



Innovation trends in green technology

KE Matters: Appleyard Lees x Cambridge Zero – 16 April 2024

Paul Beynon

Innovation | Branding | Strategy | Solutions



Introduction



Paul Beynon

MEng(Hons), CPA, EPA

- UK and European Patent Attorney
- Partner – Engineering



Introduction



Innovation | Branding | Strategy | Solutions

Capabilities

Over 70:

- patent attorneys
- trade mark attorneys
- IP solicitors

Teams in:

- chemistry
- life sciences
- electronics
- physics
- software
- engineering

Experience

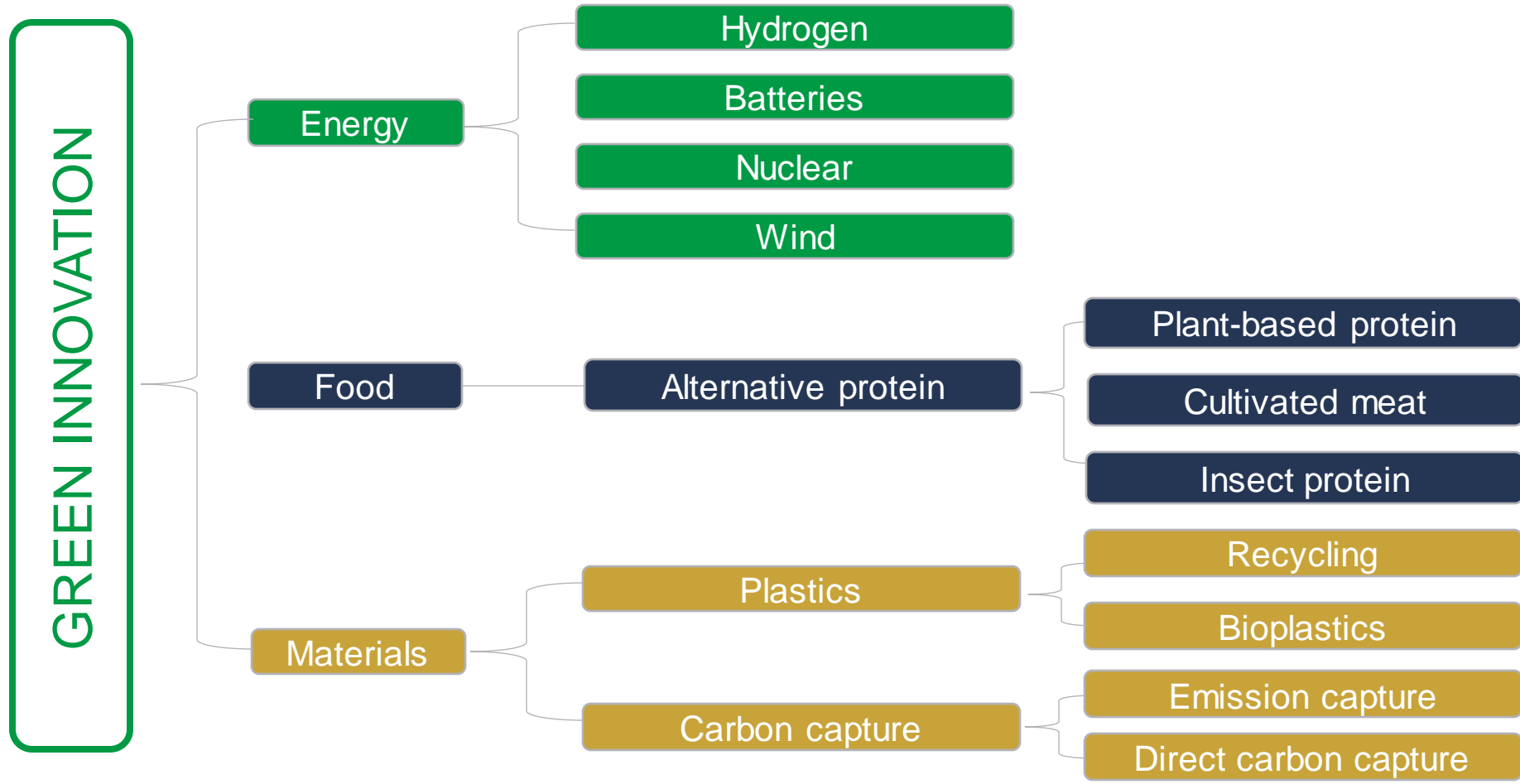
Clients from the UK, and overseas, include:

