# (Wild)fires in the UNFCCC Context: Science to Policy to *Action*

**Looking Towards 2025-30**

Pam Pearson,

Director

International Cryosphere Climate Initiative

# Climate Policy: Evolving View of Arctic/Cryosphere

- Traditionally seen as indicator/“early warning” of climate change
- AR5 (2013) and SROCC (2019) began raising global feedbacks
- Policy makers still associate Cryosphere with polar and mountain impacts
- Science has shifted to impacts [threats/risks] not only *within* Cryosphere, but also *from* Cryosphere on global systems
- Inclusion of Indigenous knowledge
- Unique in that most *irreversible/permanent on any human timescale*
- Strongly tied to temperature: every tenth of a degree matters (more ice melts), leads to need for “urgency” alongside “ambition” to avoid overshoot with multi-century/millennial, regional/global loss and damage beyond adaptation limits

# Key Arctic Wildfires Science-to-Policy Forums

- **Key bodies**
  - UNFCCC + Paris Agreement
  - IPCC (WMO/UNEP)
  - Arctic Council
  - CLRTAP
  - IMO
  - Indigenous legislatures
  - CCAC

- **Key meetings**
  - UNFCCC: COPs and SB Meetings
  - Arctic Council/AMAP
  - UNECE/WGSR/TFTEI

- **Key publications**
  - IPCC Reports:
    - SROCC (2019)
    - AR6 (2023), AR7 (c:a 2028)
    - Methodology Report on SLCFs (2027)
  - AMAP Reports

- **Key participants**
  - Negotiators
  - High-level government actors
  - Indigenous peoples
  - Observers and others
  - “General public”

# Impacts: Arctic Climate

- **Emissions and impacts travel (regional/hemisphere)**
- **Fires release methane, CO, CO2, black carbon**
- **Largest single BC source globally (36%)**
- **Close to cryosphere (Arctic) = more intense regional warming/sea ice, snowpack, glacier and ice sheet melt**
- ***Wildfires [most] often spread from set agricultural fires***
- **Not carbon-neutral: humus C loss; time frame; abrupt permafrost thaw**
- **Model-dependent: Model defines "impact" (or not) from:**
    - **Deposition?**
    - **Seasonal snow/ice?**
    - **Indirect effect (clouds)?**
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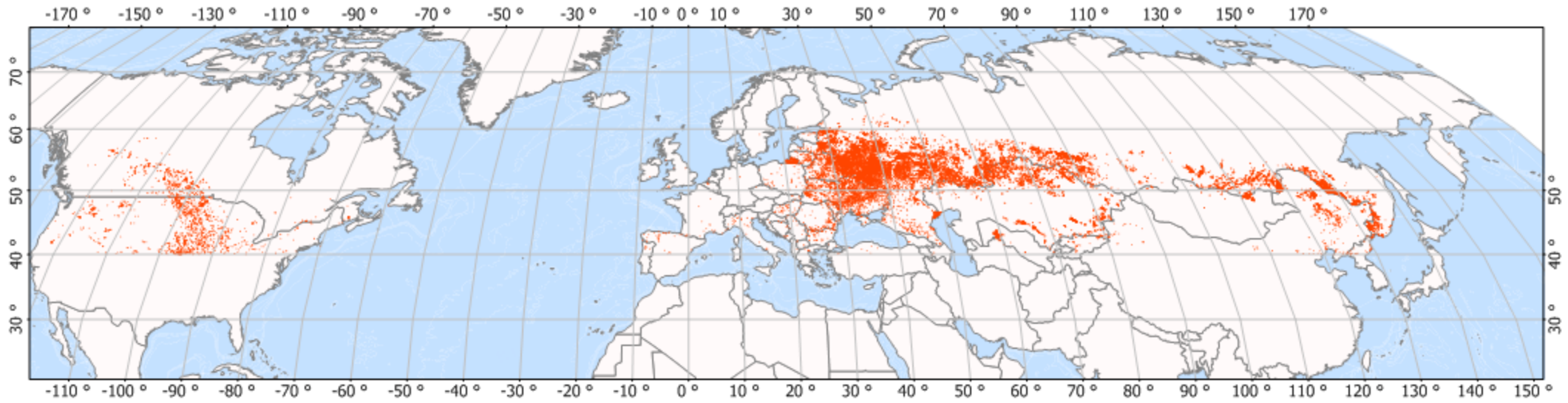
# Agricultural Fires* - April 2006

