The Power of Interactive Climate Education

From Global Insight to Local Impact

Jillian James, En-ROADS Climate Ambassador

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Climate Survival Introductions

My name is _____, and I lived through _____.

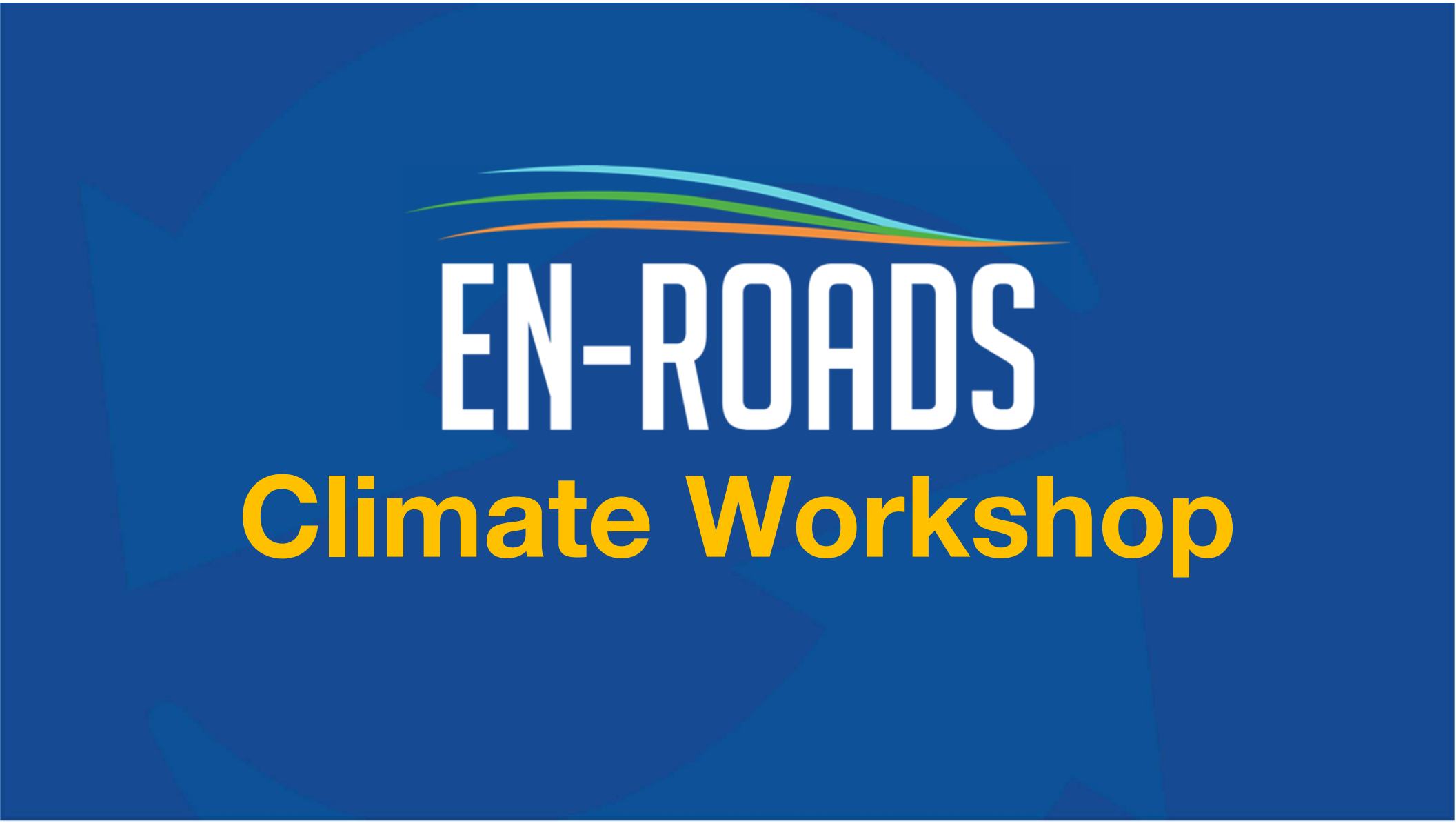
Interactive Polling

pe.app/jillianjames

"If you want to teach people a new way of thinking, don't bother trying to teach them. Instead, give them a tool, the use of which will lead to new ways of thinking."

- BUCKMINSTER FULLER, ARCHITECT, VISIONARY 1895-1983

En-ROADS Game with MIT D-Lab Students


EN-ROADS
Climate Workshop

Developed by:

Agenda

- Introduction
- Scenarios of Climate Success
- Debrief

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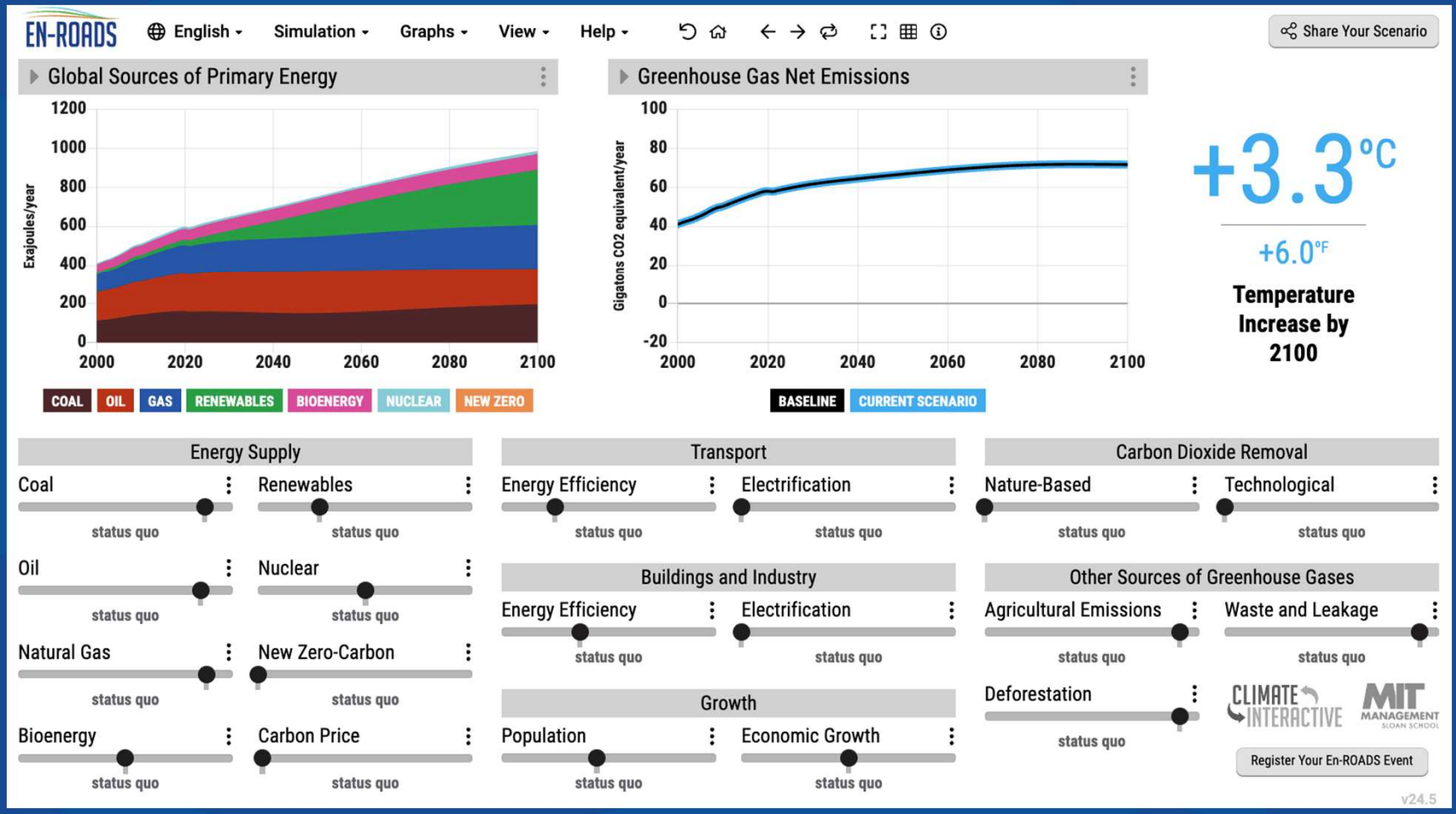
En-ROADS is a cutting-edge simulation model used to test climate solutions and generate climate scenarios for the future.



