

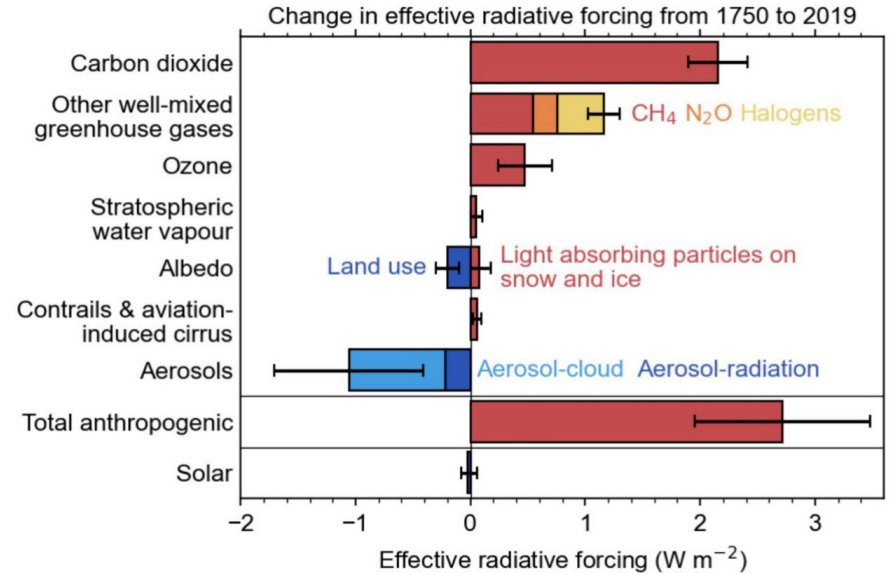
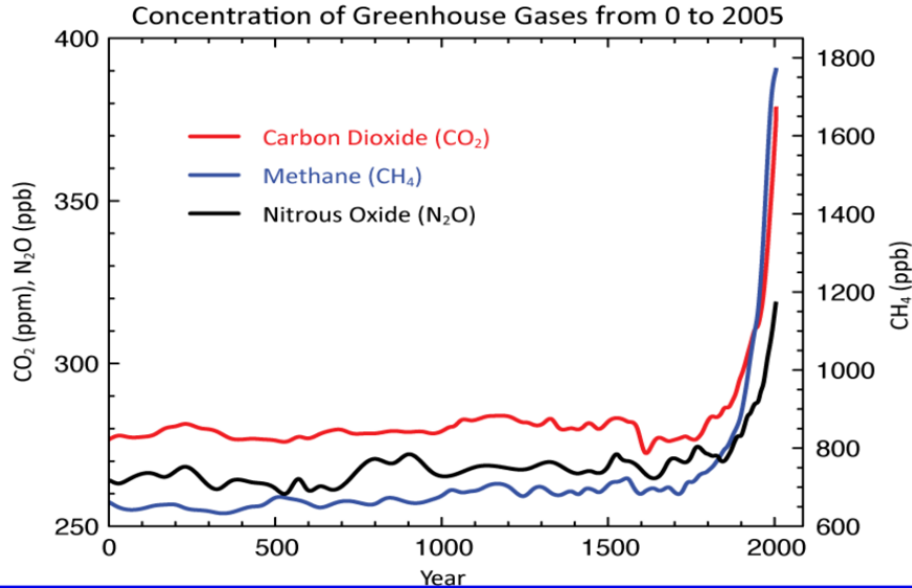
Agriculture and Climate Change

