AN INDEPENDENT PRESENTATION OF

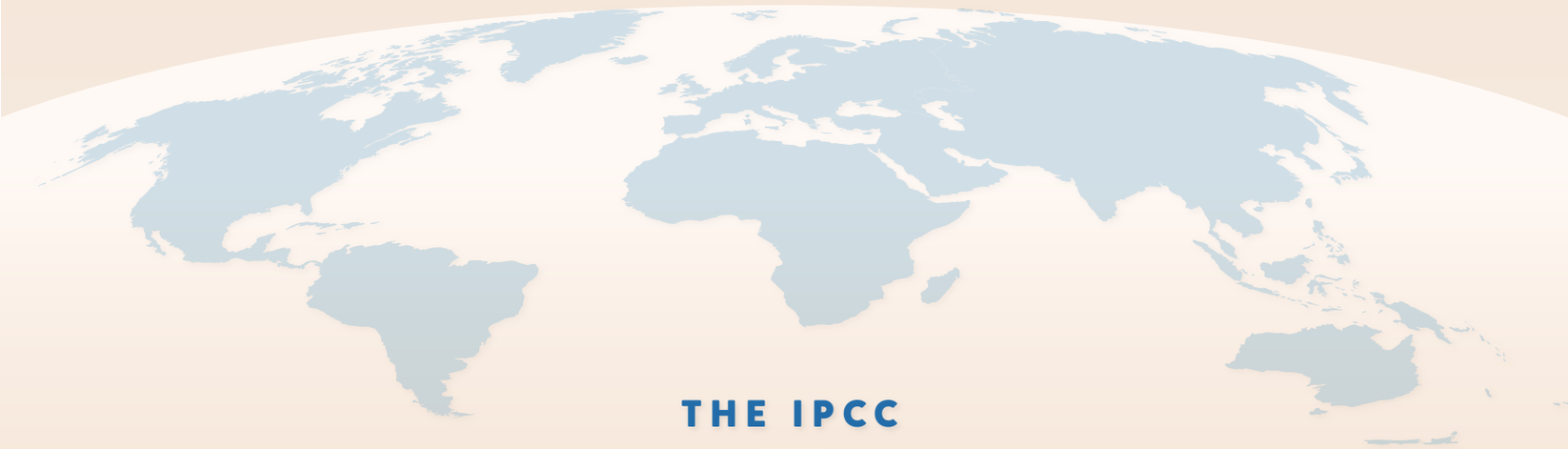
INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC)

CONCLUSIONS BY JOHN LANG

STOPPING CLIMATE CHANGE

SIXTH ASSESSMENT REPORT

I → II → III → SYR



THE IPCC

A UN body of government representatives that commissions expert reports on the state of the climate.

ASSESSMENT REPORTS

Massive systematic reviews of all the world's climate knowledge, every seven years or so

INTERGOVERNMENTAL

IPCC report summaries are endorsed by all 195 member nations before publication

MEANING GOVERNMENTS CANNOT IGNORE THE FINDINGS THEY HAVE THEMSELVES ENDORSED

VOLUNTEER EXPERTS

Hundreds of scientists (and other experts) contribute thousands of hours to IPCC reports

SIXTH ASSESSMENT REPORT (AR6)

2021 - 2022

THE IPCC SELECTED 721 EXPERTS FROM 90 NATIONS TO PARTICIPATE

THE SCIENCE

Assesses the scientific basis of the climate system and how we are changing it

WHAT IT IS

The IPCC provides objective information about climate change to governments

It synthesises existing science and analysis

I

THE IMPACTS

Assesses climate change impacts, underlying vulnerabilities and options for adaptation

II

THE OPTIONS

Options for mitigation, reducing emissions and removing CO_2 from the atmosphere

III

IPCC WORKING GROUPS

Assessment Reports are prepared by three IPCC Working Groups. Each publishes a report:

I II III

WHAT IT'S NOT

The IPCC is neutral on policy — it does not tell world leaders what to do

It does not publish its own original research

18,000 PAPERS

278 EXPERTS

SYNTHESIS

Summary of the three reports + any 'Special Reports' that fell in this reporting cycle

SYR

Special Reports are interdisciplinary assessments of specific issues:

SR GLOBAL WARMING OF 1.5°C

SR CLIMATE CHANGE AND LAND

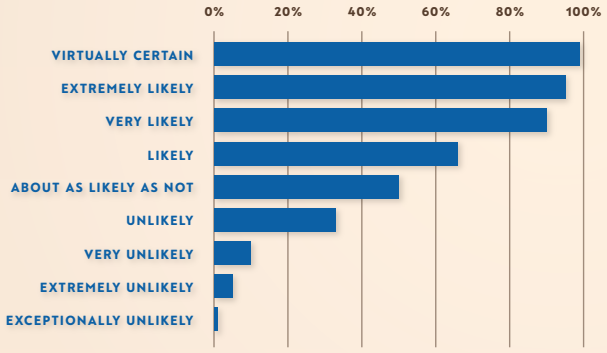
SR OCEAN AND CRYOSPHERE

COMMUNICATING UNCERTAINTY

For all findings, IPCC working groups use 'calibrated language' to convey the likelihood ('very likely') or level of confidence ('very high') in their conclusions.

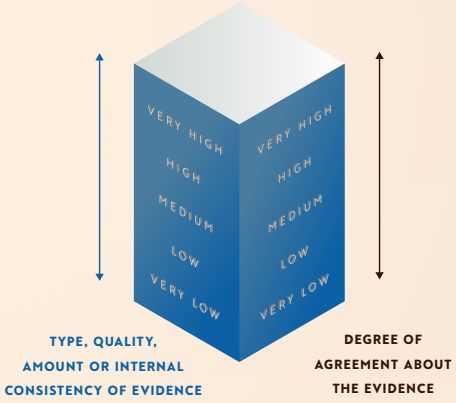
LIKELIHOOD
(PROBABILISTIC)

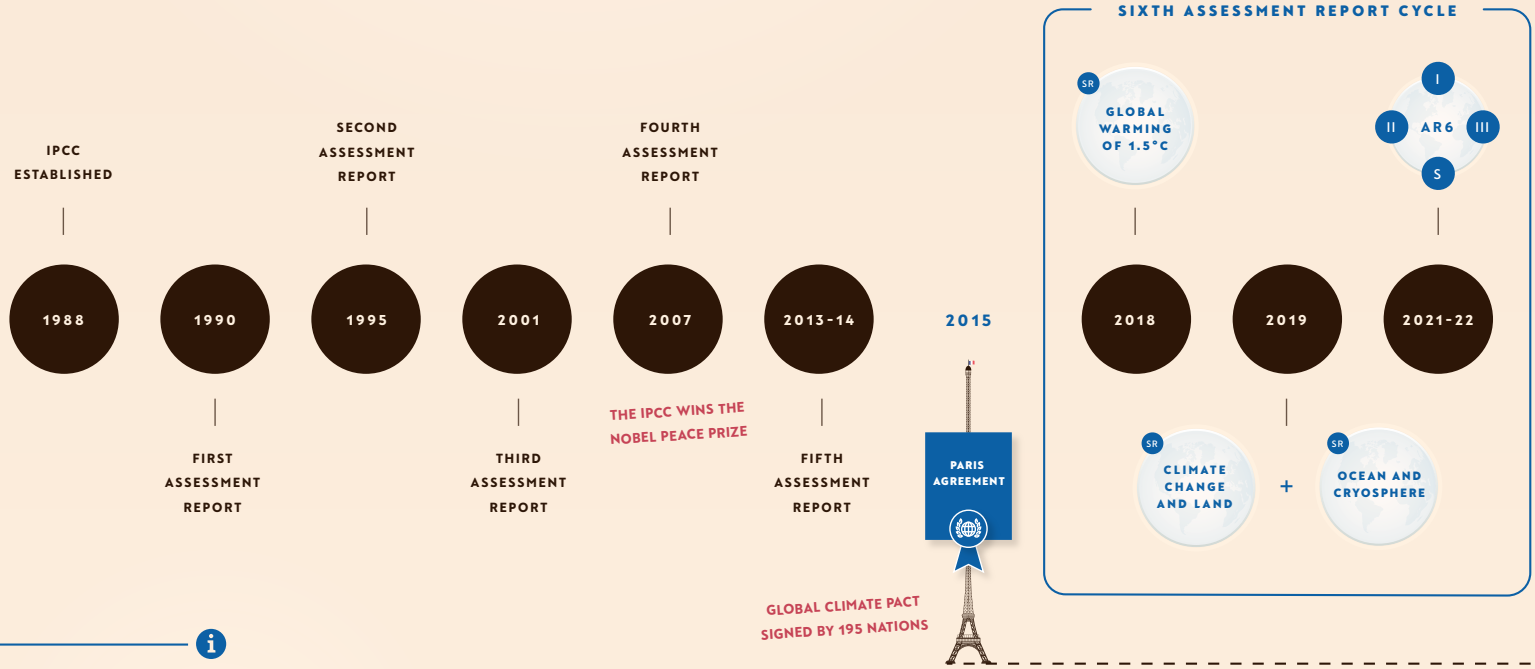
A quantitative measure of certainty in a finding based on statistical observations, model results, expert surveys etc.



