
The Tipping Point
Is it too late?
April 2, 2026

I will start with the conclusion

01 We have reached the "**tipping point**" in global warming - the point where "we" can no longer control the warming

02 We have at least 5 interrelated tipping points

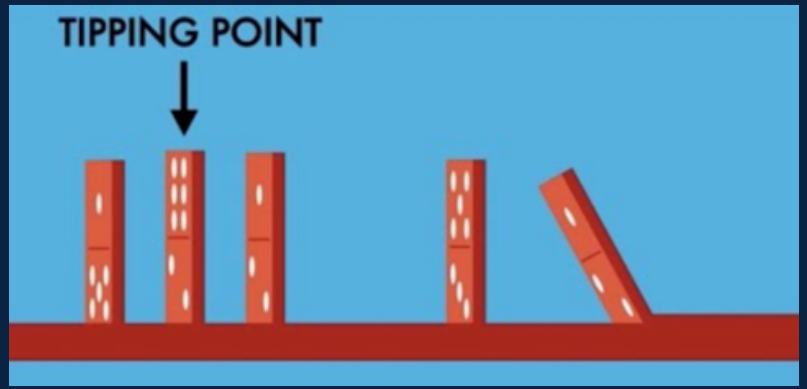
03 NOTE: I'm not a climate scientist, a meteorologist, or a geologist . . . *but I can add 2 and 2 and get 4.*

PART 1

GLOBAL WARMING

The Tipping Points

Understanding irreversible thresholds in the Earth's climate system



We'll Cover Six Areas Today

01 **What is a Tipping Point?**
The concept of irreversibility in climate science

02 **The 1.5°C Threshold**
Why this number matters more than any other

03 **Five Major Tipping Systems**
Ice, forests, ocean, permafrost, coral reefs

04 **Cascading Effects**
How tipping points can trigger each other

05 **Where We Stand Today**
Current data and trajectories

06 **Pathways Forward**
What science tells us about our options

What Is a Climate Tipping Point? And what's the problem?

Definition

A tipping point is a critical threshold in the climate system. Once crossed, a relatively small additional change triggers a self-reinforcing shift to an irreversible state.

Think of it like a domino that, once pushed, keeps falling on its own — no more pushing needed.

Here's the problem

- No one wants to admit we have reached the tipping point. . . "If we act now, we still have time to solve the problem."
- Politicians and corporations kick the can down the street and pass the buck to their kids and grandkids
- Problem:
  As long as we emit ***anything***, we add the to GHG already in the atmosphere - and things get worse!

PART 2

The Paris Agreement <1.5 ℃ before 2030

The 1.5°C Threshold — Why Does It Matter?

+1.4°C

⚠ Current status

Recorded (2024)

1.5°C

Paris Agreement
2030 target ceiling

2.0°C

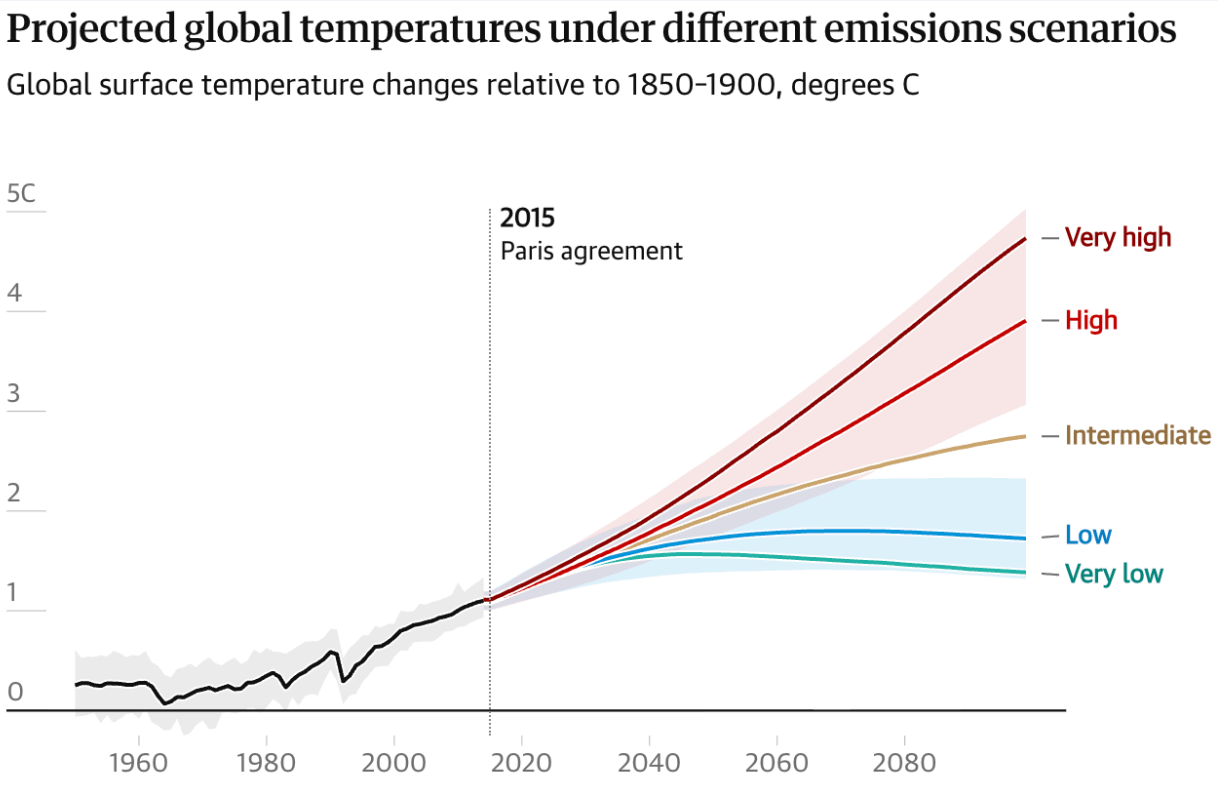
Upper bound before
critical risk rises sharply