Dylan Major

AOSC 680

14 Nov 2024

Greenhouse Gases

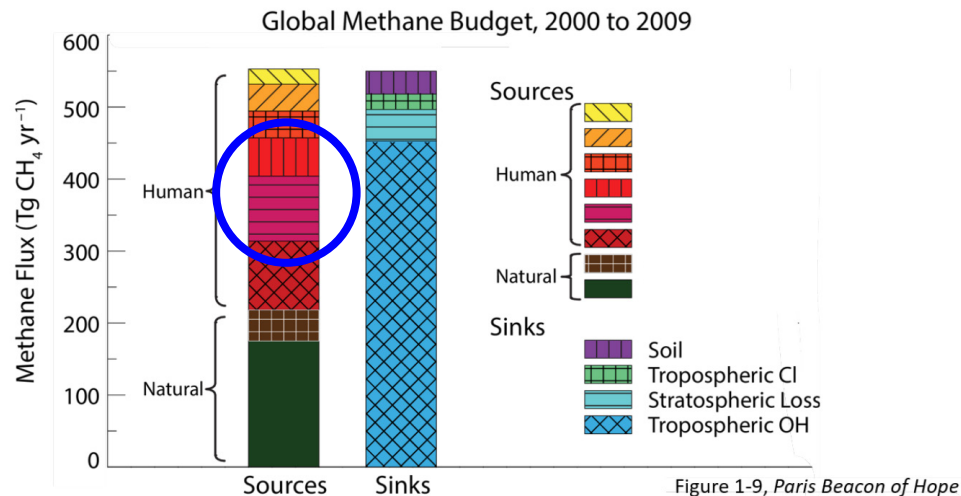


<https://www.ipcc.ch/site/assets/uploads/2018/05/ar4-wg1-errata.pdf>

Figure 7.6, IPCC (2021)

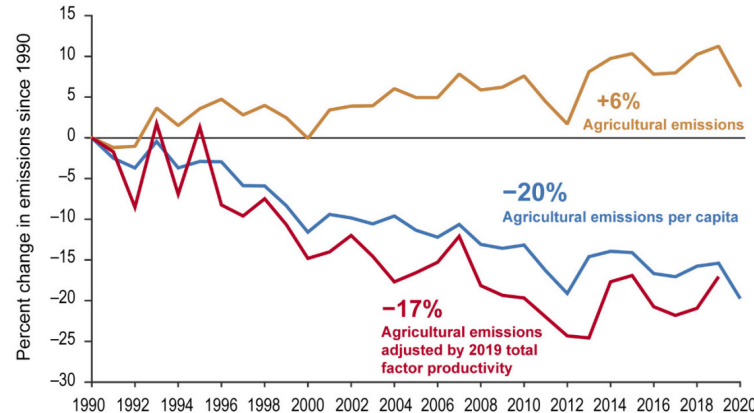
https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_TS.pdf

Methane and U.S. Emissions Trends

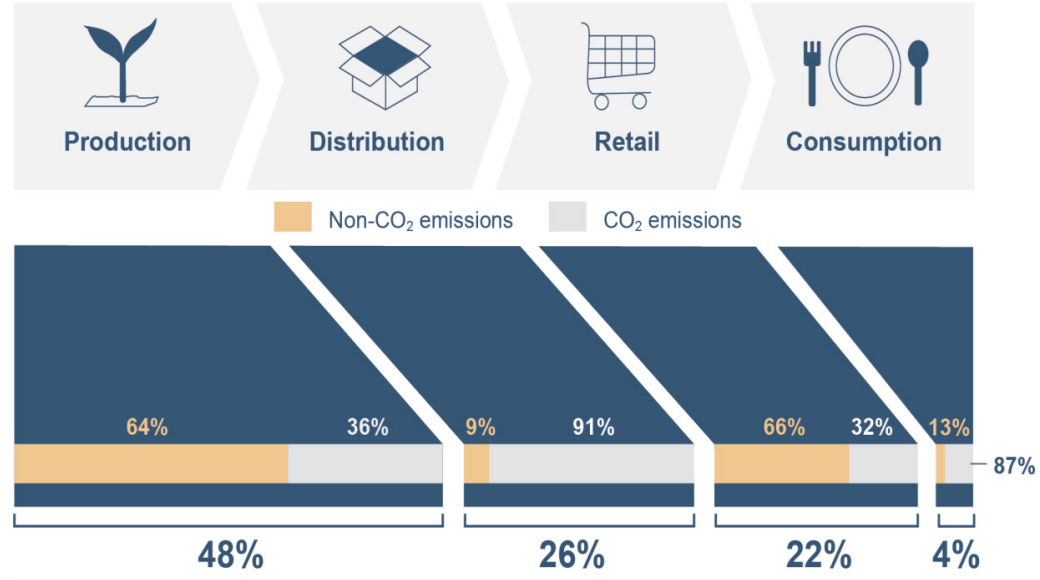
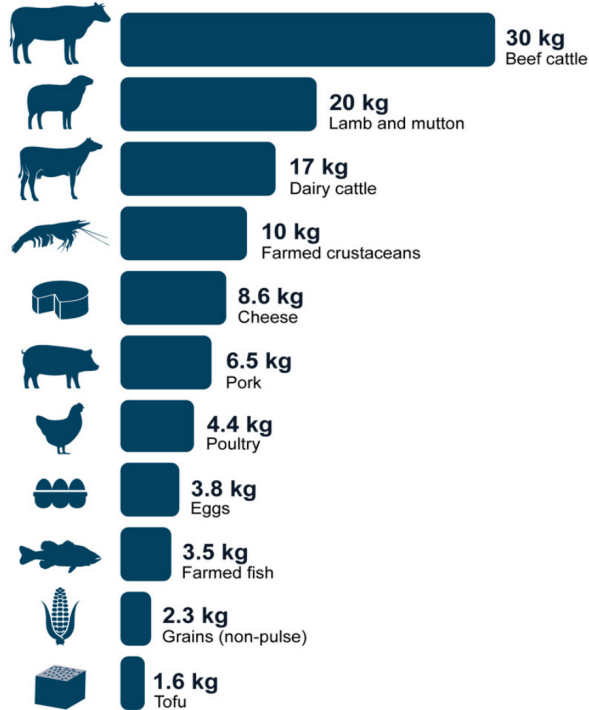