CONFIDENCE
(QUALITATIVE)

Assessing the level of confidence involves considering two dimensions:





WHY IS THIS REPORT IMPORTANT?

Because it tells us we can do what is necessary at a much cheaper 'cost' than we once assumed.

THE REPORT IN THREE NUTSHELLS

NOW OR NEVER

Delaying emission reductions puts 1.5°C and, increasingly, 2°C out of reach. The window to 1.5°C is fast closing

STOPPING IT WON'T COST THE EARTH

Rapid decarbonisation is cost effective. Many of the tools needed to shift away from fossil fuels are already available

FOSSIL FUELS NEED TO BE TOAST

Existing and planned fossil fuel infrastructure would, by itself, exhaust our carbon budget for 1.5°C or 2°C

WHAT'S THE PROBLEM?

The world's temperature is rising because heat-trapping blankets of carbon dioxide (CO_2) and other greenhouse gases (GHGs) are accumulating in the atmosphere, meaning less heat can escape to space.

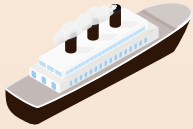
CO_2 IS CUMULATIVE

ATMOSPHERIC LEVELS ARE HIGHER THAN AT ANY TIME IN AT LEAST 2 MILLION YEARS

1850 (PRE-INDUSTRIAL) → 2000 → 2010 → 2020 → 2030

01 Humans emit about 40 billion tonnes of CO_2 into the atmosphere every year.

EQUIVALENT TO THE WEIGHT OF OVER 860,000 TITANICS



02 Since 1750, we've emitted over 2,500 billion tonnes of CO_2.

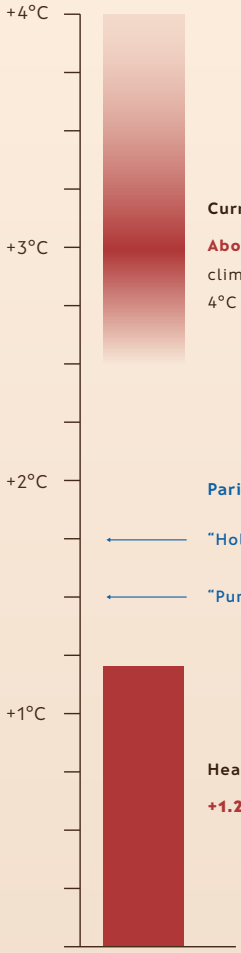
53 MILLION TITANICS

03 In 2021, the land + ocean absorbed about 56% of human CO_2 emissions, but this proportion will decrease the more CO_2 we emit into the atmosphere.

04 About 40% of the CO_2 we emit today will still be in the atmosphere in 100 years.

AND ABOUT 20% WILL STILL BE IN THE ATMOSPHERE IN 10,000 YEARS!

05 Because CO_2 is stubborn and accumulates in the atmosphere, in order to stabilise temperatures at any level, we have to take human CO_2 emissions to net zero.



Current policies if implemented?

About 3°C of heating by 2100, but climate system uncertainties mean 4°C cannot be ruled out

Paris Agreement goals:

"Hold warming to well below 2°C"

"Pursue efforts to limit warming to 1.5°C"

Heating to date?

+1.2°C (Increasing by 0.2°C per decade)

ABOUT 17% OF ALL CUMULATIVE CO_2 EMISSIONS SINCE 1850 WERE PRODUCED IN 2010-2019

STILL GROWING

CO_2 emissions increased by 54% globally between 1990 and 2019

BUT SLOWING

The rate of annual growth has slowed from 2.1% to 1.3% between 2000-09 and 2010-19

GOTTA GET GOING

Humans need to slash annual CO_2 emissions by 5% per year from 2022 to 2030 to have a shot at 1.5°C

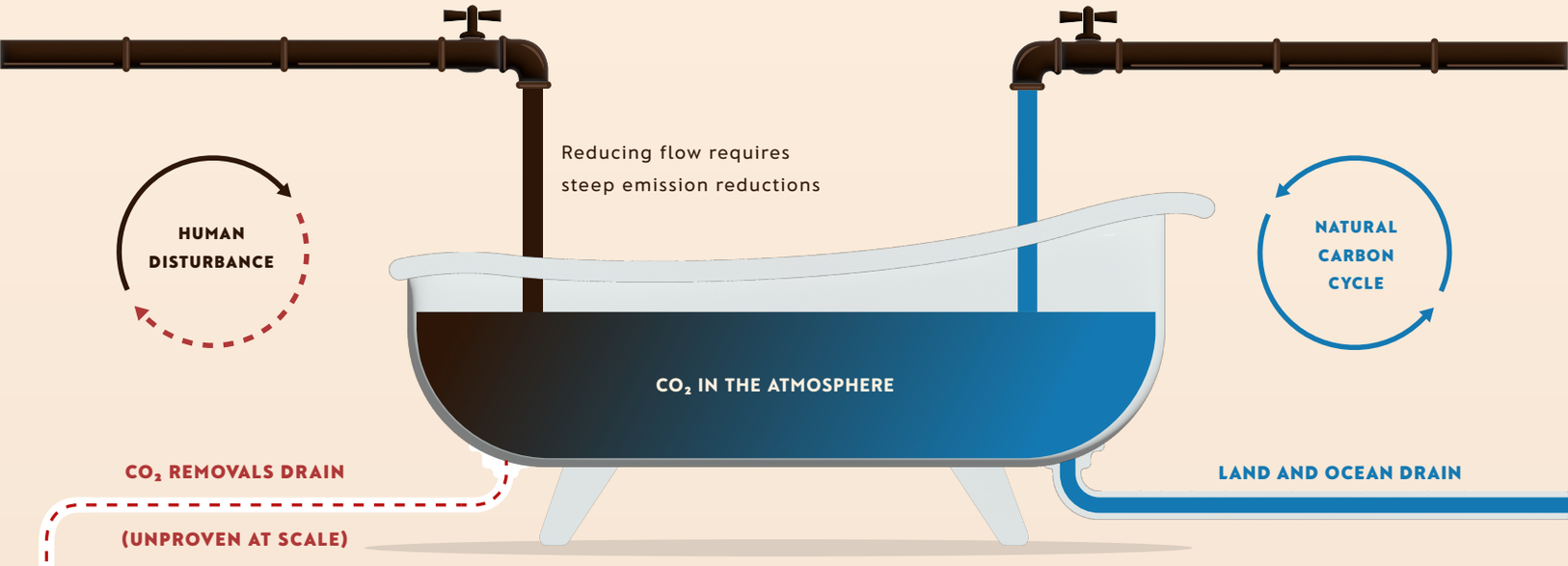
HOW DO WE STOP IT?