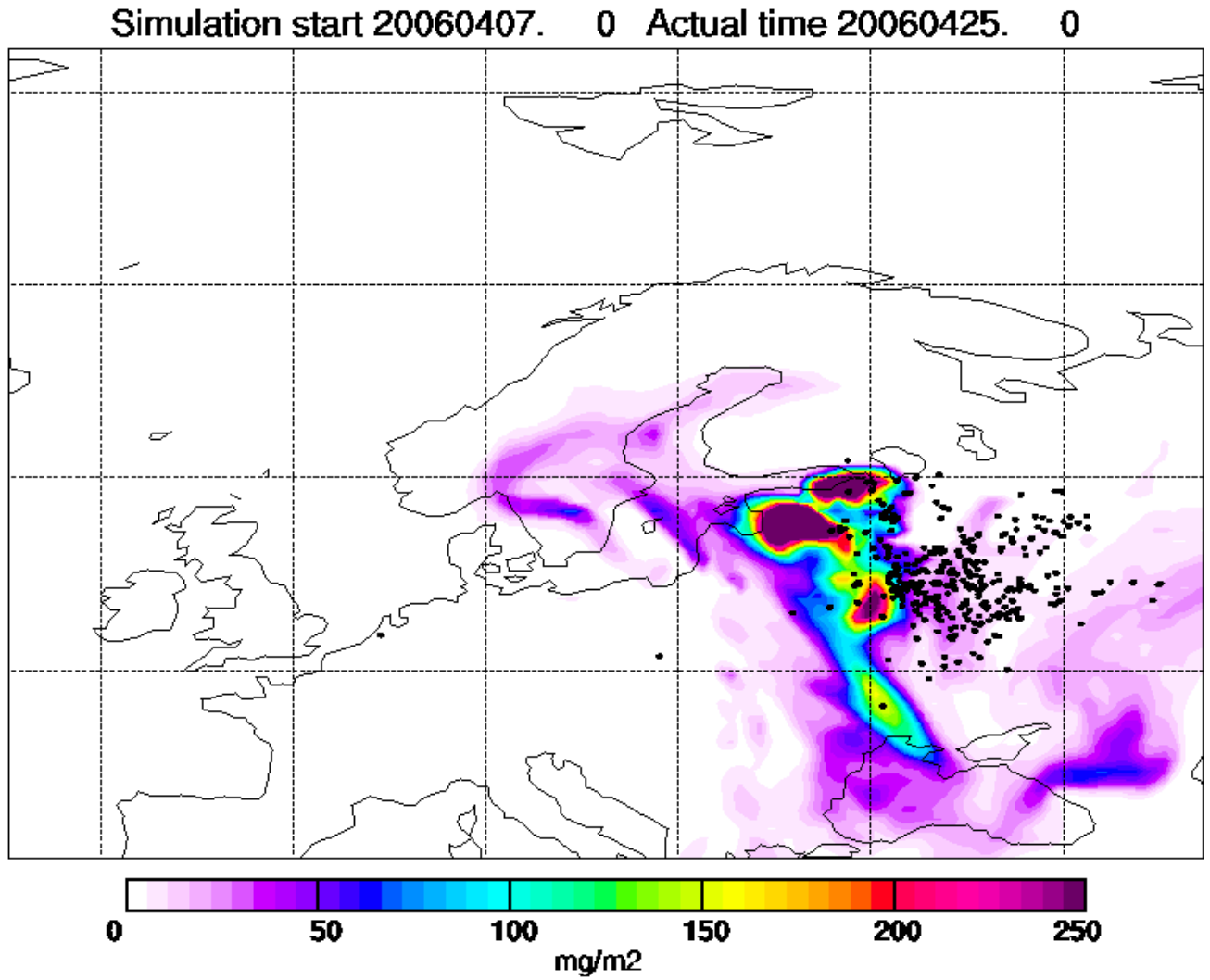



*all fires north of 40N Latitude

Cryosphere

Climate

# Transport of Ag Burning Emissions into the European Arctic (NILU animation, Stohl et al)

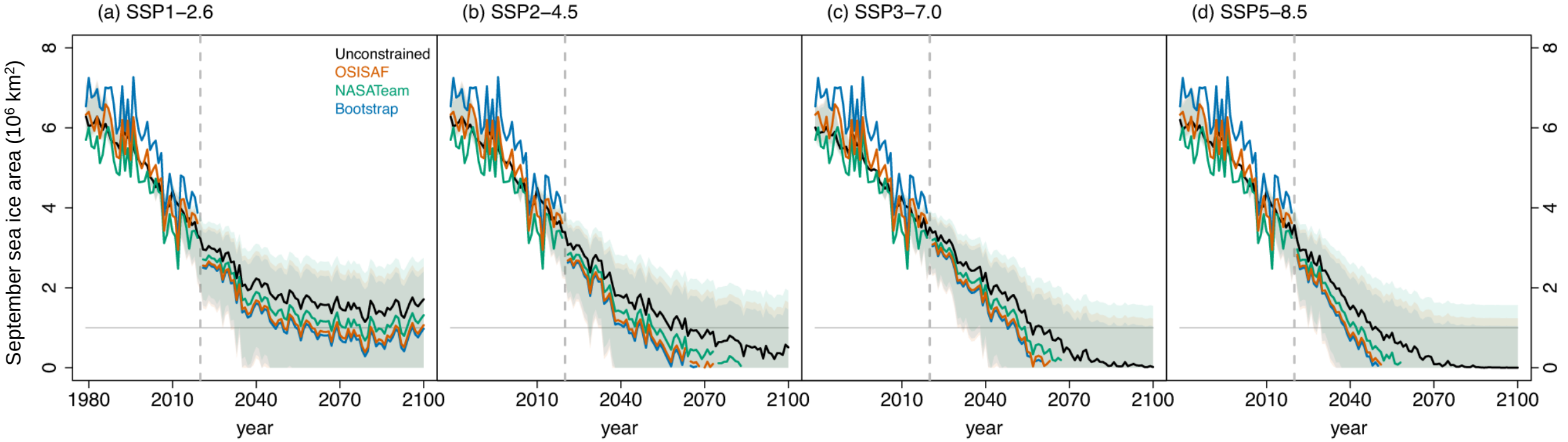


# Extreme Air Pollution

Picture courtesy: Ann-Christine Engvall