En-ROADS Events

11,628	166	3,419	354,065
EVENTS	COUNTRIES	FACILITATORS	PARTICIPANTS

Over **350,000 participants** in **166 countries**

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Let’s briefly review the science and what’s at stake….

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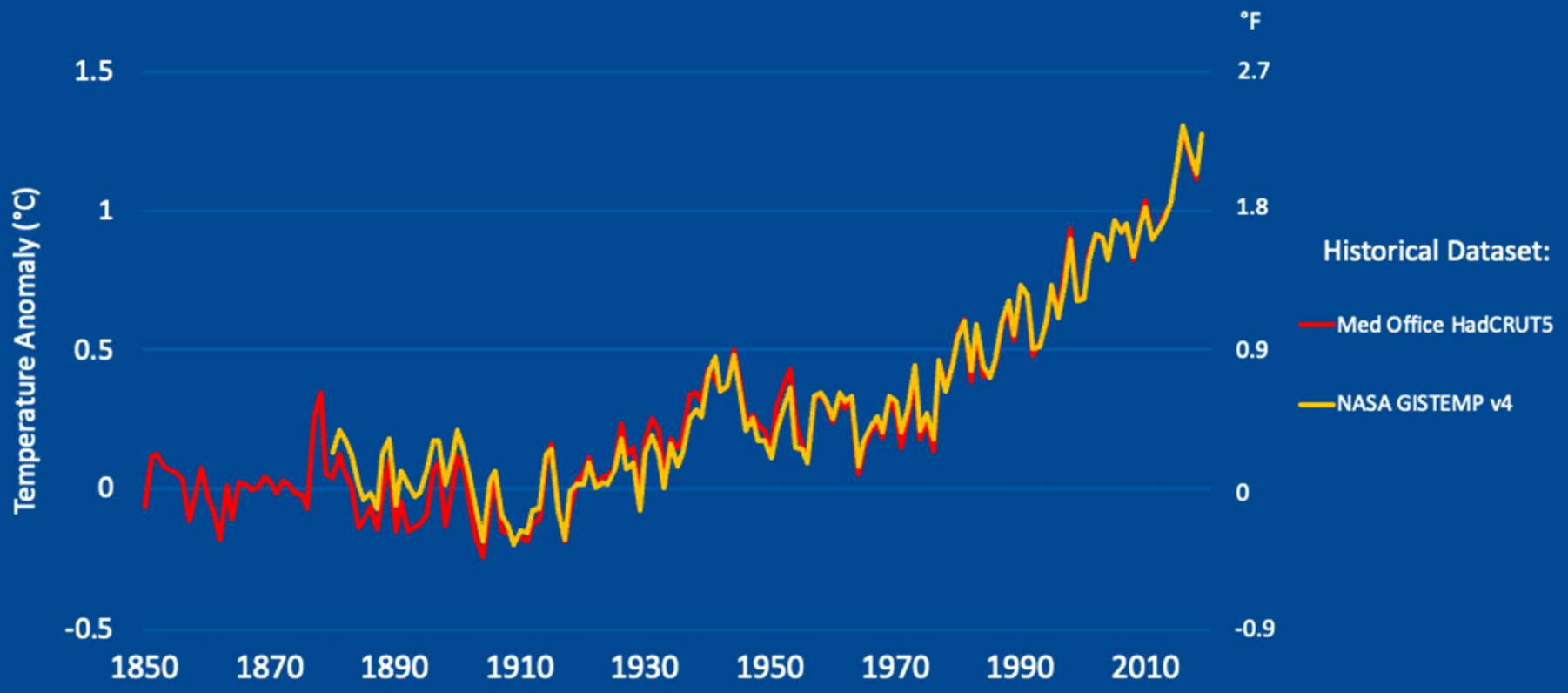
Global Temperature Change from Preindustrial (°C)



