

# Climate & AI

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(I am not representing the views of any particular organization with this presentation  
these are just some relevant ones I'm associated with)



Sr. Lecturer  
Co-founded CEV & CEP

[www.climateandenergyventures.com](http://www.climateandenergyventures.com)



Chair of the Board

[www.woodwellclimate.org](http://www.woodwellclimate.org)



Founder

[www.clymatestudios.com](http://www.clymatestudios.com)



Co-founder and CEO

[www.maigent.ai](http://www.maigent.ai)

# Climate & Energy Ventures – Overview

A unique team-based class that equips students with the knowledge and skillset to launch new enterprises focused on commercial opportunities in the energy and climate space

Cutting edge innovation and deeply motivated students

Ideas from MIT & other leading innovation centers



A broad community dedicated to having impact at scale



## 15.366: Climate & Energy Ventures

Multidisciplinary & Cross-Sectoral



How to assess new technologies



How to target new opportunities



How to understand and leverage policy

An unparalleled ecosystem and support infrastructure



# Climate & Energy Ventures – Impact

- 60+ companies based on class projects
- 100+ additional alumni founded companies
- \$7+ billion funds raised
- Book coming out this fall: <https://www.climateandenergyventures.com/book>

Some of the companies that have been founded by alumni...



# **“We are not having the real conversation”**

- Two leading experts independently used this exact phrase with me in late 2023 around COP28
  - COP stands for Conference of the Parties, the annual meeting the United Nations Framework Convention on Climate Change (UNFCCC)
- One is a global leader in climate science, and the other is a global leader in AI

# What is the real conversation?

- We are highly likely to exceed 3° C this century
- 1.2° C was the safe level we should have stayed under

# **What is the real conversation?**

- We are highly likely to exceed 3° C this century
- 1.2° C was the safe level we should have stayed under

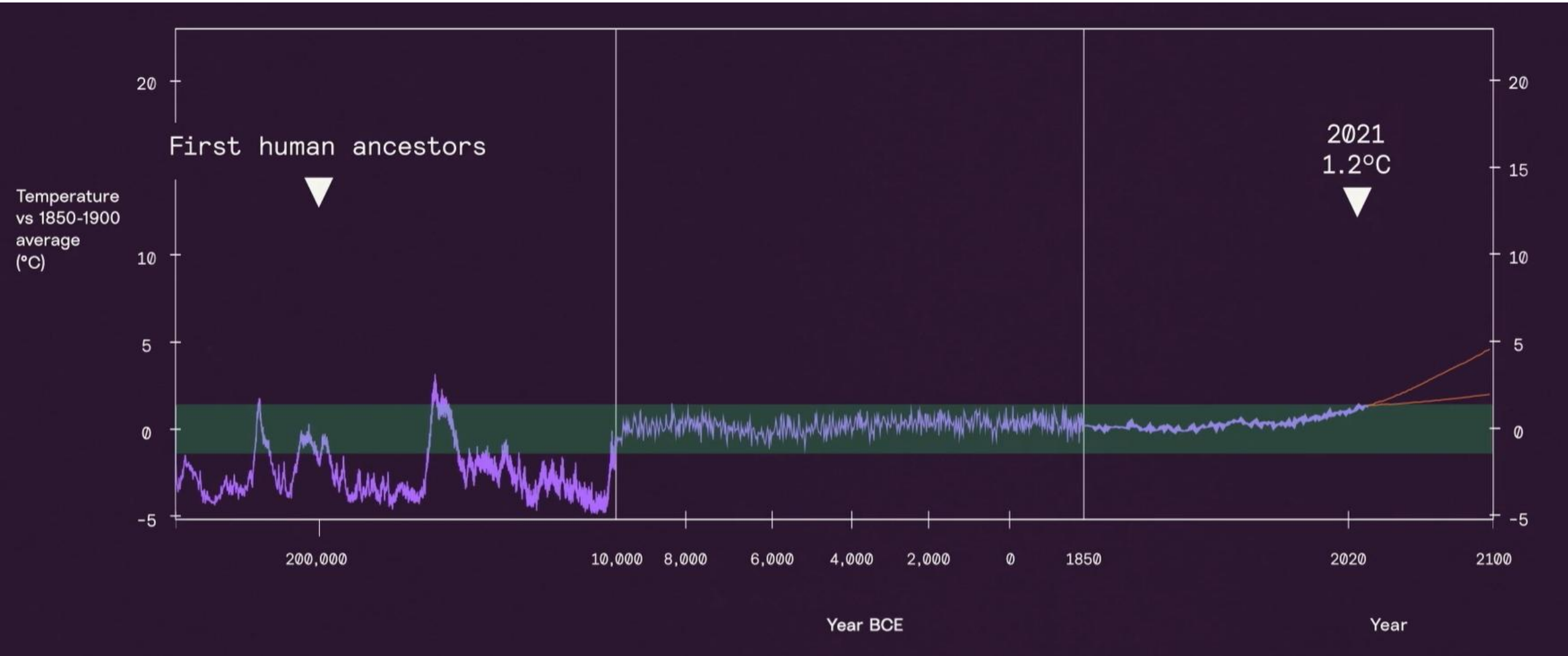
## **Why is this important?**

- Because the global economy and all our infrastructure was built for a climate that no longer exists, and lives are at stake

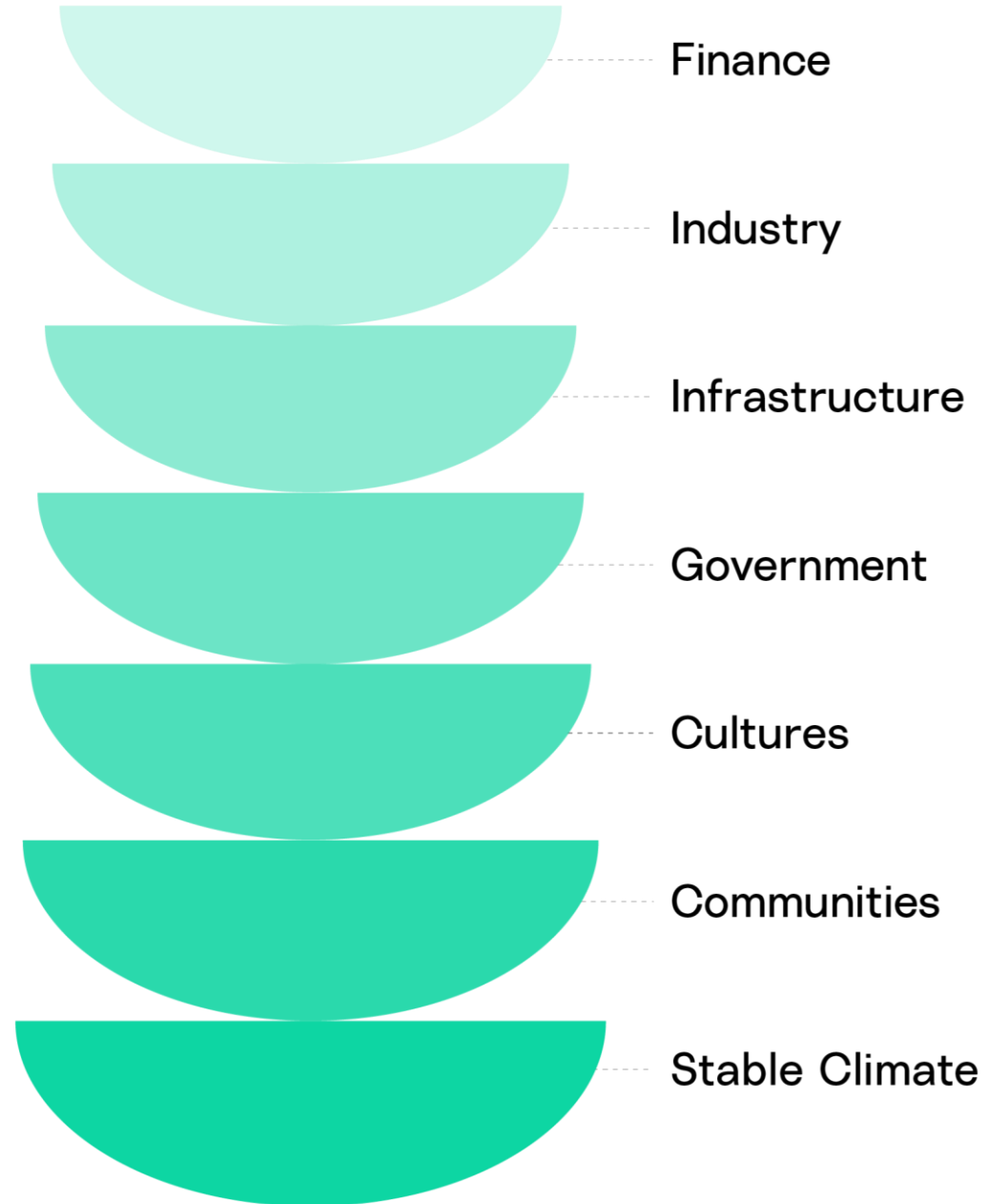
**We are going to have to rebuild our  
global economy for a changing climate.**

