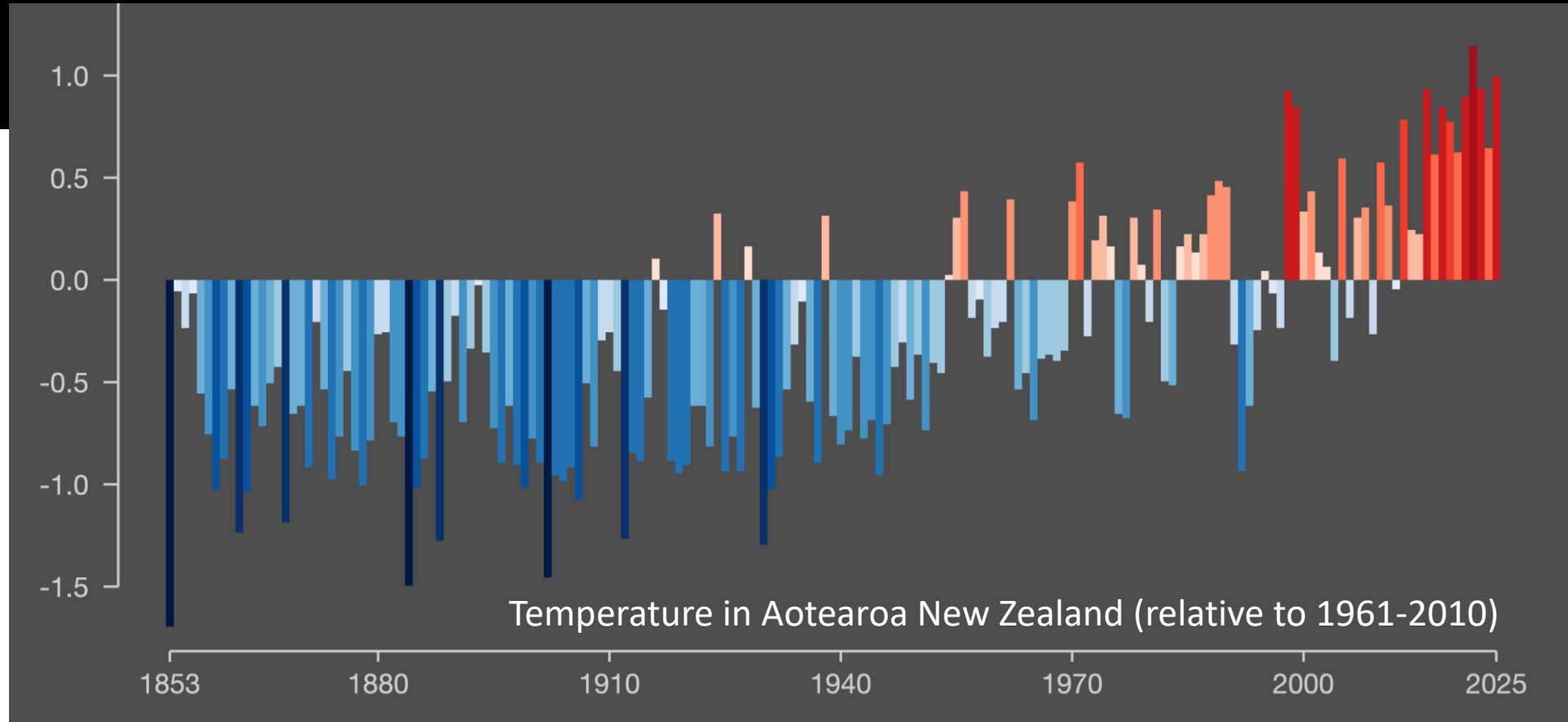


The Economic Costs of Climate Change

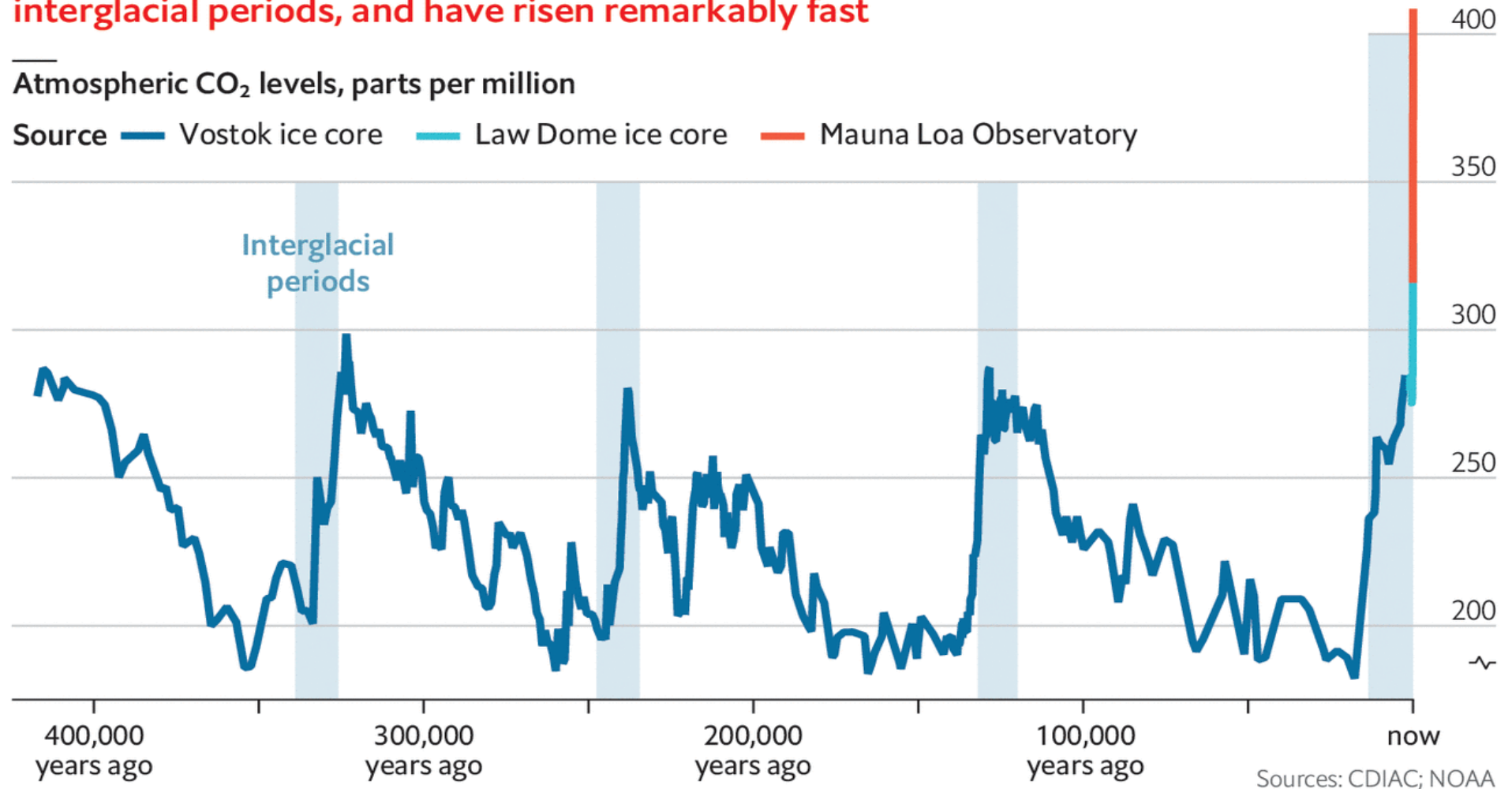
Ilan Noy, Te Āwhionukurangi Chair in the Economics of Disasters and Climate Change