# Preserving Arctic Sea Ice

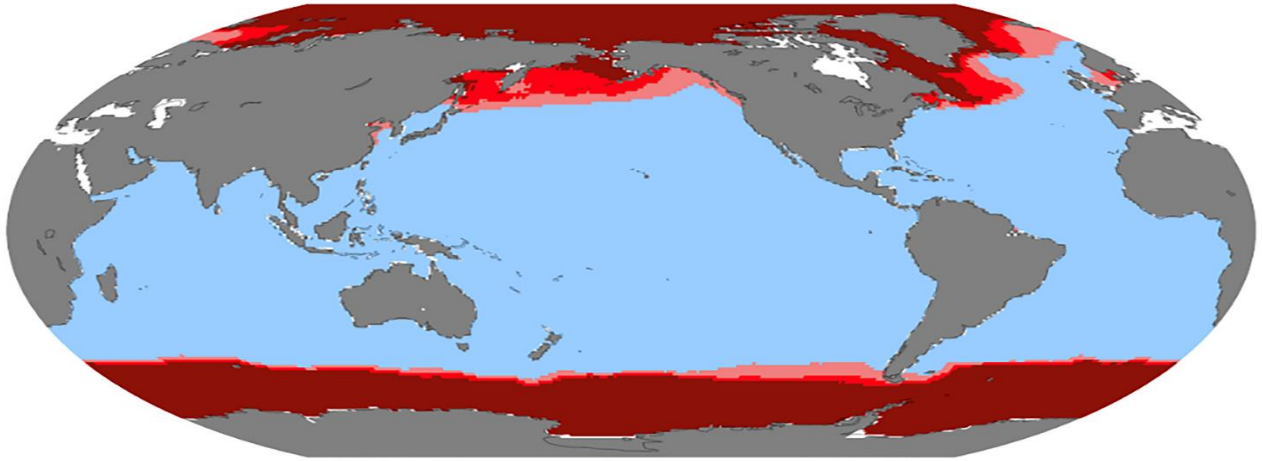
- Losses occurring faster and at lower temperatures than projected
- Only very low emissions stabilize above total summer loss
- 1.7**°C threshold, 2°C July-Sept most years**
- **BC reductions (especially near-Arctic) help**