- start-ups / scale-ups
- university spin-outs
- SMEs
- multi-nationals

*Inside Green Innovation:
Progress Report - Third Edition*



Inside Green Innovation: Progress Report – Third Edition





Themes

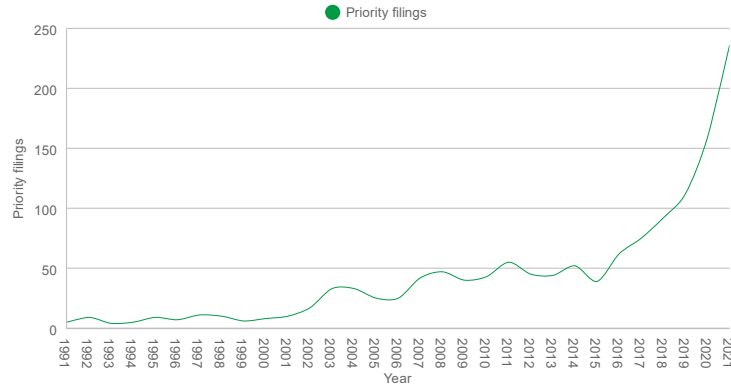
- 1) Historic highs
- 2) Carbon capture - a necessary solution?
- 3) Impact of regulations and policy

Theme 1: Historic Highs

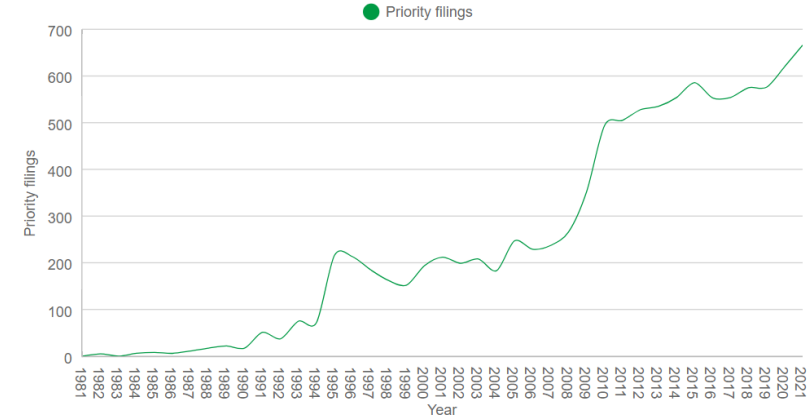


Historic highs – energy

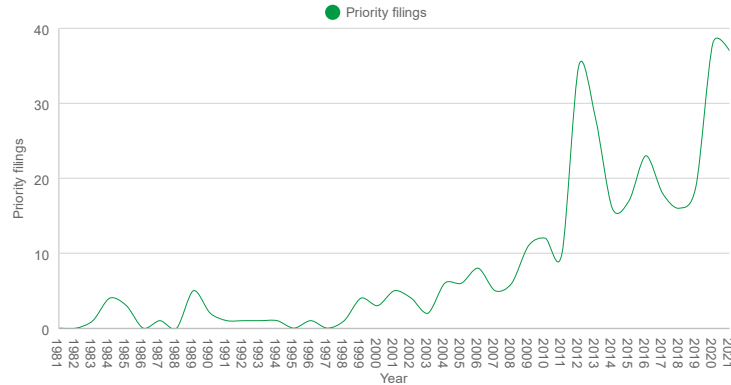
Green hydrogen production (30-year trend)



