continued to increase, with unequal historical and ongoing contributions arising from unsustainable energy use, land use and land-use change, lifestyles and patterns of consumption and production across regions, between and within countries, and among individuals (*high confidence*). {2.1, Figure 2.1, Figure 2.2}

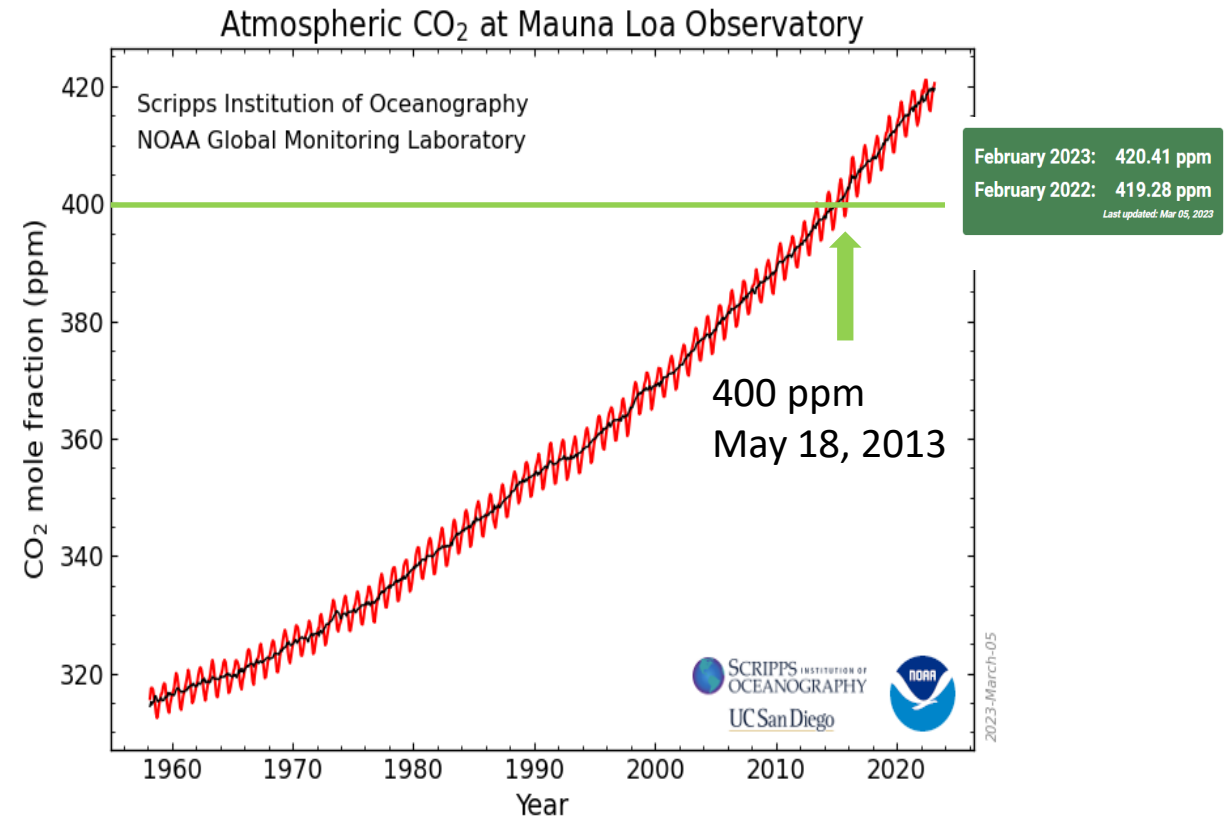
- Observed increases in well-mixed GHG concentrations since around 1750 are **unequivocally** caused by GHG emissions from human activities over this period.
- Global surface temperature was 1.09°C higher in 2011–2020 than 1850–1900, with larger increases over land (1.59°C) than over the ocean (0.88°C).
- Global surface temperature has increased faster since 1970 than in any other 50-year period over at least the last 2000 years (high confidence).



Summary for Policy Makers (36 pages)

Current Status and Trends

- Global net anthropogenic GHG emissions are estimated to be about 12% higher than in 2010 and 54% higher than in 1990.
- Average annual GHG emissions during 2010-2019 were higher than in any previous decade on record, while the rate of growth between 2010 and 2019 ($1.3\% \text{ year}^{-1}$) was lower than that between 2000 and 2009 ($2.1\% \text{ year}^{-1}$).

