

# The Science of Net Zero

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Oxford Net Zero Seminar Series  
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# The Science of Net Zero

Cumulative CO<sub>2</sub>-warming-equivalent emissions to the time of net zero determine peak warming



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Near-term emissions reductions  
complemented with Nature-  
based Climate Solutions



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based Climate Solutions

In the longer term net CO<sub>2</sub>  
uptake by the biosphere  
declines due to Earth  
System Feedbacks:

**“Peak Tree”**



# The Science of Net Zero

So we will need to scale up  
geological CO<sub>2</sub> storage



# The Science of Net Zero

The destination: **Hard Net Zero**  
One tonne of CO<sub>2</sub> is refossilised  
for every tonne generated by  
burning fossil fuels



# The policy challenges of Net Zero

Oxford Net Zero Seminar Series  
18 January 2021

**Sam Fankhauser**

Grantham Research Institute (LSE) and Oxford Net Zero



Grantham  
Research Institute  
on Climate Change  
and the Environment

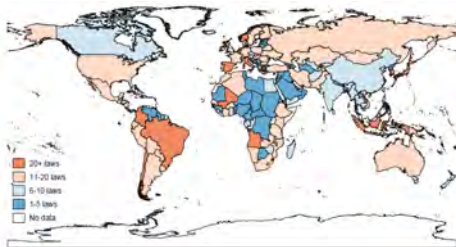


# A broad societal consensus on climate action

## Local communities



## National governments



## Civil society



## Business

Tesla joins Wall Street's S&P 500 share index

Elon Musk's car firm becomes stock market's sixth-largest member on joining



## Finance



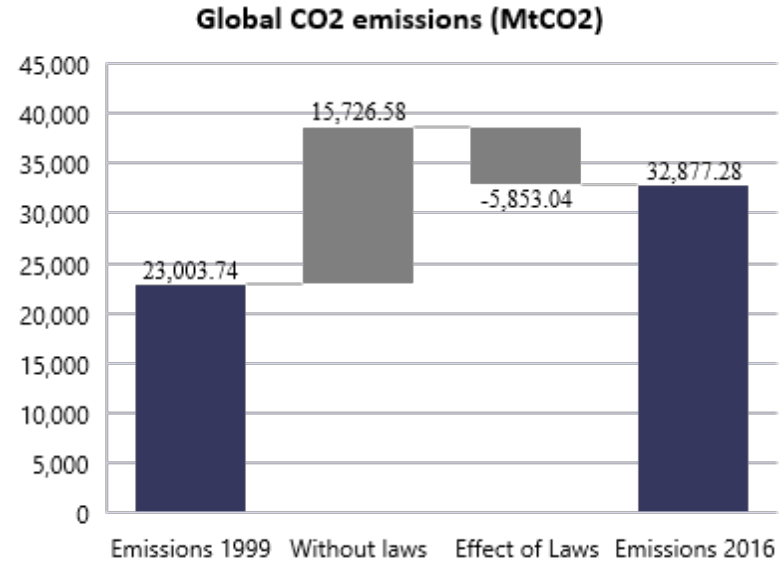
## Courts





# But current efforts to reduce GHG emissions are insufficient

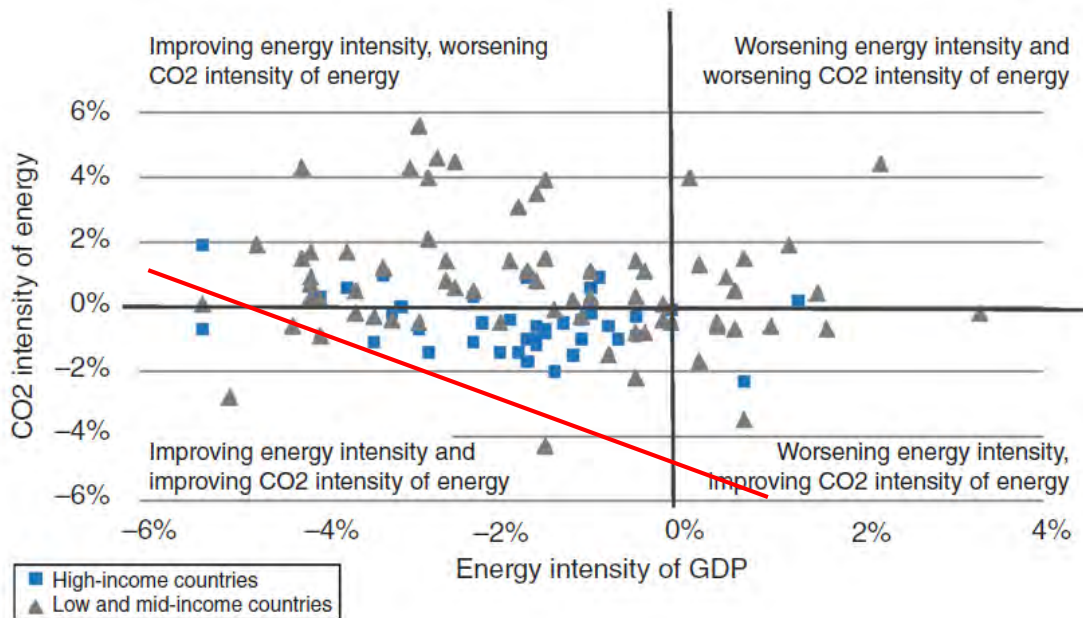
- In 2016, global climate policy and legislation has saved ca. 5.8 GtCO<sub>2</sub> (see chart)
  - ca the US annual output
- Cumulatively, between 1999 and 2016 global climate policy and legislation has saved ca 38 GtCO<sub>2</sub>
  - ca one year of global output
- In comparison, remaining carbon space is 420-770 GtCO<sub>2</sub>



Source: Eskander and Fankhauser, Nature Climate Change, 2020.