Why 1.5°C?

- Research shows tipping risk jumps dramatically between 1.5° and 2°C
- We are already at ~1.44 °C and rising - the uncertainty is ~ ±0.13°C

- In Paris, the **Yr 2100** threshold was set at 3˚C
- Then, after COP26 in Glascow (2021), which reaffirmed the 1.5C pledge, carbon-cutting commitments brought the projected temperature rise to about 2.8˚C.
- Today, after COP30 in Brazil, the forecast stands at about 2.5˚C - *if* all existing promises are fulfilled.

The 1.5°C Threshold — Why It Matters

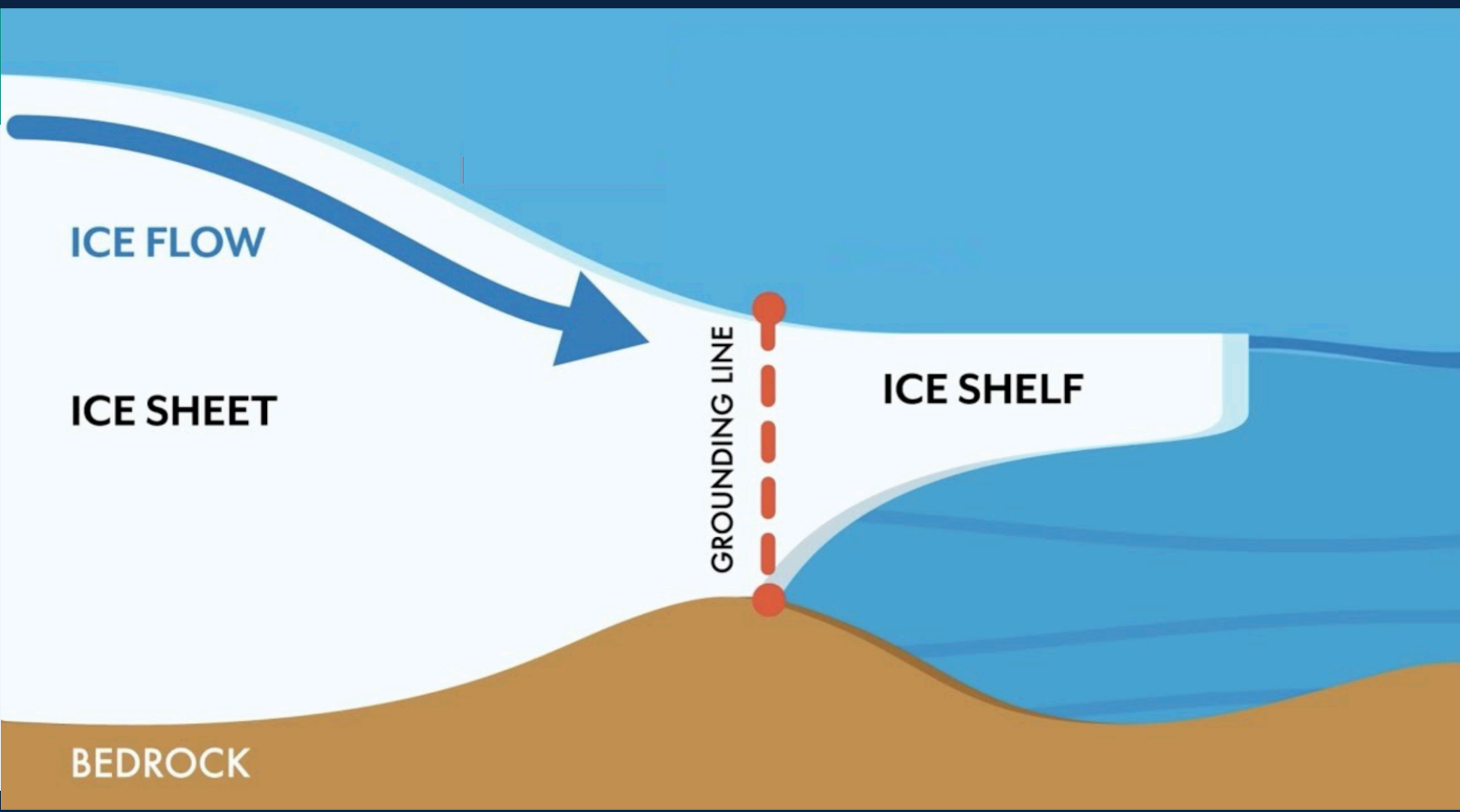


- Research shows tipping risk jumps dramatically between 1.5° and 2°C
- Multiple tipping points may become unavoidable above 2°C