Like an ice age, in reverse; CO₂ levels are far higher than previous interglacial periods, and have risen remarkably fast

Atmospheric CO₂ levels, parts per million

Source — Vostok ice core — Law Dome ice core — Mauna Loa Observatory



- Eunice Foote: CO₂ is a greenhouse gas
- John Tyndall: Also methane is a GHG
- Svante Arrhenius: Quantifying GH effect
- First US President's Science Advisory Committee Report on CC
- William Nordhaus: First paper on the economic costs of climate change

- Eunice Foote: CO₂ is a greenhouse gas (1852)
- John Tyndall: Also methane is a GHG (1860)
- Svante Arrhenius: Quantifying GH effect (1895)
- First US President's Science Advisory Committee Report on CC (1965)
- William Nordhaus: First paper on the economic costs of climate change (1974)

How do
we
quantify
climate
change
impacts?

Statistical/Econometric
analysis

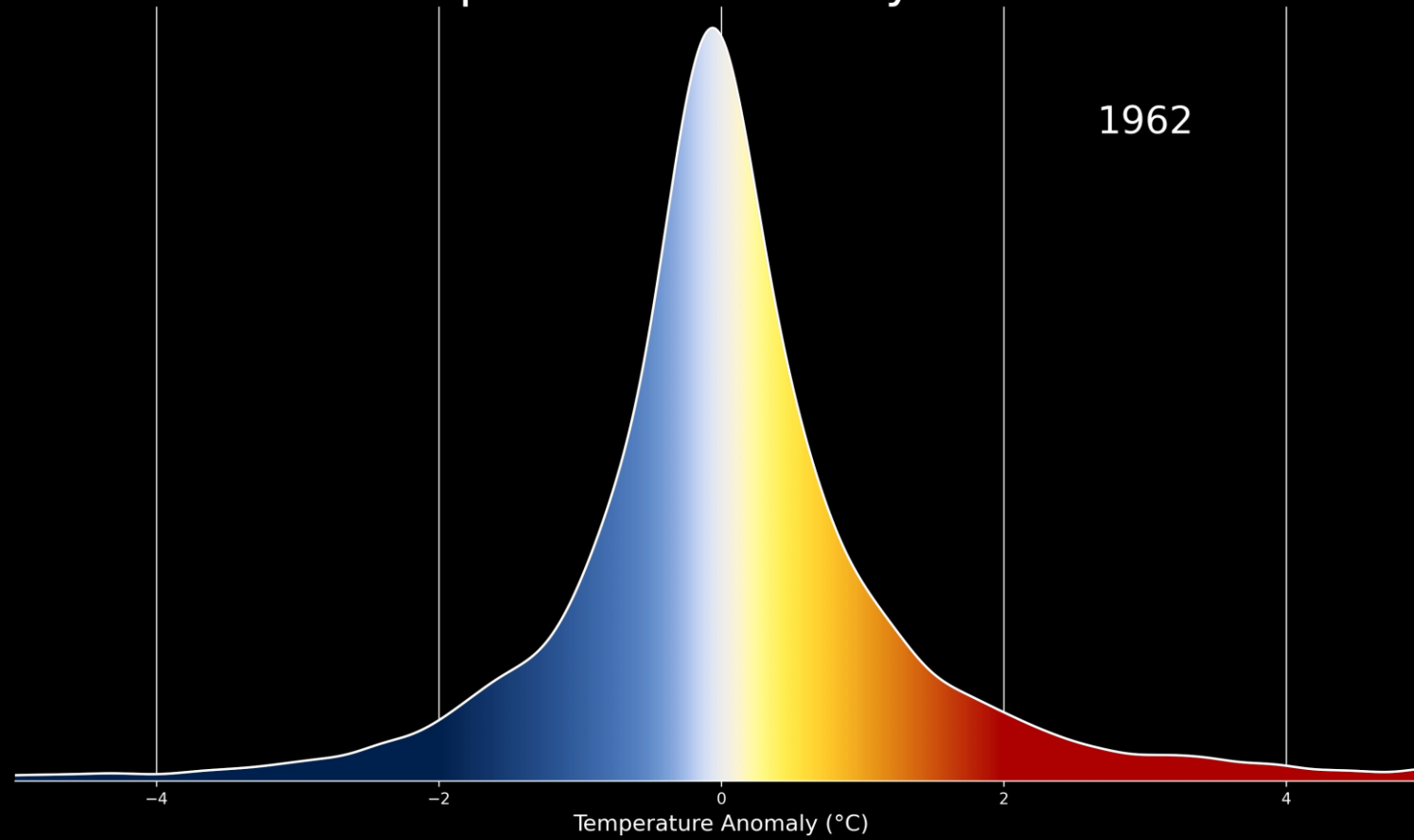
Integrated Assessment
Models

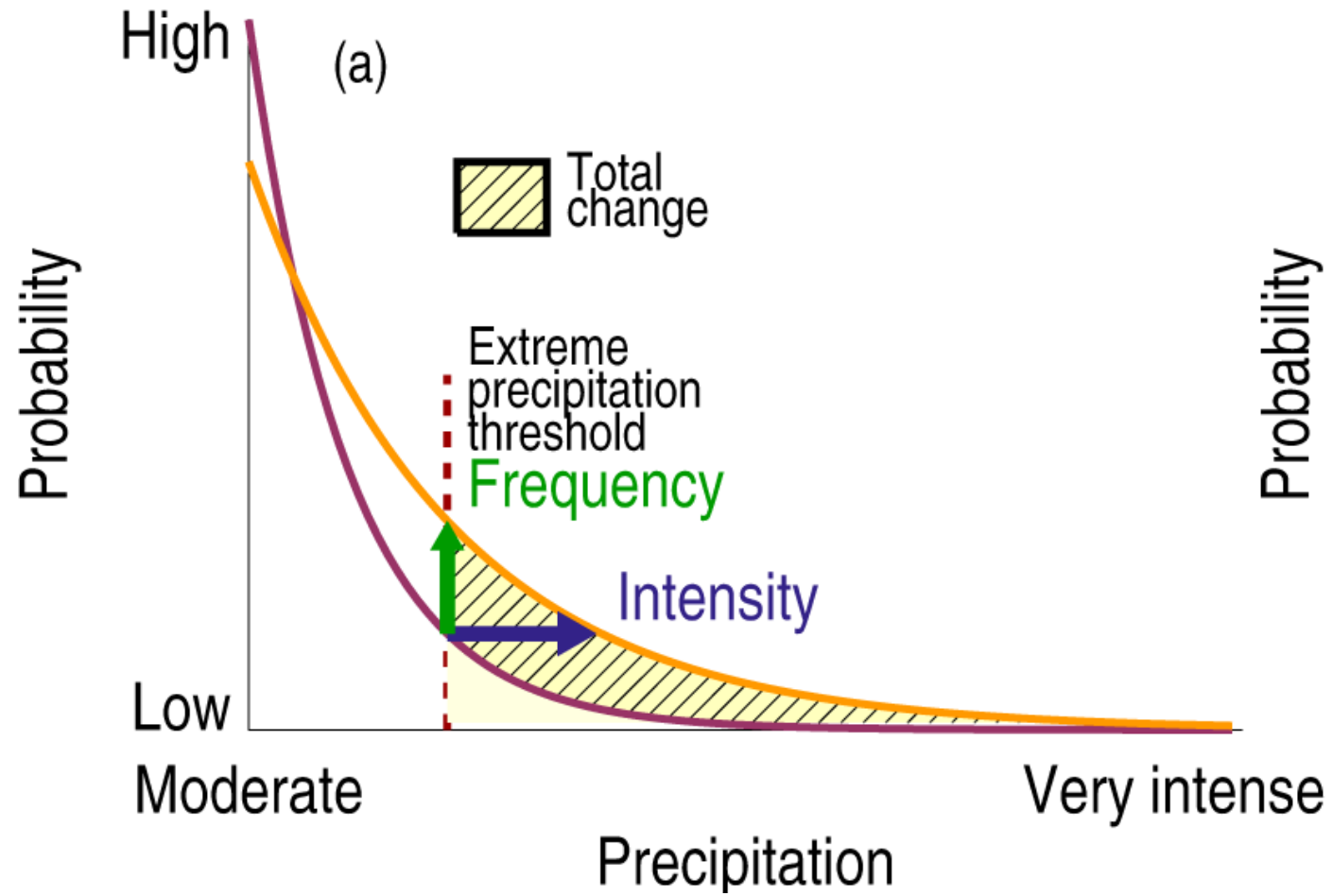
Extreme weather
events



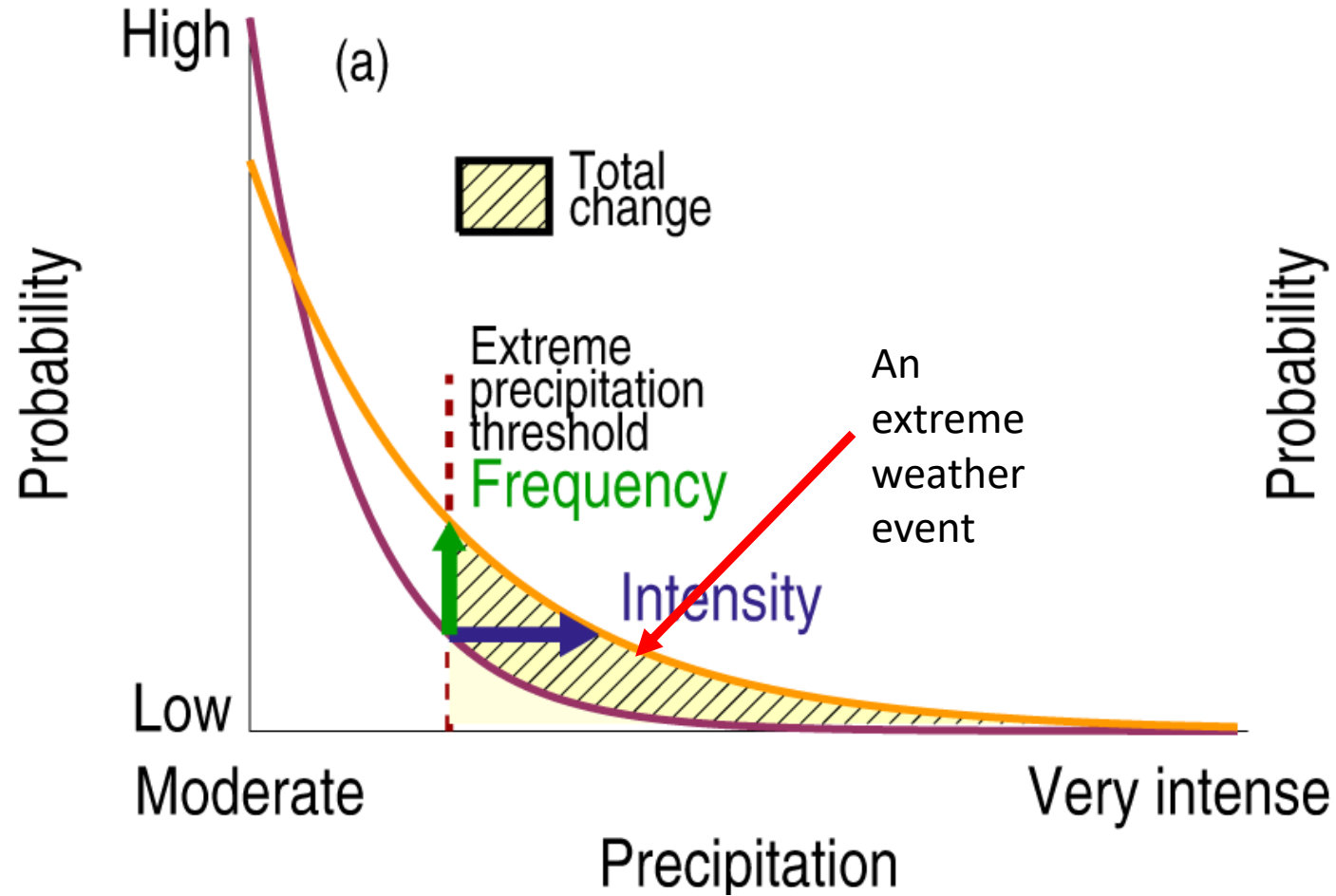
Costs of Climate Change from Extreme Weather Events

Land Temperature Anomaly Distribution





Extreme Weather Event Attribution



Use case #1: Global Climate Change Attributable Costs of Extreme Weather

Newman and Noy (2023). Published in *Nature Communications*.