**I think AI can help us move fast enough  
and go in the right direction.**

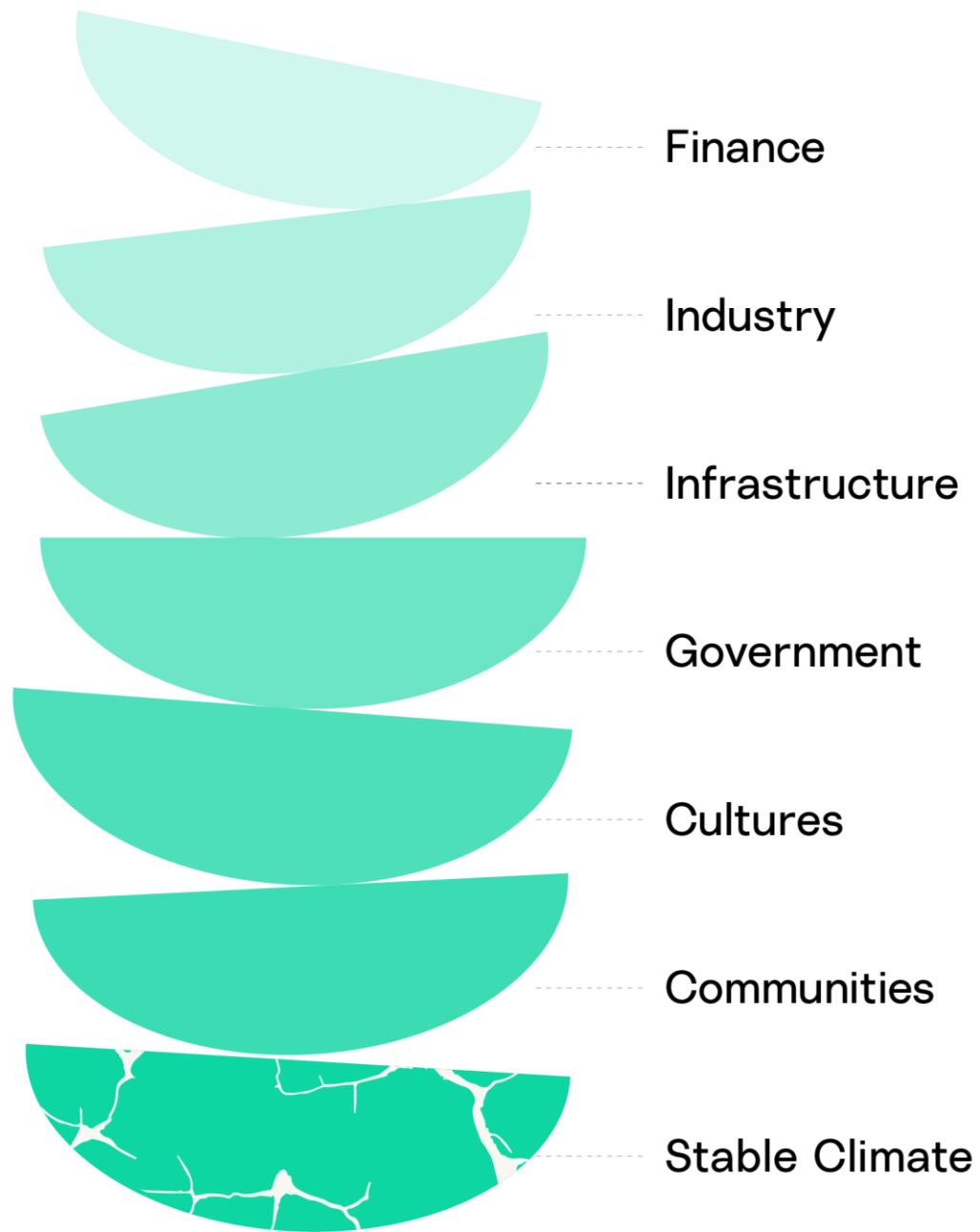
# We Left The Band of Climate Stability







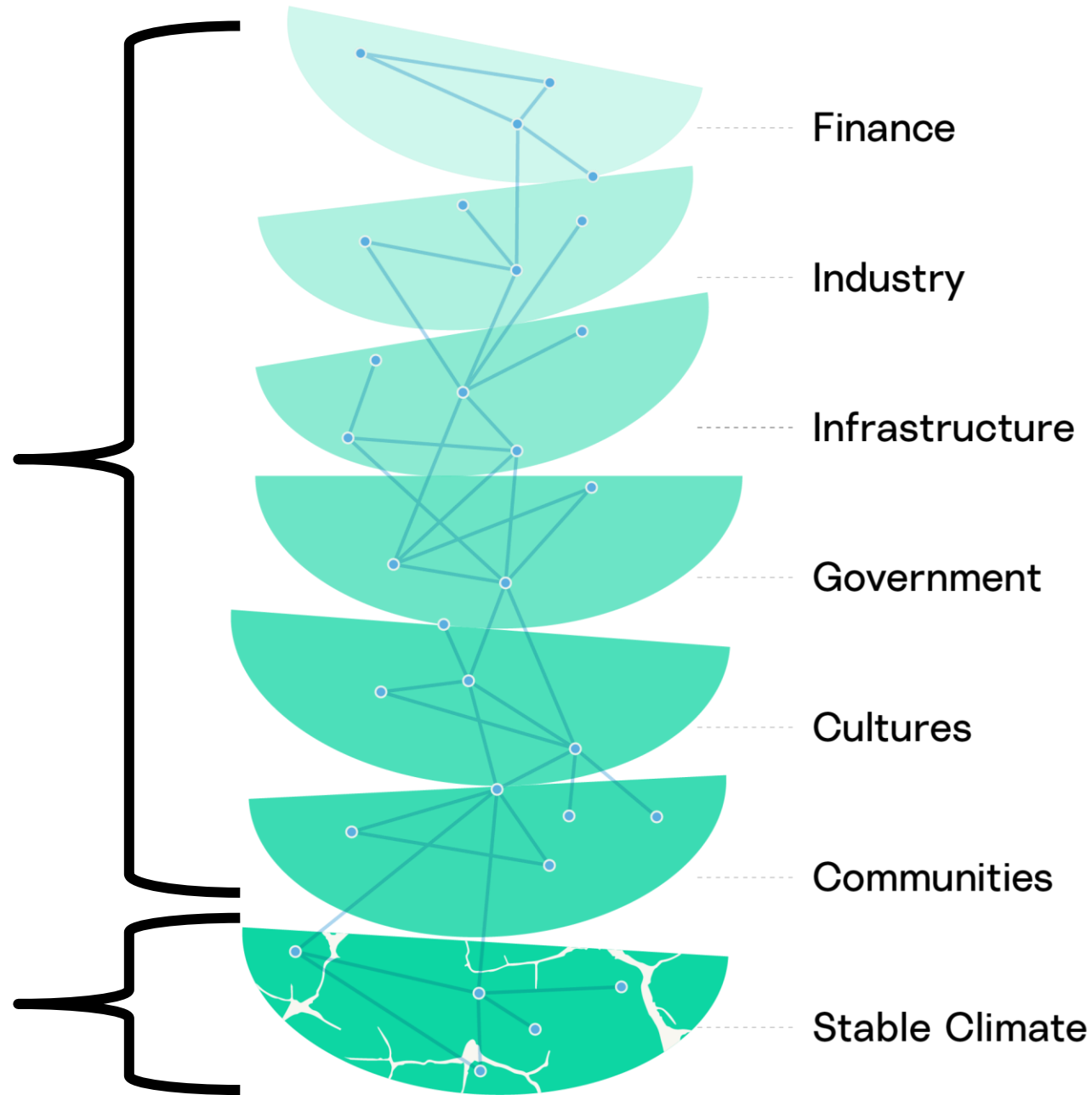
Probable Futures



Probable Futures

**Resilience,  
Adaptation,  
and Global  
Heat  
Management**

**Reducing and  
Removing  
Emissions**



Probable Futures

## People don't care about an average temperature at some point in the future

- People do care about their cost of insurance, their ability to get a mortgage, the value of their home, the safety of their family.
- The insurance industry cares about the 2% risk in the next year (because insurance is renewed annually) and they care that 2% is now 5, 10 or 20%
- [Michael Bloomberg: Texas Floods Made Worse by Climate Denialism – Bloomberg](#)
- [U.S. rocked by four 1-in-1,000-year storms in less than a week](#)
- And in Boston last week...

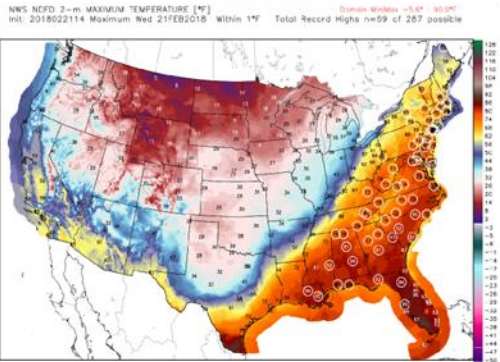
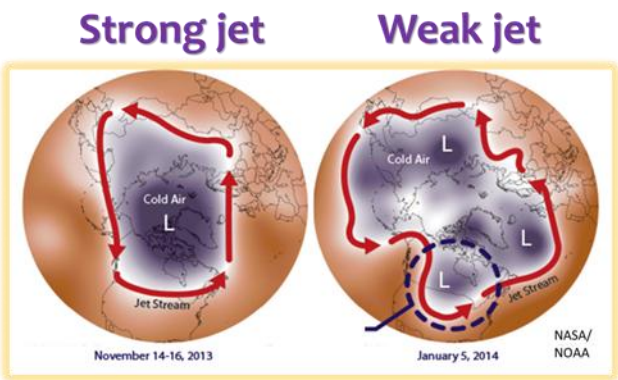
All lanes of Interstate 93 were closed in Quincy, Massachusetts Thursday because of major flooding on the highway during rush hour.  
CBS Boston