- The difference of 0.5°C corresponds to millions of people affected
-

PART 3

The Five Major Tipping Systems

Ice Sheets · Amazon · Permafrost · Ocean Circulation · Coral Reefs


ICE FLOW
ICE SHEET
GROUNDING LINE
ICE SHELF
BEDROCK

Tipping Point 1: Ice Sheets — Greenland & Antarctica

The Mechanisms

Ice-Albedo Feedback: As ice melts, darker ocean and land is exposed. Dark surfaces absorb more heat, melting more ice — a self-reinforcing loop.

Greenland: Could be destabilized at 1.5–2°C. Full melt would raise sea levels by ~7 metres over centuries.

West Antarctic Ice Sheet: Marine ice sheet instability means collapse is already underway.

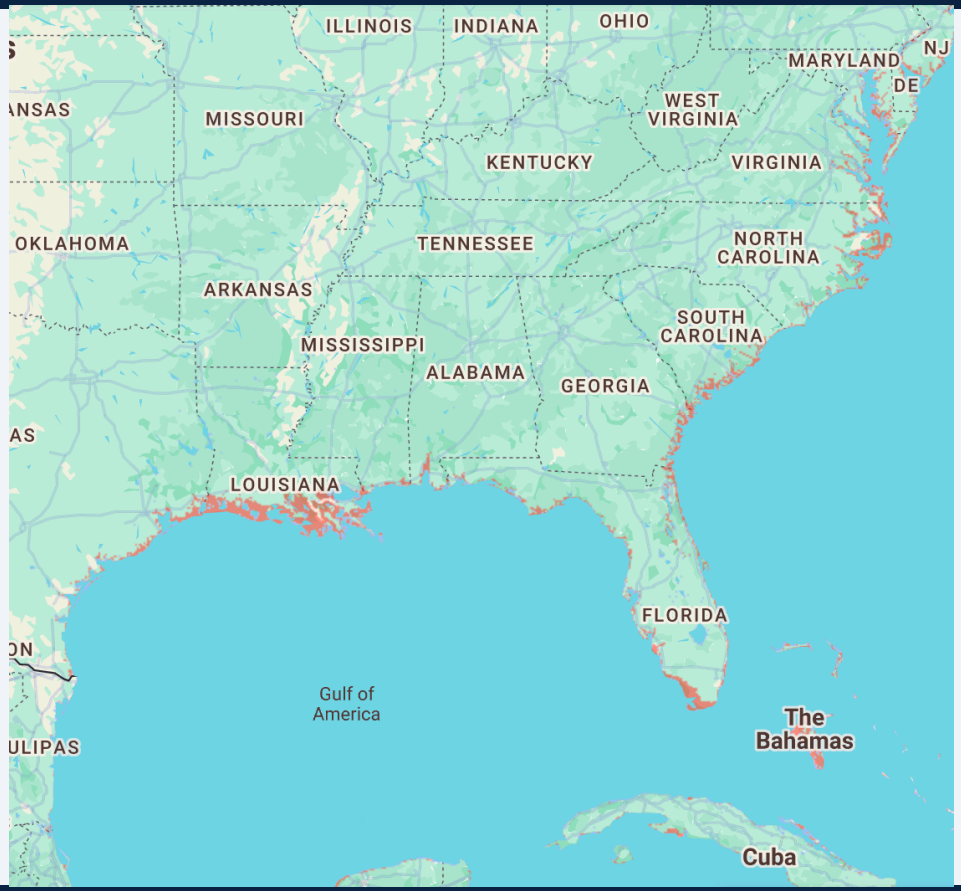
~7 m Sea level rise from full Greenland melt (centuries)