# Challenge 1: Speeding up action

Even 2°C requires a combined drop in energy and carbon intensity of ca 5% pa



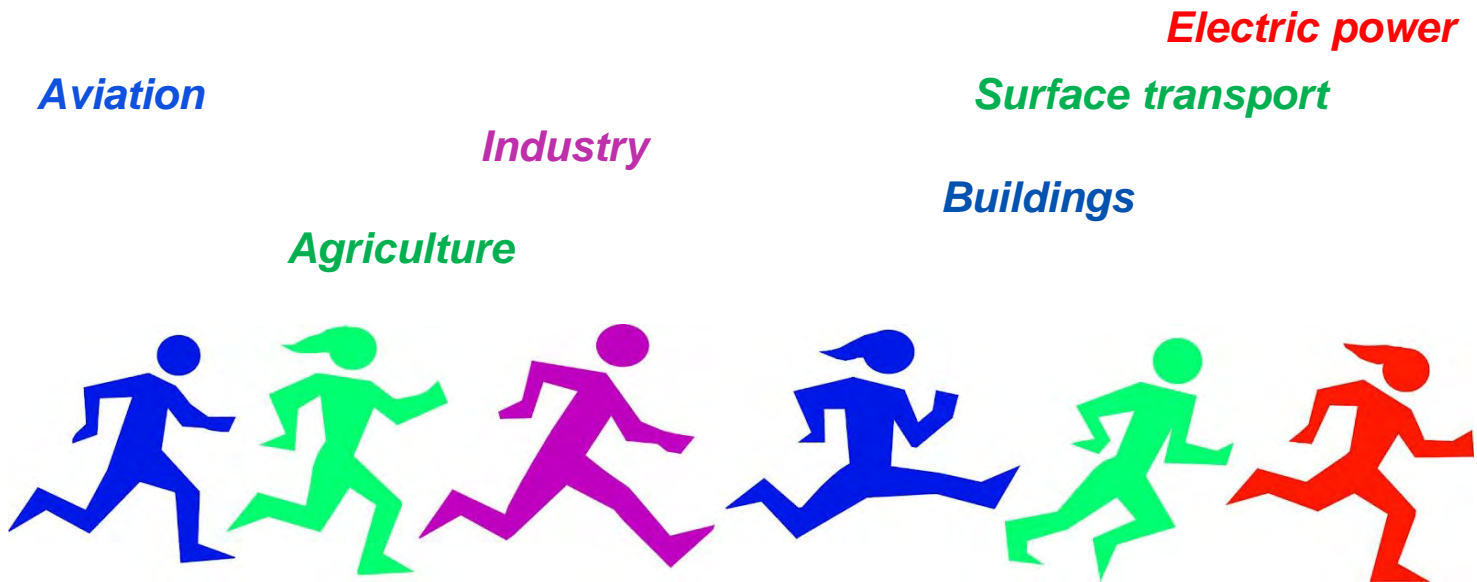
Some basic carbon accounting