To stop global heating we need to drive down global **CO_2 EMISSIONS** to net zero, where the sum of human-caused CO_2 emissions and removals is zero.

01 Urgently turn down the **HUMAN CO_2 EMISSIONS TAP**

AS FAR AS HUMANLY POSSIBLE

02 Match any remaining inflow with an equal outflow using **CO_2 REMOVALS**



THE BEST FORM OF 'CO_2 REMOVAL'?

That would be turning down the tap through emission reductions. Avoiding a tonne of CO_2 today will almost always be easier and cheaper than sucking out CO_2 from the atmosphere later this century.

THE GOOD

Falling costs of clean energy and the strengthening of climate policies have moved us away from the bleakest climate futures. Many of the tools we need to shift away from fossil fuels and slash emissions are available now.

CLIMATE POLICY HAS BECOME WIDESPREAD

At least 56 nations have laws covering climate mitigation and 100+ have pledged net zero by mid-century targets

POLICIES AND LAWS ADDRESSING MITIGATION MEAN EMISSIONS ARE 4-10% LOWER THAN THEY WOULD HAVE BEEN OTHERWISE

CLEAN ENERGY HAS BECOME CHEAP

And it's getting cheaper every day. Multiple low-carbon technologies have shown rapid progress — in cost, performance + adoption

'DECOUPLING' HAS BECOME A REALITY

For some nations, it's no longer a matter of having to choose between economic growth and emission reductions

THANKS TO TARGETED POLICY WHICH COMBINED 'TECHNOLOGY PUSH' TO IMPROVE MARKET READINESS WITH 'MARKET PULL' TO CREATE STABLE DEMAND

SOLAR

25x more solar electricity is now produced compared with a decade ago.

COST

↓85%

(2010-2019)

WIND

5x more wind electricity is now produced compared with a decade ago.

COST

↓55%

(2010-2019)

Solar and wind energy, the fastest growing sources of electricity, reached a record 10% of global generation in 2021. Two-thirds of energy installation in 2019 was renewables.

BATTERIES

Costs have fallen to less than one-eighth of their 2010 value.

COST

↓85%

(2010-2019)

ELECTRIC VEHICLES

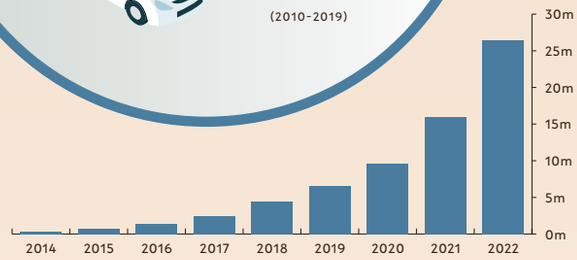
The global electric fleet is skyrocketing, folks.

ADOPTION

↑x100

(2010-2019)

IN NORWAY, 90% OF NEW VEHICLE SALES WERE FULLY ELECTRIC IN JUNE 2022



GLOBAL ELECTRIC VEHICLE FLEET (MILLIONS)

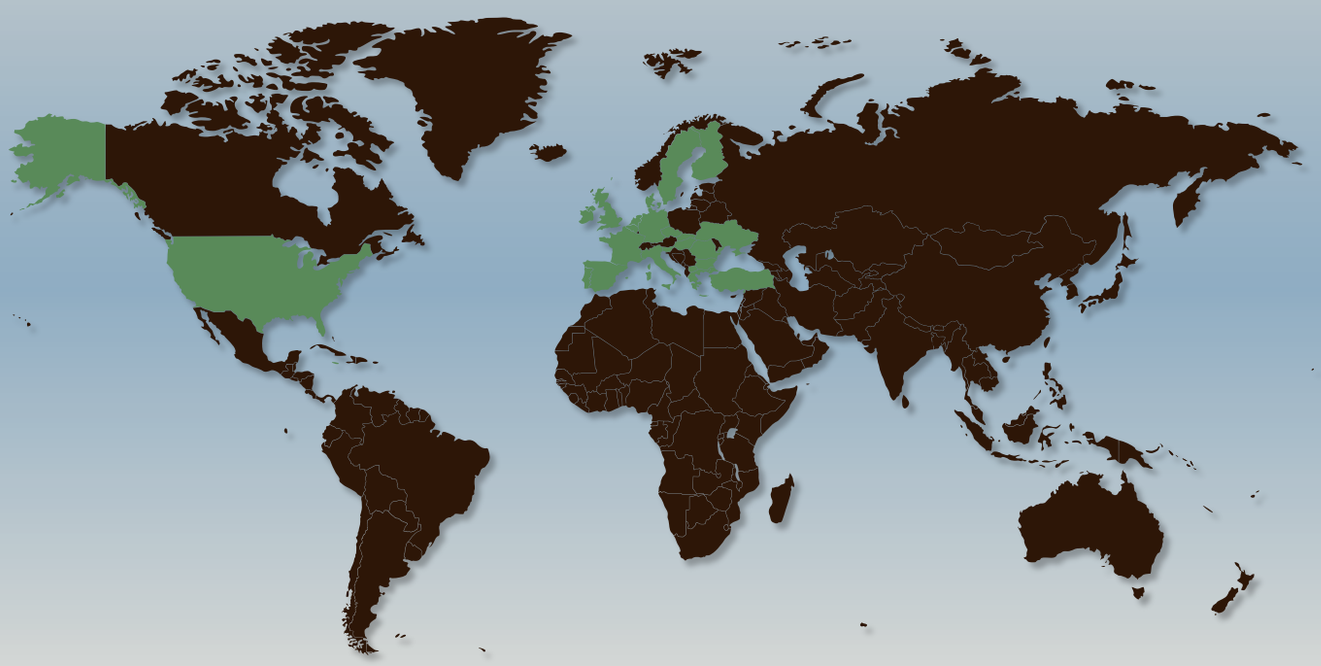
ELECTRIFICATION

About 20% of our final energy demand today is provided by electricity. If we triple that to 60% by 2050 (and deploy renewables on a massive scale) we can limit global heating to 1.5°C.

SEPARATING EMISSIONS FROM ECONOMIC GROWTH

At least **18 wealthy nations** have sustained emission reductions alongside economic growth for several years. In some, emission reductions reached 4% a year, in line with scenarios likely to limit heating to 2°C.

BUT "THESE REDUCTIONS ARE SMALL COMPARED WITH GLOBAL EMISSIONS GROWTH"



THE BAD

Globally, emissions continue to rise across all sectors. The pandemic offered a once-in-a-generation opportunity to stimulate green growth and help point the emissions curve downwards. It was missed. Fossil fuel infrastructure is still being rolled out all across the developed and developing world.