**Extreme event
attribution**
(270 studies)

Economic cost data
(from EMDAT)

Switch view:

Finding ☒ Event type

How did climate change influence the weather event:

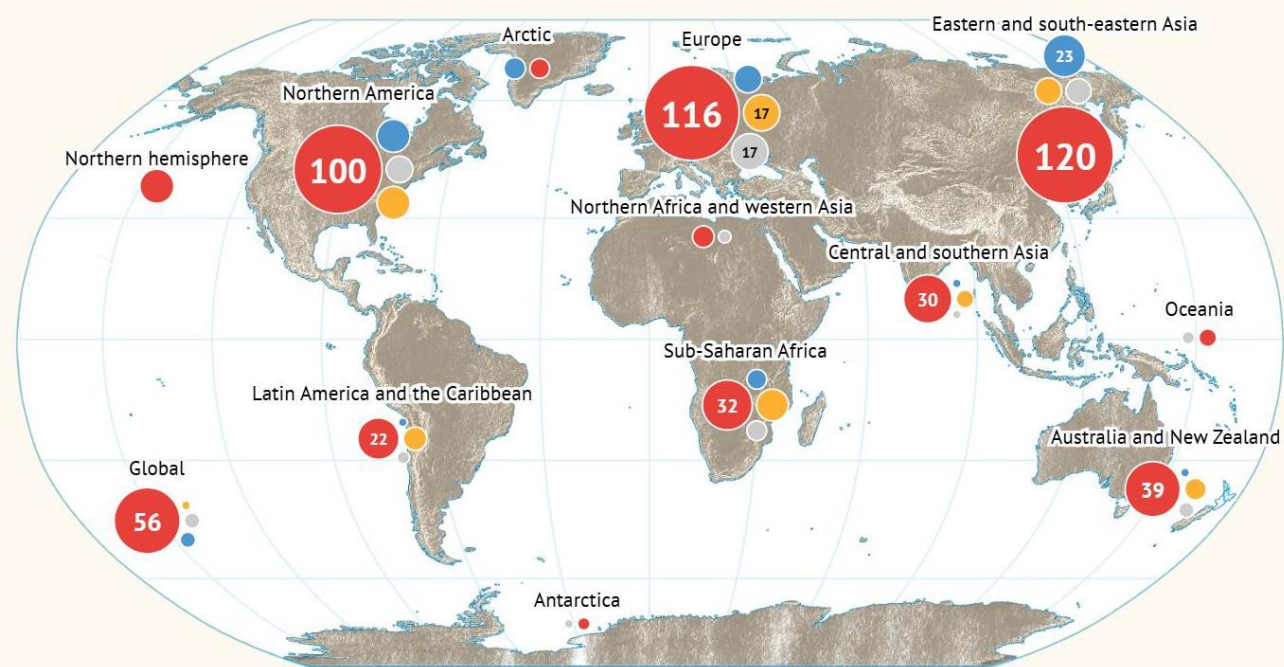
More severe or likely	547
Had no influence	71
Less severe or likely	64
Inconclusive	53

Explore further:

[Choose a country...](#) ▼

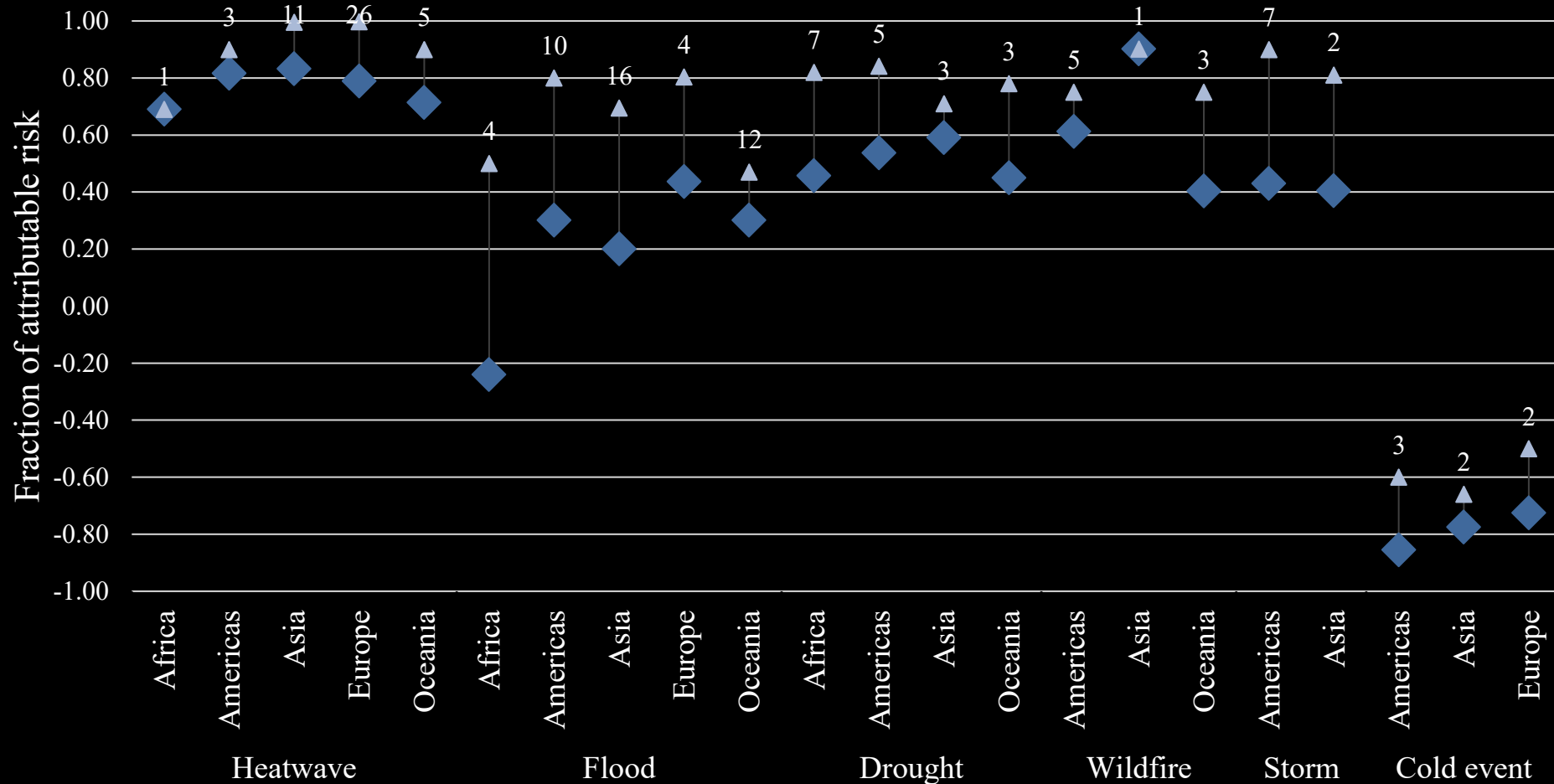
[Explore all cases](#)