$$\text{CO2} = \frac{\text{CO2}}{\text{energy}} * \frac{\text{energy}}{\text{GDP}} * \text{GDP}$$

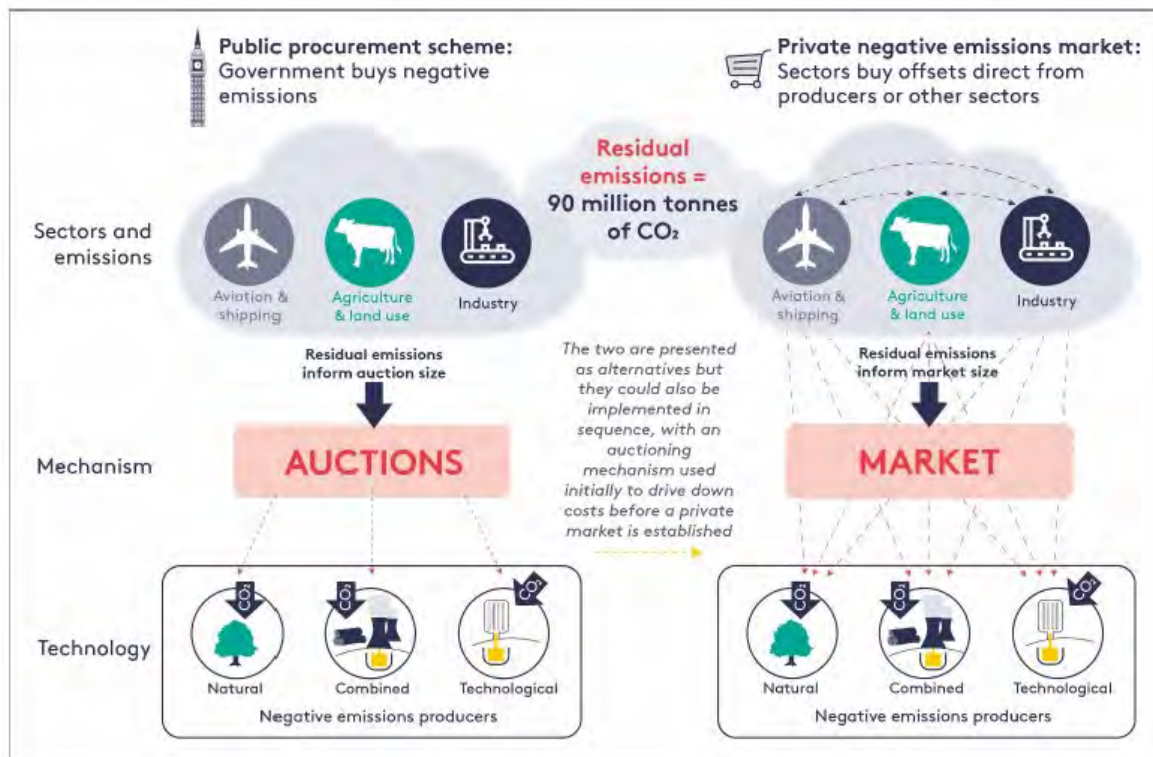
— Annual reduction in the first two factors needed or 2°C, given expected GDP growth