FOSSIL FUEL SUBSIDIES

An average of **$555 billion** in global fossil-fuel subsidies was dished out each year from 2017 to 2019

REMOVING THESE SUBSIDIES COULD REDUCE EMISSIONS 10% BY 2030 WHILE IMPROVING PUBLIC REVENUE AND ECONOMIC PERFORMANCE

STRANDED ASSETS

Decommissioning and reduced use of existing fossil fuel infrastructure and the cancellation of new installations are required for 1.5°C or 2°C pathways

EMISSIONS REBOUND

Due to Covid-enforced restrictions, emissions dropped by 6% in 2020 — but then rebounded to their highest levels ever in 2021

SINCE 2015, THREE-QUARTERS OF PLANNED COAL PLANTS HAVE BEEN CANCELLED. GLOBAL COAL USE HAS NOT INCREASED SINCE 2013

The projected economic value of stranded assets that would suffer from premature write-offs is estimated to be between

$1-4 TRILLION

(from 2015 to 2050)

to limit global heating to about 2°C

CO_2 BUDGETS vs FOSSIL FUELS

The projected cumulative CO_2 emissions from existing + planned fossil fuel infrastructure:

- "Exceed" the world's CO_2 budget for 1.5°C
- "Approximately equal" the budget for 2°C.

REMEMBER, WE CURRENTY EMIT ABOUT 40 BILLION TONNES OF CO_2 ($GtCO_2$) EVERY YEAR

YOU DO THE MATH

420 $GtCO_2$ — 1.5°C BUDGET

1070 $GtCO_2$ — 2°C BUDGET

850 $GtCO_2$ — EXISTING + PLANNED INFRASTRUCTURE

NECESSARY DECLINE BY *2030*
(compared with 2019 levels)

COAL	OIL	GAS
↓ 75%	↓ 10%	↓ 10%

NECESSARY DECLINE BY *2050*
(compared with 2019 levels)

COAL	OIL	GAS
↓ 95%	↓ 60%	↓ 45%

Using "far less fossil fuel than today" is "fundamental" to limiting future heating to any temperature target.

THE UGLY

Globally, CO_2 emissions have to peak *immediately* to limit heating to about 1.5°C. Then we need to cut them in half by 2030. Non-CO_2 greenhouse gas emissions need to be decisively reduced, too.

STEEP CO_2 EMISSION REDUCTIONS OF ABOUT 5% PER YEAR ARE REQUIRED, DRIVEN BY POLICIES AND ACTIONS THAT GET IMPLEMENTED TODAY

It becomes "impossible" to limit heating to

1.5°C

with no or limited overshoot

What if national carbon-cutting pledges are not strengthened more before 2030?

It "strongly increases" the challenge to limit heating to

2°C

PARIS AGREEMENT

NATIONAL CARBON-CUTTING PLEDGES

In 2015, 195 nations agreed to submit 'Nationally Determined Contributions' (NDCs) to the UN every five years, with the intention of **ratcheting up carbon-cutting pledges** over time to deliver the temperature goals of the Paris Agreement. Currently there is a big gap.

	TODAY Annual greenhouse gas emissions in 2020	TOMORROW Where they need to be in 2030	THE EMISSIONS G A P	THE CUT The percentage cut needed by 2030
1.5°C	Around **55 billion** tonnes of CO_2e	**29 billion** tonnes of CO_2e	**26 billion** tonnes of CO_2e	**55%**
2°C		**39 billion** tonnes of CO_2e	**16 billion** tonnes of CO_2e	**30%**

600,000 TITANICS

THE EMISSIONS DIVIDE

Climate inequity according to household incomes.

"ADDRESSING INEQUALITY AND MANY FORMS OF STATUS CONSUMPTION... SUPPORTS CLIMATE CHANGE MITIGATION EFFORTS"

THE FINANCE SHORTFALL

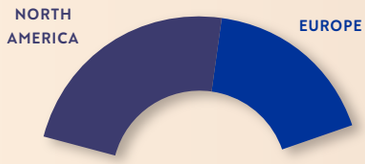
The shortfall is particularly pronounced in **developing nations** which need between **4-8 fold** more annual investment until 2030.

WORLD'S WEALTHIEST 10%

Responsible for 36-45% of GHG emissions

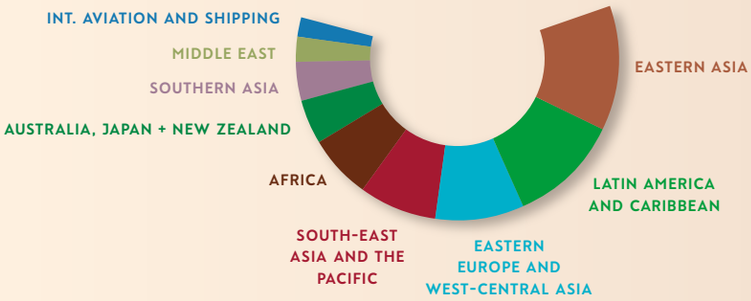
WORLD'S POOREST 50%

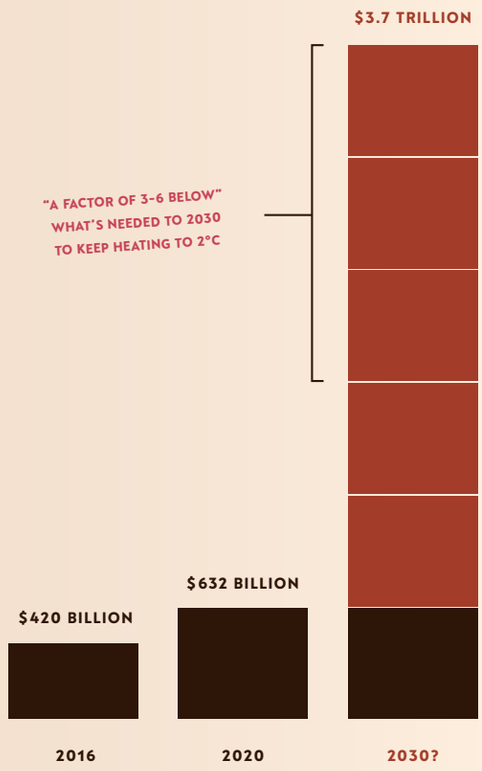
Responsible for 13-15% of GHG emissions



THE HISTORICAL DIVIDE

Share of historical net CO_2 emissions per region from 1850 to 2019.





The electricity sector alone needs global investment of about $2.3tn per year over 2023-52 for an evens chance of holding heating to 1.5°C with no or limited overshoot.

AND THE GREAT

Transitioning to a low-carbon energy system is more economically attractive than maintaining a carbon-intensive system, especially if the benefits of avoided climate impacts and co-benefits (such as improved air quality) are factored in. "Some studies find that mitigation increases the speed of economic growth compared with baseline scenarios."

In other words, stopping climate change is cheaper than not stopping it.

HOWEVER, IT WILL CAUSE SUBSTANTIAL ECONOMIC AND EMPLOYMENT DISRUPTION. AS WE ALL KNOW, NOBODY LIKES CHANGE

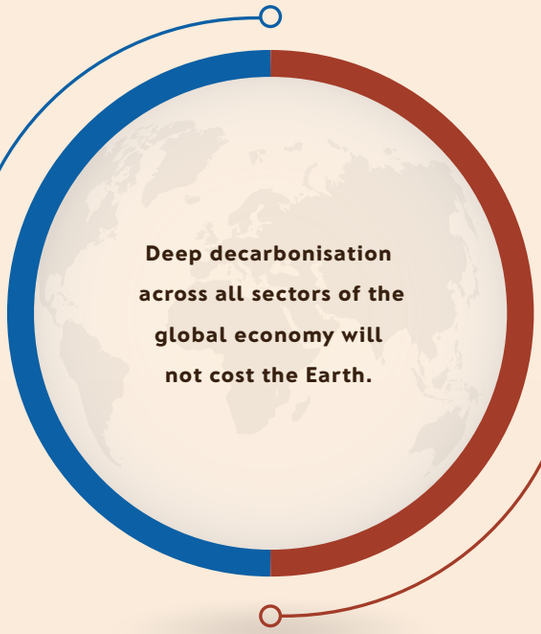
Economic growth slows

***0.04% p.a.**

over the 21st Century to likely contain global heating to

1.5°C

*Relative to outdated reference scenarios that do not account for the economic benefits of acting on climate change.