Source: C-

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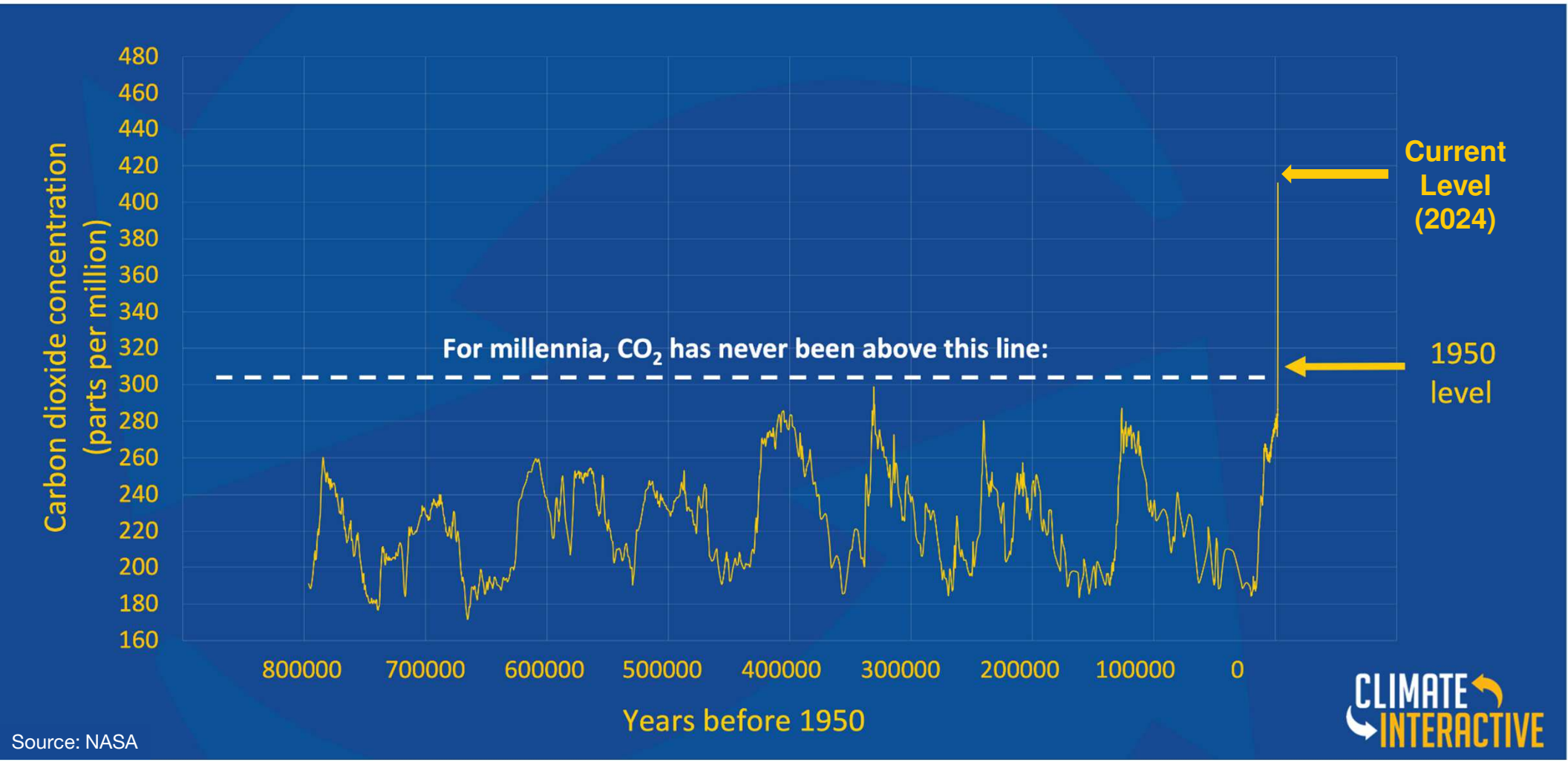
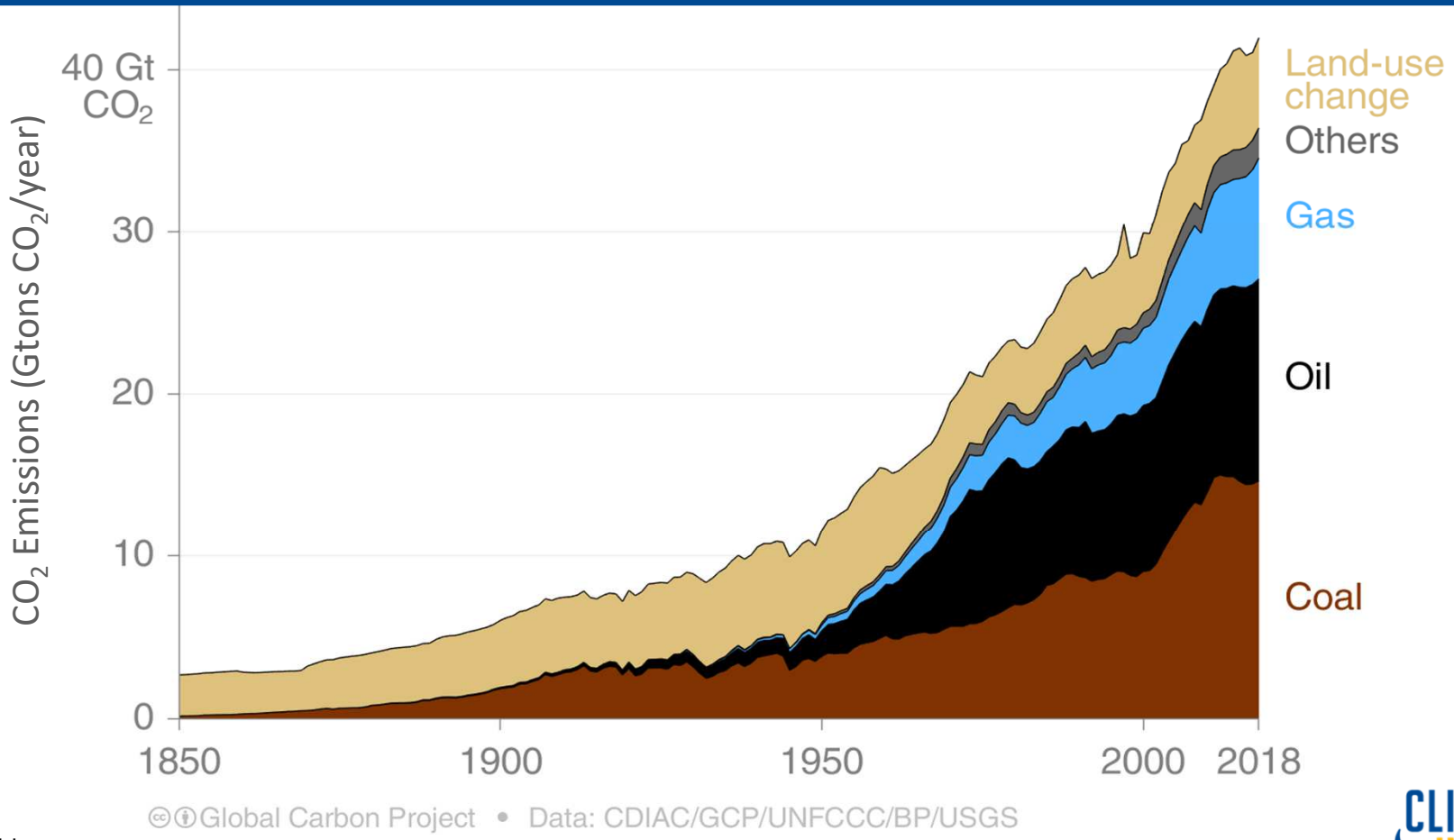
Atmospheric CO_2 is higher than any time in that last 800,000 years, and levels are increasing faster than any time in millions of years.



Source: NASA

CO_2 Emissions by Source



Source: Carbon Dioxide Information Analysis Center (CDIAC)

Others = Emissions from cement production and gas flaring

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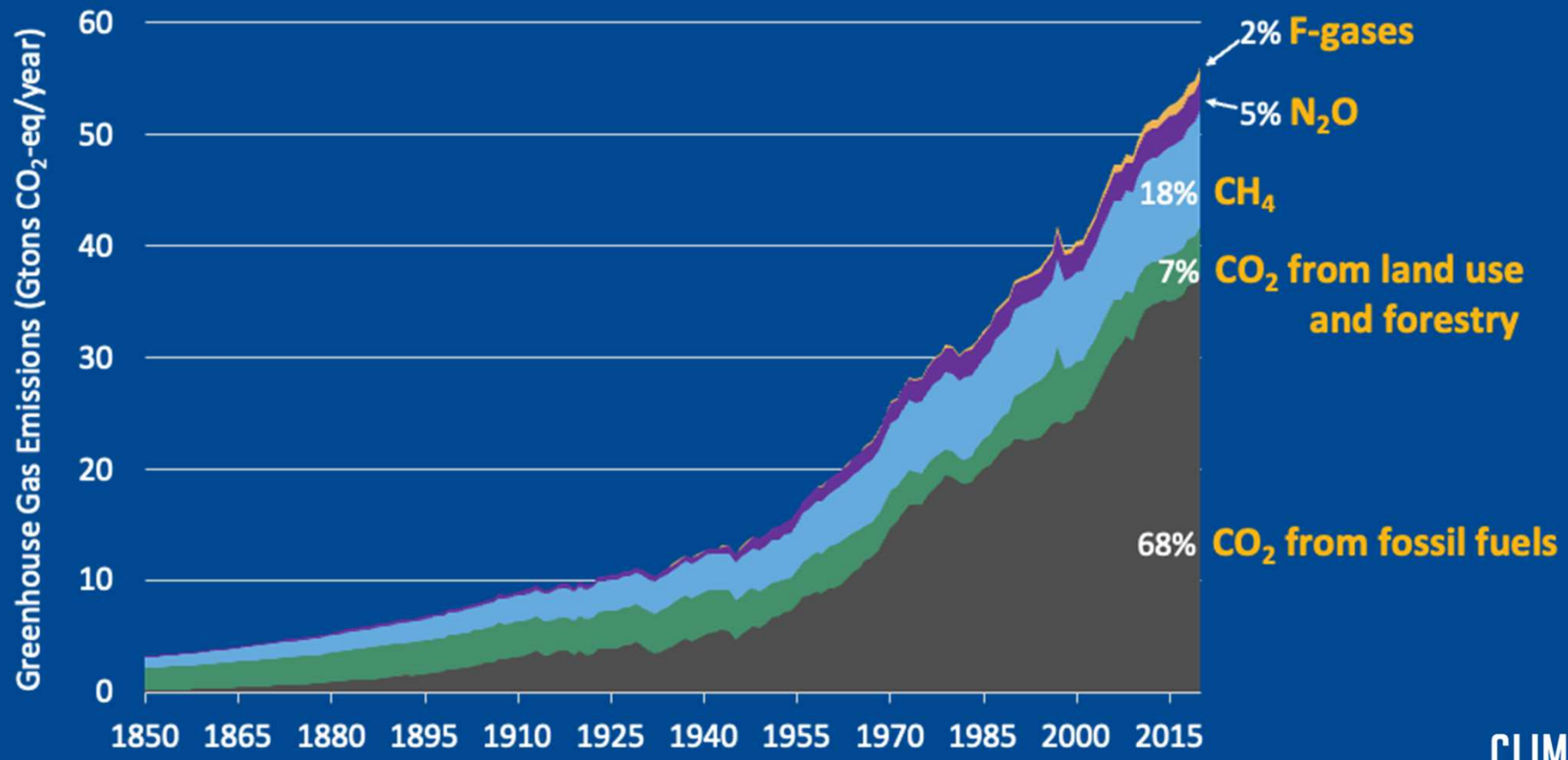
Total Annual Global Greenhouse Gas Emissions by Gas