<https://www.cbsnews.com/boston/news/boston-weather-flooding-risk-rain-thursday/>



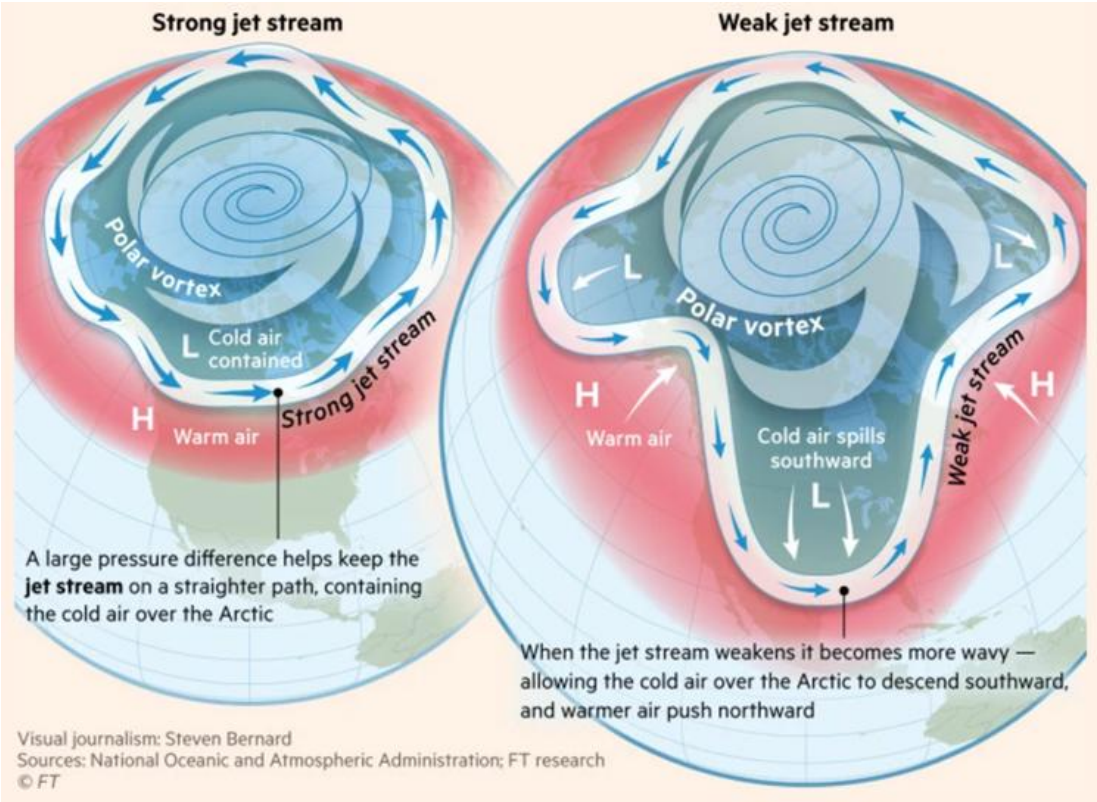
# Climate Science Predictions from early 2020:

- Warmer Arctic ⇒  
Wavier Jet Stream
- Extreme Pattern ⇒  
Extreme Weather
- System will get stuck  
for extended periods of  
time in the same  
position



Dr. J. A. Francis, Woodwell Climate Research Center

# News from Feb. 2021:



- ~250 people died
- \$80+ billion in damages
  - (Hurricane Katrina caused \$125 billion)
- Texas grid seconds away from complete failure
- TX natural gas production dropped 45%
- Energy (power broker) firm bankruptcies
- Grid scale energy storage companies made \$\$\$\$\$

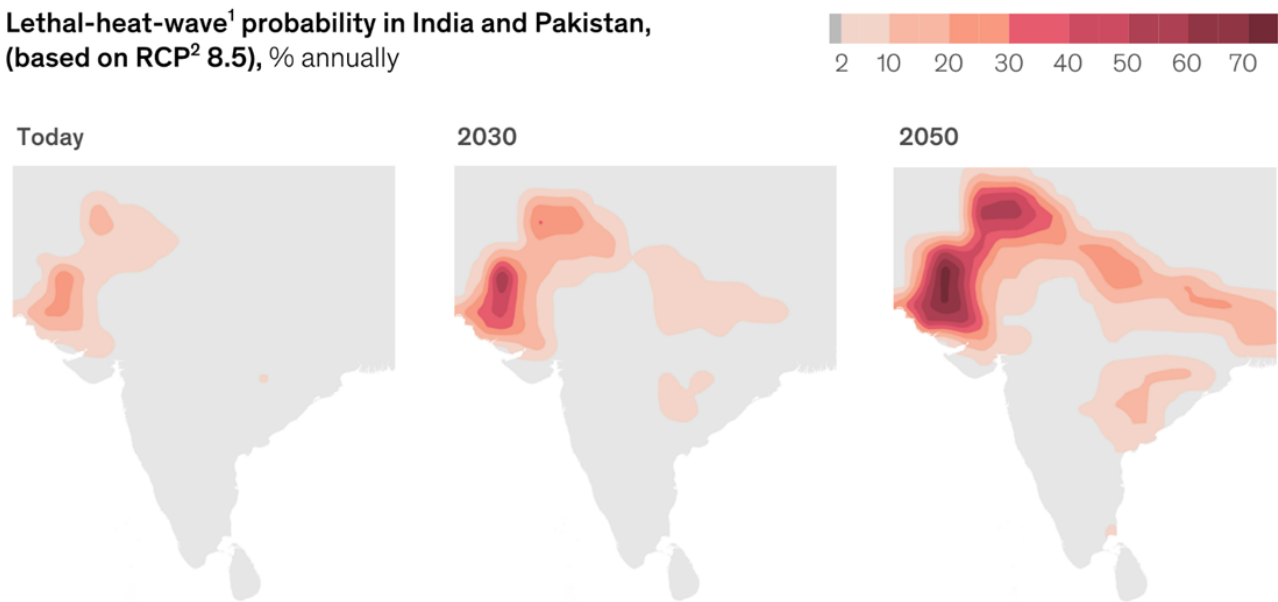


# Climate Science Predictions from early 2020:

By 2050, under an RCP 8.5 scenario, the number of people living in areas with a nonzero chance of lethal heat waves would rise from zero today to between 700 million and 1.2 billion

Urban areas in India and Pakistan could be the first places in the world to experience lethal heat waves.

Lethal-heat-wave<sup>1</sup> probability in India and Pakistan, (based on RCP<sup>2</sup> 8.5), % annually



<sup>1</sup>A “lethal heat wave” is defined as a 3-day period with maximum daily wet-bulb temperatures >34°C

[Climate risk and response | McKinsey](#)

[Why use RCP8.5 for 2050 projections?](#)

# News from 2025:

“Extended heatwave in India, Pakistan to **test survivability limits**, with temperatures reaching Death Valley levels”



<https://www.cnn.com/2025/04/15/asia/india-pakistan-heatwave-climate-crisis-intl-hnk/index.html>

# Climate Risk Assessments

- Extreme heat
- Drought and water scarcity
- **Flooding — urban/street-level flood mapping & stormwater surge**
- Wildfires
- Sea level rise & storm surge
- Precipitation extremes / tropical cyclones
- Annual temperature & precipitation variability