Economic growth slows

***0.03% p.a.**

over the 21st Century to likely contain global heating to

2°C

*Relative to outdated reference scenarios that do not account for the economic benefits of acting on climate change.

LOW-PROBABILITY, HIGH-IMPACT EVENTS

Due to deep uncertainties, reference scenarios do not account for extreme events at the 'tail end' of distributions. These are climate impacts that could cause catastrophic or (more) irreversible damage.

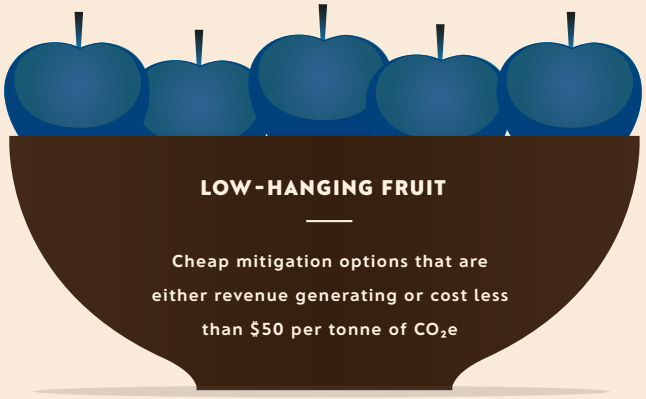
THESE UNMODELED RISKS RAISE THE POTENTIAL COSTS OF NOT ACTING ON CLIMATE CHANGE

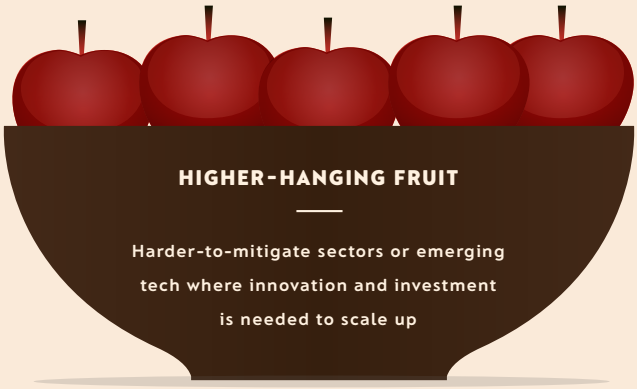
TWO FRUIT BOWLS

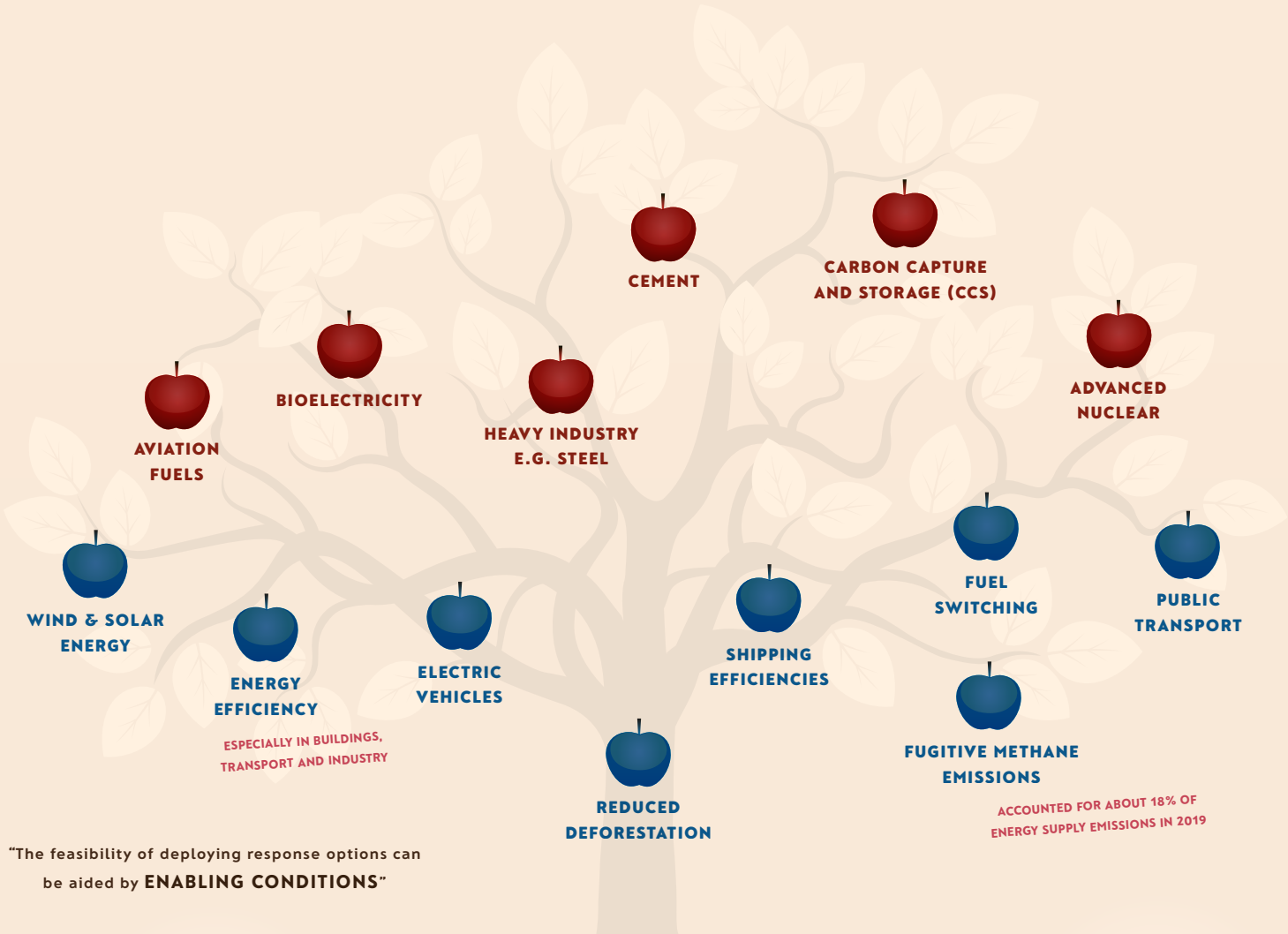
Mitigation options available at a cost of less than $100 a tonne of CO_2e "could reduce global emissions to about half by 2030 (high confidence)." Fully deployed, this menu of options would keep 1.5°C alive.

01 We need to deploy the hell out of clean tech and options that are available today

02 And invest in driving down the cost of technologies we need tomorrow







"The feasibility of deploying response options can be aided by **ENABLING CONDITIONS**"

INNOVATION

INNOVATION IN ENERGY TECHNOLOGIES IS A "KEY DRIVER" OF EMISSION REDUCTIONS

SOIL CARBON SEQUESTRATION

FINANCIAL FLOWS

CLIMATE GOVERNANCE

INSTITUTIONAL CAPACITY

"THERE IS SUFFICIENT GLOBAL CAPITAL AND LIQUIDITY TO CLOSE INVESTMENT GAPS"

FOOD FOR THOUGHT

1. Eat more plants
2. Don't waste food
3. Log in to Zoom (fly less)
4. Walk + cycle more
5. Shift to an electric vehicle
6. Insulate your home
7. Buy less crap

DEMAND-SIDE MANAGEMENT

Efforts to reduce demand would "significantly reduce" the challenge of mitigation overall. Behavioural and cultural changes represent a "substantial overlooked strategy".