Note decrease in per capita emissions despite rise in net emissions

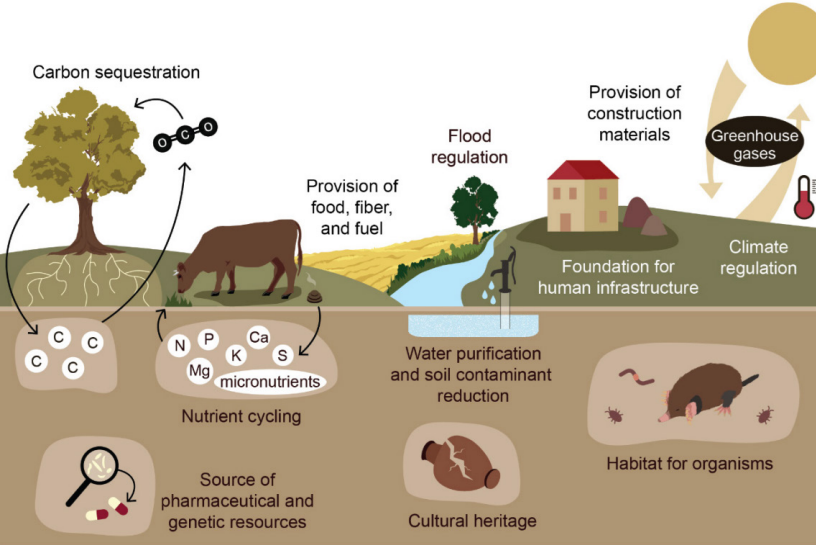
US Agricultural Greenhouse Gas Emissions Indices, 1990 to 2020