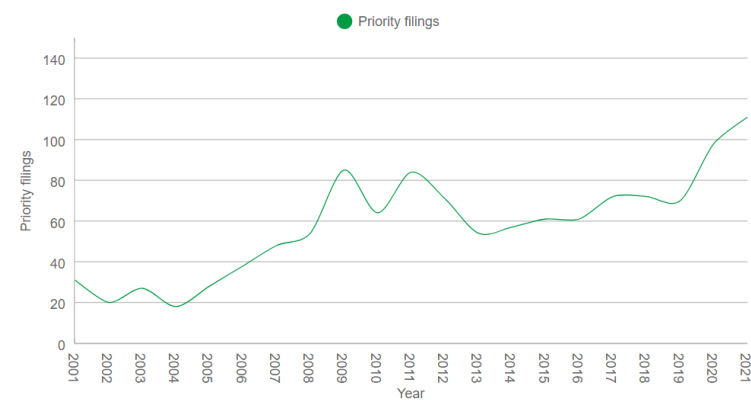
Lithium-ion batteries (40-year trend)



Small modular reactors and microreactors (40-year trend)



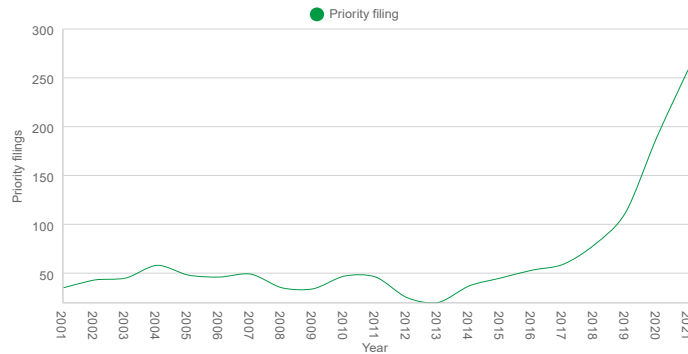
Floating wind turbines (25-year trend)



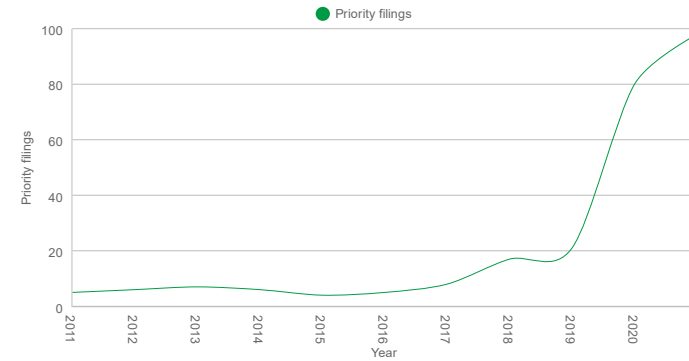


Historic highs – alternative protein

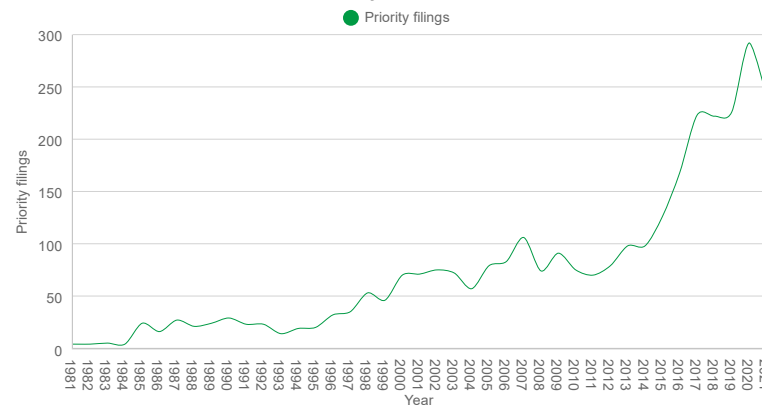
Plant-based meat (20-year trend)



Cultivated meat (10-year trend)



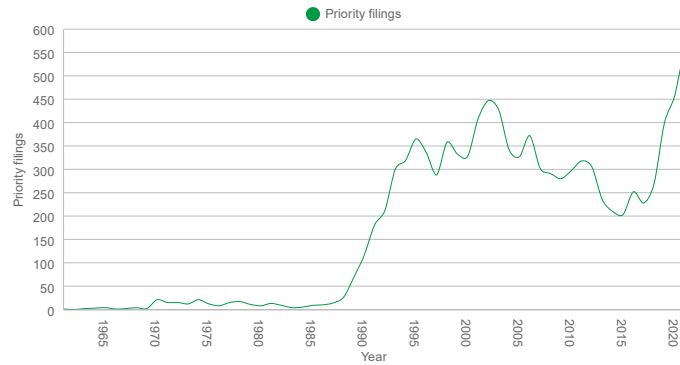
Insect protein (40-year trend)