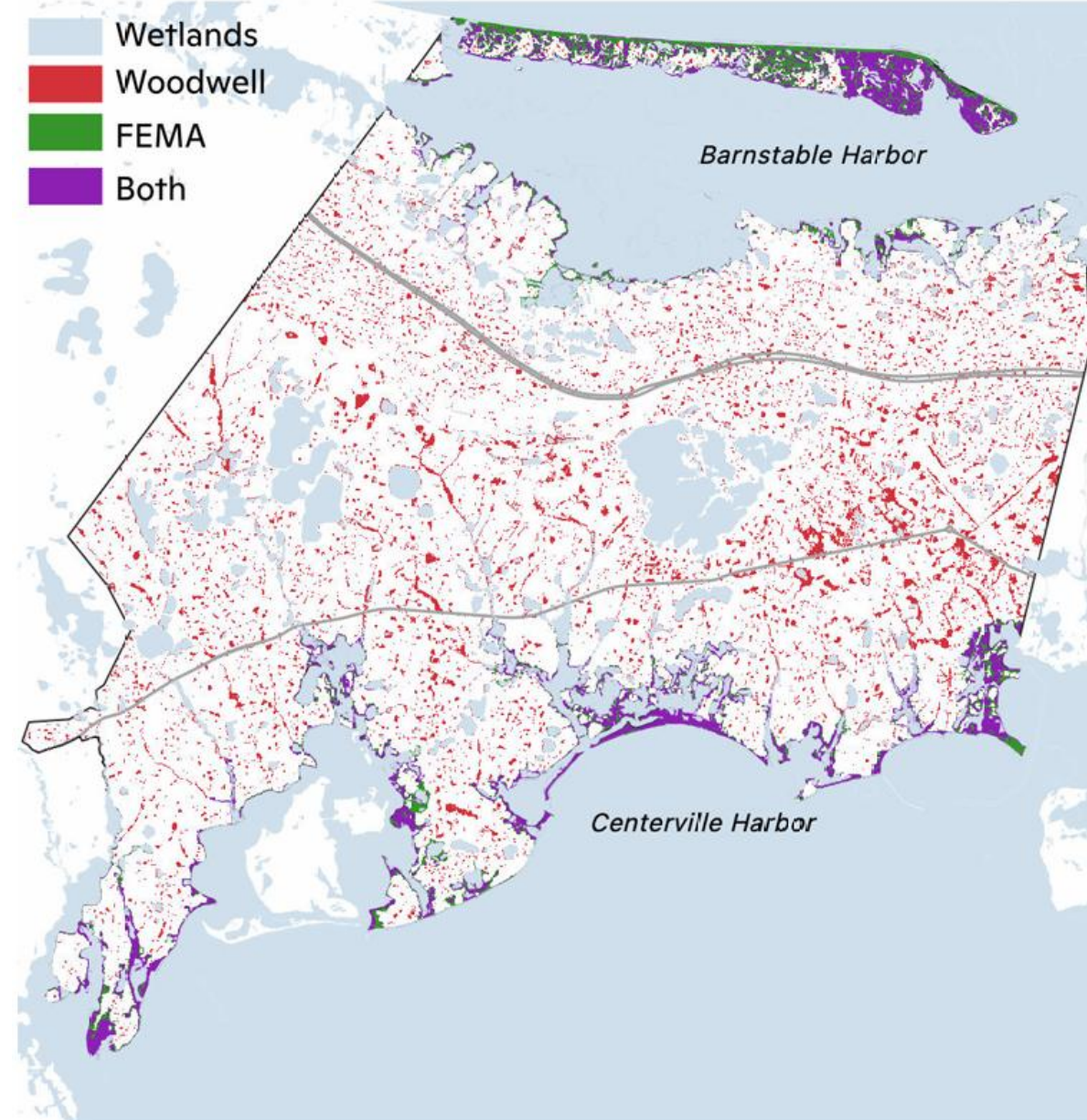


<https://www.woodwellclimate.org/project/just-access/completed-assessments/>

# Flood Map of Barnstable, MA

- Buyers of commercial and residential property have the right to know about the real flood risk
- Owners are not going to be happy about the implications to their property values
- ...but owners have the right to know about the safety risk to their families and others
- Communities can take action

## Woodwell vs FEMA 100-year flood





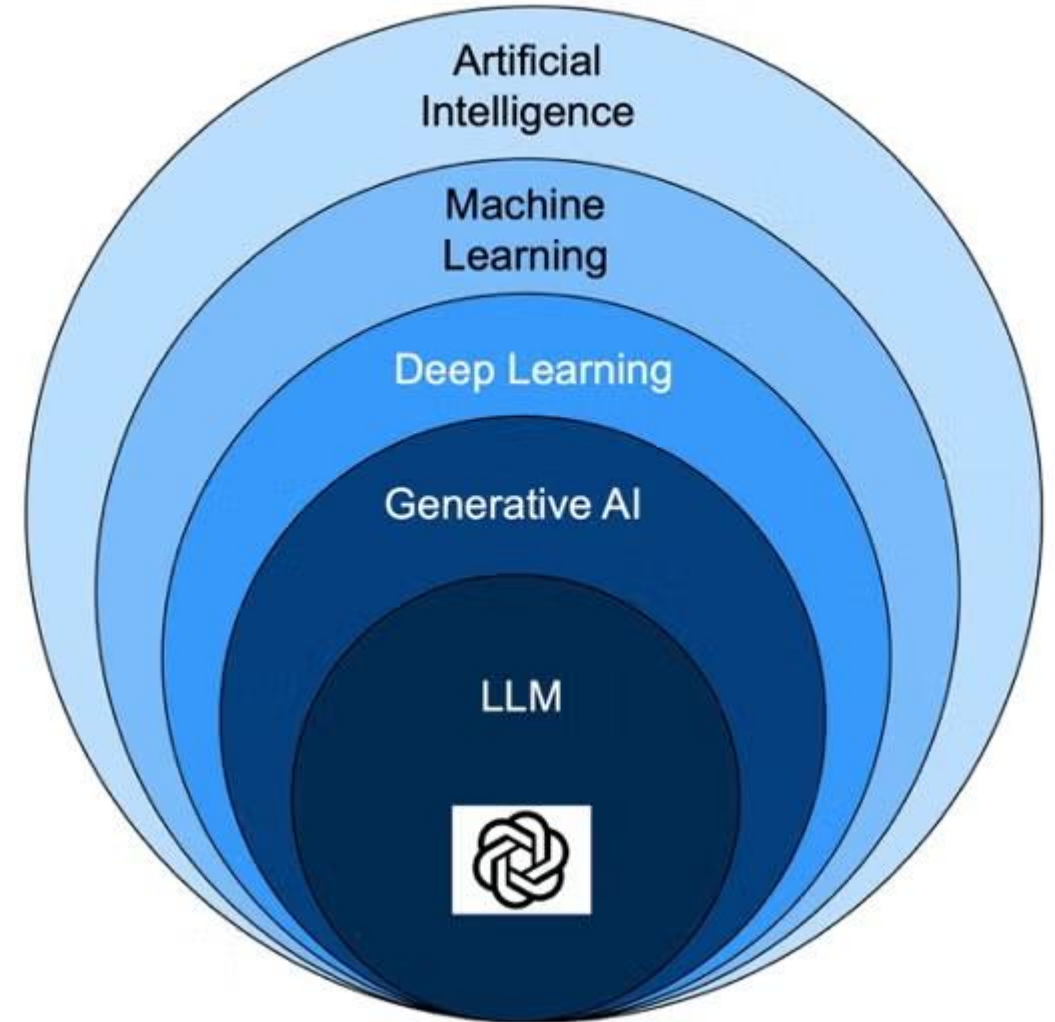
# How AI can help

- Woodwell has done ~50 climate risk assessments... but the world needs 4 million!
  - There are not enough climate scientists and experts to do this work
  - AI can help existing experts do more and train/enable more experts
- Almost all communities need to:
  - Upgrade infrastructure
  - Protect vulnerable populations
  - Update zoning and building codes
  - Engage stakeholders
- There is neither enough funding nor enough time to do this the old-fashioned way
- AI can help communities move faster and in the right direction with the same resources
  - AI can make recommendations based off the climate risk assessments
  - AI is very good at customizing complex information for many audiences of 1 (clone example)



# AI Overview

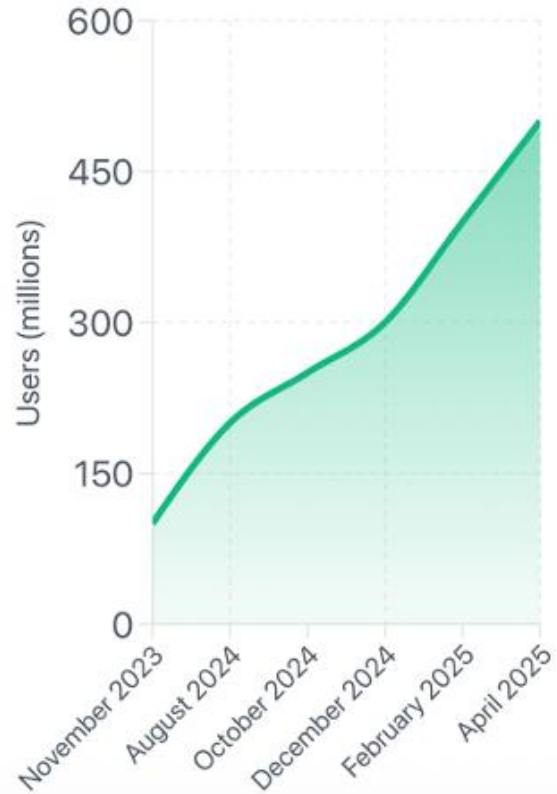
- “AI” is a broad term
- What most people mean now when they use this term is Generative AI / LLMs
- Why is this a big deal?
  - You can just talk to the computer, no coding needed → much more accessible
    - (only 0.5% of the world knows how to code)
  - It can create new content at a level that is useful and impressive