Source: C-ROADS

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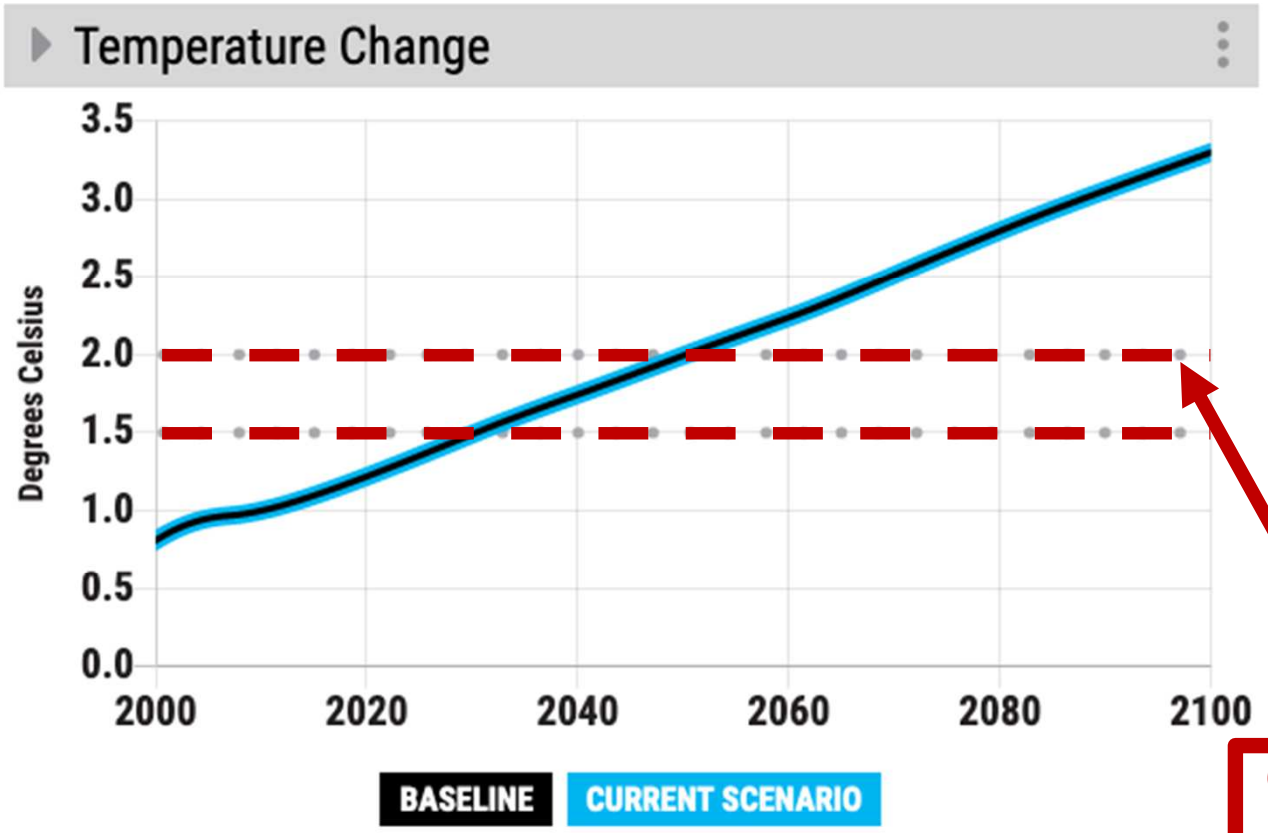
Baseline Scenario



+3.3°C

+5.9°F

Temperature Increase by 2100

Our climate goals (1.5ºC to 2ºC)

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What would 3+ °C (or 5.4+ °F) of warming mean?

Arctic sea ice is gone in **2 out of every 3** summers[1]

50% of insect species lose >50% of their habitat range[2]

Drought: **11 months longer**

Increase in average drought length[3]

Area burned by summer wildfires in Mediterranean **doubles**[4]

Compared to today

See the impacts of your scenario in the Impacts graph section of En-ROADS

Scenarios of Climate Success

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En-ROADS Control Panel

Simulator accessible at: ***en-roads.org***

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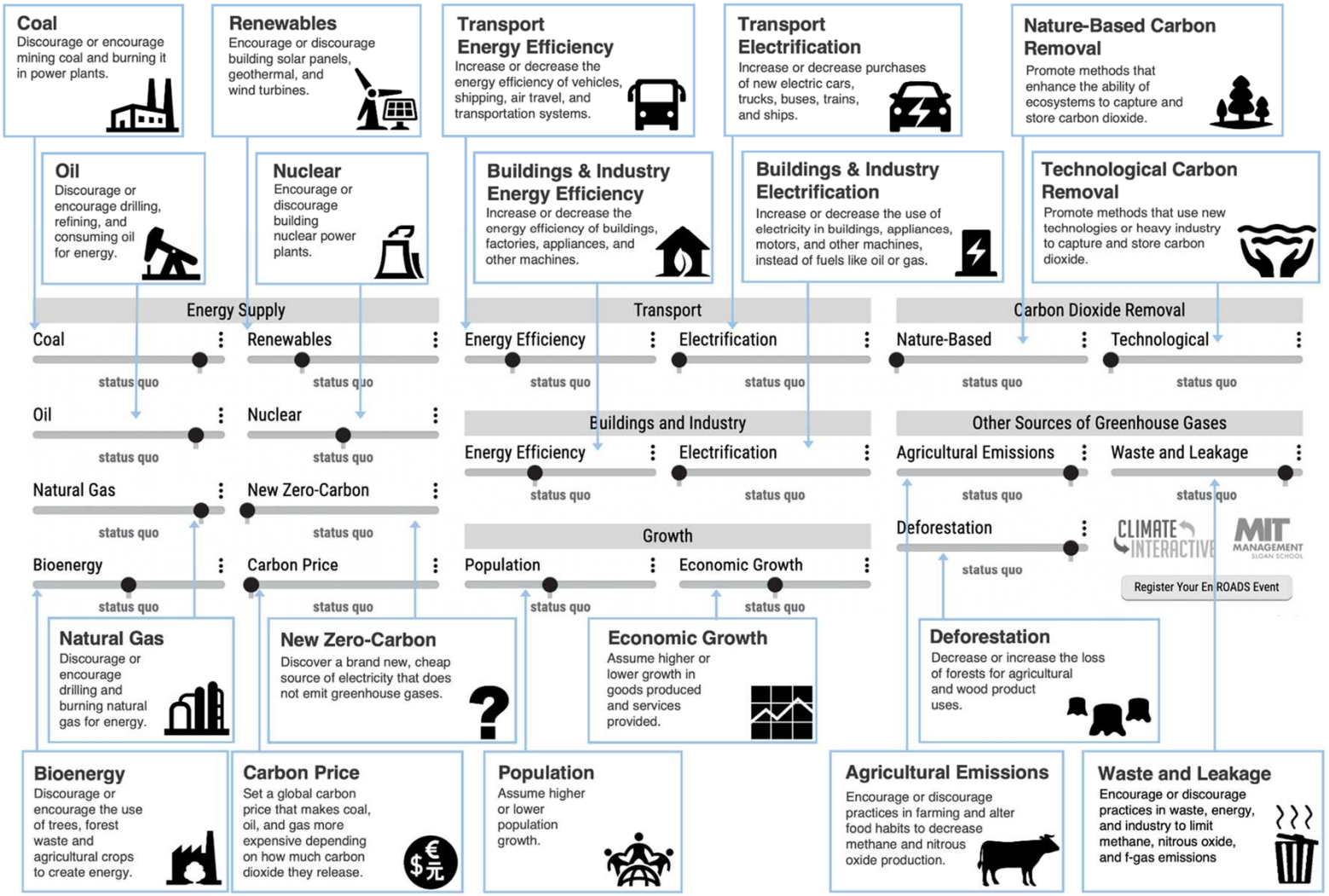
MIT MANAGEMENT SLOAN SCHOOL



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Your Actions

What actions have you or your organization done in the last five years to help mitigate climate change?

