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Why climate action? What do we know?

Hobart Climate Assembly 17/02/2024

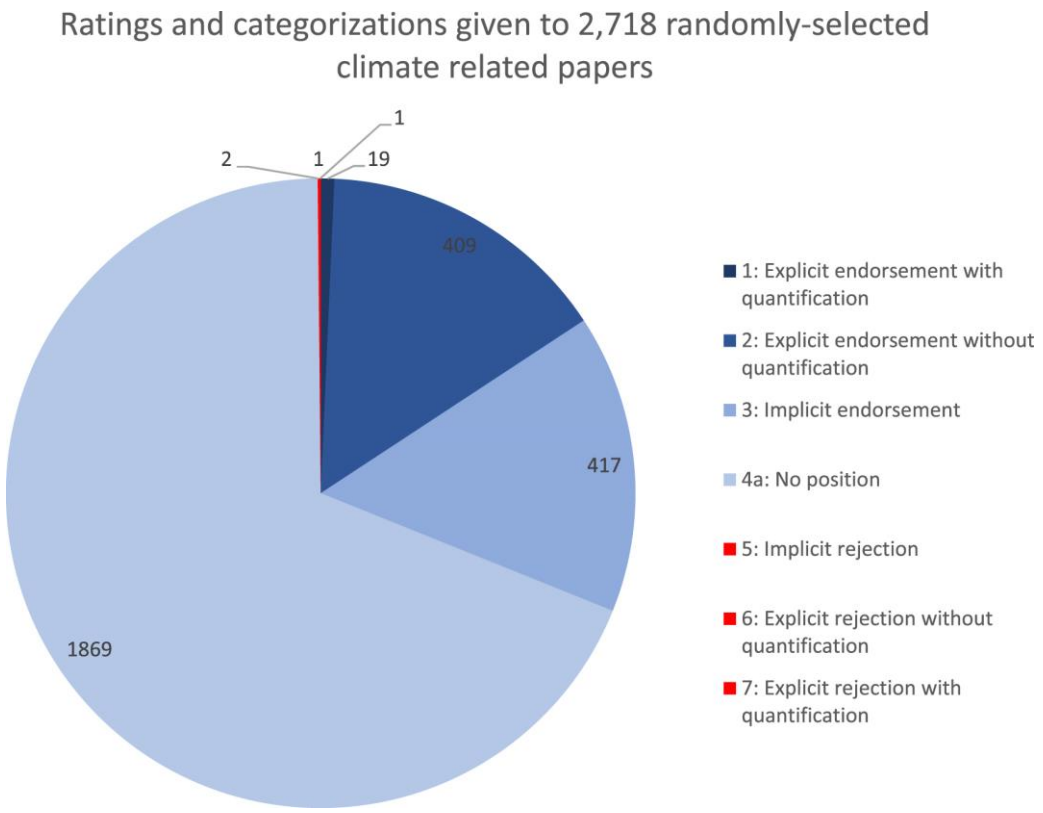


Dr Kathleen Beyer

Director Climate Futures Research Group and Senior Lecturer Climate Impacts and Adaptation, School of Geography and Spatial Sciences, University of Tasmania, Australia

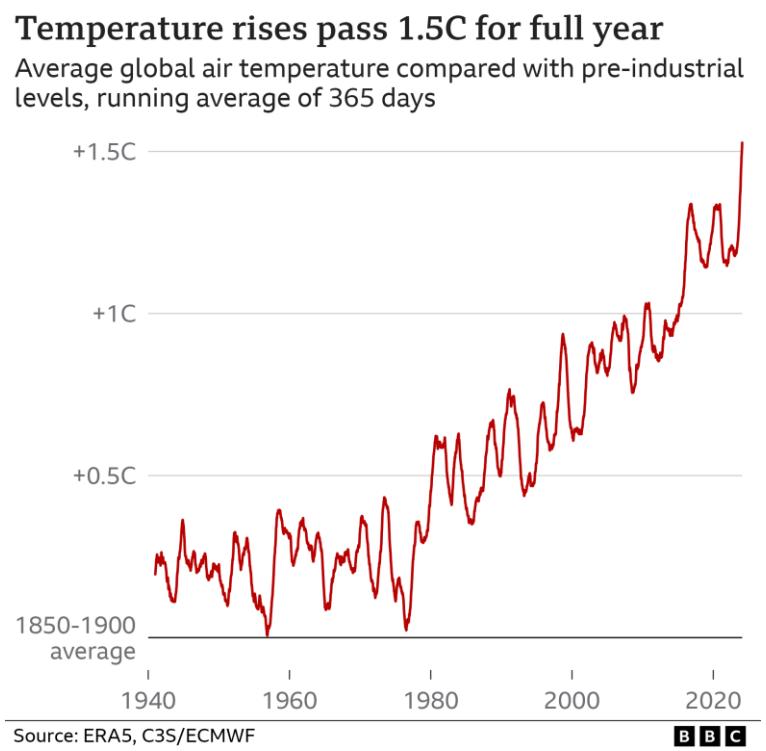
Greater than 99% consensus on human caused climate change in the peer-reviewed scientific literature

"...there is no significant scientific debate among experts about whether or not climate change is human-caused. This issue has been comprehensively settled, and the reality of anthropogenic climate change (ACC) is no more in contention among scientists than is plate tectonics or evolution"