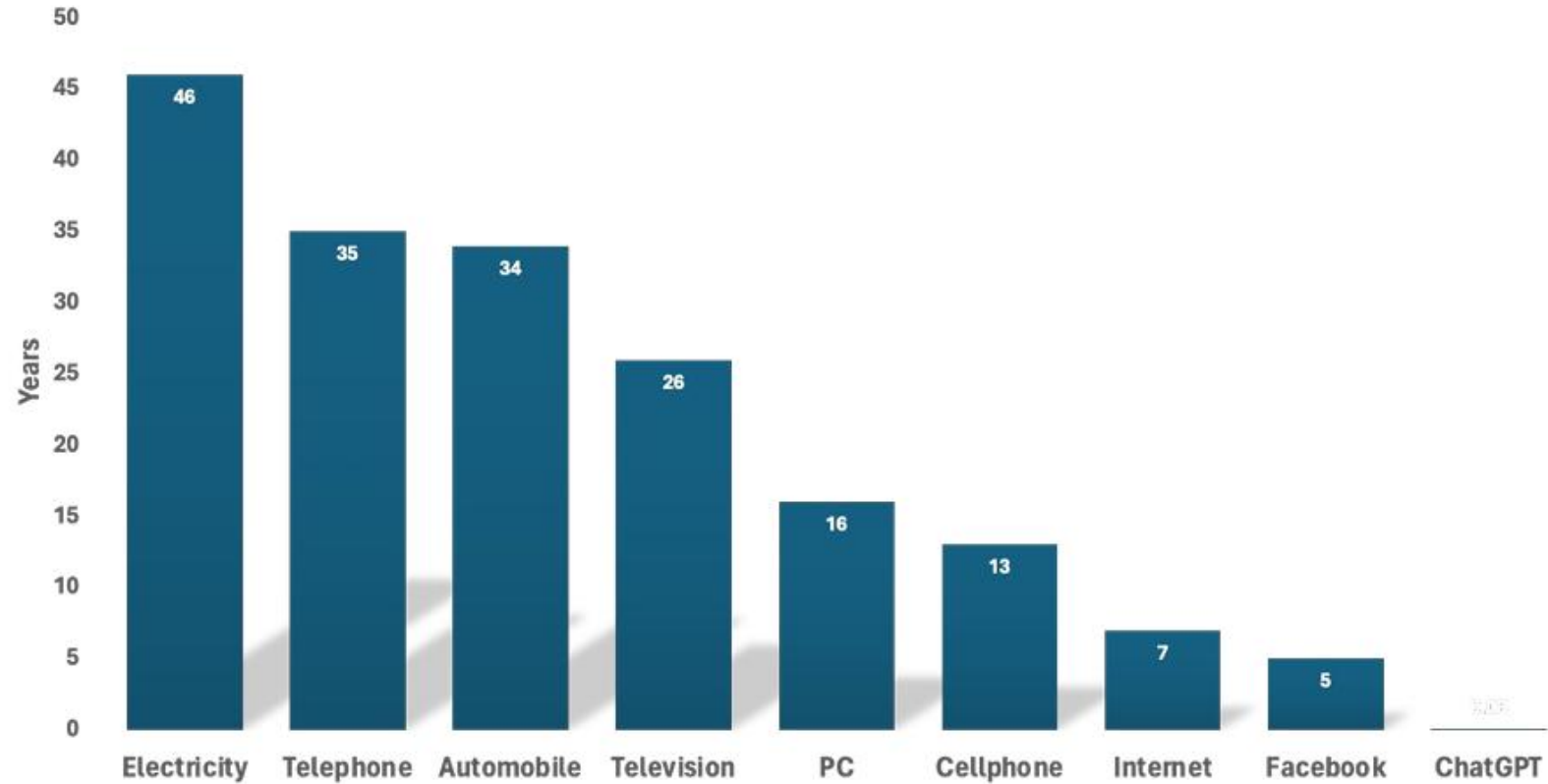
<https://it.tufts.edu/quick-primer-ai>

## ChatGPT's Explosive Growth

Weekly Active Users (in millions)



## ChatGPT reached 100M users in 60 days



<https://foundationmodelreport.ai/2025.pdf>

# GPT?

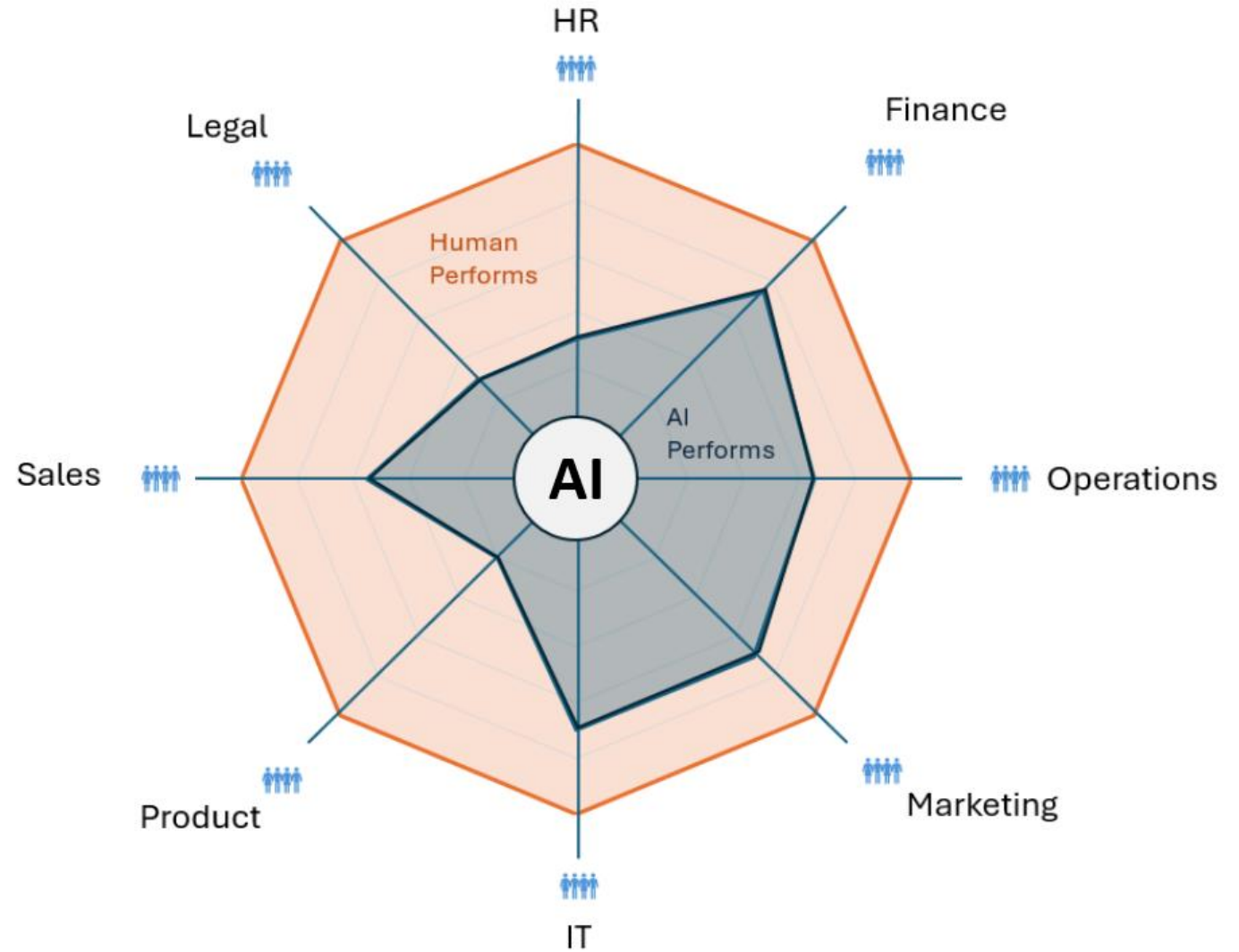
- GPT stands for generative pretrained transformer
  - Generative – It creates (generates) new content like text, code, or summaries.
  - Pre-trained – It's trained on a massive amount of data before you ever use it, learning general patterns in language.
  - Transformer – A type of deep learning architecture that understands the relationships between words in a sequence, regardless of their position. This allows the model to process entire sentences at once (not just one word at a time) and capture complex patterns in language.
    - Knowing that “bank” means something different in “river bank” vs. “money in the bank.”
- Basically, it's a really good autocomplete
  - Monday, Tuesday, Wednesday, \_\_\_\_\_
  - Peanut butter and \_\_\_\_\_
  - Summer people, some are \_\_\_\_\_

# Important Concepts about LLMs

- They are probabilistic
- They confidently make things up
- They often get things wrong
- They don't actually "understand" anything
- They are typically not plugged into real-time information
- Context and prompting matter greatly
- There are lots of different models with various strengths and weaknesses
- Need to keep testing as the frontier changes rapidly
- Human in the loop is important to proper use

# Jagged Frontier

- AI capabilities are uneven
- The frontier is jagged, not smooth
- Now is the worst it will ever be
- People / experts need to identify and fix the stuff that is wrong
- This can help improve AI
- Domain-specific testing is essential
- People must stay in the loop



(for illustrative purposes – not accurate %'s)

# Prompt to GPT-4o: When you are performing work, do you actually "understand" what you are doing?

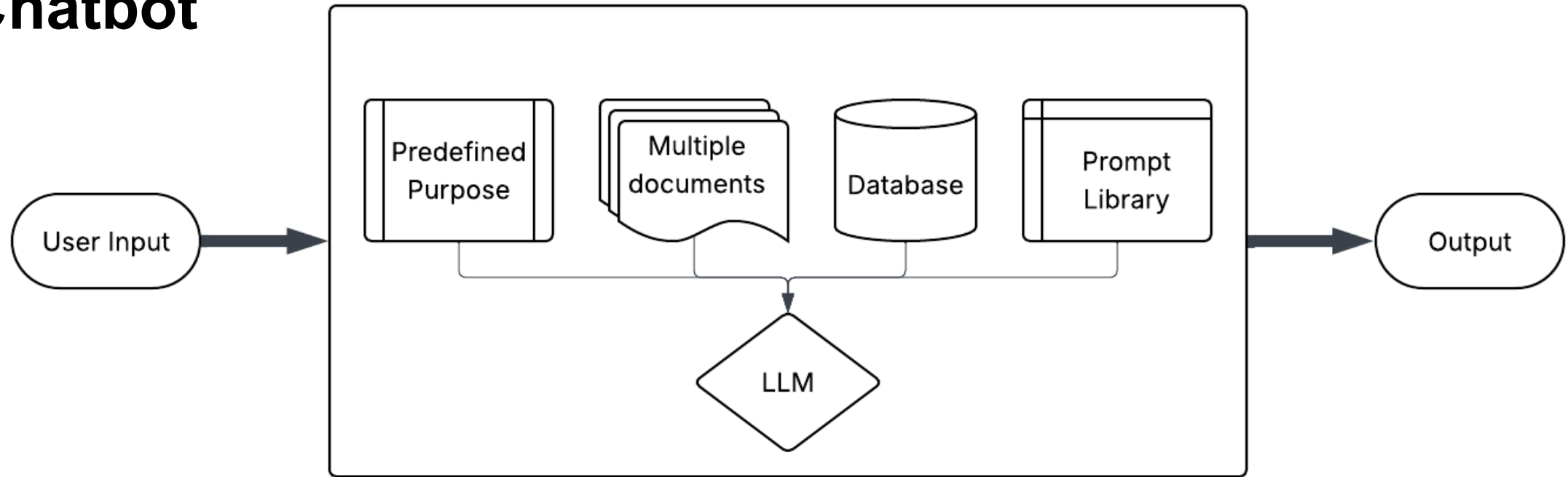
“Great question. The short answer is: **not in the human sense of understanding.**”

When I perform work—like answering questions, analyzing data, or generating text—I'm processing patterns in language based on training data and algorithms. I don't have consciousness, emotions, or subjective awareness. So:

- I don't “**know**” things like a person does. I generate likely responses based on probabilities learned from massive text corpora.
- I don't **understand meaning** intrinsically, but I can model relationships between concepts and simulate understanding to be useful in conversation.
- I can **follow logic, reason, and produce coherent arguments**, but it's all statistical pattern matching—there's no internal experience or comprehension behind it.