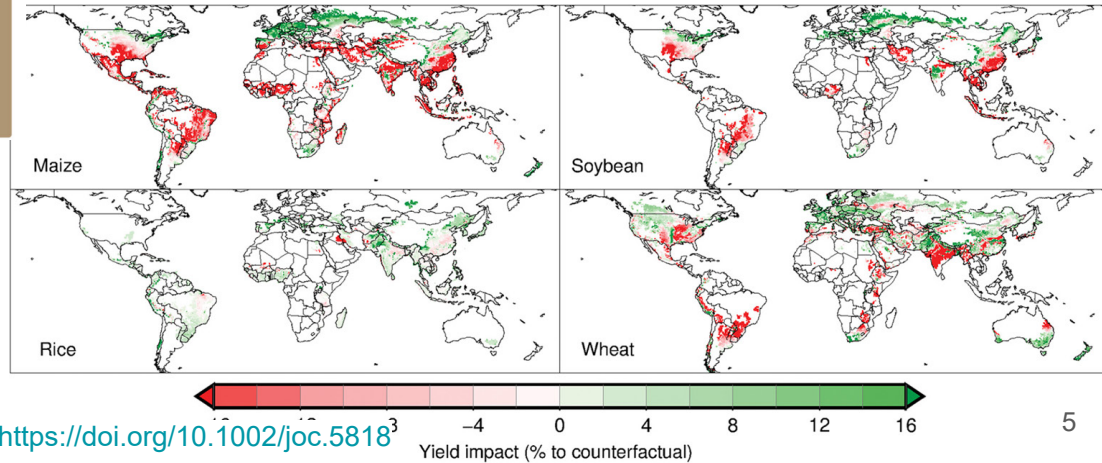
Emission Demand



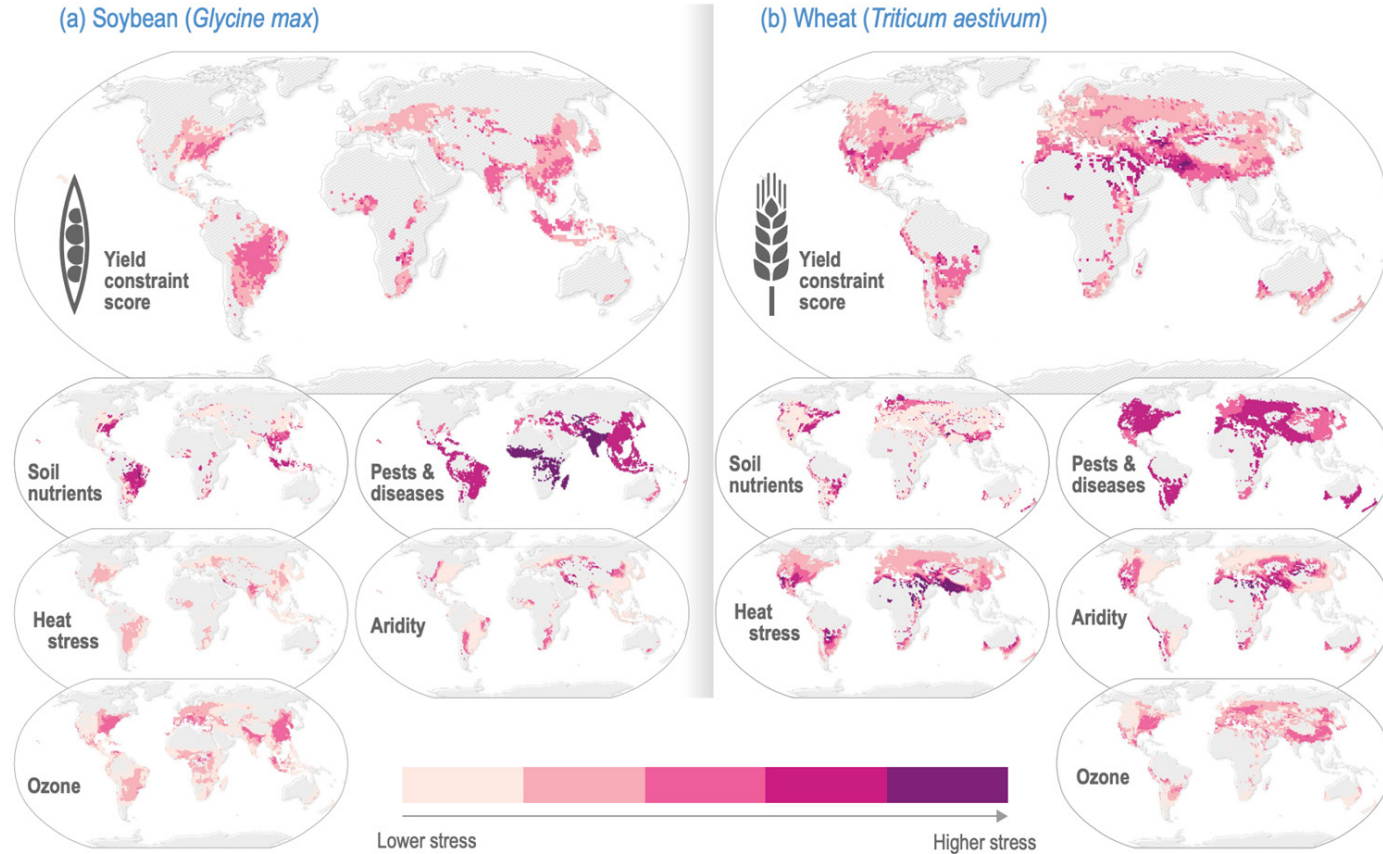
Climate and Ag. are Interconnected



Staple Crop Yield Change From Climate Change (1981 - 2010)

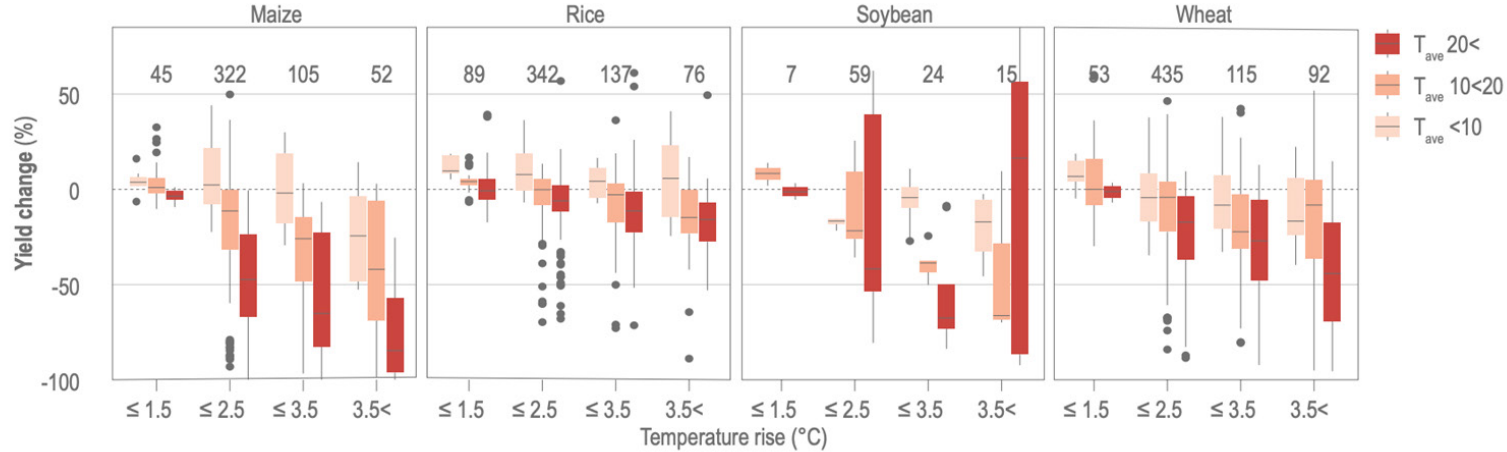


Stresses on Soy and Wheat



Global Staple Crop Yield and Change

Crop yield is decreased by 1% but heavily regionally variable



Life history strategy	Crop type	Climate change (general)	Temperature (incl. heat stress)	Precipitation (Incl. drought, flood)	Phenology & seasons	Carbon dioxide	Pests & diseases	Ecosystem services	Combined (sum of all drivers)
Annual (above ground)	Vegetable	+	—	—	—	na	—	—	+
	Legumes	—	+	+	—	+	—	na	+
	Leafy crops	na	na	na	na	na	—	na	—
Annual (below ground)	Soft fruit	+	na	na	—	na	—	—	+
	Root crops	+	—	—	+	+	—	na	+
Perennial	Tree fruits and nuts	+	+	+	+	na	—	—	+
All		+	+	+	+	+	+	+	+