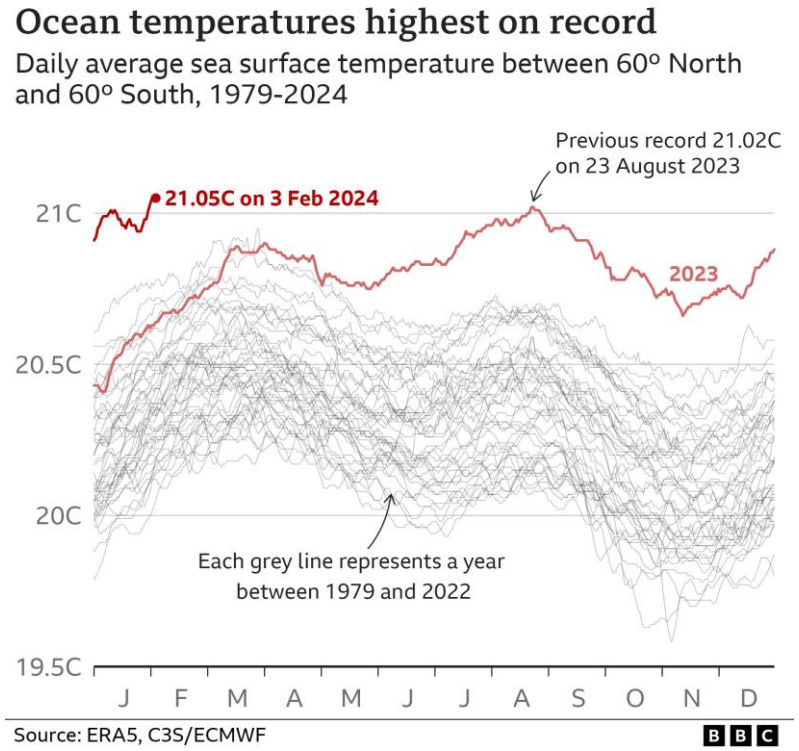


https://iopscience.iop.org/article/10.1088/1748-9326/ac2966

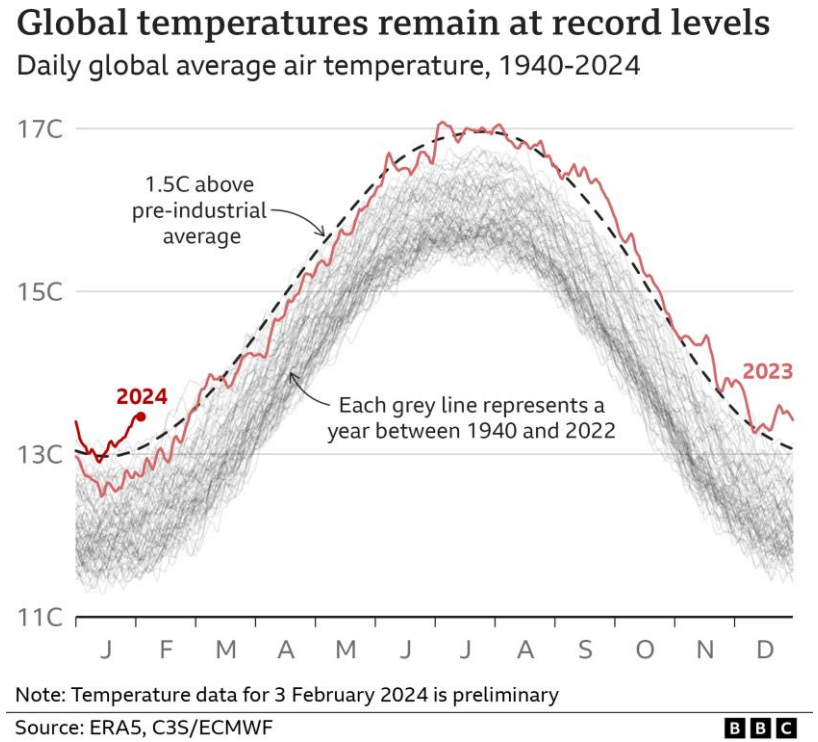
2023 - World's first year-long breach of key 1.5C warming limit



The period from February 2023 to January 2024 reached 1.52C of warming, according to the EU's Copernicus Climate Change Service. The graph above graph shows how that compares with previous years.



The world's sea surface is also at its highest ever recorded average temperature - yet another sign of the widespread nature of climate records. As the graph above shows, it's particularly notable given that ocean temperatures don't normally peak for another month or so.

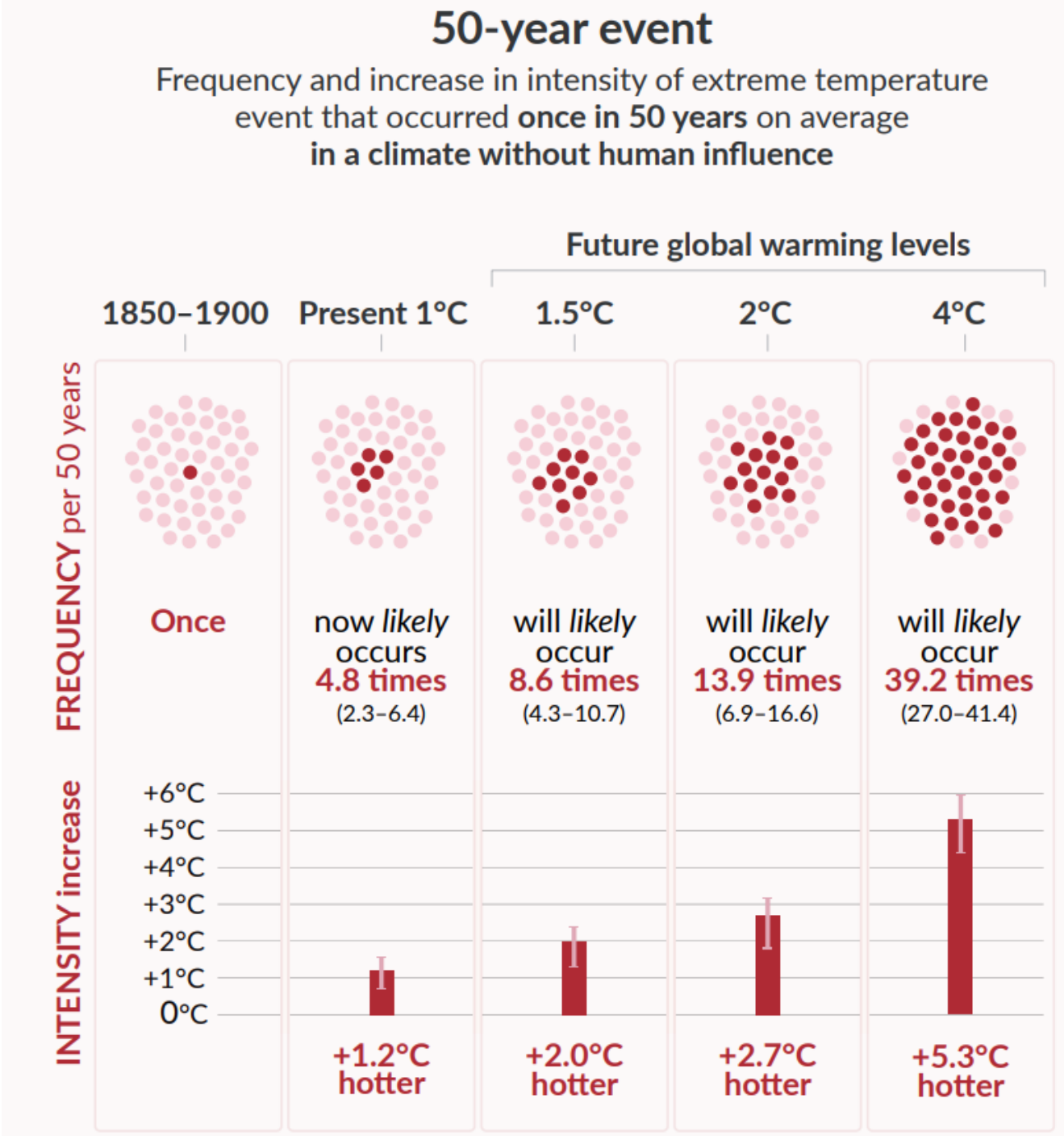


Global average air temperatures began exceeding 1.5C of warming on an almost daily basis in the second half of 2023, when El Niño began kicking in, and this has continued into 2024. This is shown where the red line is above the dashed line in the graph above.