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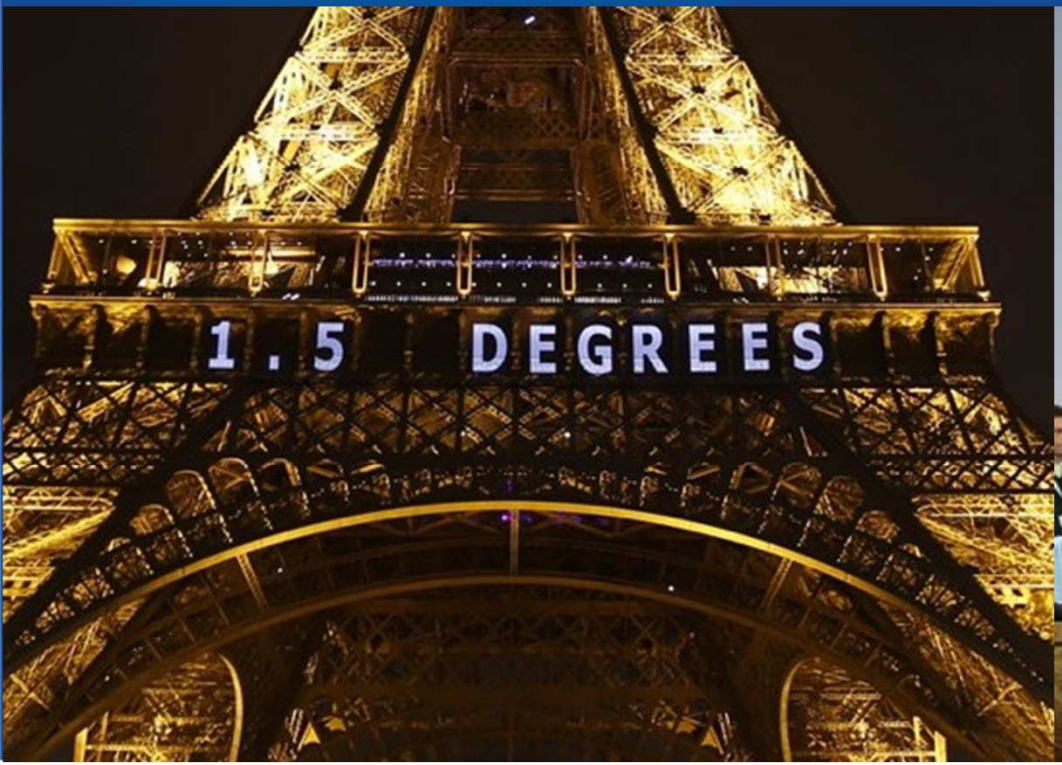
What else would it take to limit warming to less than 2 °C or even 1.5 °C?



Multisolving Lens

Consider a co-benefit from your proposal. How can you address more than one problem with one action?

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Multisolving Lens

Consider in what ways could implementation of this policy harm vulnerable communities?

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Debrief

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Reflection

Think of something you would love about being part of this sort of future.

Take **one minute of silence** to reflect on your experience.

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How are you **feeling?**

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Debriefing Discussion

- What surprised you?
- What were your key insights?
- What will you take away from today, and how can you apply what you learned to the real world?

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Looking ahead

- We have the tools
- Solar and wind are growing and getting cheaper
- Corporations are investing in clean tech
- Countries and states are stepping up
- The general public is becoming more educated and engaged

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Large companies are taking action

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5,276 companies have their science-based climate targets validated

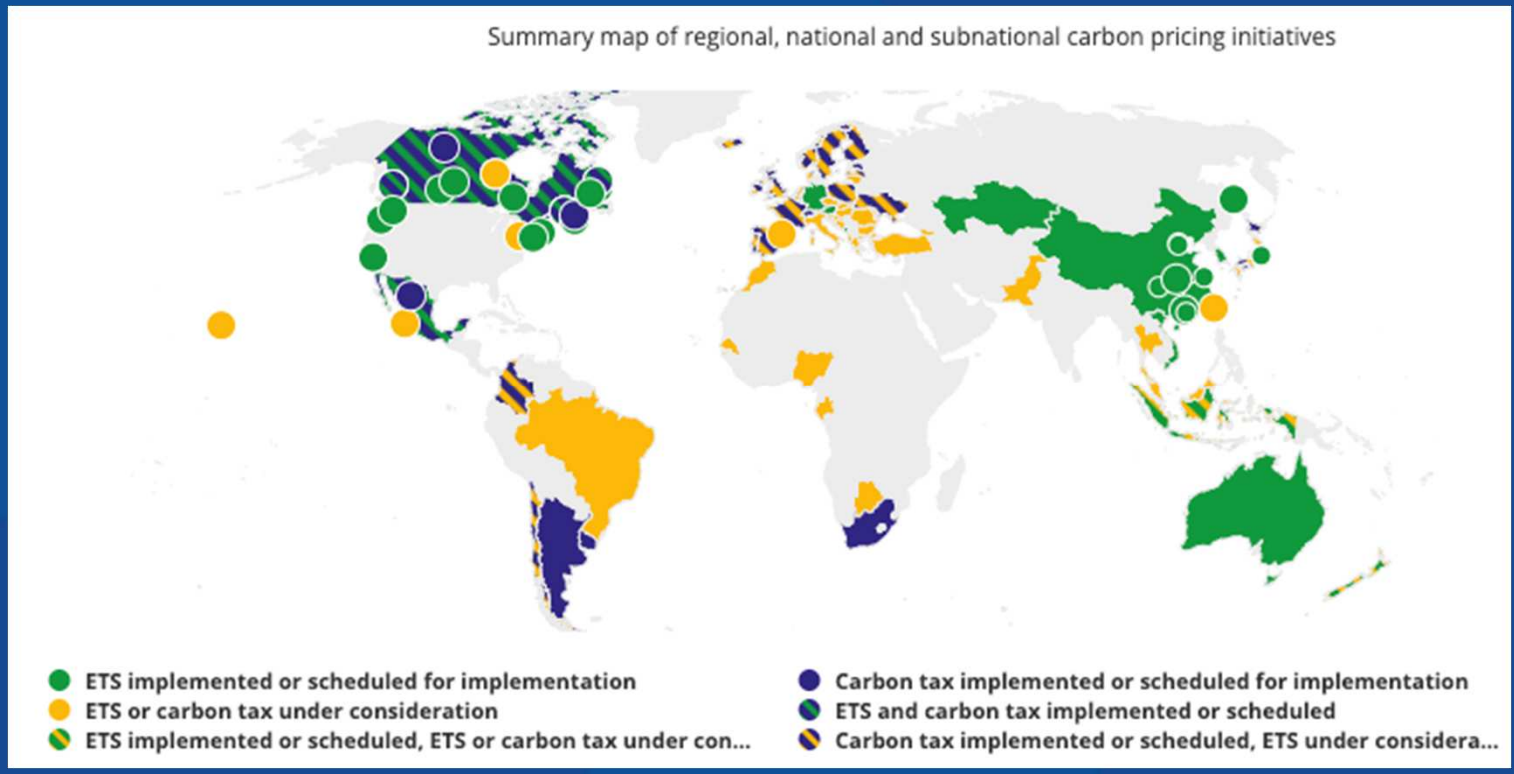
In 2024, Amazon asks thousands of suppliers and platform vendors to report their greenhouse gas emissions

Over 400 global companies have made a commitment to procure 100% renewable energy

Carbon prices are being enacted around the world

Current or planned carbon pricing covers **23%** of global emissions

70+ jurisdictions (regional, national or sub-national) have implemented or are considering carbon prices



Source: World Bank, 2023

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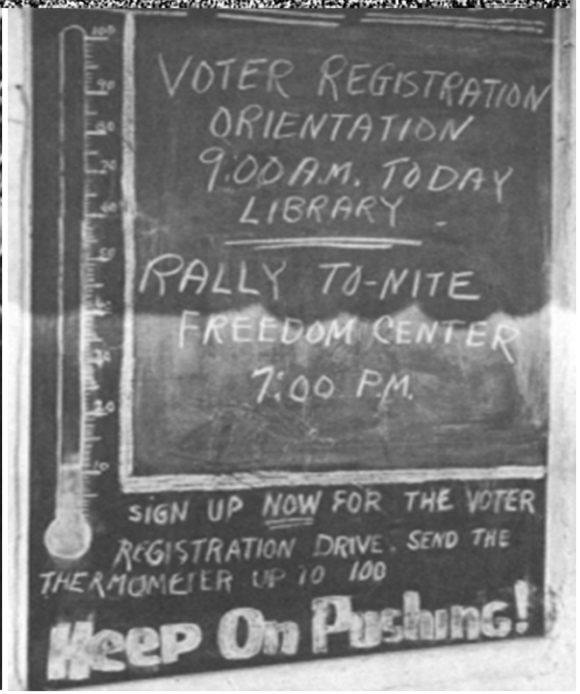
Local Action

Share local actions at your table.