GREATEST POTENTIAL?

CHANGES IN FOOD DEMAND

Could avoid 8 billion tonnes of CO_2e per year by 2050

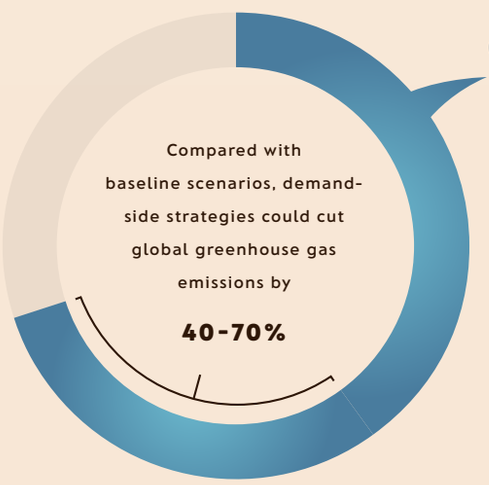
LAND TRANSPORT

Could avoid 6.5 billion tonnes of CO_2e per year by 2050

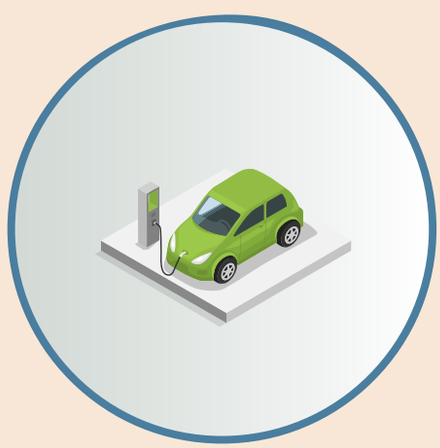
PUBLIC GRANTS FOR LOW-INCOME AND VULNERABLE REGIONS, ESPECIALLY IN SUB-SAHARAN AFRICA "WOULD BE COST-EFFECTIVE AND HAVE HIGH SOCIAL RETURNS"

THE $100BN PER YEAR IN CLIMATE FINANCE PROMISED BY WEALTHY NATIONS TO POORER ONES STILL NEEDS TO BE MET AND EXCEEDED

ADAPTATION FINANCE HAS BEEN OVERLOOKED TO DATE, WITH MORE THAN 90% OF FUNDS GOING TO MITIGATION BETWEEN 2017 AND 2020



DEMAND-SIDE STRATEGIES HAVE "STRONG BENEFITS FOR HUMAN WELLBEING"

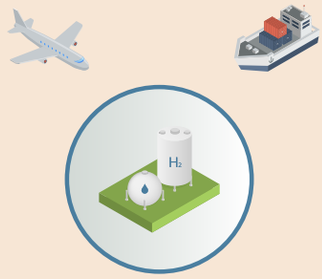


TRANSPORT

Electric vehicles offer the greatest potential for land transport; bio-based, alternative or synthetic fuels for aviation and shipping.

BUILDINGS

Buildings account for 31% of final energy demand, 18% of electricity demand and 31% of global CO_2 emissions. Energy efficiency, better materials and renewables could cut buildings emissions 61% by 2050: 8.2 billion tonnes of CO_2.



LAND-USE

Agriculture, forestry and other land uses can provide mitigation and carbon removal that benefit livelihoods, food security and nature, while providing resources such as wood.

A LACK OF AVAILABLE FINANCE "FORMS A CRITICAL BARRIER" TO THE ROLLOUT OF LAND-BASED CLIMATE MEASURES. SOLUTIONS IN LINE WITH 2°C PATHWAYS ARE ESTIMATED TO COST $400BN A YEAR BY 2050 — **LESS THAN EXISTING SUBSIDIES** DISHED OUT FOR AGRICULTURE GLOBALLY

CITIES

Urban areas can "significantly reduce emissions" by addressing how they are "designed, constructed, managed and powered". Preventing "carbon lock-in" relies on "rapidly expanding cities leapfrogging to low-carbon technologies" and better urban planning that "co-locates jobs and housing to achieve compact urban form".

Reducing or changing urban energy and material use across all sectors

Electrification and moving to low-carbon energy sources

"Enhancing carbon uptake and storage" through green and blue infrastructure

WHICH PRODUCE "MULTIPLE CO-BENEFITS" LIKE BETTER AIR QUALITY

WORLDS APART

The IPCC used 1000+ scenarios — packaged up as 'Illustrative Mitigation Pathways' — to examine how energy tech, infrastructure choices, land-use changes and societal trends might cause, or prevent, future emissions. Scenarios are not forecasts or predictions, rather *stories* of what could happen in the future depending on the choices we make today.

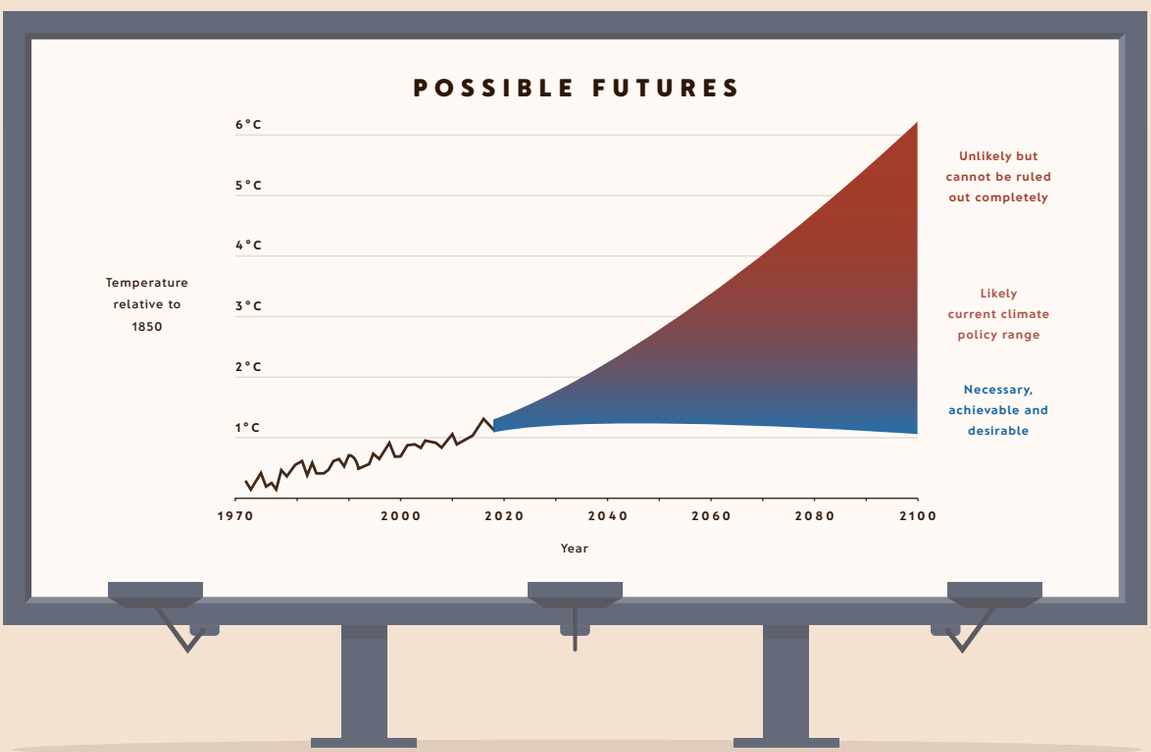
PATHWAYS:	BELOW 1.5°C	BELOW 2°C	ABOUT 2°C	BELOW 3°C	ABOVE 4°C
	A BEST CASE SCENARIO: NET ZERO CO_2 BY MID-CENTURY	GRADUAL STRENGHTENING OF POLICIES	SLOW STRENGHTENING OF POLICIES	ROUGHLY IN LINE WITH CURRENT NATIONAL PLEDGES	REVERSAL OF CLIMATE POLICY
IPCC CLIMATE CATEGORIES*	C1	C3	C4	C6	C8
GHG EMISSION REDUCTIONS BY 2030	43%	21%	10%	2%	-20%
NET ZERO CO_2 EMISSIONS YEAR	2050 - 2055	2070 - 2075	2075-2080	FAIL	FAIL
TOTAL CUMULATIVE CO_2 EMISSIONS 2020-2100 ($GtCO_2$)	320	800	1,160	2,790	5,600
PEAK HEATING	1.6°C	1.7°C	1.9°C	2.7°C	4.2°C