~3.3 m Additional sea level rise from West Antarctic collapse

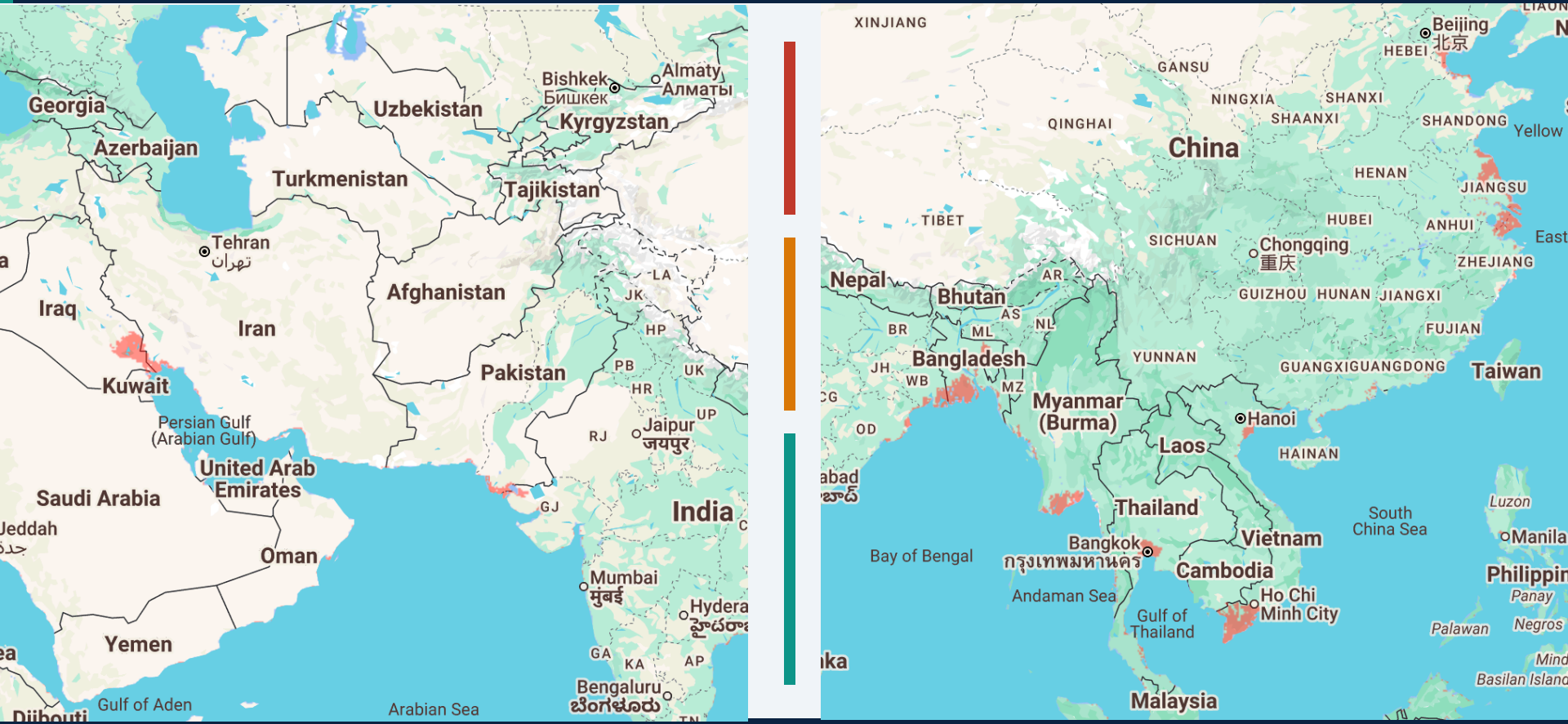
Key warning signs observed:

- Loss of ice mass has quadrupled since the 1990s
- Thwaites glacier showing accelerating retreat

Tipping Point 1: Ice Sheets — Greenland & Antarctica



Tipping Point 1: Ice Sheets — Greenland & Antarctica



Tipping Point 2: Amazon Rainforest Dieback

The Mechanism

The Amazon creates its own rainfall. Trees recycle moisture through rain-evaporation, which sustains the forest.

Current status: ~17% is already deforested. Some eastern regions are already emitting more CO_2 than they absorb.

The feedback loop: Deforestation reduces rainfall → trees die of drought → more deforestation → less rainfall. Past 25%, the whole system may tip to savanna.

~17% of the Amazon already deforested — decreases the ability to absorb CO_2

If the Amazon tips:

- Release of 90 billion tonnes of CO_2 stored
- Loss of the world's largest biodiversity reservoir
- Disruption of rainfall patterns across South America
- Collapse of agricultural systems in the region

Tipping Point 3: Permafrost & Methane Release

The Mechanism

Permafrost is permanently frozen ground covering ~25% of the Northern Hemisphere's land surface.

It contains well over **2,000 billion tonnes of organic carbon** — twice the amount currently in the atmosphere.

As it thaws: Organic material decomposes, releasing CO_2 and CH_4 (methane. Methane is 70-80× more potent than CO_2 .