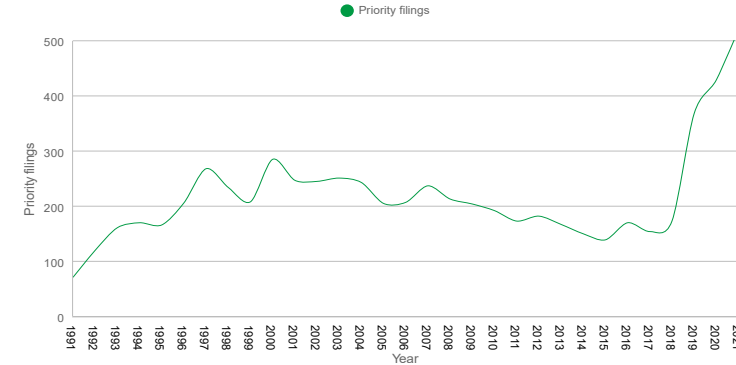


Historic highs – materials

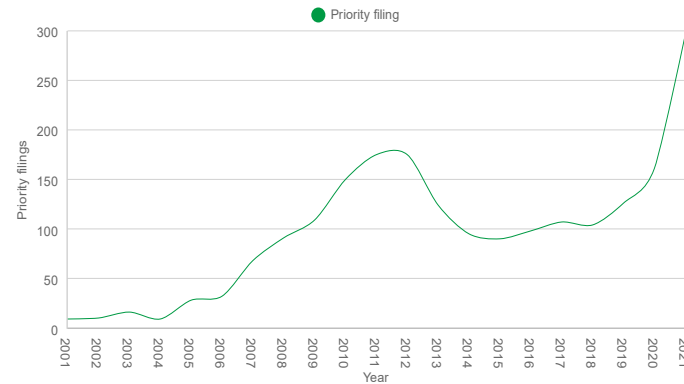
Bioplastics (60-year trend)



Chemical recycling (30-year trend)



CCUS (20-year trend)



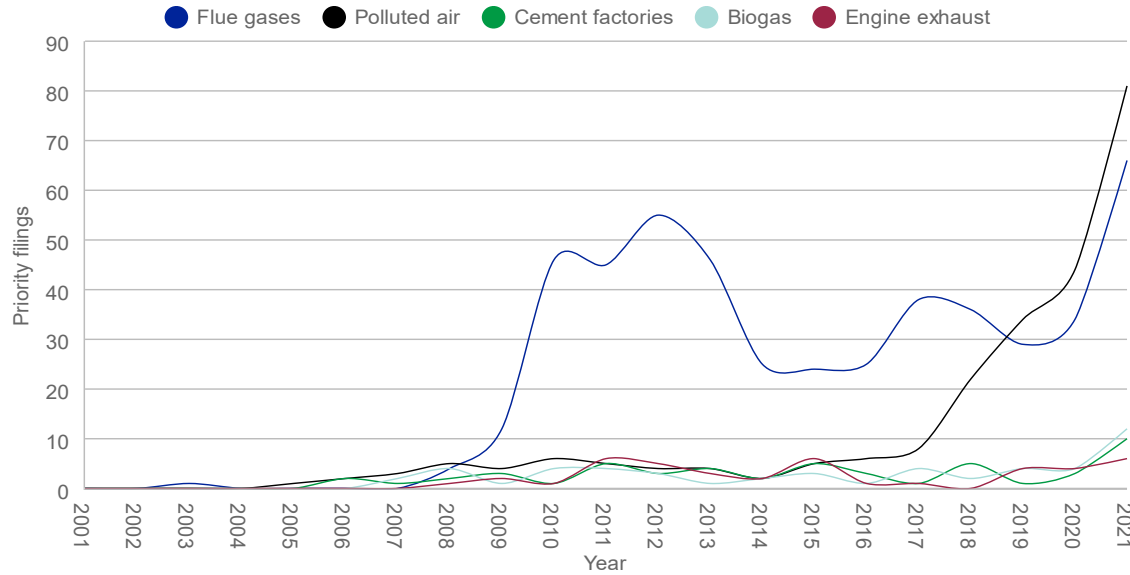
Theme 2: Carbon Capture – A Necessary Solution?