1 Gt = ONE BILLION TONNES OR 21,500 TITANICS

LIKELIHOOD OF STAYING BELOW 2°C	90%	76%	59%	8%	0%
LIKELIHOOD OF STAYING BELOW 3°C	100%	99%	98%	71%	4%
NET ZERO GHG EMISSIONS	2095 - 2100	>2100	>2100	N/A	N/A
TEMP. IN 2100 (50% CHANCE)	1.3°C	1.6°C	1.8°C	2.7°C	4.2°C
NET NEGATIVE EMISSIONS BY 2100	-220	-40	-30	0	0

*Only five of the eight IPCC climate categories are presented here. For each, the median value across the relevant model pathways is shown.

While most scenarios that limit heating to well below 2°C employ significant amounts of negative emissions, not all do. Scenarios with more immediate emission reductions tend to have no or low overshoot and limit the amount of late-century carbon dioxide removal (CDR) needed. All mitigation pathways show "greatly reduced" fossil fuel use.



MOST PATHWAYS THAT LIMIT HEATING TO BELOW 2°C RELY ON SOME DEGREE OF CO_2 REMOVAL (CDR)

THERE ARE NO SCENARIOS WHERE LARGE DEPLOYMENTS OF CDR AVOID THE NEED TO SUBSTANTIALLY REDUCE EMISSIONS

CUTTING EMISSIONS FASTER REDUCES THE NEED FOR CDR

CO_2 REMOVALS DRAIN (UNPROVEN)

The deployment of CO_2 removal, be that via trees or technology, is "unavoidable" if net zero emissions are to be achieved. Future reliance can be minimised with swift action to reduce emissions over the near-term.

CDR IS "NECESSARY"

Nations will need to counterbalance **non-CO_2 emissions** and **residual emissions** that cannot be easily eliminated from hard-to-transition sectors such as heavy industry and aviation.

THEN WHAT?

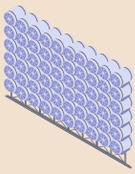
Negative emissions. Upscaling CDR in the longer term could allow us to eventually turn down the world's thermostat; that is, reverse global heating if we were, for example, to overshoot 1.5°C.

VERY CRUDELY, CARBON DIOXIDE REMOVAL CAN EITHER BE NATURE-BASED OR TECH-BASED. NEITHER ARE 'GET OUT OF JAIL FREE' CARDS — THERE IS NO SUBSTITUTE FOR RAPID EMISSION REDUCTIONS

NATURE-BASED CDR

Planting trees is easy and cheap, but unreliable. Long-term storage cannot be guaranteed because forests are vulnerable to disturbances such as fires and insect attacks, both of which are increasing as the world gets hotter.

TREE-PLANTING AND ECOSYSTEM RESTORATION (E.G. RESTORING PEATLANDS OR SEAGRASS MEADOWS) ARE THE ONLY "WIDELY DEPLOYED" FORMS OF CO_2 REMOVAL AVAILABLE TODAY



TECH-BASED CDR

Engineered solutions for removing CO_2 from the atmosphere are in their infancy and extremely expensive. But as with solar and batteries, costs may come down with substantial investment and deployment.

SUCKING IT UP

The upscaling of CO_2 removal methods face "various feasibility and sustainability constraints". For example, BECCS (see below) poses a risk to biodiversity, water, soil, air quality, resilience, livelihoods and food security...

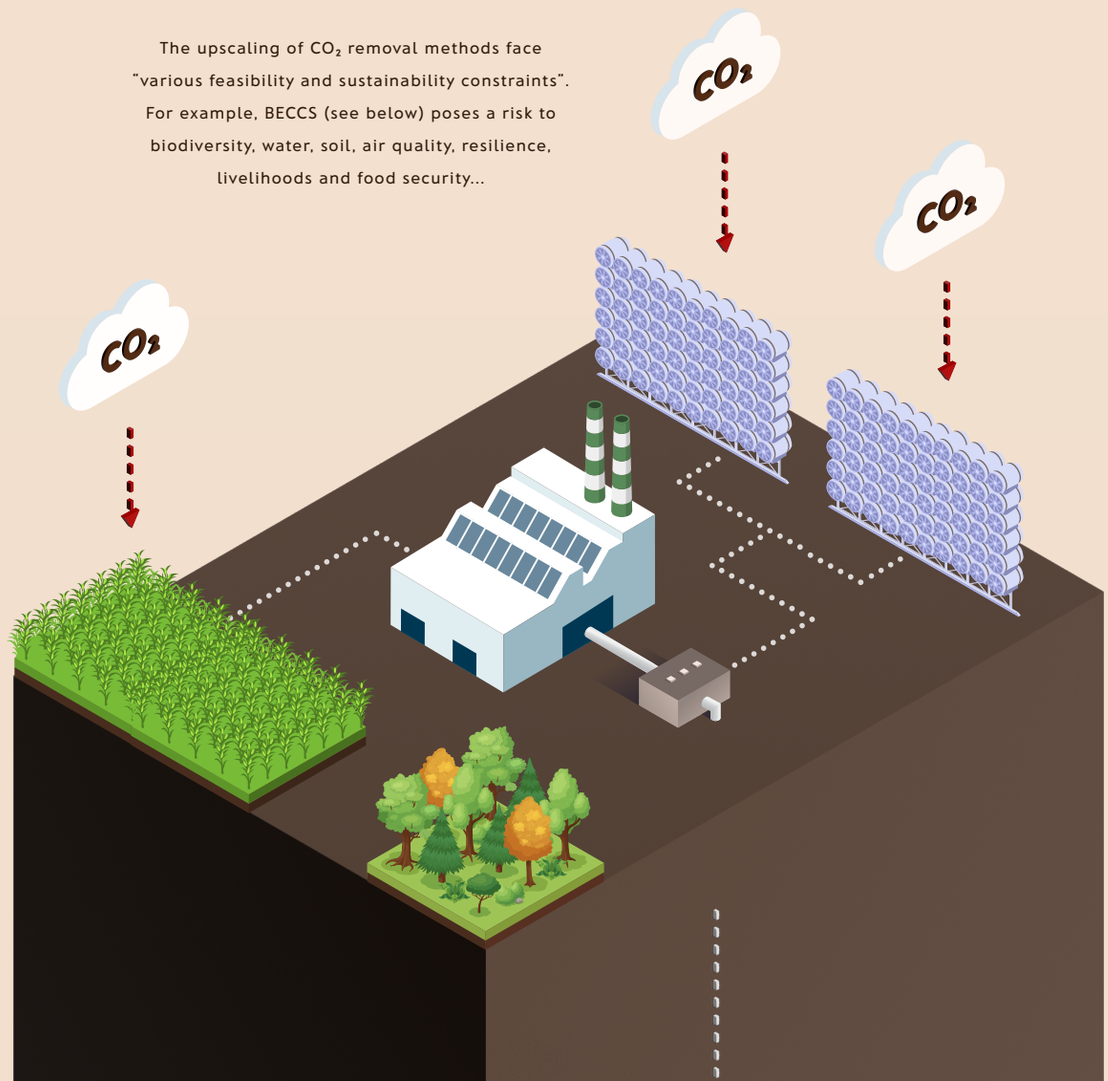
FAQS

HOW MUCH MIGHT WE NEED?