1.7 Gt CO_2

Permafrost emits an estimated 1.7 Gt CO_2 per year

~4°C

Arctic warming rate — 4× faster than global average

Already observed:

- The thawing of the Siberian, Alaskan/ Canadian permafrost is decades ahead of models
- Landscape goes into thermokarst collapse

Tipping Point 4: Ocean Circulation (AMOC)

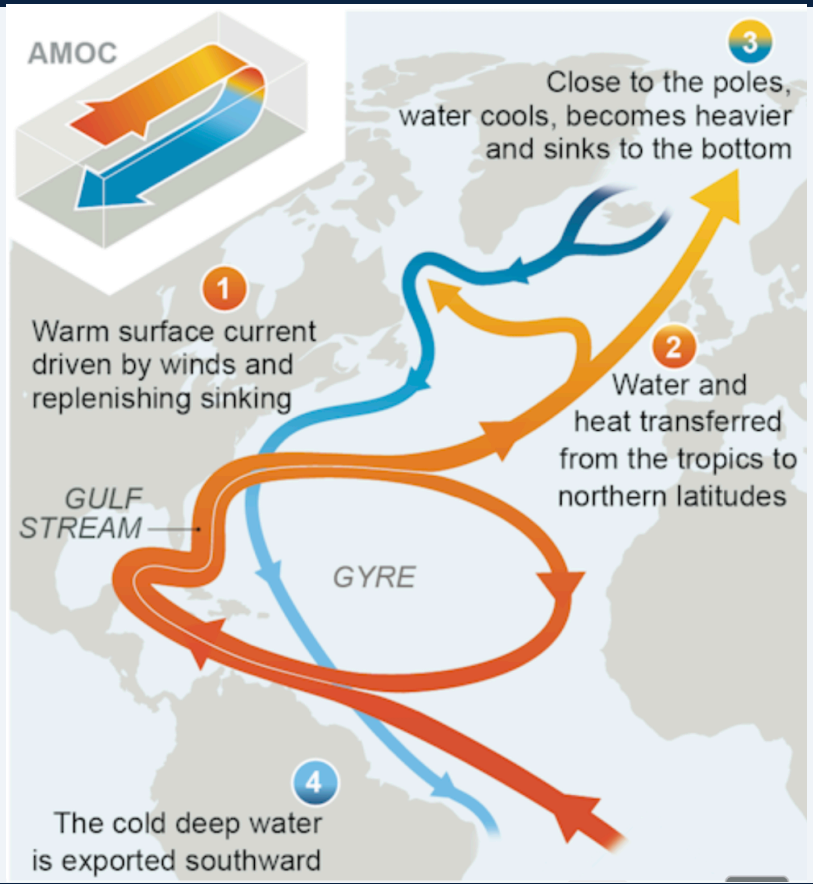
Atlantic Meridional Overturning Circulation

The Mechanism

The **AMOC** Circulation is the ocean conveyor belt that moves warm water north and cold water south — regulating climate across Europe and North America.

The disruption: Fresh meltwater from Greenland *reduces* ocean salinity, weakening the density-driven circulation.

AMOC formed around 34 million years ago when tectonic plates closed the Arctic-Atlantic gateway



Tipping Point 4: Ocean Circulation (AMOC)

Atlantic Meridional Overturning Circulation

Consequence of collapse:

- Europe cools by 5–10°C — despite warming
- Disruption of monsoons in Africa and Asia
- Shifts in major rainfall patterns globally
- Phytoplankton - the base of the ocean's food-chain - becomes less protein rich, more carbon-heavy, and lower in nutrients

Weakest in 1,000 years

Current AMOC strength, based on proxy data

2025–2095

Estimated window for potential collapse under high-emissions scenarios

Note on uncertainty:

The timing of the AMOC collapse is one of the more uncertain tipping points . . .
- but the direction of change is undisputed

Tipping Point 5: Coral Reef Collapse

50% of the world's coral already lost since the 1950s

The tipping:
At 1.5°C, 70–90% of coral reefs will be severely damaged. At 2°C, over 99%.

The 2023–2024 mass bleaching:

affected over 60% of the world's reefs — the most severe ever recorded - - with limited signs of recovery

Tipping Point 5: Coral Reef Collapse

The Mechanism

Coral bleaching occurs when ocean temperatures rise just 1–2°C above the seasonal maximum.

Stressed corals expel their **symbiotic algae**, which are the food source for corals. Without it, corals die within weeks to months if heat persists.

Ocean acidification (by absorbed CO_2) dissolves the coral calcium carbonate structures

50% of the world's coral already lost since the 1950s

The tipping:
At 1.5°C, 70–90% of coral reefs will be severely damaged. At 2°C, over 99%.