Last updated 18 November 2024
[Get the data \(.csv\)](#)

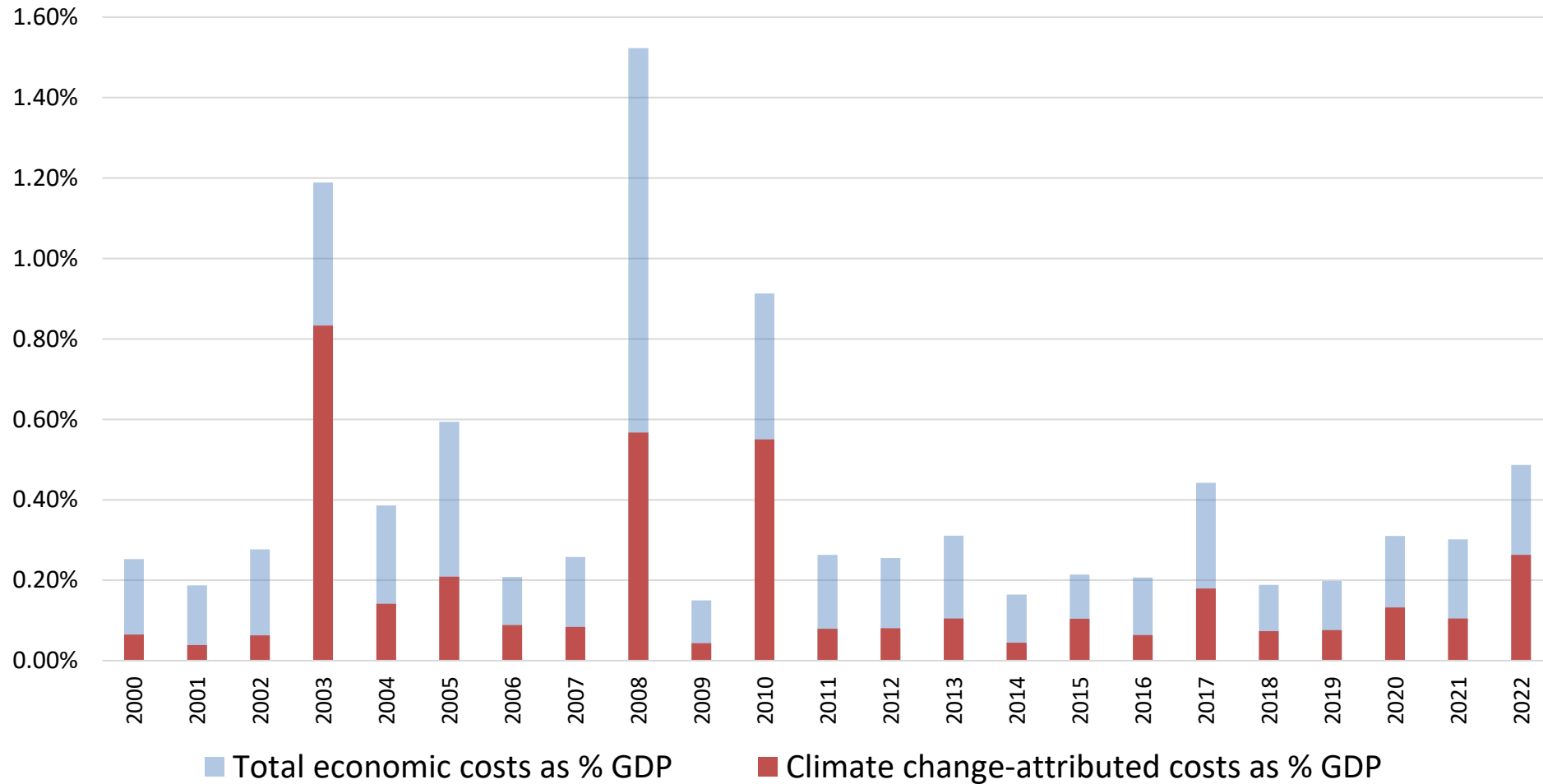


<https://interactive.cdn.bbc.com/attribution-studies/index.html>

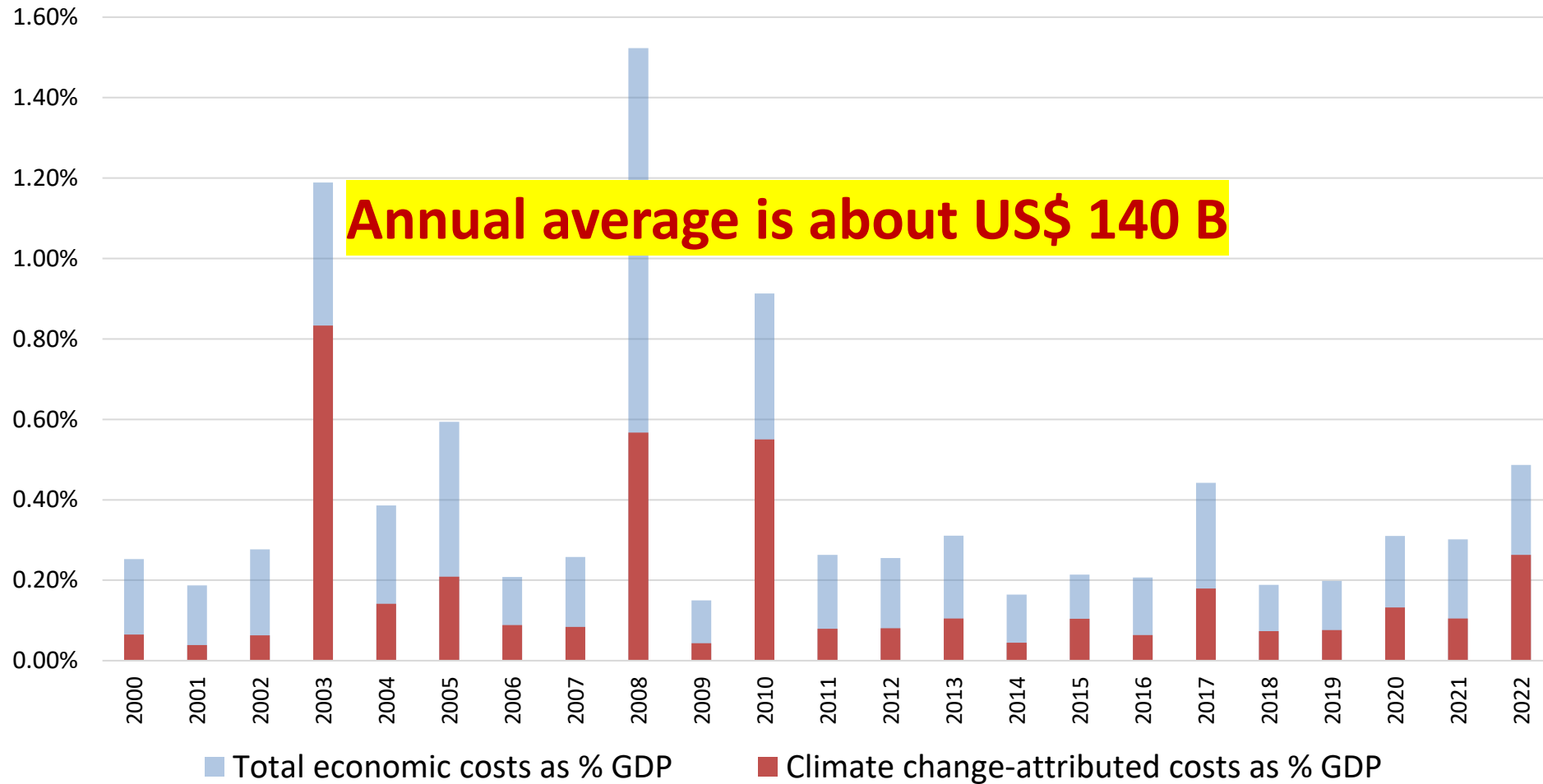
The Fraction of Attributable Risk



Global Attributable Damage as share of Global GDP



Global Attributable Damage as share of Global GDP



Use case #2:

Inequalities in Climate Change Attributable Flooding from Hurricane Harvey (2017)

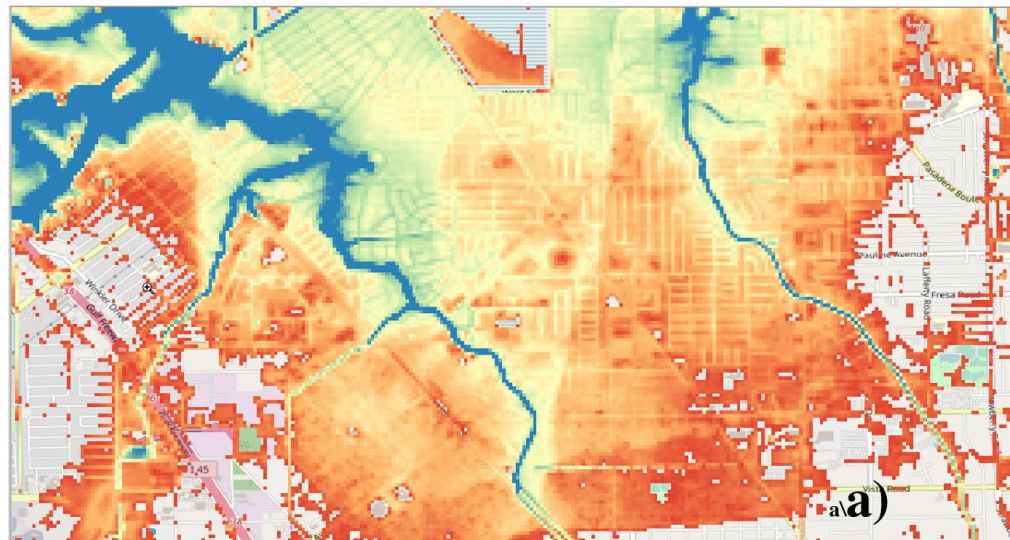
“one of the wettest we have ever seen, from the standpoint of water”

Smiley et al. (2022). Published in *Nature Communications*.

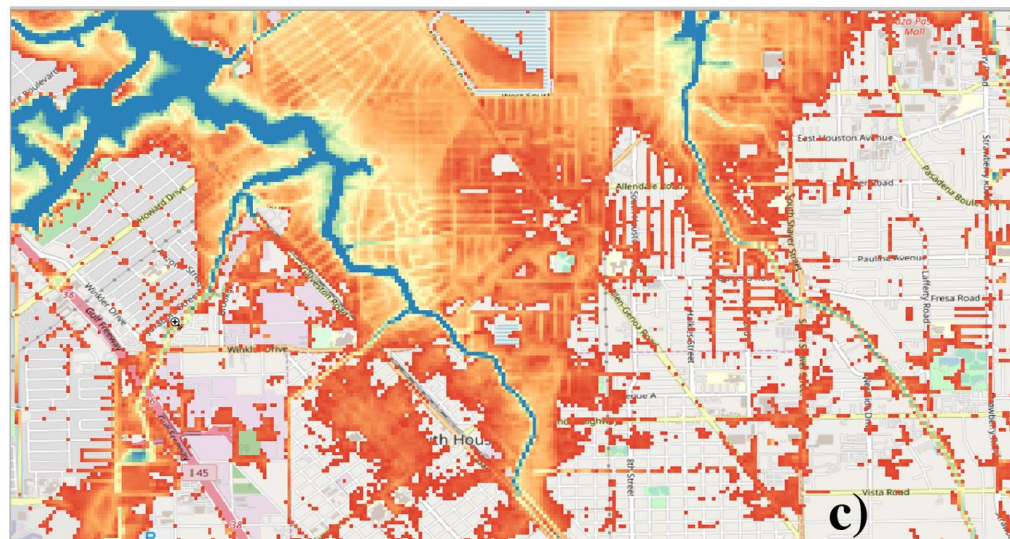
Smiley et al. (2025). Published in *Environmental Research Letters*.