Carbon capture – a necessary solution?

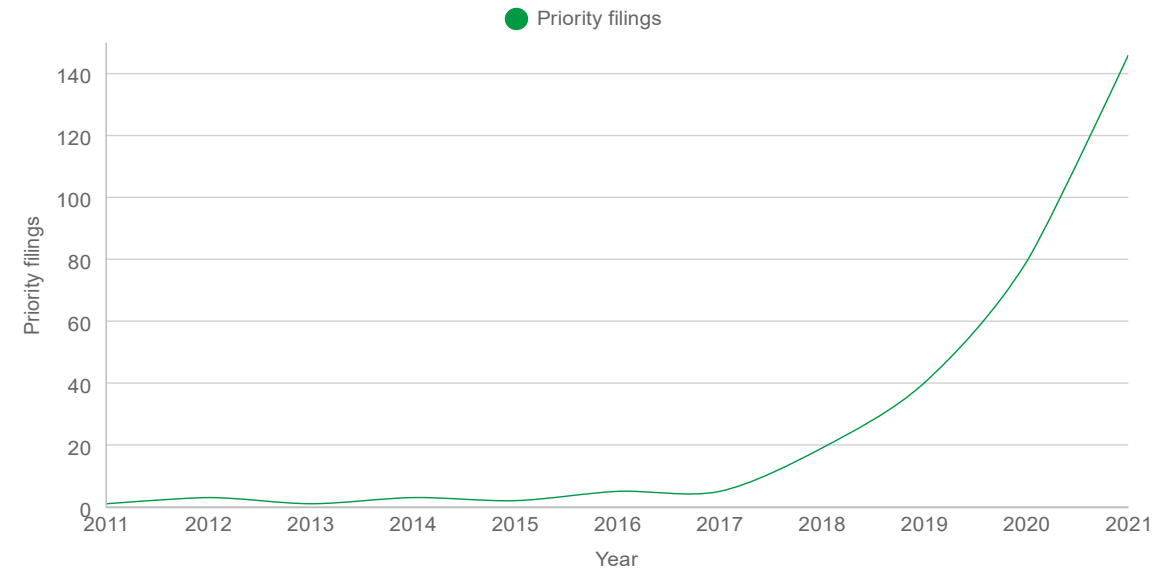
CCUS

(20-year trend - priority filings by source of waste gas)



Direct air capture innovations

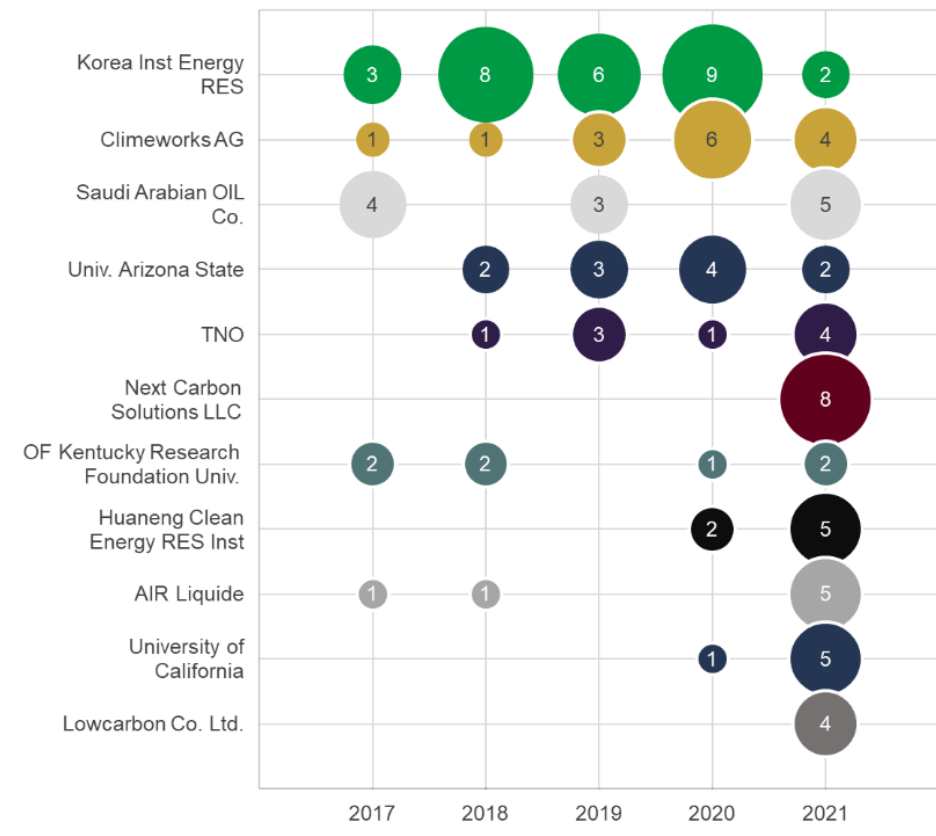
(10-year trend)