The 2023–2024 mass bleaching:

affected over 60% of the world's reefs — the most severe ever recorded - - with limited signs of recovery

PART 4

The Cascading Effect

Ice Sheets · Amazon · Permafrost · Ocean Circulation · Coral Reefs

Cascading Effects — When Tipping Points Trigger Each Other

The most dangerous scenario: Tipping points do not act independently. Crossing one can trigger others — creating a chain reaction that pushes the entire Earth system toward a new, hostile equilibrium.

Arctic warming → **Permafrost thaw** → **CO_2 & CH_4 release** → **More warming** → **Ice sheet melt**

Arctic Amplification Loop:	Ice melts → darker surface → more heat absorbed → more ice melts → permafrost thaws → methane released → more warming
Amazon–Rainfall Cascade:	Deforestation → less rainfall → more forest die-off → less rainfall → drought spreads → carbon release → faster global warming
Ice–Ocean–Atmosphere Loop:	Greenland melts → AMOC weakens → heat stays in tropics → more evaporation → more CO_2 in ocean → coral bleaching → coastal flooding

PART 5

Where Do We Stand Today?

We emit ~38-54 Gt of “man-made” GHG per year

What are the GHG?

Gas / category	Share of total GHG
CO_2 (fossil fuels + cement)	~75–80%
CH_4 (methane)	~10–15%
N_2O (nitrous oxide)	~5–7%
Fluorinated gases	~1–3%

Where do they come from?

Sector (all gases)	Share of total GHG
Energy (power, heat)	~25–30%
Agriculture & land-use	~20–25%
Industry	~20–25%
Transport	~15-20%
Buildings	~5–10%
Waste	~3–5%

Records Are Falling — Recent Climate Extremes in the past 3 years

2023 Hottest year on record
Global average 1.45°C above pre-industrial baseline

2023 Canadian wildfires
Largest wildfires in Canada's recorded history; 18 million ha burned

2023 Ocean heat record
All-time high ocean surface temperatures — by a large margin

2023 Antarctic sea ice
Lowest extent on record — 1 million km² less than when first recorded

2023-24 Global coral bleaching
4th mass bleaching event — largest in recorded history

2024 First year above 1.5°C
A threshold that was once discussed as decades away

Records Are Falling — Recent Climate Extremes in the past 3 years

2023 Hottest year on record
Global average 1.45°C above pre-industrial baseline

2023 Canadian wildfires
Largest wildfires in Canada's recorded history; 18 million ha burned

2023 Ocean heat record
All-time high ocean surface temperatures — by a large margin

2023 Antarctic sea ice
Lowest extent on record — 1 million km² less than when first recorded

2023-24 Global coral bleaching
4th mass bleaching event — largest in recorded history

2024 First year above 1.5°C
A threshold that was once discussed as decades away

2026 may go down as the worst year for Colorado River flows in recorded history.

Even though we know we have a problem . . .

Observed warming is unprecedented in 2,000 years. CO_2 levels are highest in 800,000 years.

We are already experiencing tipping point early warnings. Arctic amplification is accelerating. Sea level rise is accelerating.

Exact timing and sequence of cascades. Possibility of rapid AMOC collapse. Extent of permafrost methane release.

. . . we keep saying . . .

"The crisis is close to catastrophic, but we still have time to do the right thing and avoid the crisis."

- "Together, we can reduce emissions and help safeguard a future climate where humans can thrive."

STRATEGY: FIRST, WE IGNORE IT - AND WE ACT RECKLESSLY STUPID

IGNORANCE

- Politicians in particular love agreements and targets. They think (?) that if we only meet the Paris targets and stay below **1.5˚, we have the situation under control.**

RECKLESSNESS

. . . they allow and preside over these follies:

- >1,100 new **coal-fired power plants** are being built around the world (#1 and #2 are China and India)

- Since Paris, the world's largest financial institutions have invested >$267 billion in agri/land-use/forest projects that are responsible for **deforestation**

THEN, WE DO A LITTLE BIT

⚡ Decarbonise energy

Transition from fossil fuels to renewables. Solar and wind are now cheapest energy sources in history.

🌳 Halt deforestation

Protect and restore forests, particularly the Amazon. Sequester ~2.6 Gt CO_2/year.

🌾 Transform food systems

Agriculture contributes ~25% of global emissions. Dietary shifts and reduced food waste are critical.

🚆 Electrify transport

Shift to EVs, cycling, and public transport. Transport = ~16% of global emissions.

🏗️ Improve efficiency

Buildings, industry, and appliances represent large efficiency gains available now.

💰 Price carbon

Market signals to make fossil fuels reflect their true cost. Currently 23% of emissions are covered by carbon pricing.

PART 6

Pathways Forward

What do we *have* to do?

WE NEED TO DO MORE . . .

We adapt . . .