"The world as we have created it is a process of our thinking. It cannot be changed without changing our thinking."

- Albert Einstein

"Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it is the only thing that ever has."

- Margaret Mead

Global Climate Strikes

September 2019: Over 7 million people in 185 countries

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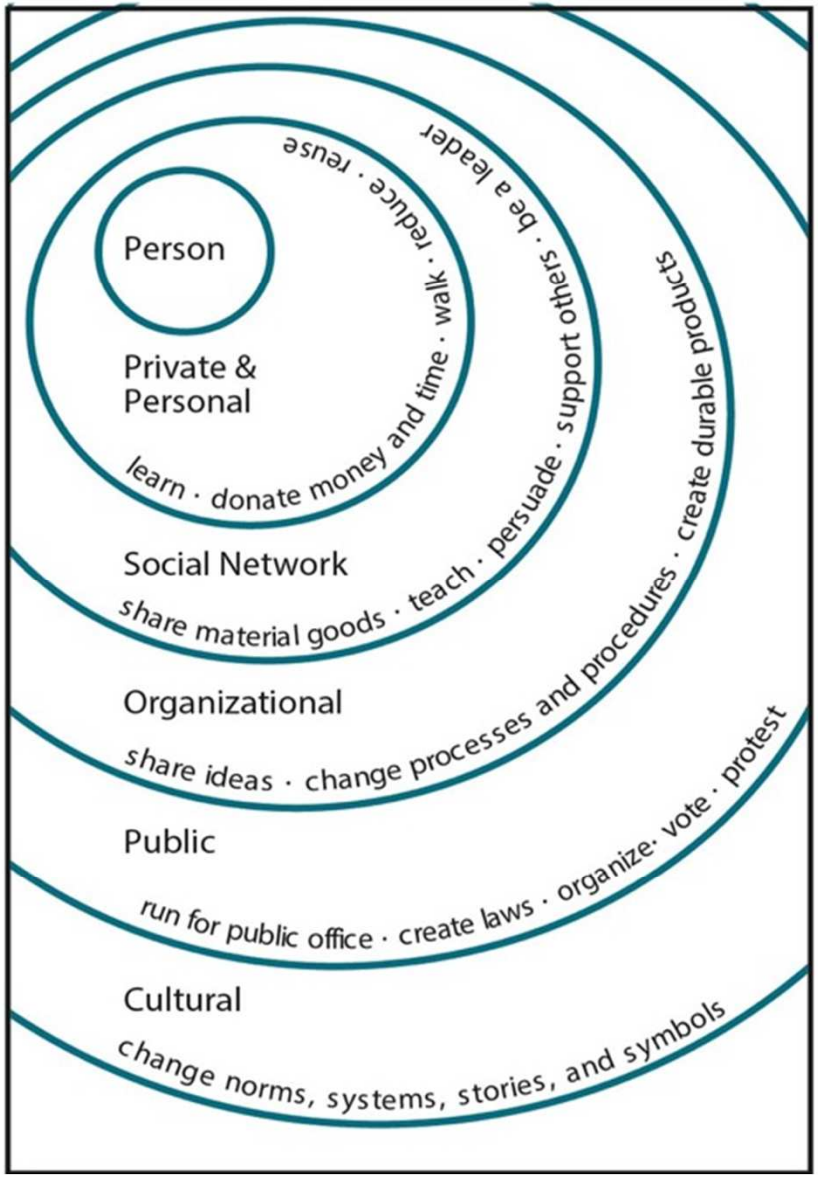

What can you do?

Illustration by Elise Amel

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The En-ROADS Climate Ambassador Program

A unique leadership opportunity to become a climate leader in your field, for those who complete the En-ROADS training.

780+ En-ROADS Climate Ambassadors

80+ Countries

40+ Languages

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Local Climate Ambassadors for Zonta

Location(s)	Name	Contact Details
Montreal, Canada	Sana Badruddin	sanabadruddin@gmail.com
Massachusetts	Jillian James	JillianJ@alum.mit.edu
Swampscott, MA	Rebecca Leblanc	rebecca@lcaresource.com
Boston, MA New York City, NY	Rebecca Niles	rebeccadniles@gmail.com.
Greater Boston, MA	Tove Rasmussen	https://www.linkedin.com/in/toverasmussen/
Canada	JD Williams	info@pinnacleed.ca Subject: “EnROADS query”

The En-ROADS Training Program

Join this free, self-paced online course to…

- Learn more about the En-ROADS simulator.
- Facilitate engaging events to spark climate action – both online and in-person.
- Gain valuable insights on systems thinking, multisolving, and advanced facilitation tips.
- Begin your journey as an En-ROADS Climate Ambassador.

Register at: learn.climateinteractive.org

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Climate Commitment

I [name], declare my intention to _____.

“We’re all invited. Pick up a shovel and join the dance.”

~ Robin Wall Kimmerer in ***Braiding Sweetgrass***

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Appendix

Insights from En-ROADS

1. A combination of solutions is needed to address climate change: “It takes more than one seed to plant a garden”
2. Keeping climate change to well below 2°C, and limiting it to 1.5°C, is possible.
    - We can still avoid the worst-case scenarios – it is still physically and technologically possible.
3. All successful scenarios significantly cut burning of coal, oil, and gas in the next 10-20 years.
4. There are many lower-leverage actions that help address climate change globally but which are not as high of a priority as reducing fossil fuel use.
5. There are many opportunities to increase equity as we take these actions.

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Additional En-ROADS Insights

- The transition from high-carbon to low-carbon energy takes decades due to the long lifetime of fossil fuel capital infrastructure.
- A new zero-carbon energy source takes too long to scale up to contribute much on its own.
- Even when low-carbon energy sources are encouraged, we still burn fossil fuels unless they are actively discouraged.
- Reducing other greenhouse gas emissions (methane, N_2O, F-gases) reduces temperature quite a bit.
- A carbon price is high leverage because it changes the fuel mix and reduces energy demand.
- New technologies grow via reinforcing “learning” feedback loops.
- In a scenario in which many actions that limit fossil fuel demand have already been taken, more nuclear/new zero-carbon energy/renewables just displaces the other low-carbon sources (a dynamic known as “crowding out”).
- Afforestation is lower leverage than many expect, because its carbon removal potential is delayed and much smaller than the greenhouse gas emissions that come from burning fossil fuels.