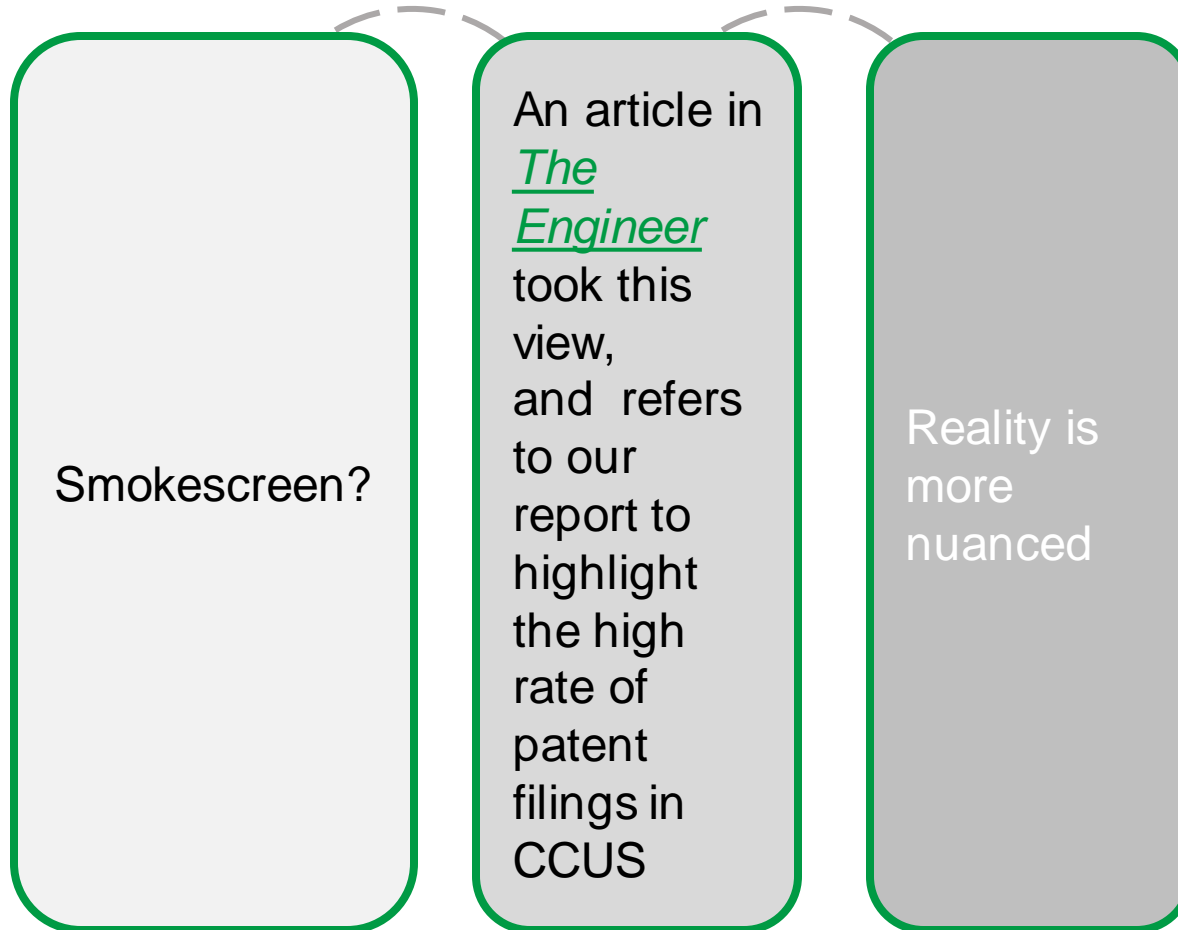
Carbon capture – top applicants

Figure 4: Five-year trend - top