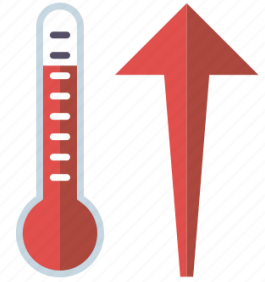


Temperature Change and Impacts

- Future climate-related risks depend on the rate, peak and duration of warming. In the aggregate, they are larger if global warming exceeds 1.5 °C...Some impacts may be long-lasting or irreversible, such as the loss of some ecosystems (*high confidence*).
- Hot extremes have intensified in cities...Observed adverse impacts are concentrated amongst economically and socially marginalized urban residents. (high confidence)

A.2 Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred. Human-caused climate change is already affecting many weather and climate extremes in every region across the globe. This has led to widespread adverse impacts and related losses and damages to nature and people (*high confidence*). Vulnerable communities who have historically contributed the least to current climate change are disproportionately affected (*high confidence*). {2.1, Table 2.1, Figure 2.2 and 2.3} (Figure SPM.1)

Mitigation Progress, Gaps, and Challenges



- A substantial ‘emissions gap’ exists between global GHG emissions commitments announced prior to COP26 and those associated with modelled mitigation pathways that limit warming to 1.5 °C.

This would make it likely that warming will exceed 1.5 °C during the 21st century (high confidence).

- Global modelled mitigation pathways that limit warming to 1.5 °C with no or limited overshoot or limit warming to 2 °C imply deep global GHG emissions reductions this decade (high confidence)



Unfortunately...

- Policies implemented by the end of 2020 are projected to result in higher global GHG emissions in 2030 than emissions implied with COP26 commitments, indicating an ‘implementation gap’ (high confidence).
- **Without a strengthening of policies, global warming of 3.2 °C is projected by 2100 (medium confidence).**

Adverse Impacts Will Intensify

a) Observed widespread and substantial impacts and related losses and damages attributed to climate change

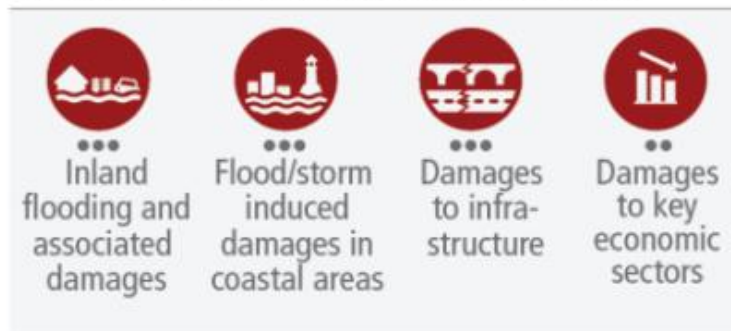
Water availability and food production



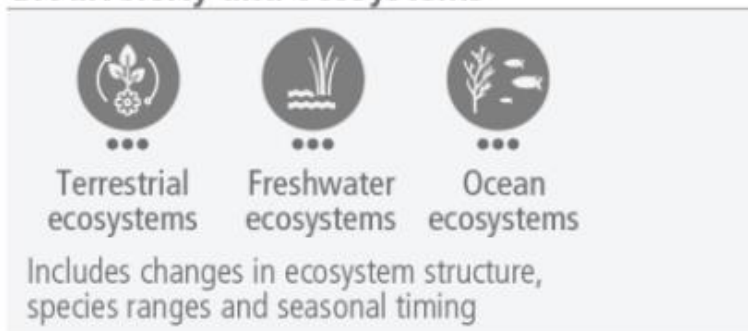
Health and well-being



Cities, settlements and infrastructure



Biodiversity and ecosystems



Key

Observed increase in climate impacts to human systems and ecosystems assessed at **global level**