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System Dynamics in En-ROADS

1. **Capital Stock Turnover** – Changes to infrastructure take time
2. **Price-Demand Feedback** – Price, demand, and supply are linked
3. **Crowding Out** – Low-carbon supplies compete for long-term market share
4. **Squeezing the Balloon** – If one energy source is limited another will grow via a compensating feedback
5. **Economies of Scale and Learning** – Increasing capacity drives down costs
6. **Economic Damage from Climate Change** – Climate change reduces GDP growth and energy consumption, balancing climate change impacts
7. **Drivers of Growth** – Population and GDP growth drive emissions
8. **Bathtub Dynamics** – CO_2 emissions must be lower than removals for CO_2 concentration and temperature to stop rising

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Features of En-ROADS

- **Transparent**

  All equations and structure are available in the online Reference Guide

- **Flexible**

  Assumptions are adjustable

- **Globally aggregated to be fast**

  Complementing, not supplanting, the integrated assessment models used by the IPCC

- **Supports grounding discussions to learn and strategize, backed with real data & science**

  However, not to serve as *predictions* for the future, which is dependent on too many behavioral variables

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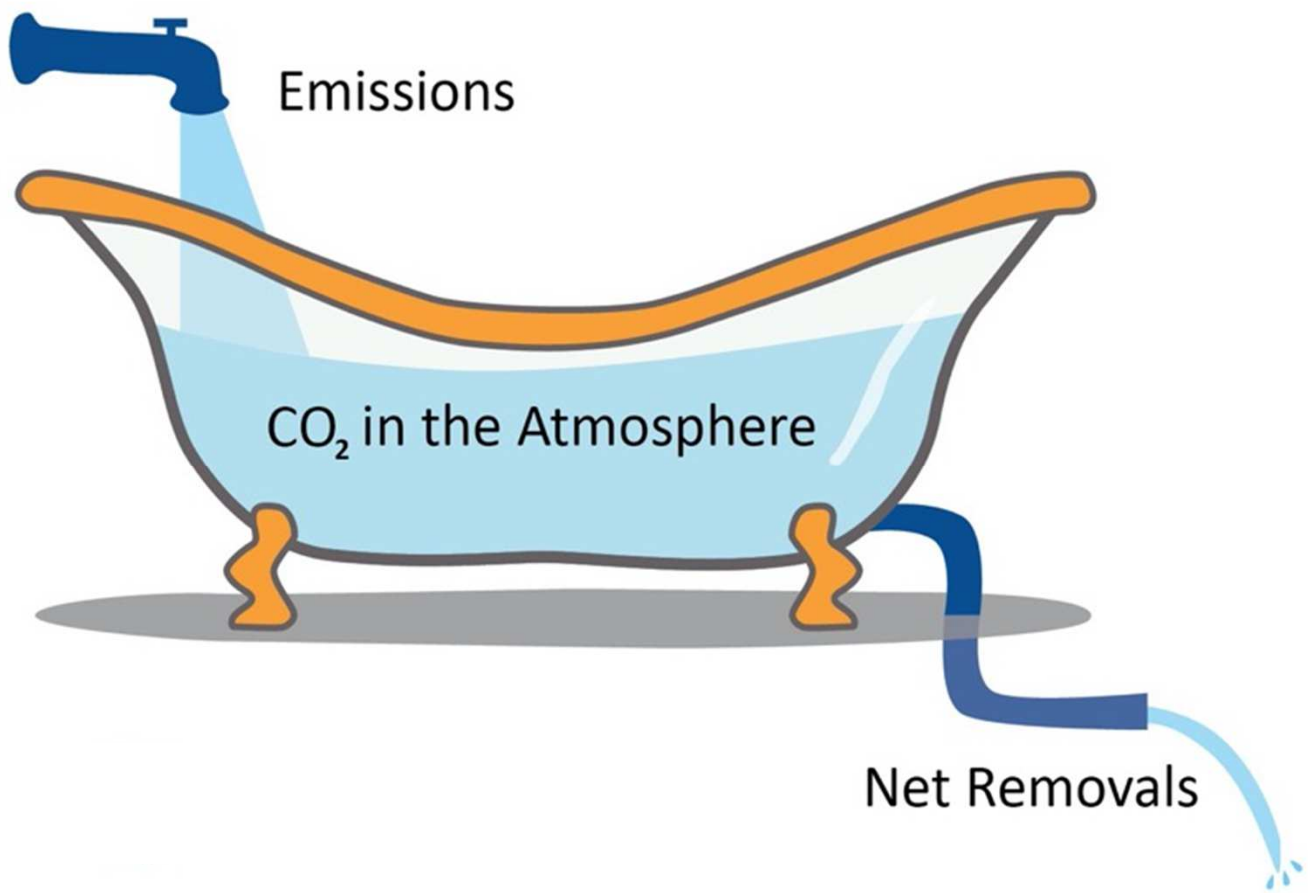
Bathtub Dynamics



Overall framing by Dr. John Sterman, MIT Sloan

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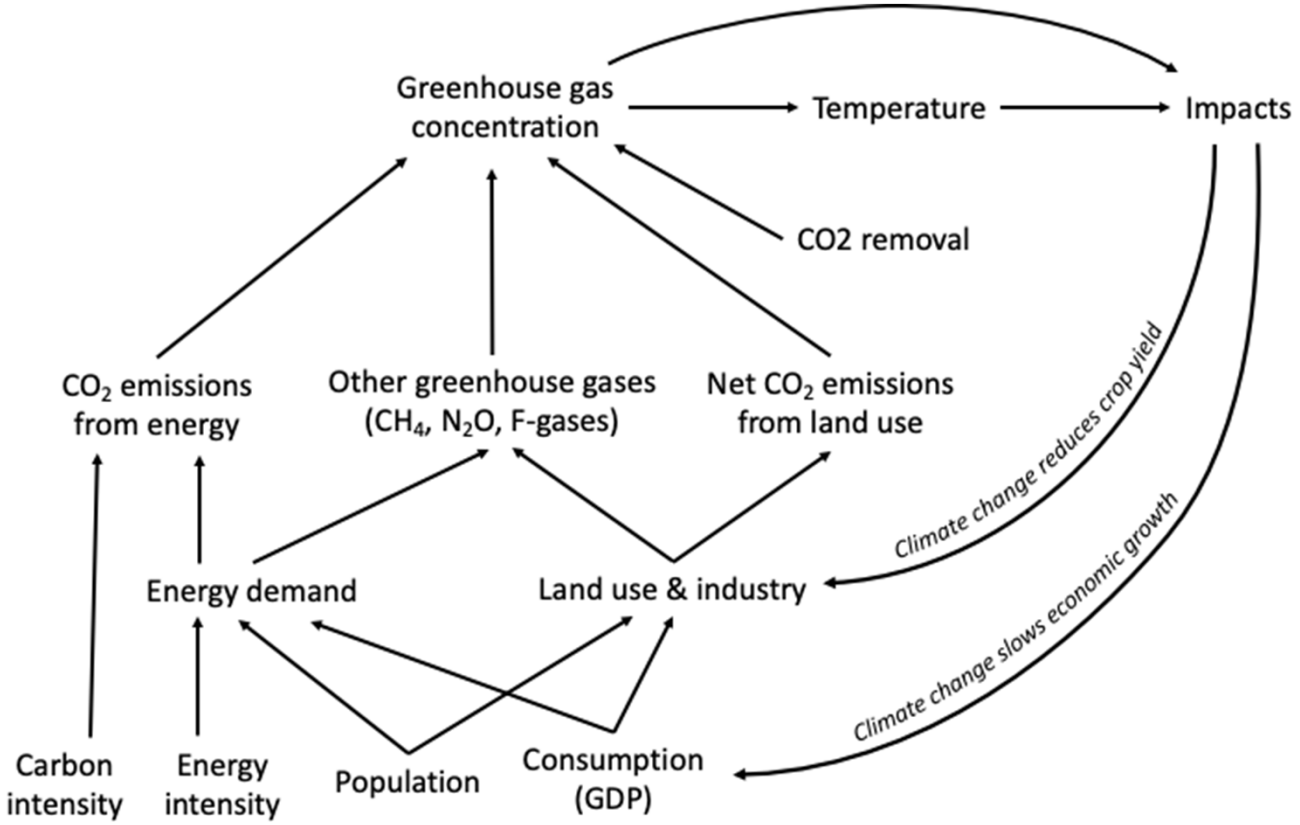
En-ROADS Core Structure



See the full model structure in the En-ROADS Reference Guide at: climateinteractive.org/en-roads-reference-guide