filers - CCUS





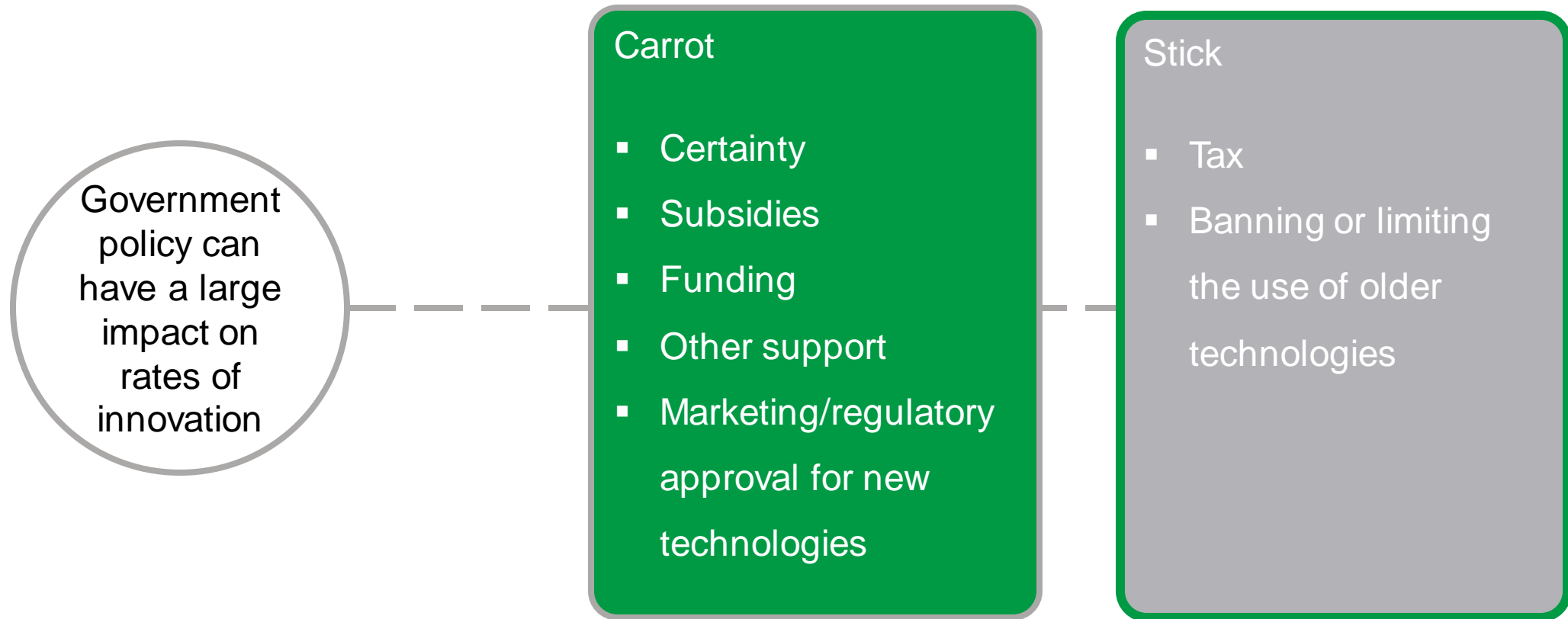
Carbon capture – a necessary solution?