https://www.bbc.com/news/science-environment-68110310

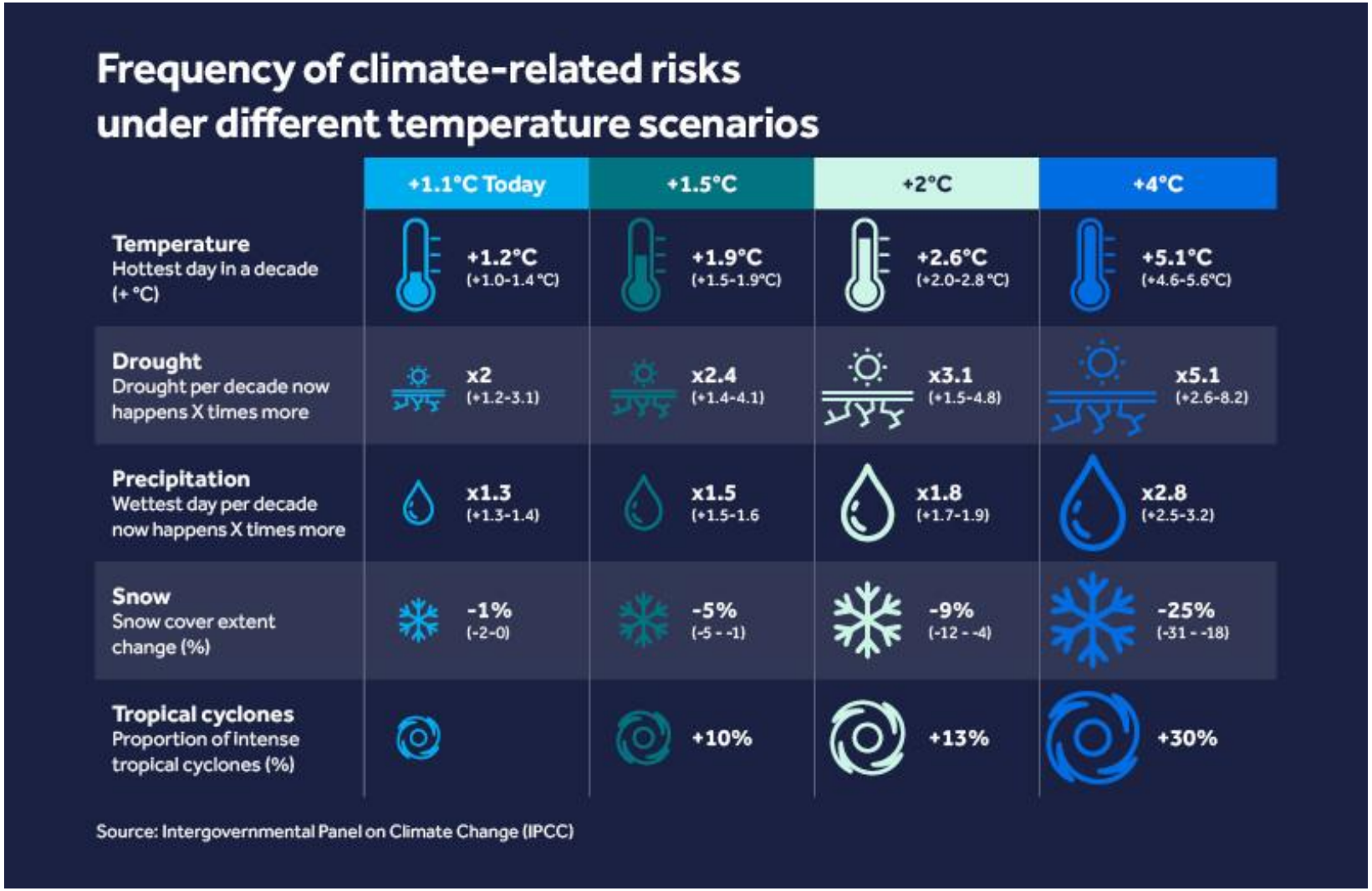
Changes in temperature

- Heat extremes are occurring **more frequently everywhere**.
- 1 in 50-year event occurs 4.8 times more often now than it did in 1850-1900.
- This **trend will continue** with this type of heat extreme occurring in most years if the global temperature reaches 4 degrees above preindustrial levels.



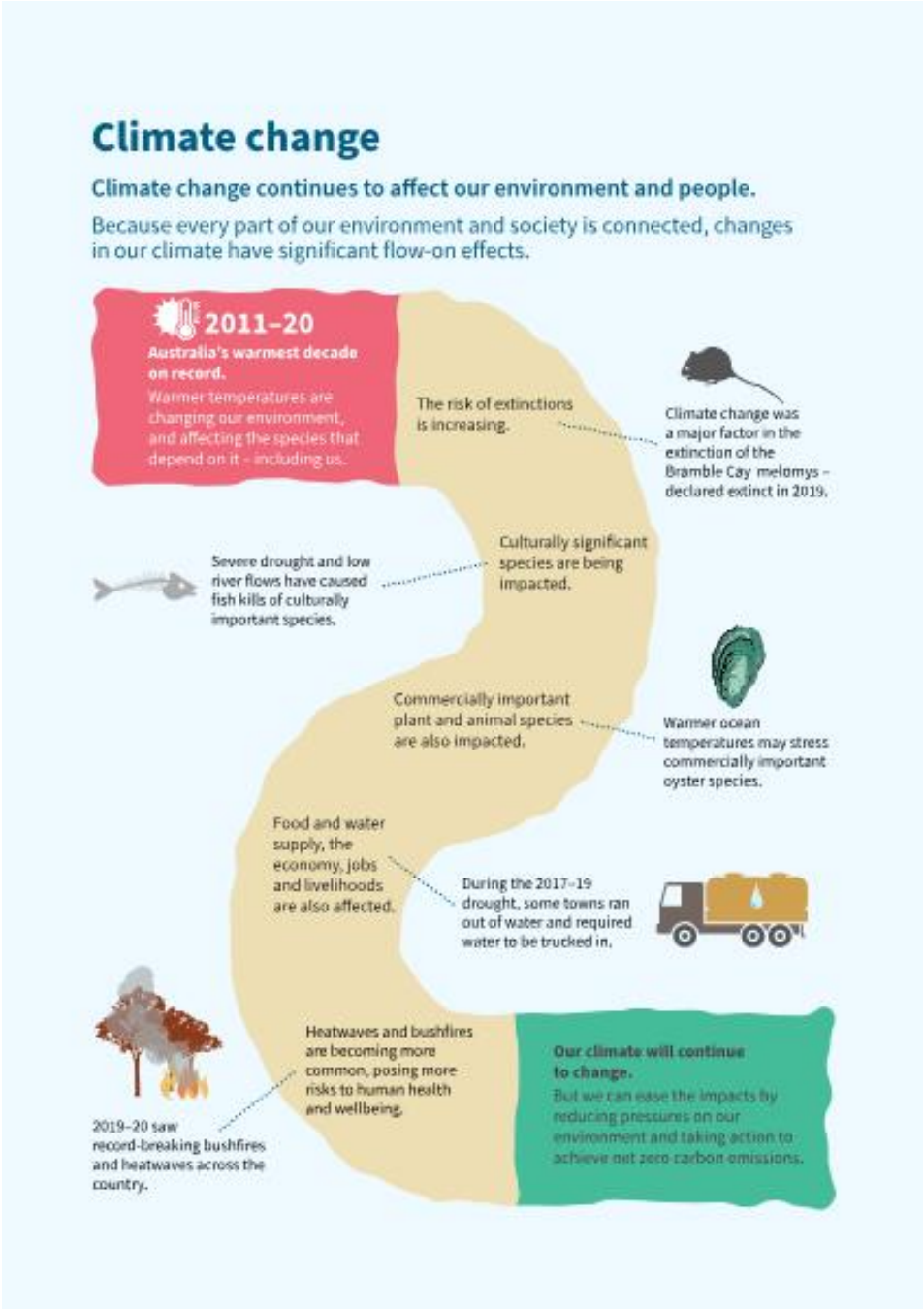
Projected changes are shown at global warming levels of 1°C, 1.5°C, 2°C, and 4°C and are relative to 1850–1900, representing a climate without human influence. The figure depicts frequencies and increases in intensity of a 1 in 50-year extreme heat event from the base period (1850–1900) under different global warming levels (IPCC, 2022).

How we tackle climate change now will have a significant impact on the severity and frequency of extreme weather events for decades.