Average direction of impact

+ Positive
 ◇ Mixed
 — Negative

Average confidence in attribution

● Low
 ● Medium
 ● High

na = not assessed

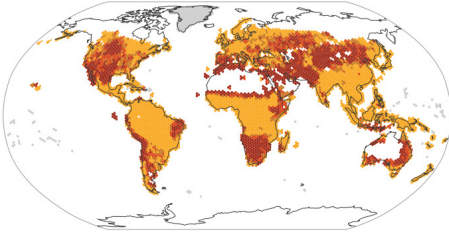
IPCC AR6
WGII
Chapter 5

IPCC AR6
WGII
Chapter 5

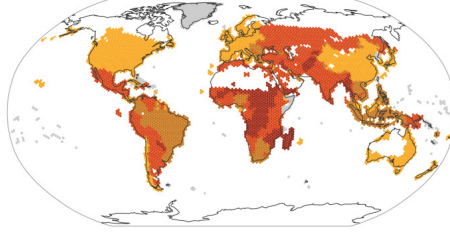
Risk = f(Exposure, Vulnerability)

On going issue – An El Nino related dry period exacerbated by climate change has killed many crops and livestock in Southern Africa. Lesotho, Malawi, Namibia, Zambia and Zimbabwe have declared states of emergency and requested \$369 million in food based aid for 68 million people. It is anticipated to continue to get worse until March or April (2025)