# Challenge 2: Tackling the difficult emissions

The debate must move beyond renewables and energy efficiency



# Challenge 3: Creating incentives for negative emissions



# Taking Action Towards Net Zero

**Kaya Axelsson**

Strategic Engagement Fellow

Oxford Net Zero



# 2020: A Turning Point on Net Zero Ambition?

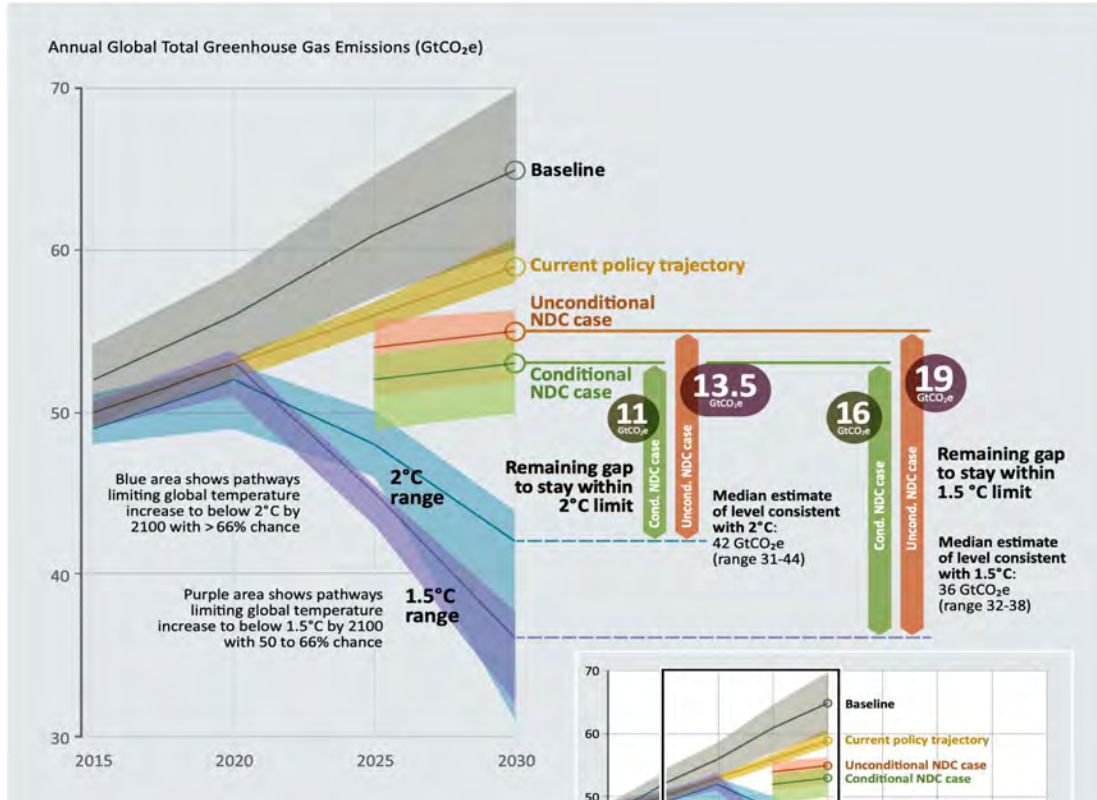
Net Zero Commitments Now Cover:

- 63% of global GHG emissions
- 80% of GDP:
  - 50% of GDP in the Race to Zero

(Hale & Smith Working Paper)



# Are Net Zero Targets Empty Promises? What of the Ambition-Action Gap?



- Many current NDCs are exaggerations on current national policies.
- Even full implementation of current NDCs leave our 2 degree carbon budget 80% depleted by 2030.
- Missing the COP26 option of revising the NDCs would make closing the 2030 emissions gap practically impossible.
- There is growing but limited evidence of subnational action filling the gap.
- Non-state actors need to adhere to high shared standards of accountability.
- Which is why setting and advocating strong criteria for net zero targets is so important!

UNEP Emissions Gap Report, 2019 Figure ES.2: Global greenhouse gas emissions under different scenarios and the emissions gap in 2030 (median estimate and 10th to 90th percentile range).