Australia and climate change

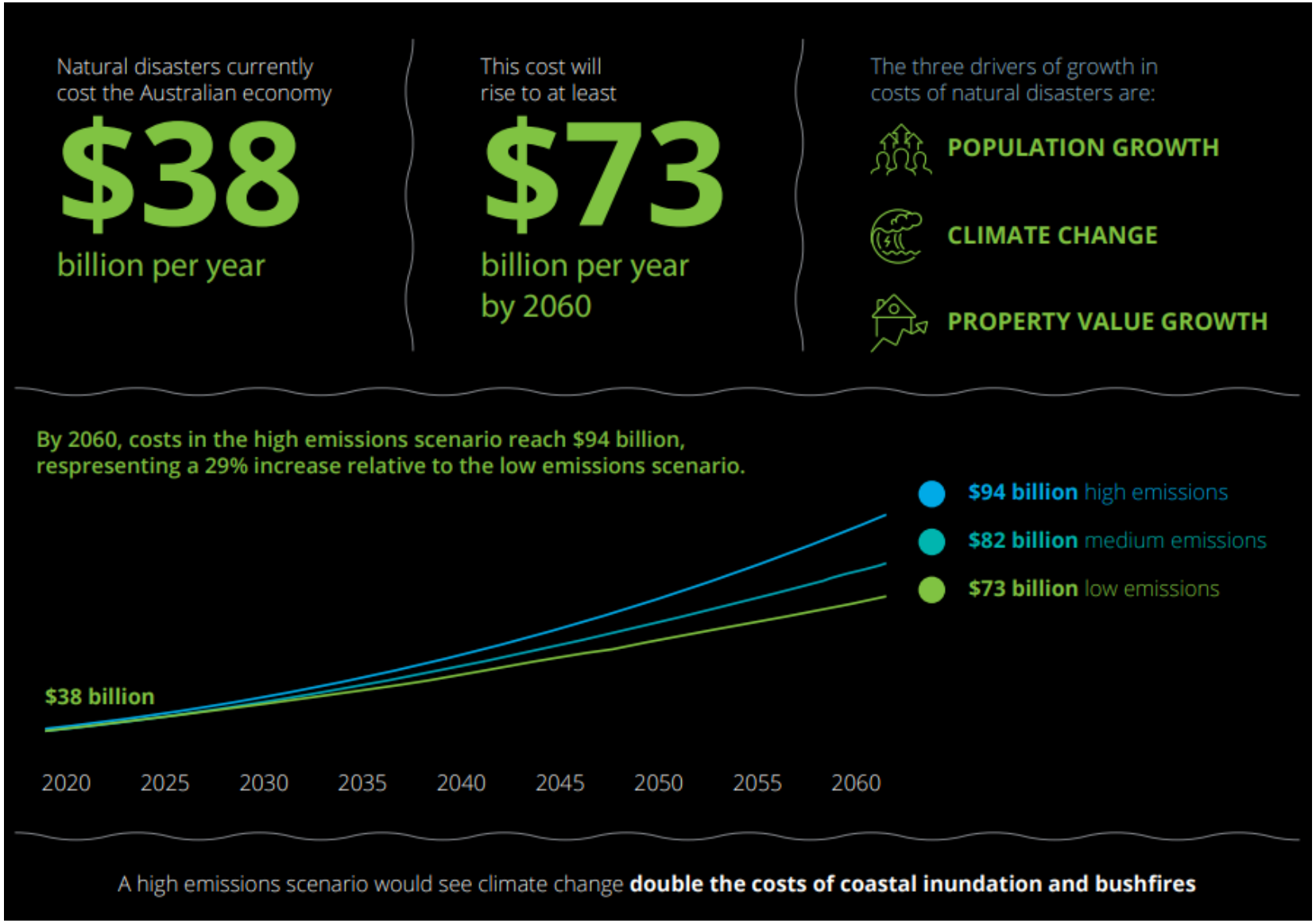
- **Higher temperatures across land, air, and sea**, alongside **more acidic oceans, rising sea levels, and reduced rainfall in southern regions**.
- Extreme events are changing in frequency, intensity, and distribution.
- **Australia has seen a mean temperature increase of 1.4°C on land and 1.1°C in the oceans**.
- The last decade was Australia's warmest on record.
- **Australia's targets:**
  - net 2030 emissions target of a 43% reduction below 2005 levels, and
  - net zero emissions by 2050.



https://soe.dcceew.gov.au/

Cost of disasters

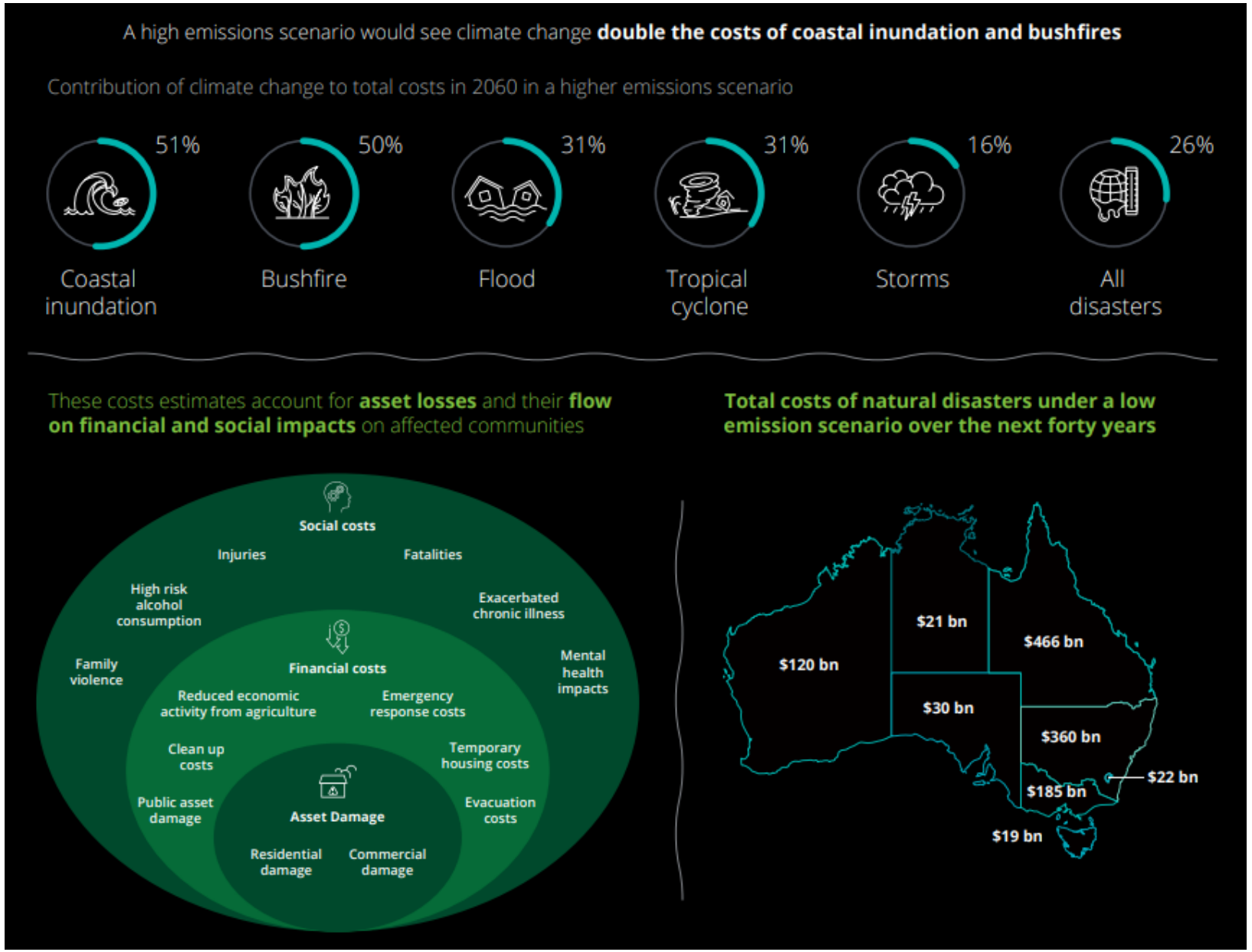
- THE ECONOMIC COSTS OF NATURAL DISASTERS IN AUSTRALIA



Deloitte Access Economics (2021) Special report: Update to the economic costs of natural disasters in Australia Australian Business Roundtable for Disaster Resilience & Safer Communities. 21 pages