Multisolving

World Health Organization | Health Topics | Countries | News | Emerge

Health benefits far outweigh the costs of meeting climate change goals

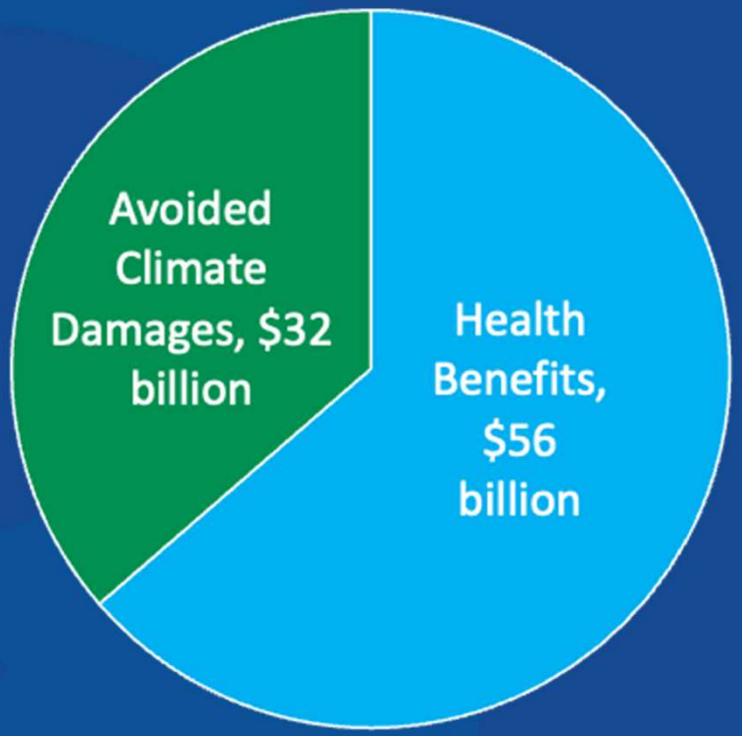
5 December 2018 | News Release | Katowice, Poland

“The health burden of polluting energy sources is now so high, that moving to cleaner and more sustainable choices for energy supply, transport and food systems effectively pays for itself,” says Dr Maria Neira, WHO Director of Public Health, Environmental and Social Determinants of Health.

“When health is taken into account, climate change mitigation is an opportunity, not a cost.”

Clean Energy & Health

Health benefits from wind and solar power in the United States from 2007 to 2015 were *even greater* than their climate benefits.



Source: Millstein, et al (2017)

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Clean Energy & Jobs

If $200 billion was invested every year in energy efficiency and clean energy in the US, **4.2 million jobs** would be created by 2030, and the 2030 unemployment rate would be reduced by 1.5%.

Source: Pollin, et al (2014)

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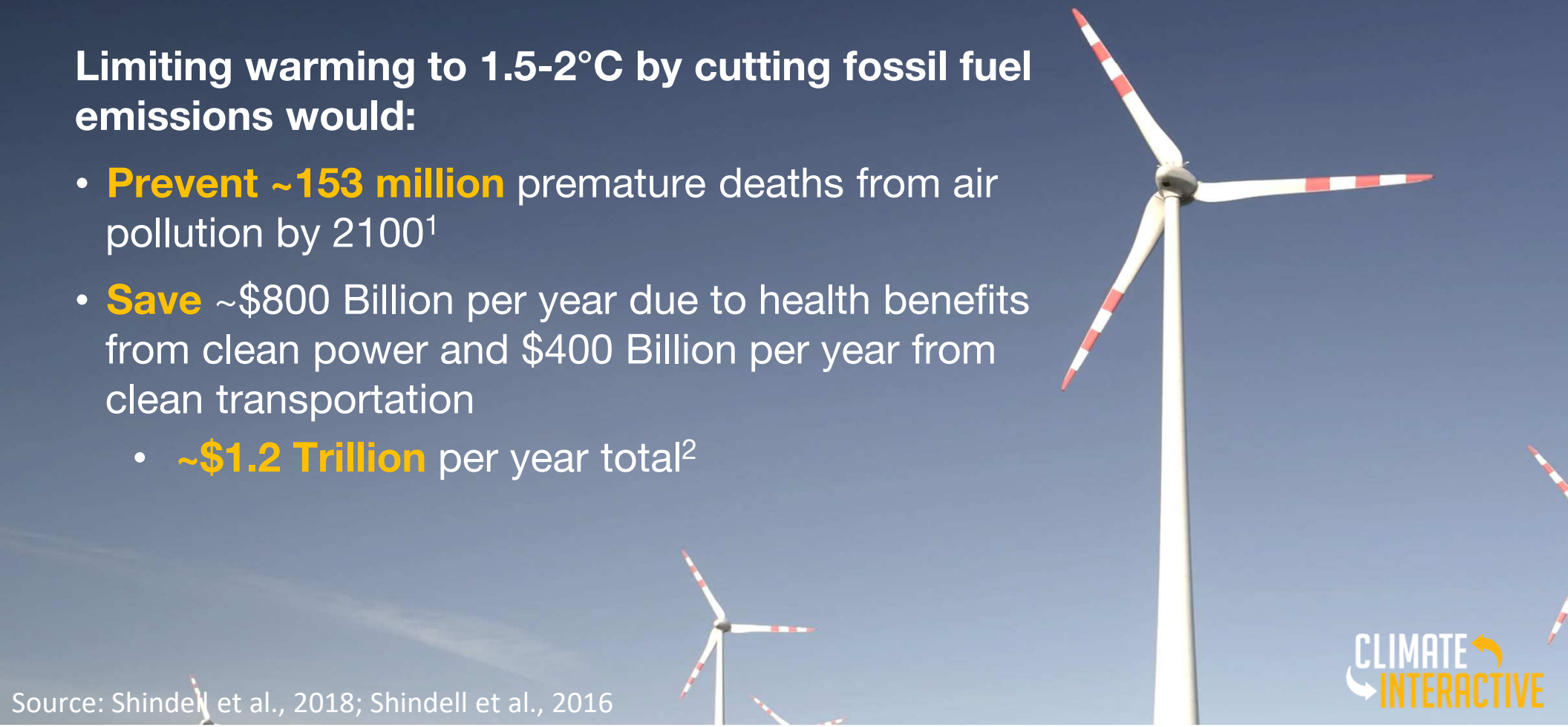
Health Benefits of Climate Action: Global

Limiting warming to 1.5-2°C by cutting fossil fuel emissions would:

- **Prevent ~153 million** premature deaths from air pollution by 2100[1]
- **Save** ~$800 Billion per year due to health benefits from clean power and $400 Billion per year from clean transportation
  - **~$1.2 Trillion** per year total[2]



Source: Shindell et al., 2018; Shindell et al., 2016

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Health Benefits of Climate Action: U.S.

The U.S. would save billions in health care costs by 2030[2]

Prevent **~295,000 premature deaths** by 2030 from air pollution caused by fossil fuel use

Prevent **~29,000 Emergency Room** visits/year for childhood asthma

Prevent **15 million adult work hours** lost/year

Source: Shindell et al., 2016

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Impacts at different levels of warming

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1.5°C of warming (or 2.7°F)

Increase of **3.0 - 4.5°C (5.4 - 8.1°F)** in extreme temperatures in some regions[1]

70% of coral reefs bleached[2]

Drought: **2 months longer**

Increase in average drought length[3]

13% of people face severe heat waves at least every 5 years[4]

2°C of warming (or 3.6°F)

Risk of river flooding **more than doubles**[1]

Average 170% increase in river flooding, with highest risk in U.S., Asia, and Europe

90% of coral reefs bleached[2]

Drought: **4 months longer**

Increase in average drought length[3]

Over 50% of world's population exposed to lethal heat
for more than 20 days per year[4]

3°C of warming (or 5.4°F)

Arctic sea ice is gone in **2 out of every 3** summers[1]

50% of insect species lose >50% of their habitat range[2]

Drought: **11 months longer**

Increase in average drought length[3]

Area burned by summer wildfires in Mediterranean **doubles**[4]

Compared to today

4+°C of warming (or 7.2+°F)

Sea level rise this century: **~1.2 meters (~4 feet)**[1]

More than two thirds of glaciers in the Himalaya Mountains melted[2]

One in six species could go extinct[3]

Three-quarters of world population exposed to lethal heat for >20 days/year[4]