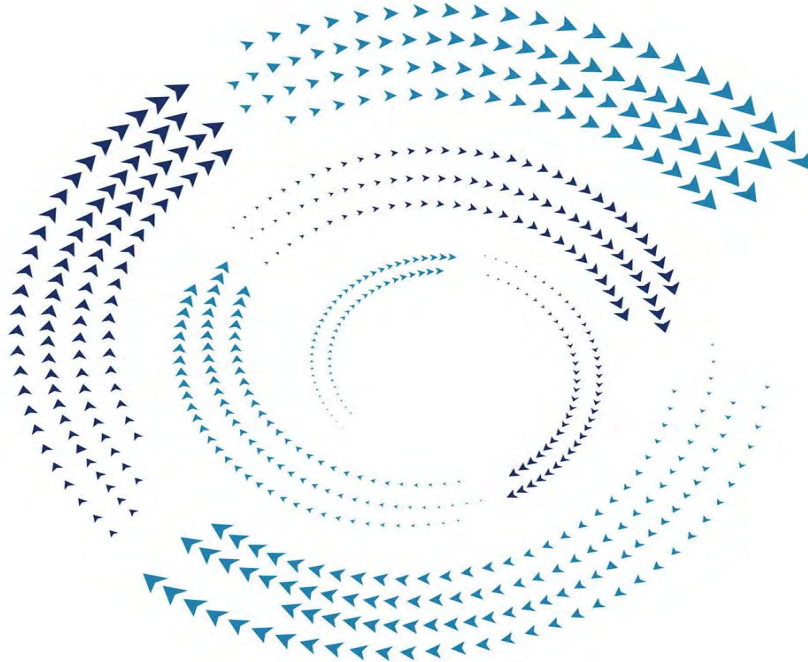


# Or cause for hope? Is there an Ambition Loop?



## Government Climate Policy

- ▲ Clear, ambitious targets and policy
- ▲ Predictable regulatory environment
- ▲ Incentives and infrastructure
- ▲ Long-term market signals
- ▲ Support for research, development, and deployment
- ▲ Clear plans and timelines for full transition to a zero-carbon economy



## Business Climate Action

- ▲ Ambitious, science-based targets
- ▲ Public updates on progress
- ▲ Investments and growth strategies aligned with a zero-carbon future
- ▲ Commercial demand for zero-carbon energy, zero-carbon transportation and zero-carbon land use
- ▲ Responsible policy engagement (individually and through trade associations)



## Innovation

Low-carbon solutions could be competitive in 75% of sectors by 2030, compared to zero in 2015.

Low-carbon growth this decade will generate over 35 million jobs. (Systemiq, 2020)





# Who's in the Race to Zero?

The objective is to **build momentum** around the shift to a decarbonized economy ahead of COP26, where governments must strengthen their contributions to the Paris Agreement. This will send governments **a resounding signal** that business, cities, regions and investors are **united** in meeting the Paris goals and creating a more **inclusive and resilient economy**.

**452**

**Cities**

**22**

**Regions**

**1,101**

**Businesses**

**45**

**Investors**

**549**

**Universities**

# What's the minimum criteria?

The High-level Climate Champions require that the commitments brought forward by networks and initiatives recognized in the Race to Zero campaign meet a minimum set of procedural criteria.

These process criteria represent the “Starting Line” for the race, so meeting them does not necessarily imply that an actor is on track to net zero, only that they have begun the process.

## 1. Pledge

Pledge at the head-of-organization level to reach (net)-zero in the 2040s or sooner, or by midcentury at the latest, in line with global efforts to limit warming to 1.5C

## 2. Plan

In advance of COP26, explain what steps will be taken toward achieving net zero, especially in the short- to medium-term. Set an interim target to achieve in the next decade, which reflects a fair share of the 50% global reduction in CO2 by 2030 identified in the IPCC Special Report on Global Warming of 1.5C

## For more information

[Click here](#) for full details on the criteria.

[A mapping of the substantive criteria is available here.](#)

## 3. Proceed

Take immediate action toward achieving net zero, consistent with delivering interim targets specified

## 4. Publish

Commit to report progress at least annually, including via, to the extent possible, platforms that feed into the UNFCCC Global Climate Action Portal



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My net zero plan toolbox



Most recommended

Case Studies

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## ICLEI – LOCAL GOVERNMENTS FOR SUSTAINABILITY

ICLEI – Local Governments for Sustainability is a global network of more than 1,750 local and regional governments committed to sustainable urban development. Active in 100+ countries, they aim to influence sustainability policy and drive local action for low emission, ...