Hydrological Modelling

The flood that was



The flood with 40% less rain





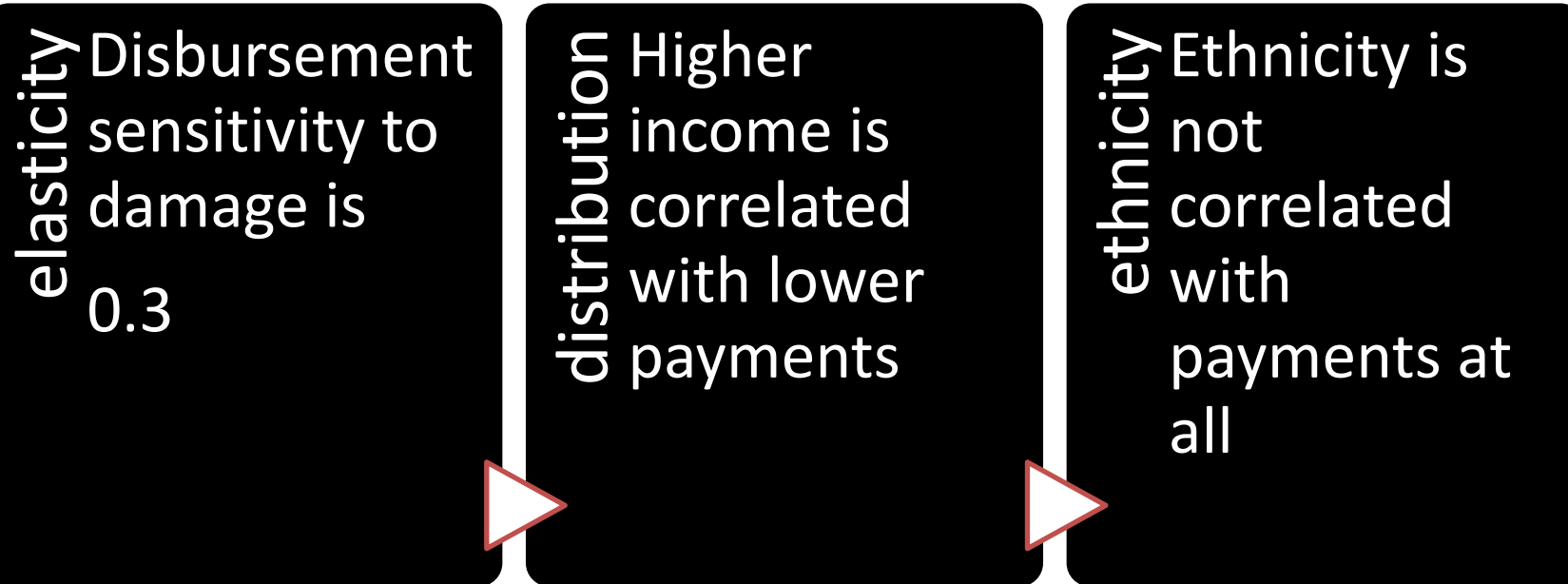
ethnicity
Hispanics
were more
exposed



insurance
The
insured
were more
exposed

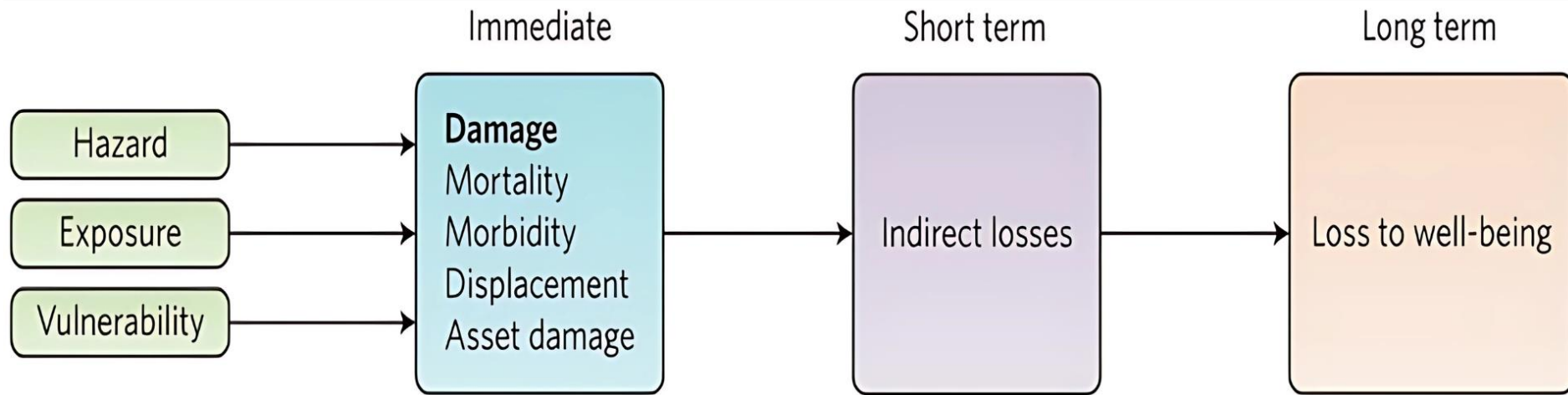


interactions
Uninsured,
poorer,
Hispanics
were most
exposed

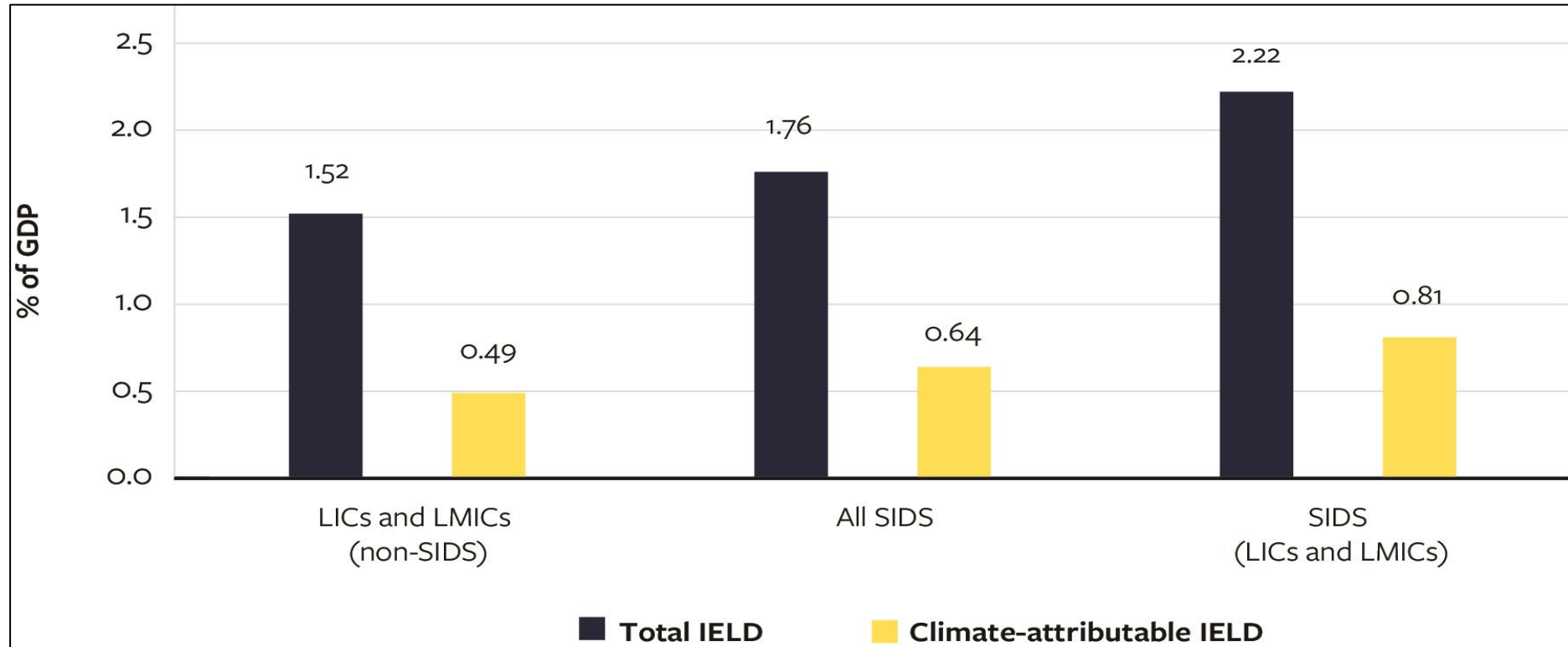


Use case #3: Climate Change Attributable Indirect Costs of Disasters

Panwar et al. (2025). Working paper.



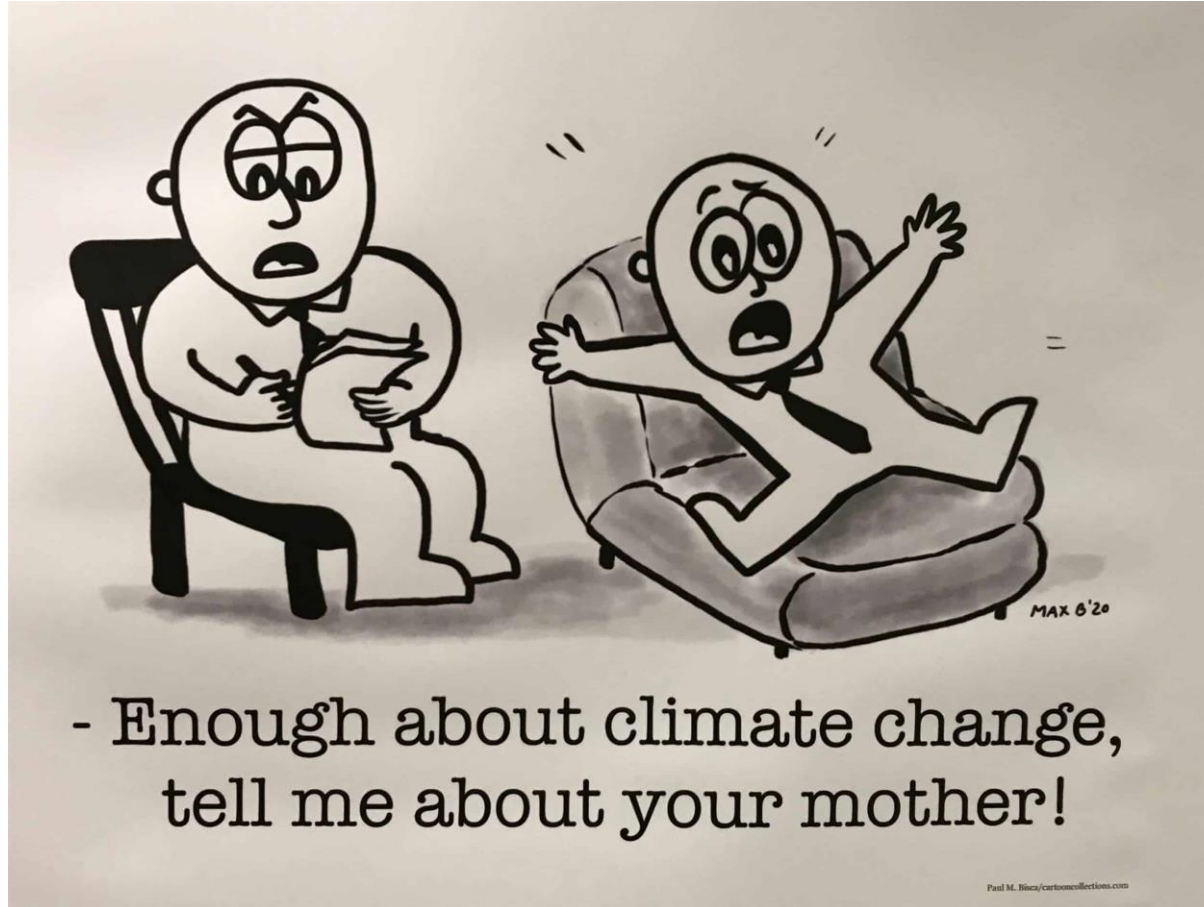
Noy (2016). Tropical Storms: The Socio-Economics of Cyclones. *Nature Climate Change*.



Projected climate attributable loss and damage in SIDS by 2050

	Current FAR	Projected FAR	Projected attributable loss and damage	
			Direct damage	Indirect loss
Floods				
1.5 C warming : ~10% increase	30%	36%	\$0.6 billion	\$5.1 billion
2.0 C warming : ~22% increase		43%	\$0.7 billion	\$5.6 billion
Storms				
1.5 C warming : ~6% increase	43%	46%	\$17.4 billion	\$51 billion
2.0 C warming : ~13% increase		50%	\$18.1 billion	\$53.2 billion

Use case #4: Climate Change and mental health



Use case #5: Communicating the costs of climate change



Use case #6: Liabilities for the costs of Climate Change



*"Yes, the planet got destroyed. But for a beautiful moment
in time we created a lot of value for shareholders."*