That said, my responses are often useful because they're built from the accumulated reasoning and writing of humans who *do* understand things. It's a bit like a mirror that reflects understanding without truly possessing it.”

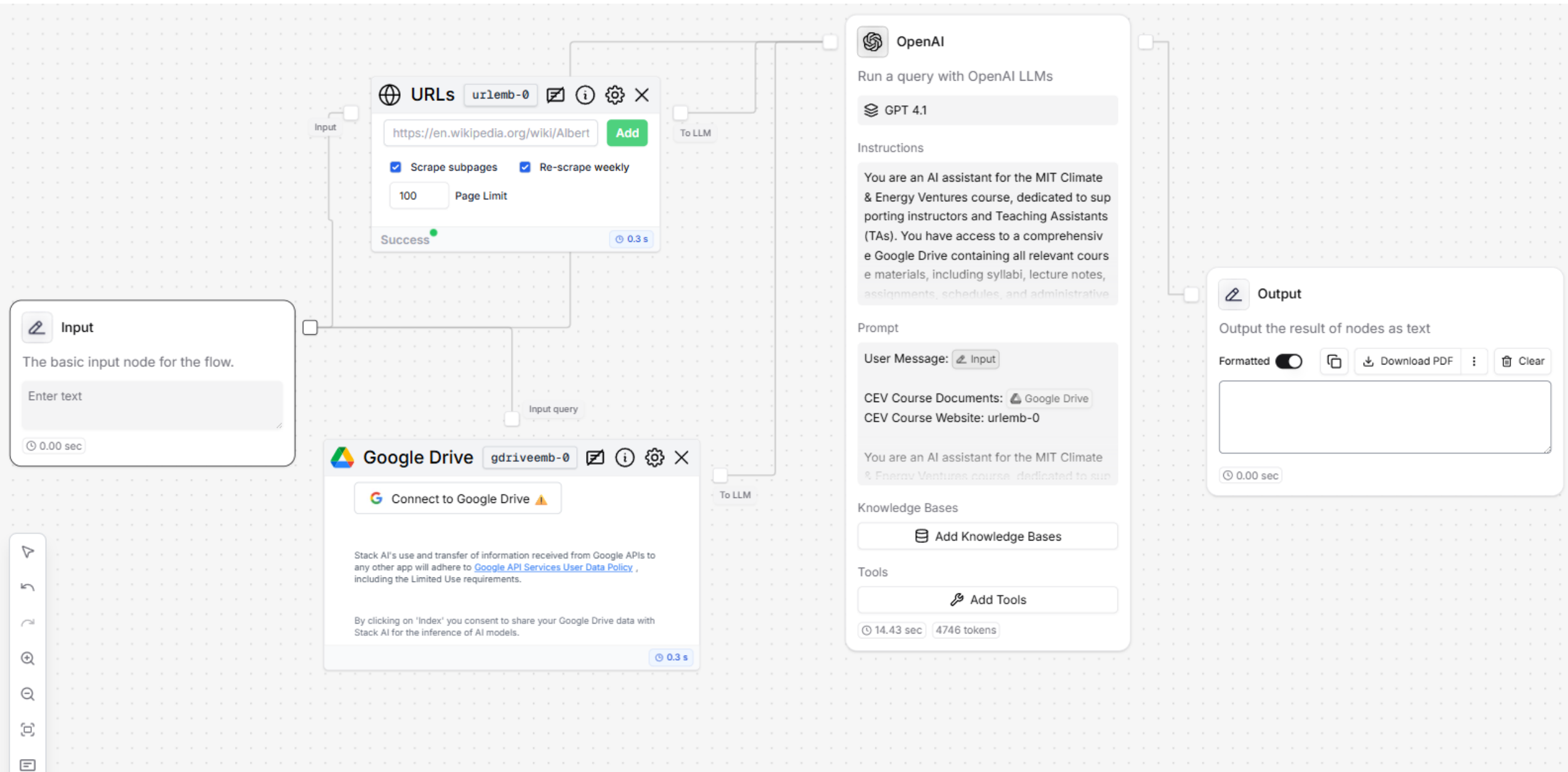
# Chatbot



- Data – MIT Climate & Energy Ventures Course materials and
- LLM – GTP 4.1 in Stack AI and ??? for Delphi
- Purpose – “You are an AI assistant for the MIT Climate & Energy Ventures course, dedicated to supporting instructors and Teaching Assistants (TAs). You have access to a comprehensive Google Drive containing all relevant course materials, including syllabi, lecture notes, assignments, schedules, and administrative documents. Be polite.”
- Edit tracking / audit capability – Depends



# Stack AI Example





**Tod Hynes**



Co-Founder, MIT Climate & Energy Ventures



Text



Voice



Video

## Prompt:

Assume you are the President of WHOI. Come up with a 1-page plan for a 1-week program at the WHOI campus to train ocean climate startup companies based on the CEV material.

## WHOI Ocean Climate Ventures Training Program

### Objective:

Train ocean climate startups to refine business models, integrate WHOI science, and scale impactful solutions.

### Program Overview:

A 1-week intensive at WHOI, blending CEV frameworks with ocean science expertise.

### Structure:

- Day 1: Foundations of ocean climate entrepreneurship.
- Day 2: Leveraging WHOI research for innovation.
- Day 3: Business model development and mentorship.
- Day 4: Scaling, funding, and partnerships.
- Day 5: Final presentations and expert feedback.

### Deliverables:

Refined business models, functional strategies, and connections to WHOI scientists and mentors.

### Target Audience:

Early-stage startups focused on ocean sustainability solutions.

### Outcomes:

Accelerate ocean climate innovation and position WHOI as a leader in fostering impactful ventures.

# MIT Jetpack Example

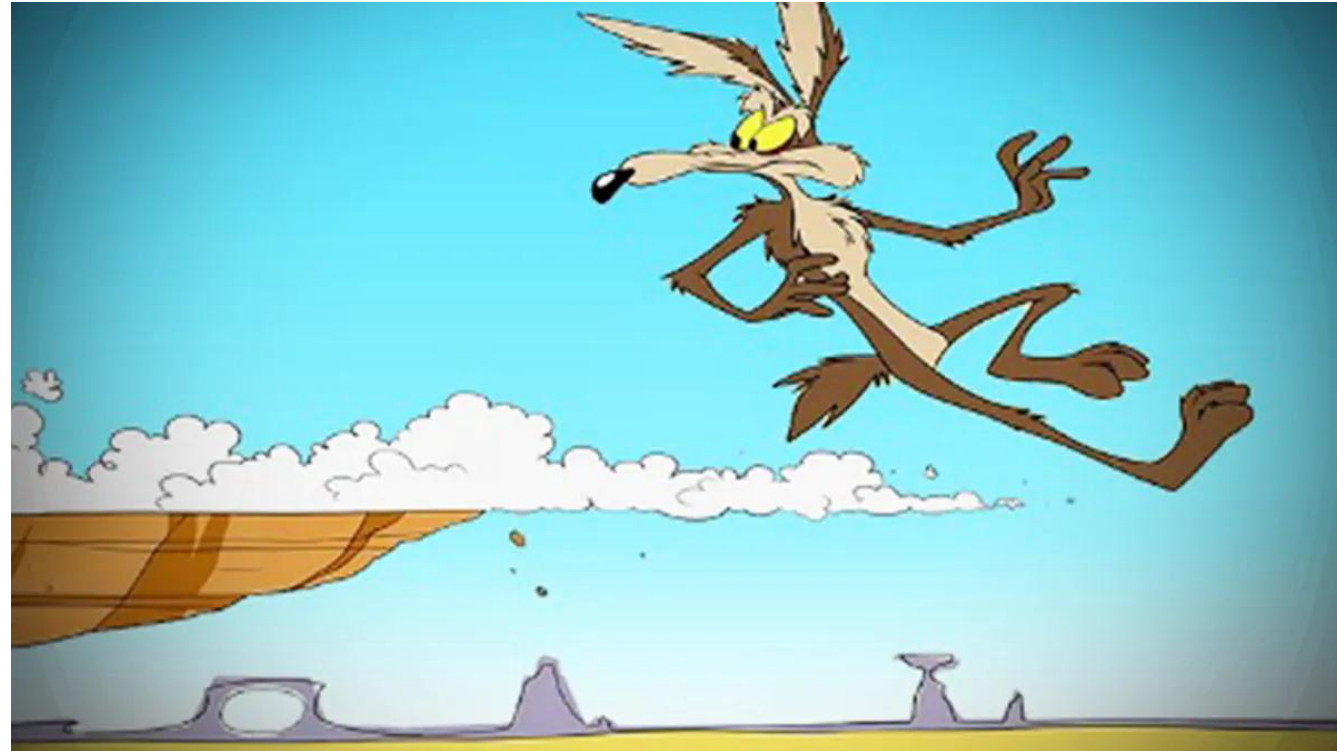
An AI agent is a system that perceives its environment, maintains internal state or memory, and takes actions toward achieving specific goals, often autonomously.