. . . meaning building resilience to unavoidable impacts

- Coastal and flood **defences** for sea level rise
- Drought-resistant **crop varieties**
- Heat-resilient urban **planning** and green spaces

- Managed **retreat** from high-risk coastal zones
- Strengthened early **warning** systems
- Coral reef restoration **projects**

All are slow, high-cost activities that require a lot of time and energy

THEN WE DO A LOT MORE (and that is good for business)

Emerging Technologies

- **Bioenergy + CCS (BECCS):** Requires large land area
- **Enhanced weathering:** Early-stage research capturing -CO_2 and make it into -CO3 and -CO4
- **Stratospheric aerosol injection:** High risk — alters rainfall patterns globally
- **Direct Air Capture (DAC):** Capture CO_2 and store it deep underground demand

Where do we look?

Sector (all gases)	Share of total GHG
Energy (power, heat)	~25–30%
Agriculture & land-use	~20–25%
Industry	~20–25%
Transport	~15–2 edição}
Buildings	~5–10%
Waste	~3–5%

THEN WE REALIZE THAT THAT'S NOT ENOUGH

With current/coming technologies, we can remove about

2 Mt of CO_2 per year

BUT . . . we emit ~**38 Bn metric tons of CO2** per year!

That is **10,000 times more** than our capabilities JUST to remove what we put in every year (at the *current* level)!

- The cost of that is estimated to be >$1Tn/yr for the next 30 years

And that is not even REDUCING to CO_2 *already* in the atmosphere.

If we want to reduce CO_2-levels from today's 420 ppm to the 1900-level of 280 ppm, we would have to REMOVE

> 1 million times more

than existing removal technology can handle.

BUT WE HAVE EVEN BIGGER PROBLEMS! Three in fact . . .

Canadian Tundra

Due to the warming in the past decade, the Canadian tundras are thawing and releasing huge amounts of GHG

An estimated 1 Tn tons GHG is stored, and has started releasing the GHG and will accelerate as global temperatures rise.

Siberian Tundra

Due to the warming in the past decade, the Siberian tundras are thawing and releasing huge amounts of GHG

An estimated 1 Tn tons GHG is stored, and has started releasing the GHG and will accelerate as global temperatures rise.

The Cuvette peat

…located in the Congo Basin of Central Africa . This peat-like area, the size of England and 10-25 ft deep, holds about 1/3 of all peat lands in the world.

An estimated GHG stored: 110 billion metric tons of CO_2-e is stored. It started releasing CO_2 five years ago

5 Key Takeaways - My opinion . . . 2 + 2 = 4

1/2 Tipping points are here - the evidence is robust. Multiple Earth systems are approaching, and some have already crossed critical thresholds.

2/2 Individual tipping points are serious; chains of tipping points will be beyond our capacity to manage.

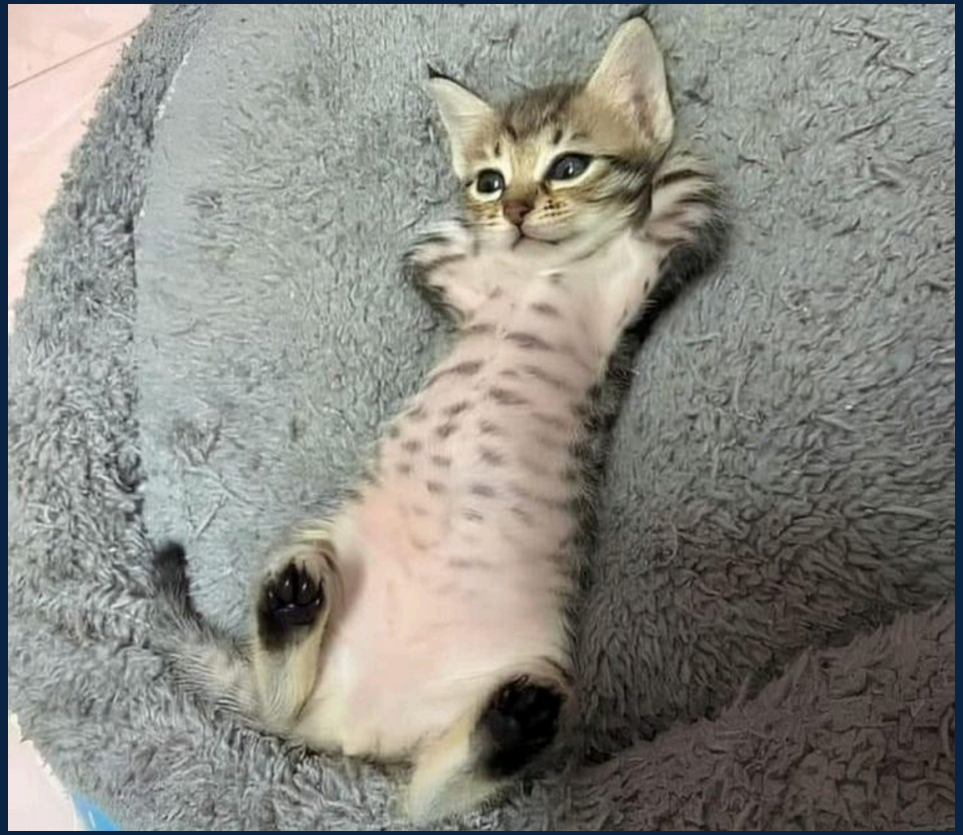
1/2 As long as we emit GHG, we contribute to worsening the situation - but even with the complete elimination of all man-made GHG, we cannot halt the catastrophe!