Billions of tonnes of CO_2 removal a year. The scale and timing will depend on the speed and scale of emission reductions in different sectors.

HOW MUCH IF WE OVERSHOOT?

Each 0.1°C of temperature overshoot above 1.5°C will require about 220 billion tonnes of additional CDR to reduce temperatures back to 1.5°C after net zero CO_2 is achieved.



BARRIERS?

Many. CDR "faces technological, economic, social, institutional, ecological-environmental and cultural barriers."

ENABLERS?

Policy instruments, greater public support and technological innovations could all help.

ENOUGH SPACE UNDERGROUND?

Yes. The geological storage capacity for CO_2 is vast in theory, estimated to be around 10,000 billion tonnes, 4x what we've put into the atmosphere since 1850.

RISKS?

"The prospect of large-scale CDR could obstruct near-term emission reduction efforts ...

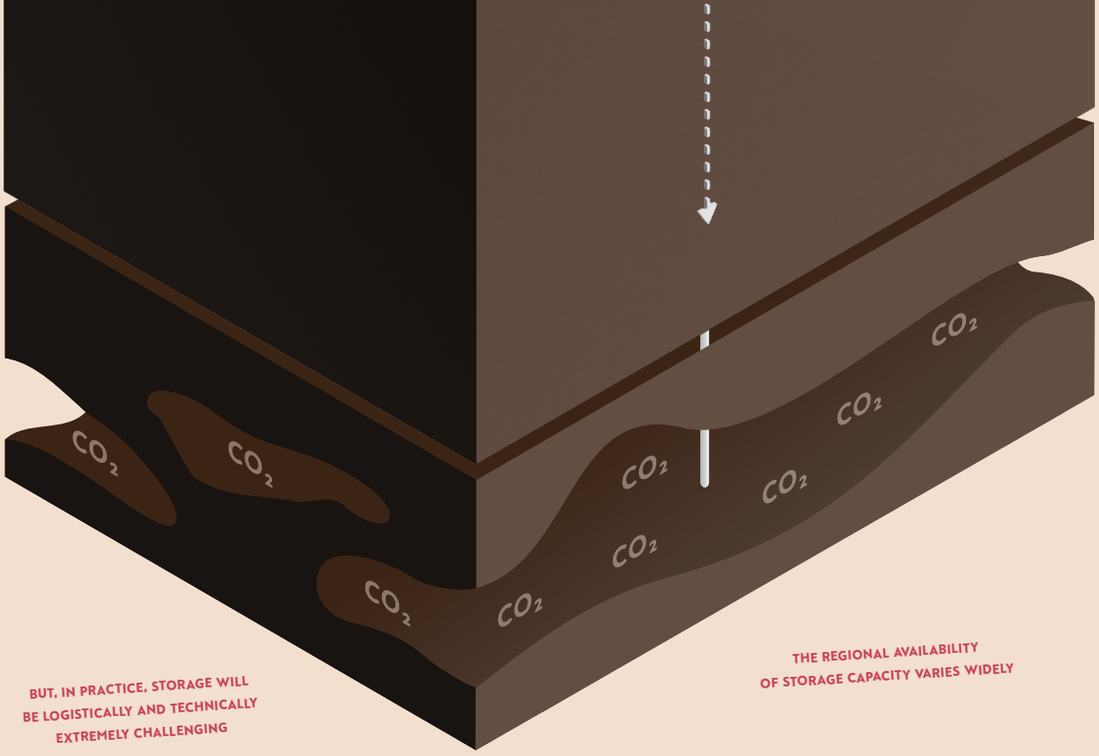
! MORAL HAZARD ALERT !

... mask insufficient policy interventions, might lead to overreliance on technologies that are still in their infancy, could overburden future generations, might evoke new conflicts over equitable burden-sharing, [and] could impact food security, biodiversity or land rights". Yip, lots.

DOES ANY CDR TECH EXIST YET?

To date, US-based company Charm Industrial has delivered 5,000 tonnes of tech-based CDR, which is the largest volume recorded so far.

EQUIVALENT TO ABOUT THE CO_2 EMISSIONS OF 1,000 CARS PER YEAR. IN OTHER WORDS, TEENY TINY

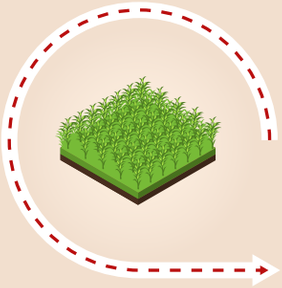


BUT, IN PRACTICE, STORAGE WILL BE LOGISTICALLY AND TECHNICALLY EXTREMELY CHALLENGING

THE REGIONAL AVAILABILITY OF STORAGE CAPACITY VARIES WIDELY

POSSIBLE FUTURES

Most IPCC scenarios that rely on CDR assume big roles for **BECCS** and **AFOLU** (mainly tree planting), though some models include a non-trivial role for **DACCS**, too. The average amounts of CDR that would be needed from 2020 to 2100 for **BELOW 1.5°C** and **BELOW 2°C** temperature pathways:



BIOENERGY WITH CO_2 CAPTURE AND STORAGE (BECCS)

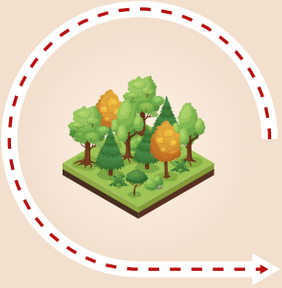
Sequestering CO_2 from the atmosphere via photosynthesis by growing industrial-scale bioenergy crops. Then we burn the biomass to generate energy and bury the resulting CO_2 emissions permanently underground.

— Very land intensive, unproven

1.5°C PATHWAY: **334 $GtCO_2$**

2°C PATHWAY: **291 $GtCO_2$**

6,257,000 TITANICS WORTH



AGRICULTURE, FORESTRY AND OTHER LAND USE (AFOLU)

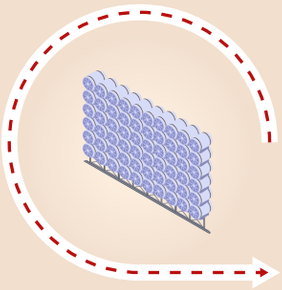
Planting or restoring forests, but also using, for example, modern farming methods, grassland and wetland restoration, agroforestry and other techniques to sequester CO_2 and reverse soil carbon losses.

— Very unreliable (permanent storage cannot be guaranteed)

1.5°C PATHWAY: **262 $GtCO_2$**

2°C PATHWAY: **209 $GtCO_2$**

4,494,000 TITANICS



DIRECT AIR CO_2 CAPTURE AND STORAGE (DACCS)

Using chemical reactions to suck CO_2 out of the air, then burying it permanently underground or using it to make other products e.g. plastics and fuels.

— Very energy intensive, unproven

1.5°C PATHWAY: **30 $GtCO_2$**

2°C PATHWAY: **19 $GtCO_2$**

409,000 TITANICS

THE BOTTOM LINE

Two variables will determine how hot our planet eventually gets and how severely climate change will impact human civilisation and the natural world. Both are uncertain.

01 How the climate system responds to a given volume of greenhouse gas emissions

02 What volume of emissions we humans pump into Earth's atmosphere

We have power over the second variable. That means we have the power to choose our future.

By John Lang

Energy&Climate INTELLIGENCE UNIT

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