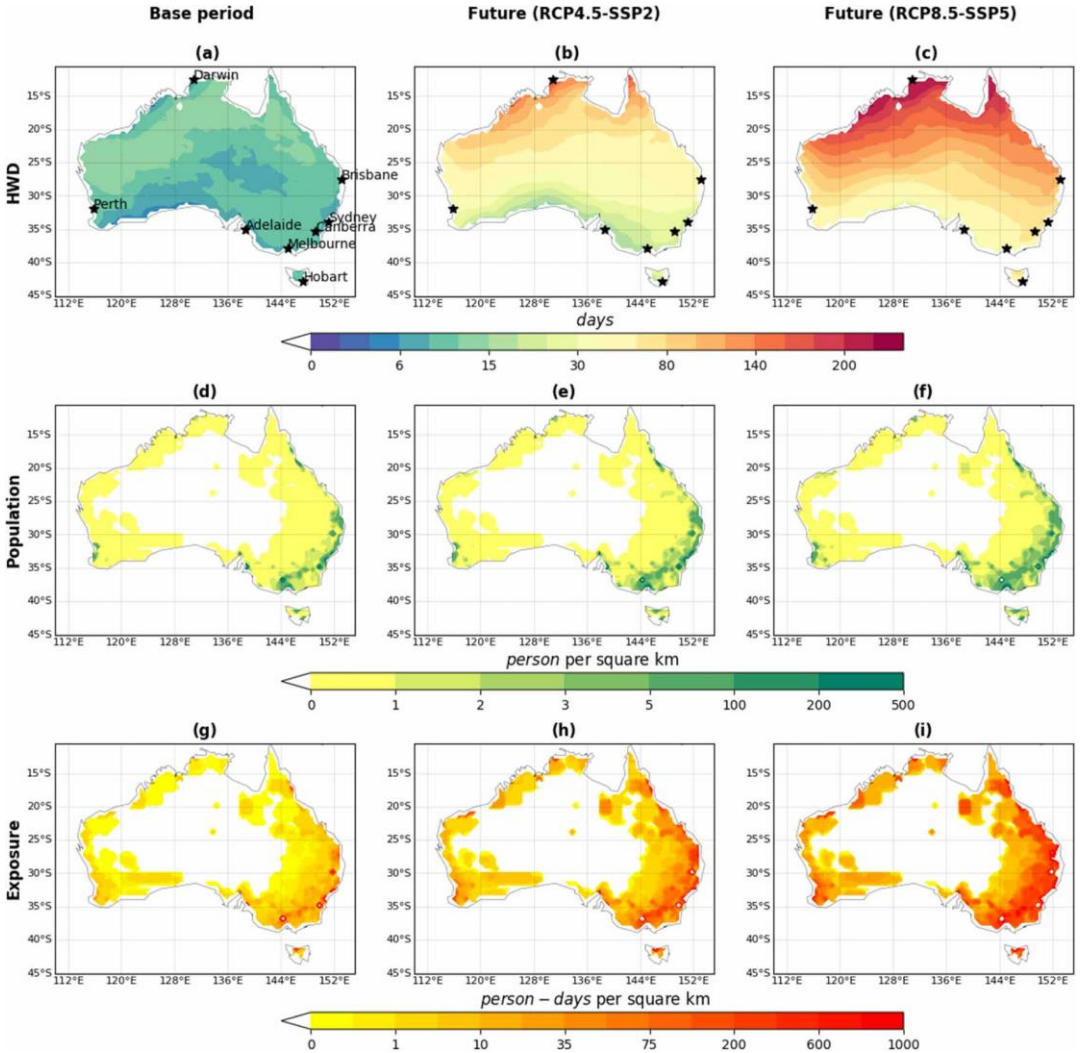
Cost of disasters

COSTS OF NATURAL DISASTERS IN AUSTRALIA



Deloitte Access Economics (2021) Special report: Update to the economic costs of natural disasters in Australia Australian Business Roundtable for Disaster Resilience & Safer Communities. 21 pages

Future population exposure to heatwaves will increase



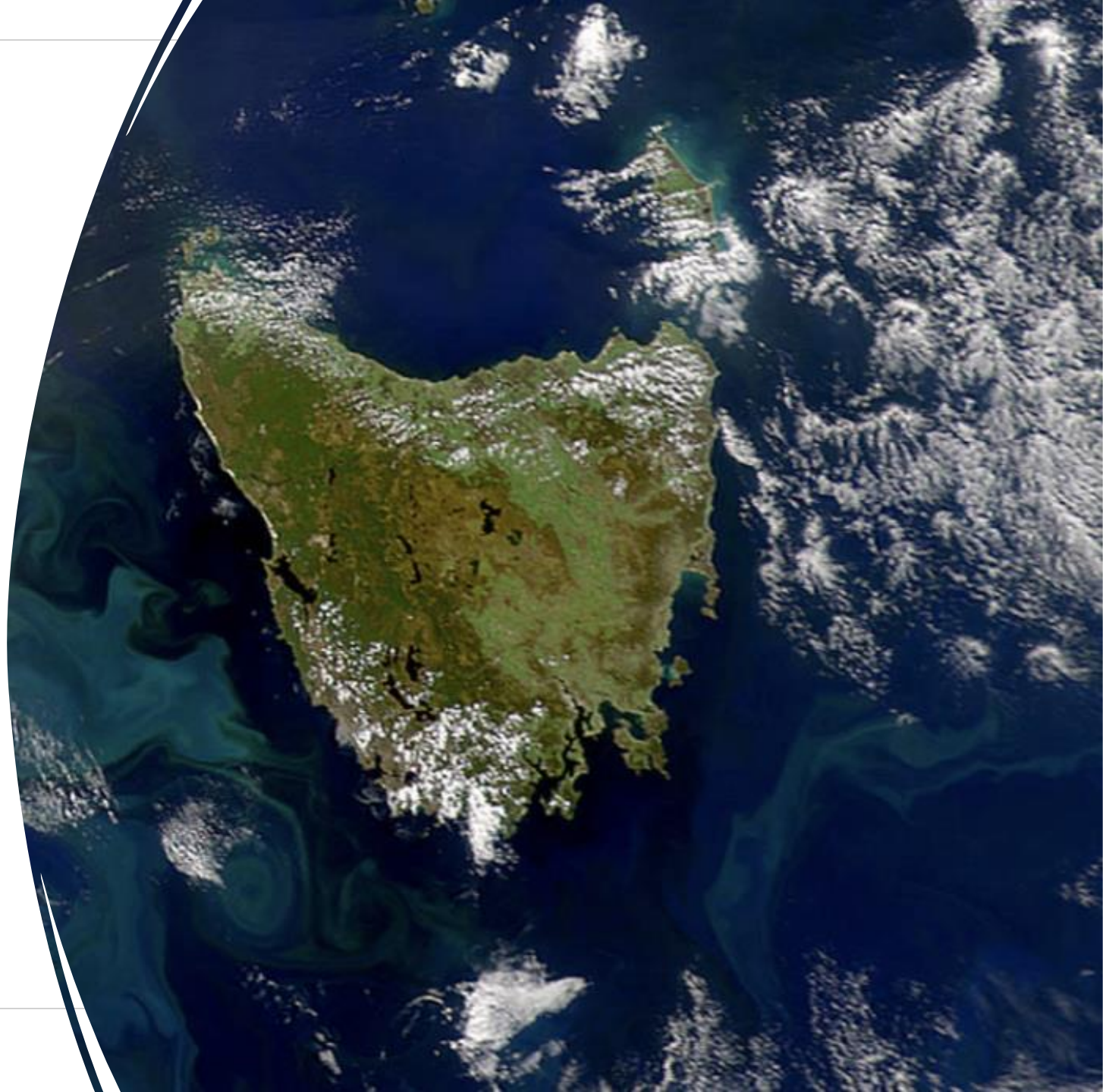
Spatial distribution of heatwave days (HWD), population and the corresponding exposure for the base (1976–2005) (a), (d), (g) and future periods (2070–2099) for RCP4.5-SSP2 (b), (e), (h) and RCP8.5-SSP5 (c), (f), (i) scenario. Here, (a)–(c), (d)–(f) and (g)–(i) show spatial HWD, population and exposure distribution respectively. Areas in white are where there is no/zero population data. Black stars on the map denote the location of the capital cities (Sydney, Perth, Melbourne, Hobart, Darwin, Canberra, and Adelaide).
https://iopscience.iop.org/article/10.1088/1748-9326/ac6dfa