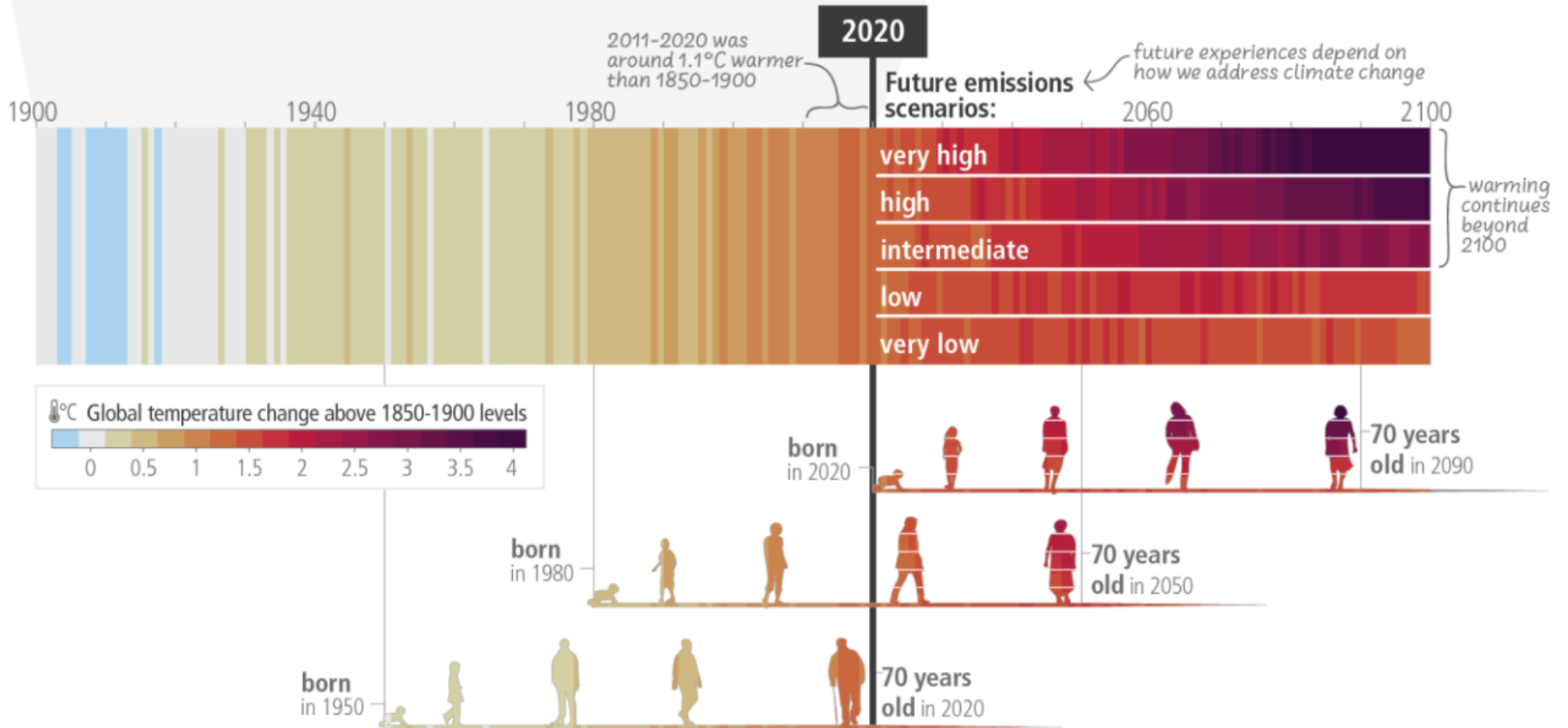
- Adverse impacts
- Adverse and positive impacts
- Climate-driven changes observed, no global assessment of impact direction

Confidence in attribution to climate change

- High or very high confidence
- Medium confidence
- Low confidence

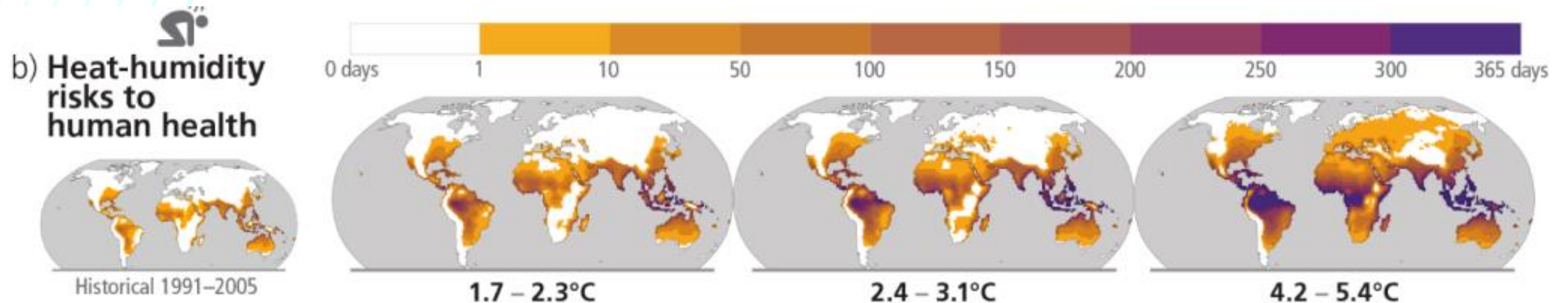
Adverse Impacts Will Intensify

c) The extent to which current and future generations will experience a hotter and different world depends on choices now and in the near-term