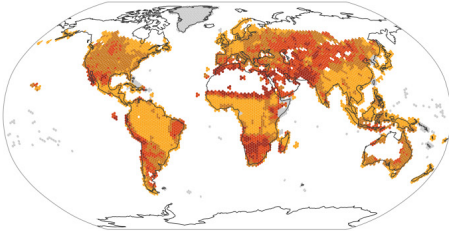
(a) Hazard and exposure indicator score



(b) Vulnerability index



(c) Drought risk index



Indicator scores for rainfed agriculture

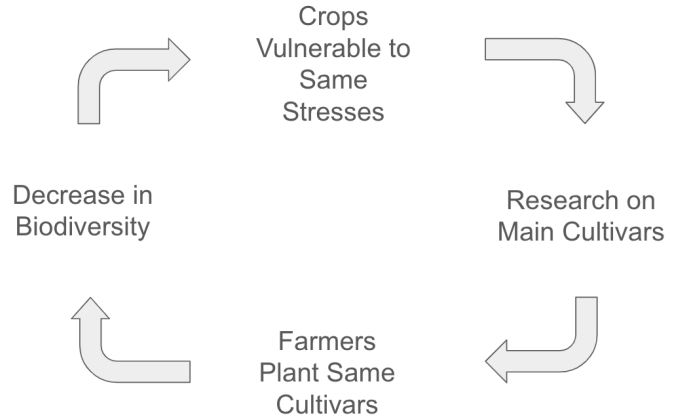


Low High

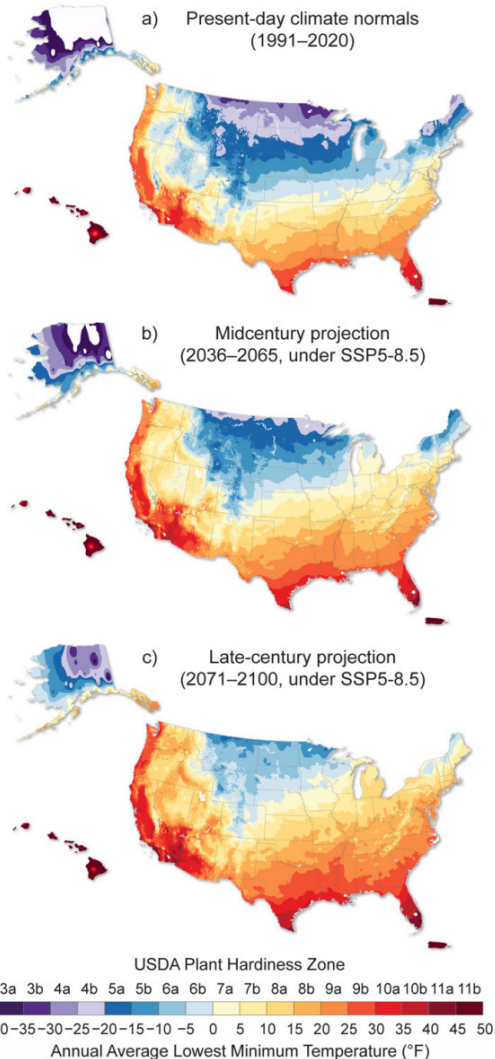
□ Areas with no crops

■ Areas with no data

Data averaged over 1.5° hexagons



Adaptation



Life history strategy	Crop type	Plant breeding/ bio-technology	Climate services	Shift planting area	Shift planting date	Shift crop/ cultivar	Conservation agriculture	Agro-ecology/ agroforestry	Agronomy	Water management	On-farm diversity	Combined sum of listed options
Annual (above ground)	Vegetable											
	Legumes			na				na				
	Leafy crops			na							na	
	Soft fruit			na				na				
Annual (below ground)	Root crops							na				
Perennial	Tree fruits & nuts				na							
	All											

Adaptation option's implementation status

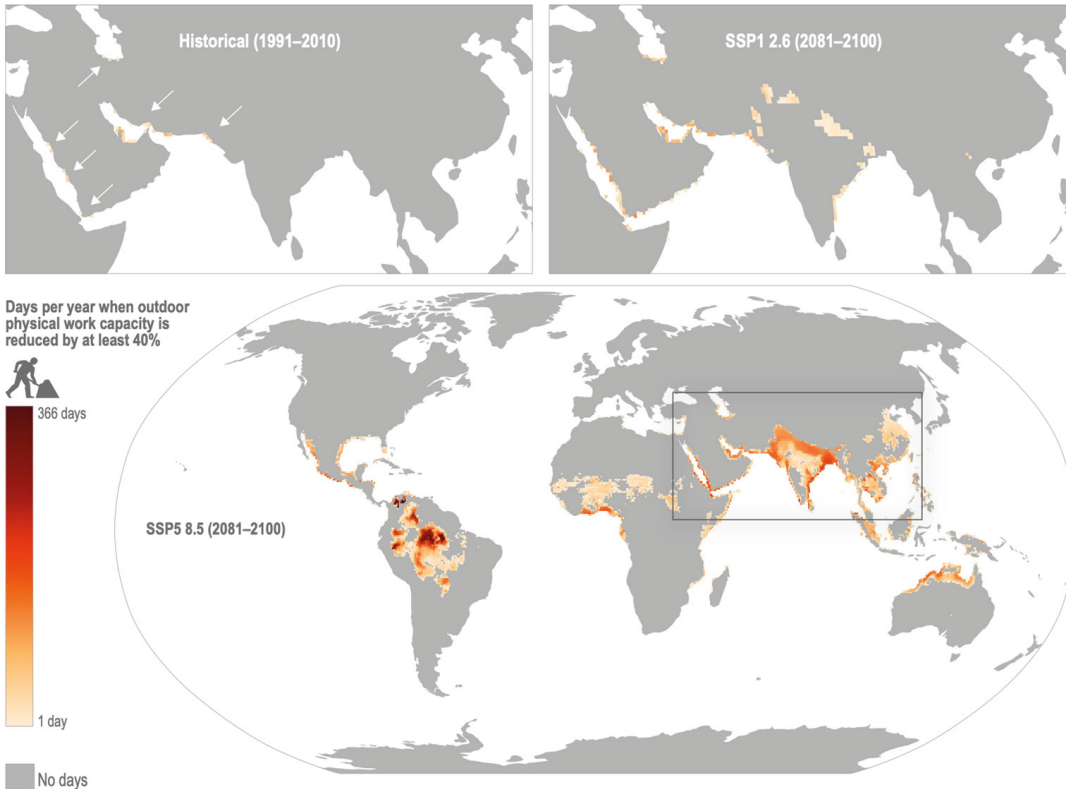


Confidence level



na = not assessed

Workers



Workers are vulnerable to health related hazards including excess heat and increased wildfire smoke