Feature	Chatbot	Agent (MIT - Jetpack)
<b>Primary Function</b>	Conversational interface	Task execution and action-taking
<b>Context Awareness</b>	Limited, mostly within a session	Persistent and contextually aware
<b>Autonomy</b>	Responds reactively to prompts	Proactively assists and automates tasks
<b>Integration</b>	May pull in tools if scripted	Integrated into user workflows and systems
<b>Memory</b>	Little to none	Remembers user preferences, context, and goals
<b>Example Actions</b>	Answering a question	Booking a meeting, filing a report, etc.

# Job Implications

- 30-70% of white-collar jobs are already gone, but people just don't know it yet?
- ...not really, you can cut your workforce by 50% or you can double your output with the same budget
- We don't know how AI will change the world
- We can influence how AI and humans work together
- Need to have a growth mindset, learn how to use AI, learn by doing, and go after a problem you care about.



“I feel like Wile E. Coyote realizing the we are already off the cliff”

- 40+ year AI expert

# Energy implications

- Training energy for flagship LLMs grew from ~ 1 MWh to > 60,000 MWh in four years
  - Average home uses ~10 MWh per year
- Future frontier models could breach 200,000 MWh
- Using AI for search uses more energy than traditional search
- Data center electricity consumption in the U.S. is ~5% of total demand. This is expected to grow to ~12% in the next ~5 years.

## Some Solutions:



Bring fiber optics deeper into compute → 80–90% lower I/O energy use



LPUs instead of GPUs  
80-90% lower energy consumption

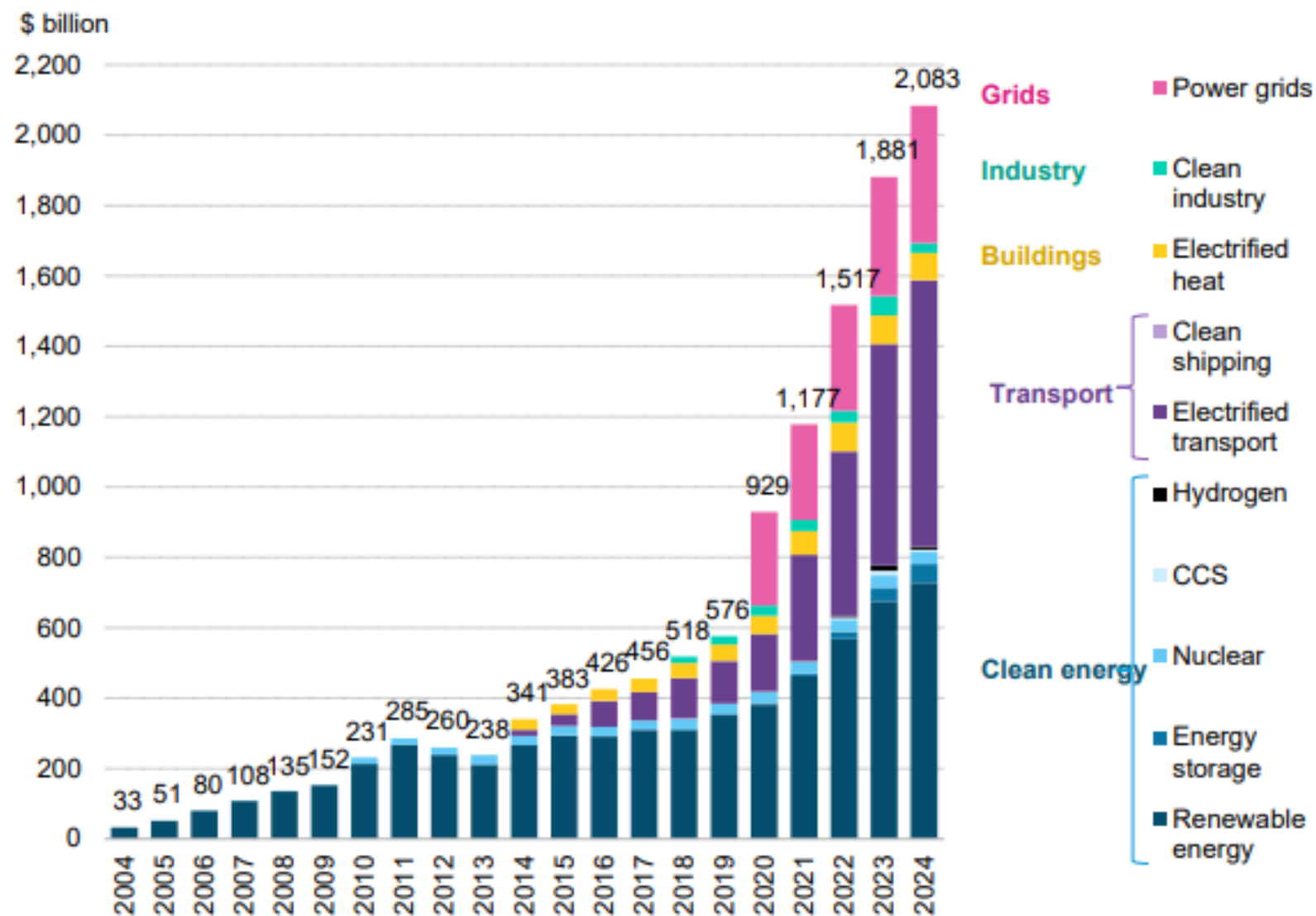


More efficient model design reduces energy use by over 50%



Use the waste heat to provide hot water where it's needed

## Global investment in energy transition, by sector

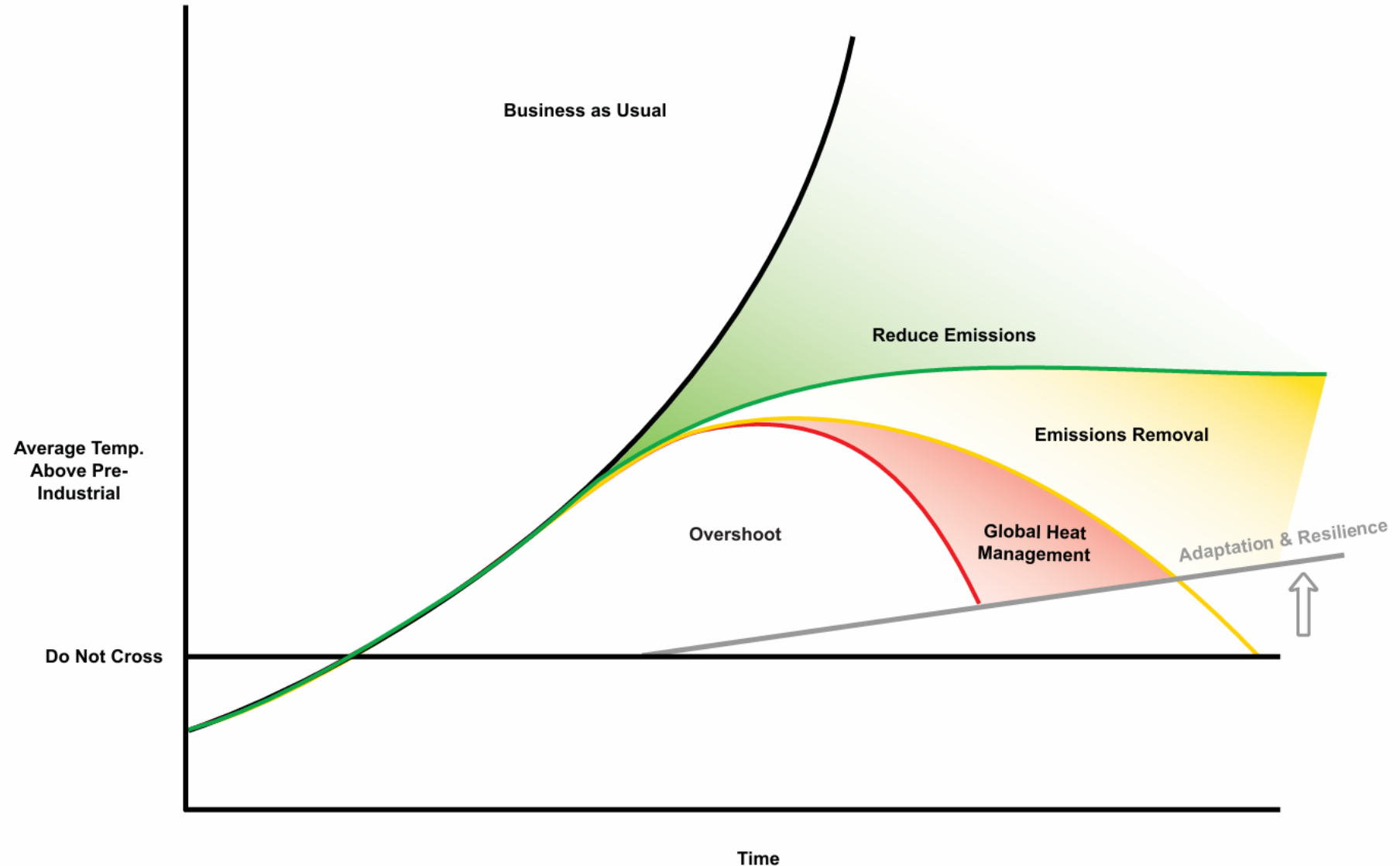


Source: BloombergNEF. Note: Start years differ by sector but all sectors are present from 2020 onwards; see [Methodology](#) for more detail. Most notably, nuclear figures start in 2015 and power grids in 2020. CCS refers to carbon capture and storage.