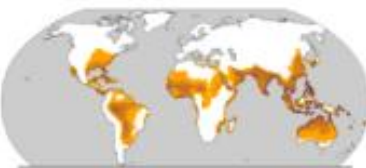


Locally and Spatially

B.2.4 For any given warming level, the level of risk will also depend on trends in vulnerability and exposure of humans and ecosystems. Future exposure to climatic hazards is increasing globally due to socio-economic development trends including migration, growing inequality and urbanization.



b) Heat-humidity risks to human health



Historical 1991–2005

Days per year where combined temperature and humidity conditions pose a risk of mortality to individuals³

³Projected regional impacts utilize a global threshold beyond which daily mean surface air temperature and relative humidity may induce hyperthermia that poses a risk of mortality. The duration and intensity of heatwaves are not presented here. Heat-related health outcomes vary by location and are highly moderated by socio-economic, occupational and other non-climatic determinants of individual health and socio-economic vulnerability. The threshold used in these maps is based on a single study that synthesized data from 783 cases to determine the relationship between heat-humidity conditions and mortality drawn largely from observations in temperate climates.

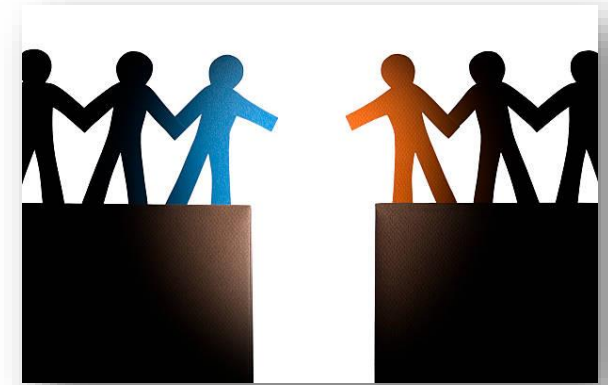
Progress in Adaptation: Gaps and Challenges

- Ecosystem-based adaptation approaches such as urban greening...have been effective in reducing flood risks and urban heat (high confidence).
- Combinations of non-structural measures like early warning systems and structural measures like levees have reduced loss of lives in case of inland flooding (medium confidence).
- Green/natural and blue infrastructure supports carbon uptake and storage, can reduce energy use, and risk from extreme events (medium confidence).



Progress in Adaptation: Gaps and Challenges

- Most observed adaptation responses are fragmented, incremental, sector-specific and unequally distributed across regions...largest adaptation gaps among lower income groups. (high confidence)
- There is increased evidence of maladaptation in various sectors and regions (high confidence). Maladaptation especially affects marginalized and vulnerable groups adversely (high confidence).



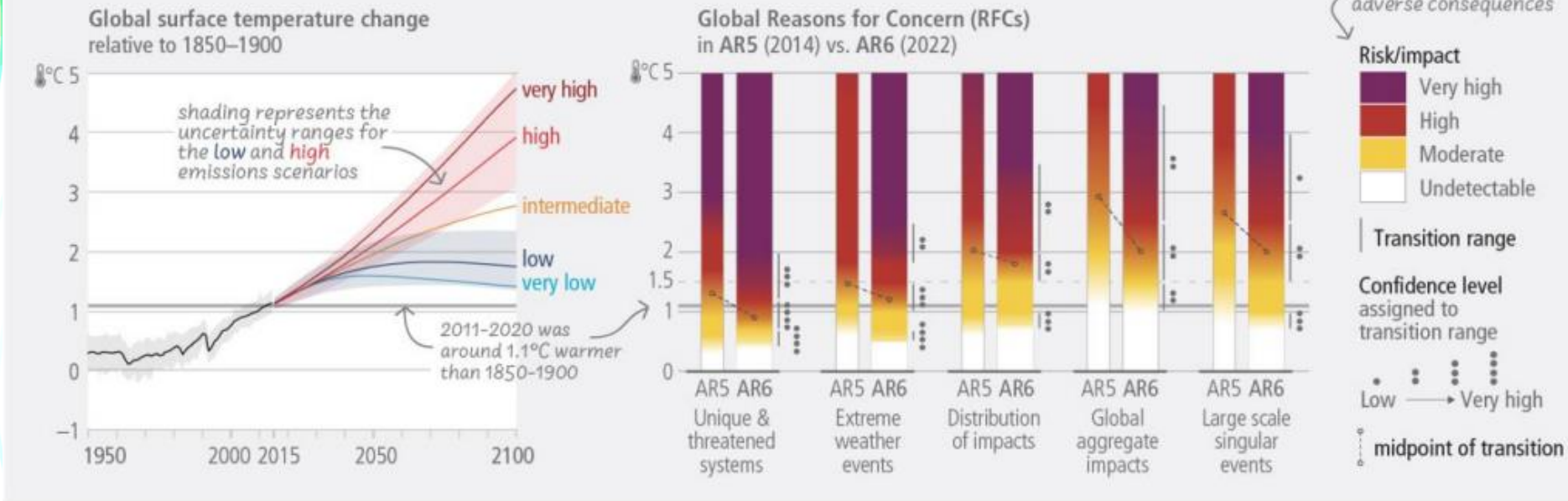
Climate Change Impacts and Climate-Related Risks