[FIND OUT MORE](#)

## GLOBAL UNIVERSITIES AND COLLEGES FOR THE CLIMATE

The Global Universities and Colleges for the Climate is a letter from networks and further/ higher education institutions showcasing their commitments towards the attainment of the UN's SDG 4 (Education) and 13 (Climate Change). The letter asks presidents and chancellors of ...

[FIND OUT MORE](#)

## NET-ZERO ASSET OWNER ALLIANCE

Convened by the UN, the Net-Zero Asset Owner Alliance seeks to transform member investment portfolios to net zero GHG emissions by 2050. 29 institutional investors make up the alliance, representing over \$5 trillion in assets. The alliance also works with other ...

[FIND OUT MORE](#)

# RELAX, THERE'S NOTHING YOU CAN DO ABOUT THE CLIMATE

Unless you work for a company. Or live in a city. Or own a phone. Or a brain.

**COUNTDOWN**

[countdown.ted.com](http://countdown.ted.com)

[#JoinTheCountdown](https://twitter.com/JoinTheCountdown)



THE Paris...  
CLIMATE 10 years  
PLEDGE Early

What can you do to be more ambitious on sustainability as a university or college?

Sign the Global Climate Letter



Join the Race to Zero



BUSINESS AMBITION FOR 1.5°C



SME  
Climate  
HUB



GLOBAL COVENANT  
of MAYORS for  
CLIMATE & ENERGY



1

# PLEDGE



PLEDGE AT THE HEAD-OF-ORGANIZATION LEVEL TO REACH NET ZERO IN THE 2040S OR SOONER, OR BY MIDCENTURY AT THE LATEST, IN LINE WITH GLOBAL EFFORTS TO LIMIT WARMING TO 1.5C.



ACT IMMEDIATELY.



YOUR PLEDGE SHOULD COVER ALL KYOTO PROTOCOL GASES, AND ALL ACTIVITIES AND SCOPES, INCLUDING SCOPE 3.



# 2

# PLAN

- ✓ **IN ADVANCE OF COP26, EXPLAIN WHAT STEPS WILL BE TAKEN TOWARD ACHIEVING NET ZERO, ESPECIALLY IN THE SHORT- TO MEDIUM-TERM.**
- ✓ **SET INTERIM TARGETS TO ACHIEVE IN THE NEXT DECADE, WHICH REFLECT A FAIR SHARE OF THE 50% GLOBAL REDUCTION IN CO2 BY 2030 IDENTIFIED IN THE IPCC REPORT ON GLOBAL WARMING OF 1.5C.**
- ✓ **EQUITY IS IMPORTANT: THE SCOPE AND TIMING OF EACH INSTITUTION'S NET ZERO JOURNEY WILL DIFFER ACCORDING TO CAPACITY, CURRENT CARBON FOOTPRINT AND OTHER FACTORS.**
- ✓ **PLAN FOR FUTURE UNCERTAINTIES, PARTICULARLY AROUND CHANGES IN TECHNOLOGY AND THE IMPACT OF THE ACTIONS OF OTHERS, WHETHER CONSUMERS, GOVERNMENT, REGULATORS OR BUSINESSES.**

# 3

# PROCEED



TAKE IMMEDIATE ACTION TOWARD ACHIEVING NET ZERO, CONSISTENT WITH DELIVERING INTERIM TARGETS.



IF YOU PLAN TO OFFSET, USE ROBUST STANDARDS TO MAKE SURE THEIR BENEFIT IS REAL AND LASTING. COMMITTEES SHOULD AVOID NON-ADDITIONALITY AND AIM FOR PERMANENCE AND VERIFIABILITY.



CLEARLY SPECIFY OFFSETTING APPROACH, WHETHER IT IS GROUNDED IN AVOIDED EMISSIONS, REDUCTIONS, OR REMOVALS.

# 4

# PUBLISH



COMMIT TO REPORT PROGRESS AT LEAST ANNUALLY, INCLUDING VIA PLATFORMS THAT FEED INTO THE UNFCCC GLOBAL CLIMATE ACTION PORTAL AS MUCH AS POSSIBLE.



MAINTAIN TRANSPARENCY WITH CLEAR AND REGULATOR REPORTING AGAINST YOUR PLAN.

Tools to help me follow these steps

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