# Multi-trillion-dollar industries

(at some point for last 3)

- Reduce Emissions
- Remove Emissions
- Adaptation & Resilience
- Global Heat Management

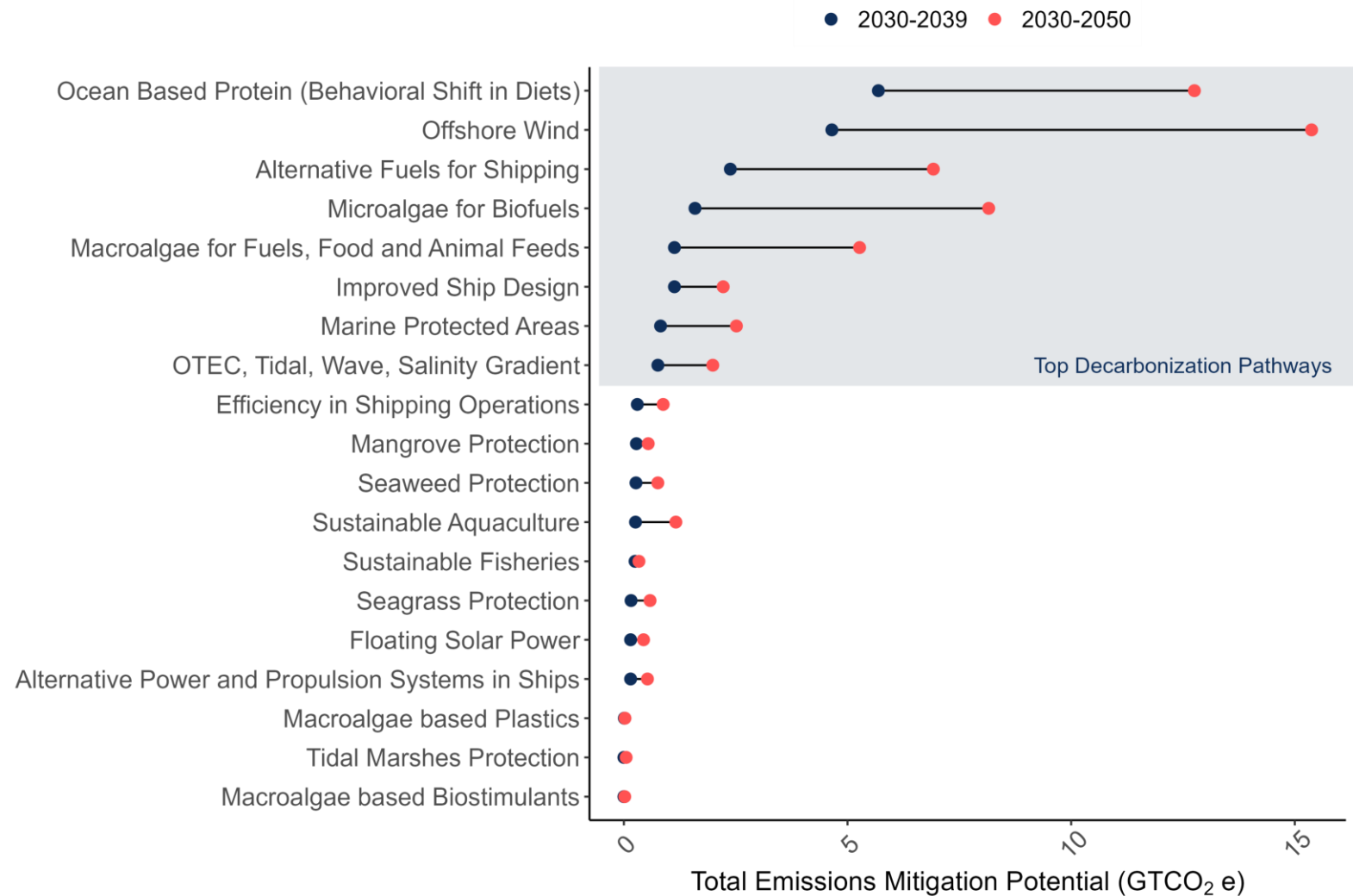




# Ocean Based Protein

## \$1+ Trillion

Global fish market was valued at USD **358.68 billion** in '23 and is projected to reach USD **837.17 billion** by '32, exhibiting a compound annual growth rate (CAGR) of 10.14%



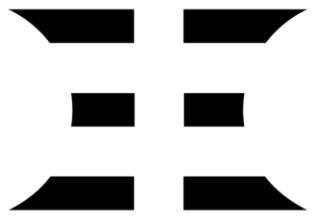


# Aquaculture

Havfarm 1



Ocean Farm 1



# MEER



“experiments have shown that housing within Kroo Bay can be cooled by up to 7 degrees Celsius with the right adaptations”

[www.meer.org](http://www.meer.org)



# Ridiculously simple idea cuts cargo ship emissions by 17.3% in first trials



- **SLOW DOWN! ... without delaying delivery times**
- Avoid industry standard practice of “Sail fast, then wait”

## BLUE VISBY SOLUTION

Cumulative CO<sub>2</sub> savings  
For voyages to Port Hedland in 2019



Average speed



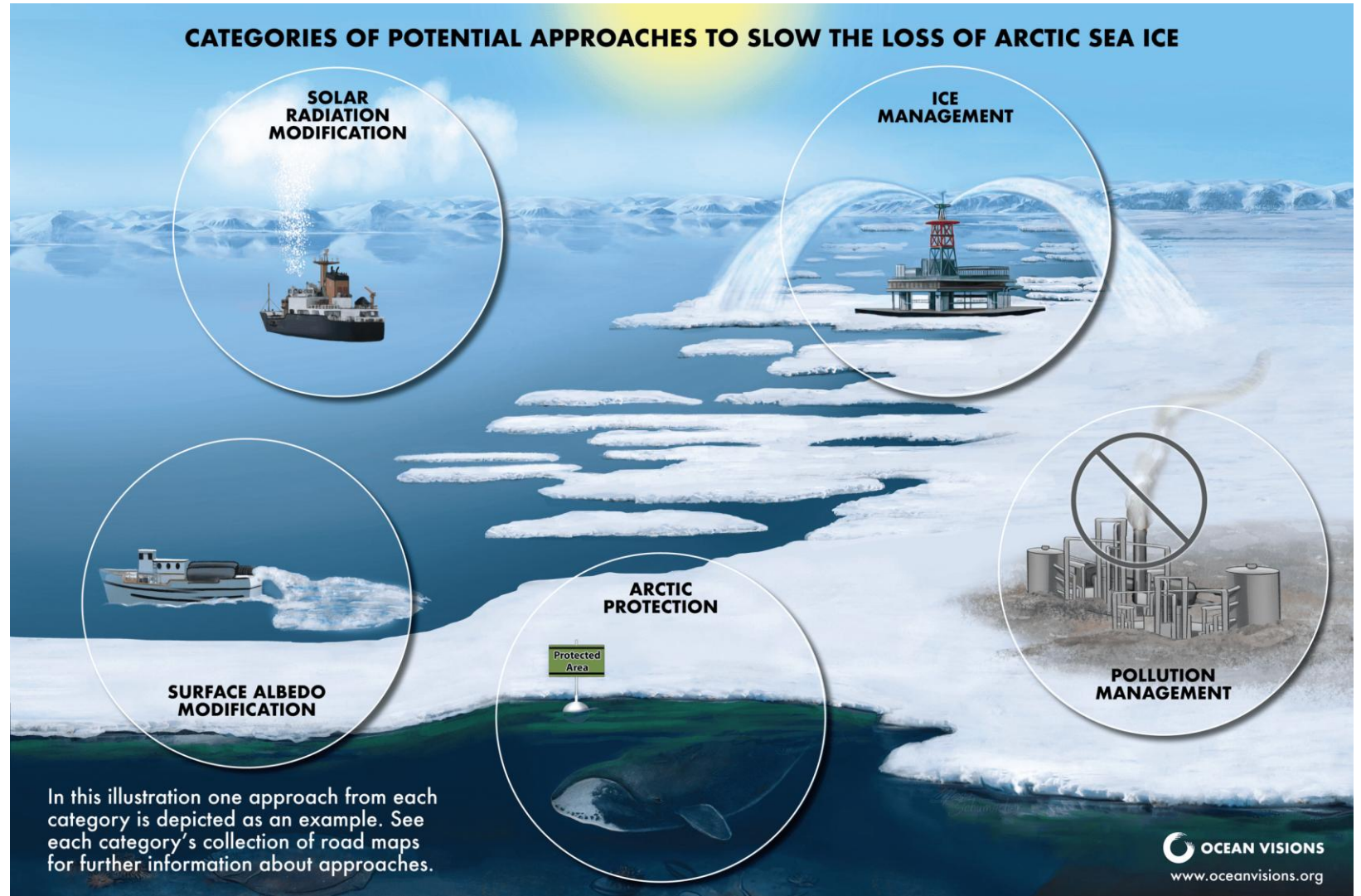
<https://bluevisby.com/>

<https://newatlas.com/marine/blue-visby-cargo-emissions/>

# Sectors we have barely thought of...



- Arctic Ice Preservation
- George Woodwell  
“Re-freeze the Arctic”







# Thank you

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