For global population heat exposure see this paper:
https://www.sciencedirect.com/science/article/pii/S0160412023003227#:~:text=Overall%2C%20global%20urban%20population%20exposure%20to%20heatwaves%20is,exposure%2C%20followed%20closely%20by%20cities%20at%20low%20altitudes.

Climate change in Tasmania

- Tasmania overall had 1201.84mm rainfall in **2023**, as an area average across the state, which is 11.5 per cent **below average and the lowest rainfall total since 2017**.
- According to the Bureau of Meteorology, **2023 was Tasmania's third-warmest year on record.**
- The mean temperature was 0.81 degrees warmer than the 1961–1990 annual average, while also being the warmest year for Tasmania overall since 2016.



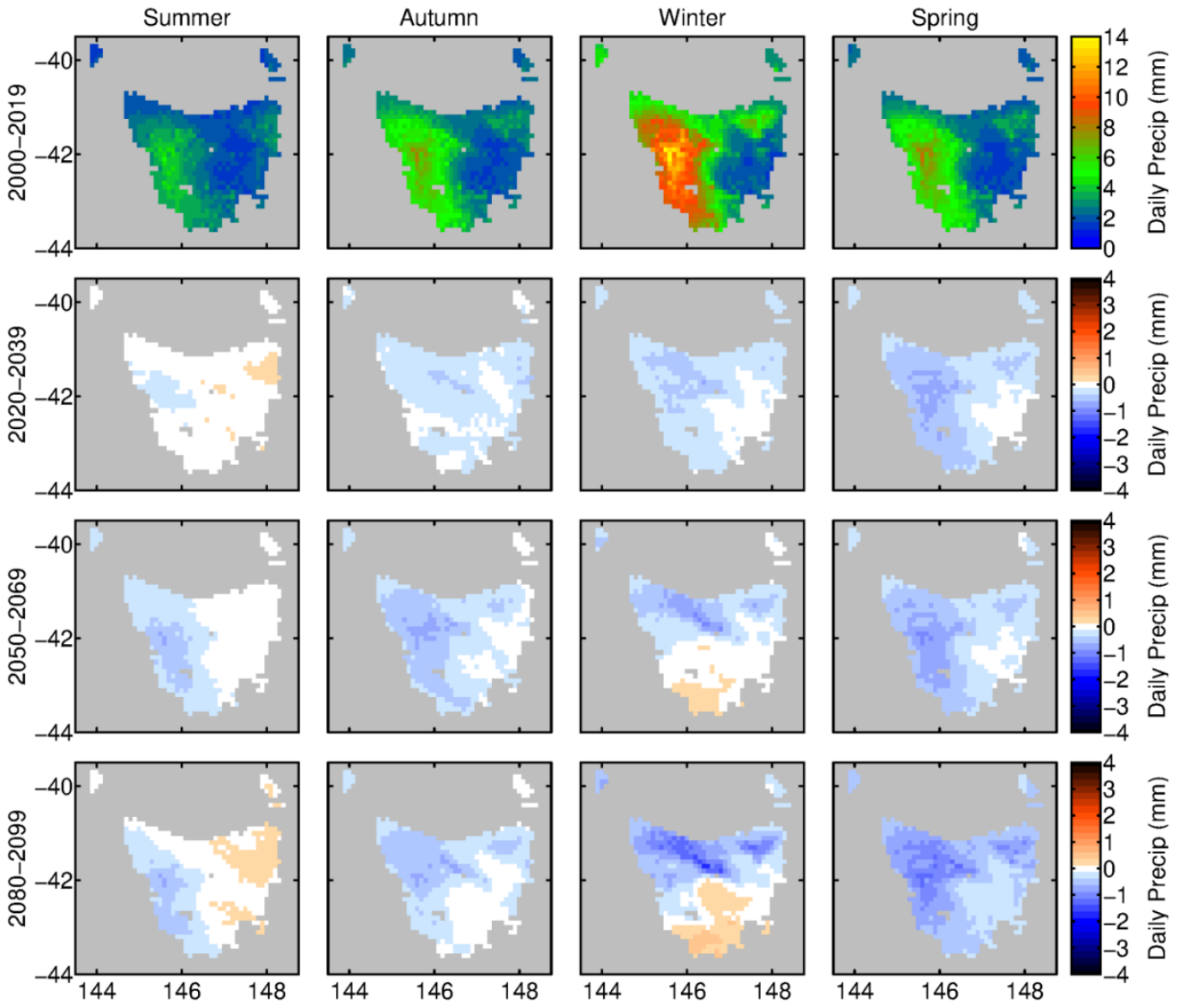


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Future changes in water availability across Tasmania

The spatial distribution of **rainfall is projected to shift**, with annual rainfall decreasing over the Central Highlands by the end of the century and increasing in the east, mainly during summer and autumn.

Annual rainfall on the west coast is projected to undergo minor changes; however, the **intra-annual distribution varies** greatly, with rainfall projected to decrease in the summer and increase through winter



Mean daily rainfall for each season (top row) and projected change in rainfall for the seasons in the periods 2020-2039, 2050-2069 and 2080-2099 from the 2000-2019 base period for each season. Results from Harris et al. (2019) utilising Climate Futures dynamically downscaled CMIP5 projections for RCP8.5. Results are multi-model mean of six-member ensemble.