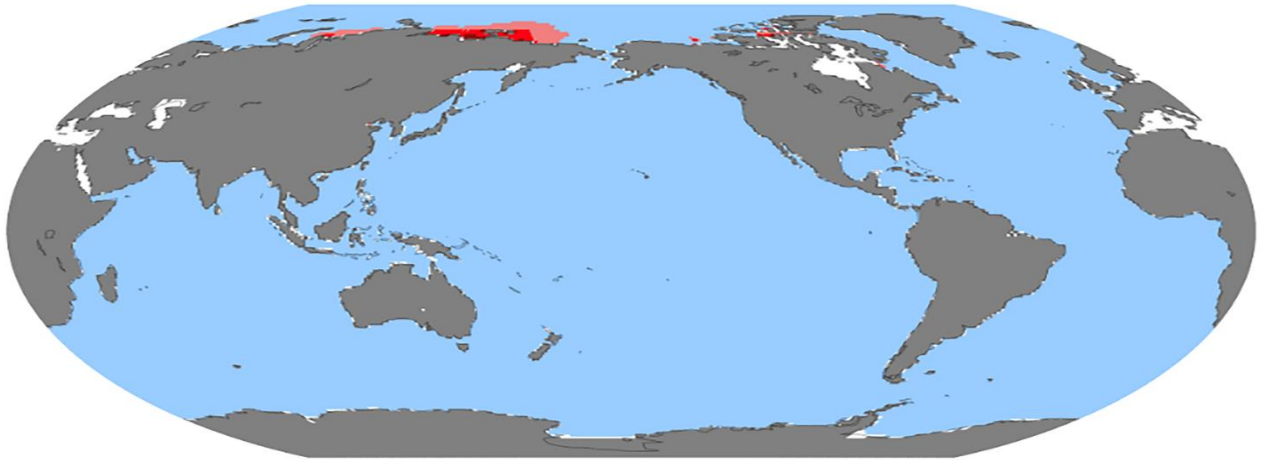

Kim et al. (2023), *Nature Communications*

# Polar Ocean Acidification:

## Loss of shelled animals destroys food chains and fisheries
## why it's not just about "radiative forcing" in Arctic



High emissions world (3-4°C) year 2100
CO2 above 650ppm



Low emissions world (1.5°C) year 2100
CO2 ≈450ppm

***Acidification lasts 30-70,000 years;***
*SRM makes it* ***worse***

IPCC SROCC (2019)