B.2 For any given future warming level, many climate-related risks are higher than assessed in AR5, and projected long-term impacts are up to multiple times higher than currently observed (*high confidence*). Risks and projected adverse impacts and related losses and damages from climate change escalate with every increment of global warming (*very high confidence*). Climatic and non-climatic risks will increasingly interact, creating compound and cascading risks that are more complex and difficult to manage (*high confidence*). {Cross-Section Box.2, 3.1, 4.3, Figure 3.3, Figure 4.3} (Figure SPM.3, Figure SPM.4)

- Compared to the 5th Assessment, global risk levels are to become high to very high at lower levels of global warming due to recent evidence of observed impacts, improved process understanding, and new knowledge on exposure and vulnerability of human and natural systems, including limits to adaptation (*high confidence*).
- Due to unavoidable sea level rise, risks for coastal ecosystems, people and infrastructure will continue to increase beyond 2100 (*high confidence*).

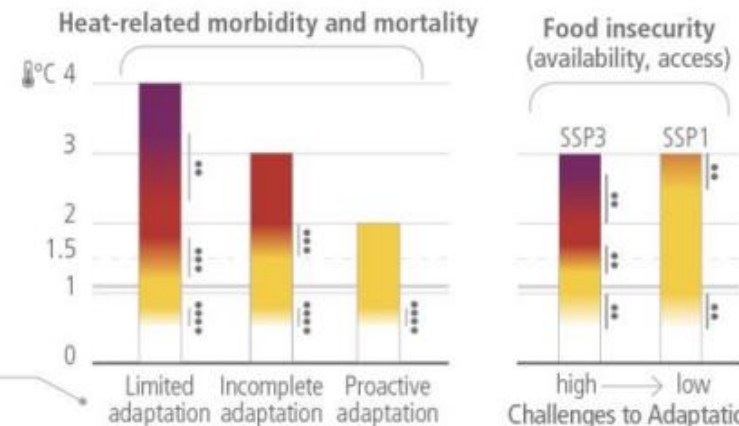
Risks are increasing with every increment of warming

a) High risks are now assessed to occur at lower global warming levels



d) Adaptation and socio-economic pathways affect levels of climate related risks

Limited adaptation (failure to proactively adapt; low investment in health systems); incomplete adaptation (incomplete adaptation planning; moderate investment in health systems); proactive adaptation (proactive adaptation management; higher investment in health systems)



The SSP1 pathway illustrates a world with low population growth, high income, and reduced inequalities, food produced in low GHG emission systems, effective land use regulation and high adaptive capacity (i.e., low challenges to adaptation). The SSP3 pathway has the opposite trends.

Unavoidable and Irreversible Changes

- Limiting global surface temperature does not prevent continued changes in climate system components that have multi-decadal or longer timescales of response (high confidence).
- Sea level rise is unavoidable for centuries to millennia, and sea levels will remain elevated for thousands of years (high confidence). However, deep, rapid and sustained GHG emissions reductions would limit further sea level rise acceleration and projected long-term sea level rise commitment.
- Relative to 1995–2014, the likely global mean sea level rise under the SSP5-8.5 GHG emissions scenario is 0.20–0.29 m by 2050 and 0.63–1.01 m by 2100 (medium confidence).

Summary

- It is likely that warming will exceed 1.5 °C during the 21st century and could increase as much as 3.2 °C in this same time timeframe.
- Compared to 5th Assessment, global aggregated risk levels are assessed to become high to very high at lower levels of global warming.
- Urban systems are critical for achieving deep emissions reductions and advancing climate resilient development.
- Mitigation and adaptation options highlight the importance of urban systems, public health, heat response and a focus on low income and marginalized communities.

Discussion?

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