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AUSTRALIA'S WINE FUTURE
A CLIMATE ATLAS

TASMANIA SOUTH EAST

RAINFALL

Projected Mean Growing Season Rainfall

454 mm	452 mm	454 mm
1997–2017	2041–2060	2081–2100

TEMPERATURE

Projected Mean Growing Season Temperature

13.8 °C	15.0 °C	16.6 °C
1997–2017	2041–2060	2081–2100

EXTREME COLD

Projected Mean Growing Season Frost Risk Days

3.9 days	3.1 days	1.2 days
1997–2017	2041–2060	2081–2100

EXTREME HEAT

Projected Mean Excess Heat Factor

8.4 EHF	11.0 EHF	11.0 EHF
1997–2017	2041–2060	2081–2100

ARIDITY

Projected Mean Annual Aridity Index

0.91	0.85	0.76
1997–2017	2041–2060	2081–2100

Wine Australia

ACE CRC ANTARCTIC CLIMATE & ECOSYSTEMS COOPERATIVE RESEARCH CENTRE

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Extreme Heat – Tasmania South East

Figure 1: Observed mean Excess Heat Factor

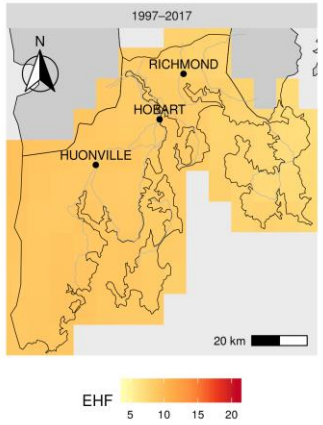


Figure 2: Observed change in mean Excess Heat Factor

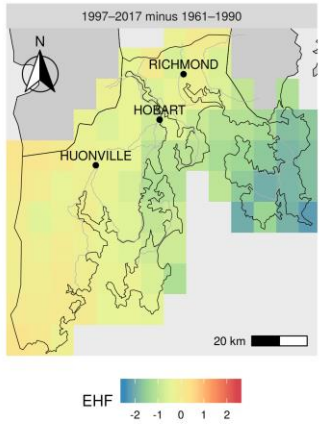


Figure 3: Projected mean Excess Heat Factor

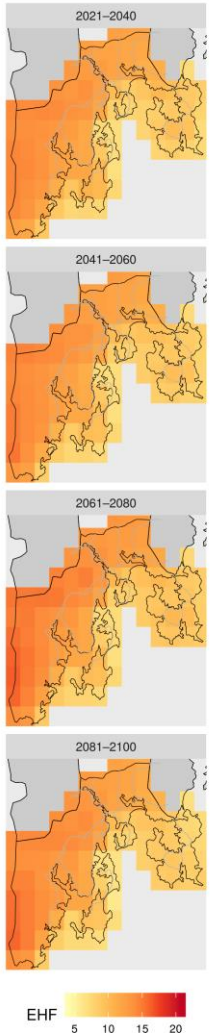


Figure 4: Projected mean number of extreme heat days

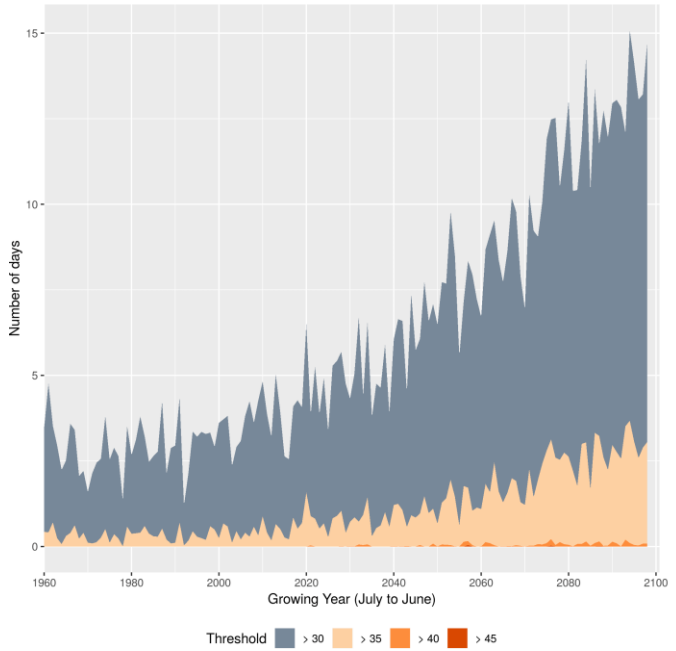


Figure 5: Projected number of days with severe risk to humans working outside

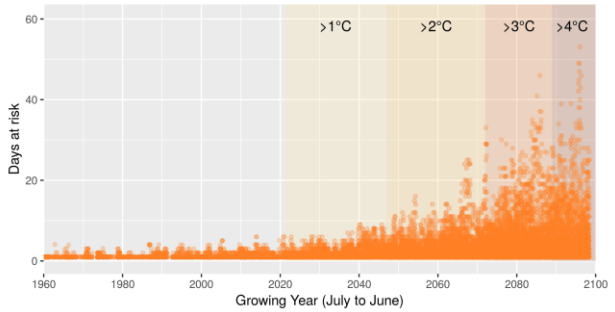


Figure 6: Projected range of hot summer days

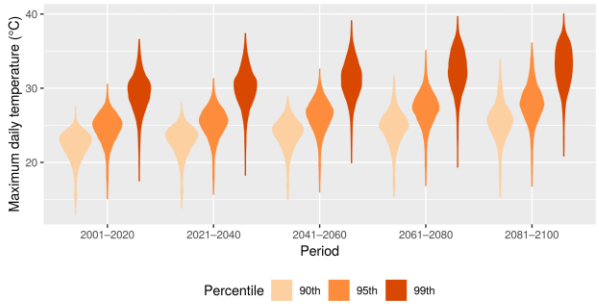


Figure 7: Distribution of daily minimum and maximum temperature during a heatwave

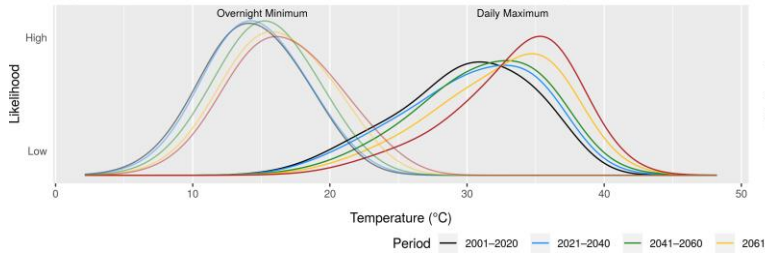
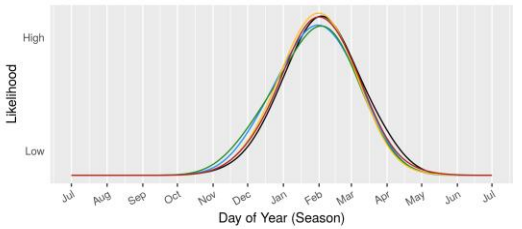