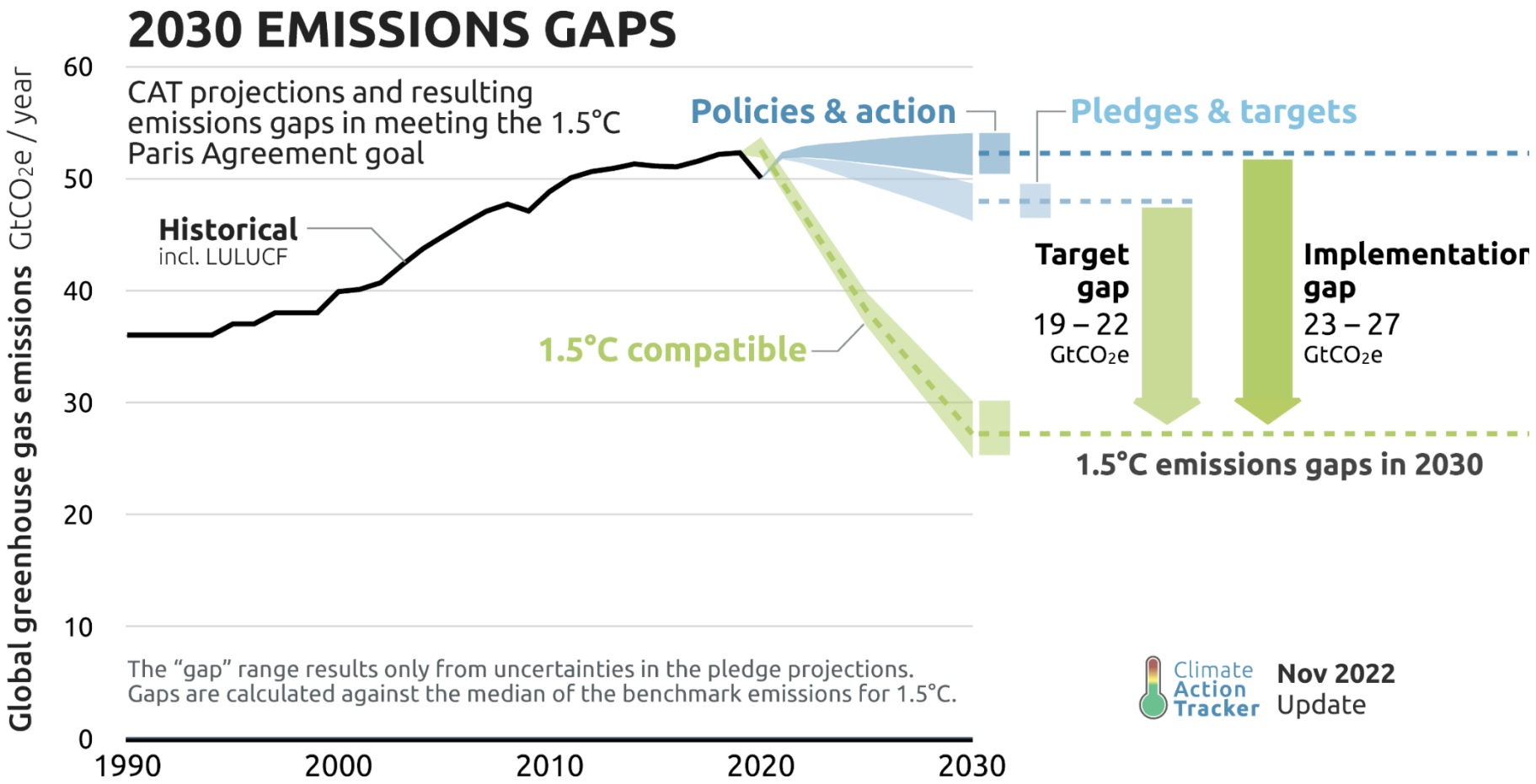
# Other (Wild)fire Impacts: Air, Water, Soil

- **Fires increasingly seen as PRIMARY source of air pollution despite EPISODIC or SEASONAL NATURE**
  - ✓ **Higher mortality from respiratory or cardiac illness, especially among young and elderly**
  - ✓ **Higher morbidity INCLUDING LONG AFTER FIRE EVENT from respiratory illness (asthma, pneumonia)**
  - ✓ **Also increased mortality/morbidity due to vehicle accidents caused by low visibility, fire itself**
- **For agriculture: radically decreases soil fertility, leading to 25-40% greater need for fertilizers.**
- **More brittle soils and fertilizer use → More run-off and water pollution; and secondary air pollution (ammonia)**