2/2 We must do what we can! Every 0.1°C avoided will reduce risk, save lives, and buy us some time

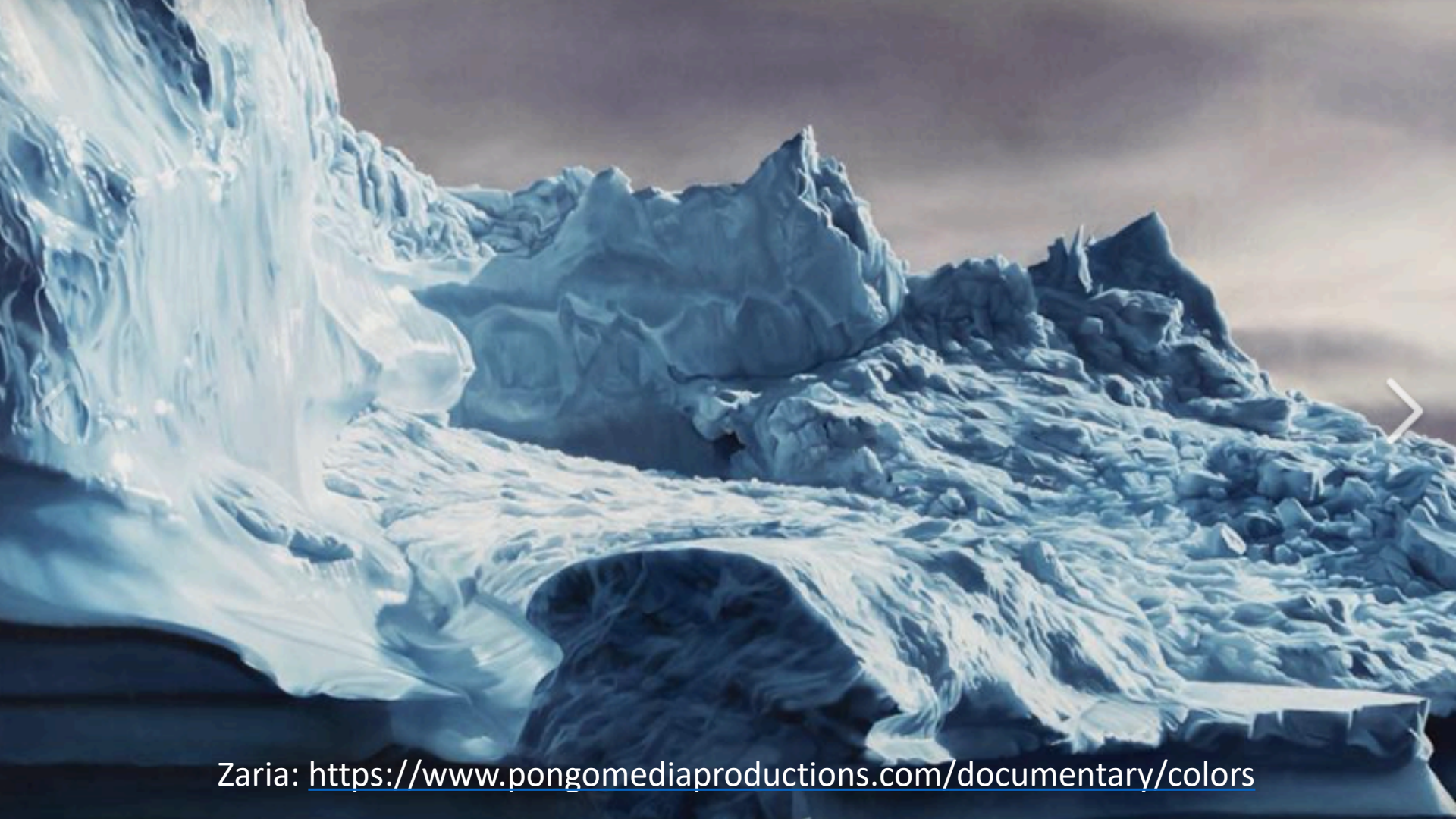
4 We have reached the point where global warming is running amok!
Precisely WHEN that will be in full swing, we don't know!

We can only hope I'm completely wrong!

Thank You



Aah!
I’m done now!



Zaria: https://www.pongomediaproductions.com/documentary/colors