Figure 8: Distribution of date of heatwave days

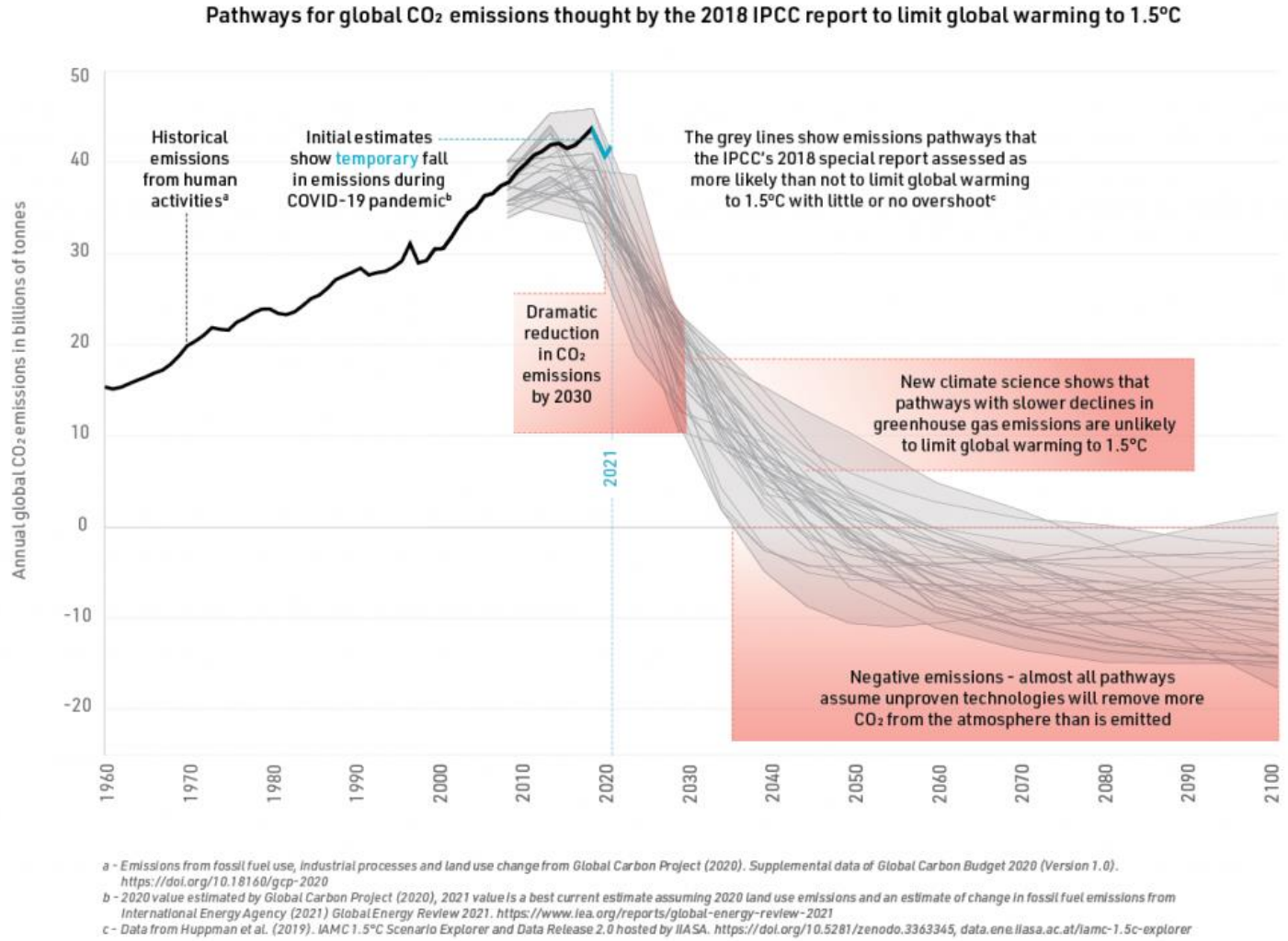


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Can we limit global warming to 1.5C°?

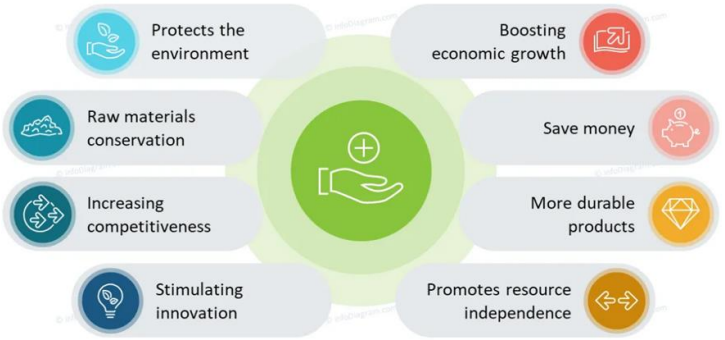
- **Achieving the 1.5°C target (Paris) is extremely challenging** (IPCC 2018).
- **Limiting warming to 1.5°C is now nearly impossible** without rapid emission reductions and large-scale carbon dioxide removal.
- The **consequences of 1.5°C warming are more manageable and adaptable compared to 2.0°C or higher**.
- **Aggressively reducing greenhouse gas emissions** towards the 1.5°C target will facilitate easier and less costly adaptation, even if reaching this goal proves unattainable.



Pathways for global CO2 emissions thought by the 2018 IPCC report to limit global warming to 1.5°C. Model results estimated that each of these pathways had a greater than even chance of limiting global warming to 1.5°C with little or no overshoot. Also shown are historical emissions from human activities, including the recent temporary fall in emissions during the COVID-19 pandemic.

2040: everything we need for a sustainable world already exists

- Solutions exist that not only reduce emissions and restore ecosystems but also bring about **improvements in health, income equality, security and community wellbeing, for example:**
  - **Decentralised solar micro-grids** in remote areas, enabling **energy exchange** among households and supporting local economies.
- **Regenerative agriculture practices** are another solution, drawing carbon from the atmosphere and enriching soil, leading to improved water retention and nutrient-rich food production.
- **Seaweed offers a powerful tool for carbon sequestration**, growing rapidly while restoring marine habitats and providing various resources such as food, fibre, and biofuels to communities.
- **Empowering girls and women** through education has profound and far-reaching impacts, underscoring the potential for positive change.



Economic benefits of sustainable practices

Tasmania

- met the 2022 target of 100 per cent self-sufficiency in renewable electricity generation.
- first-class wind resources and extensive hydroelectricity schemes.
- Tasmania Renewable Energy Target (2020): aims to increase the State's renewable energy output by 200 per cent based on 2022's renewable energy figures. In 2040, Tasmania will produce twice as much clean power as in 2022.



https://www.theguardian.com/environment/2019/may/21/determination-and-passion-how-these-renewable-energy-resources-can-save-our-planet

The future is NOW - Imperatives for Immediate Climate Action

- **A 100 Percent Clean Future**
  - Building a net-zero economy.
  - Decarbonisation transition – make more informed decisions.
- **Triple up on renewables**
  - Action to increase clean energy generation (e.g. wind, solar, water).
  - Consider the renewable energy supply chain – end-to-end approach.
  - Circularity - involves sharing, leasing, reusing, repairing, refurbishing, and recycling existing materials and products for as long as possible
- **Including people and nature**
  - Nature, including the interplay of water, nature, and ecosystems.
  - Creating better and more resilient food systems.
  - People-focused approach.
  - Place-based solutions,.
- **Accountability and commitments (local to global)**
  - An environmental justice commitment. Policies that would advance environmental justice, including by identifying and cutting disproportionately high levels of toxic pollution in vulnerable communities.





Thank you.

Dr Kathleen Beyer - kathleen.beyer@utas.edu.au

https://climatefutures.org.au/