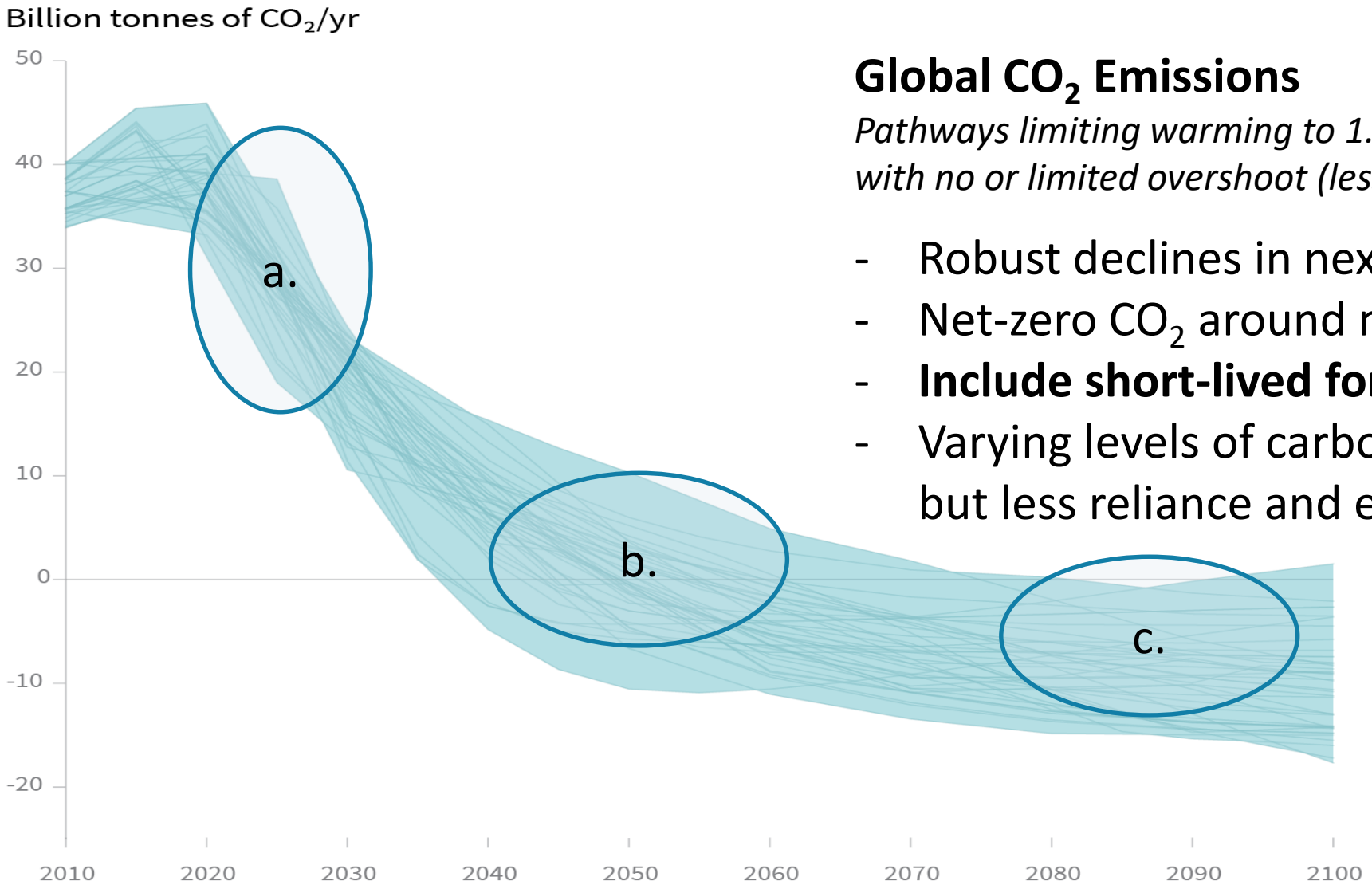
# Benefits of Fire-free Agriculture: Adaptation + Mitigation

- Many/most Arctic wildfires spread from agricultural fires (NOTE: DOES NOT INCLUDE CULTURAL BURNING/indigenous Fire Management Practices)
- Low-till and especially, no-till essential to adaptation
- Holds moisture during drought, holds soil during extreme rains
- Preserves water resources and less water pollution from fertilizer and erosion in time of water scarcity
- More reliable yields in changing climate
- “Negative emissions” and carbon drawdown (IPCC SR on Lands)
- Some controversy role of lands – but NOT of formerly burned lands
- Some controversy over degree of climate impact – but far less uncertainty ocer cryosphere/Arctic

# [Only] Sharp 1.5-consistent emissions reductions can slow irreversible Cryosphere loss and global impacts, but we're far off-track (*428ppm* peak 2024 level, annual rise 3-3.5ppm): 2025 NDC leadership needed for "course correction"



# Many (but Increasingly few) 1.5°C Pathways




## Global $CO_2$ Emissions

*Pathways limiting warming to 1.5°C and 450ppm with no or limited overshoot (less than 0.1°C):*

- Robust declines in next decade (50%)
- Net-zero $CO_2$ around mid-century
- **Include short-lived forcers**
- Varying levels of carbon-dioxide removal (CDR), but less reliance and earlier (<2060)



Source: IPCC SR15 SPM 3.A


Thank you!