Theme 3: Impact of Regulations and Policy



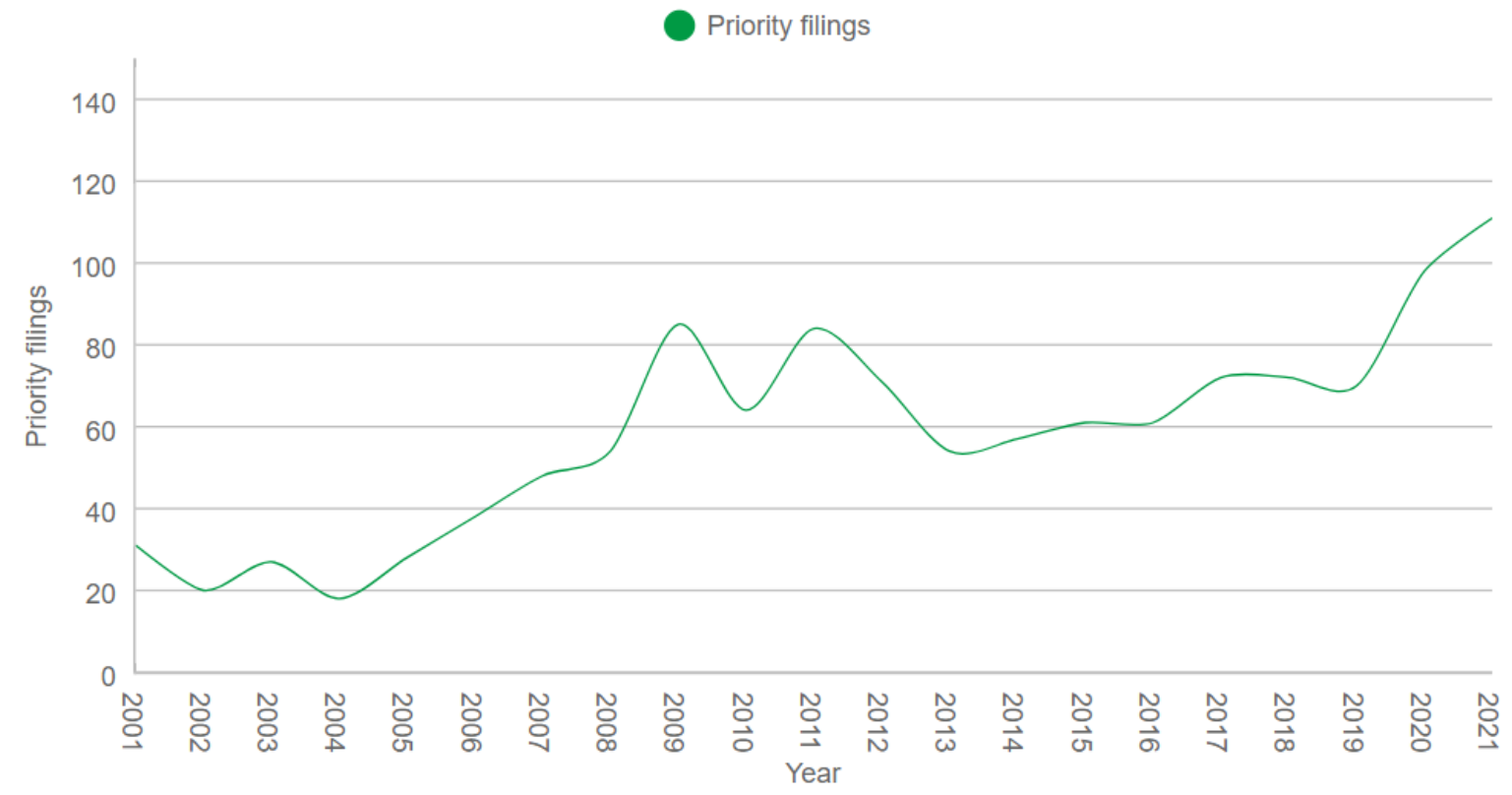
Impact of regulations and policy





Impact of regulations and policy – wind

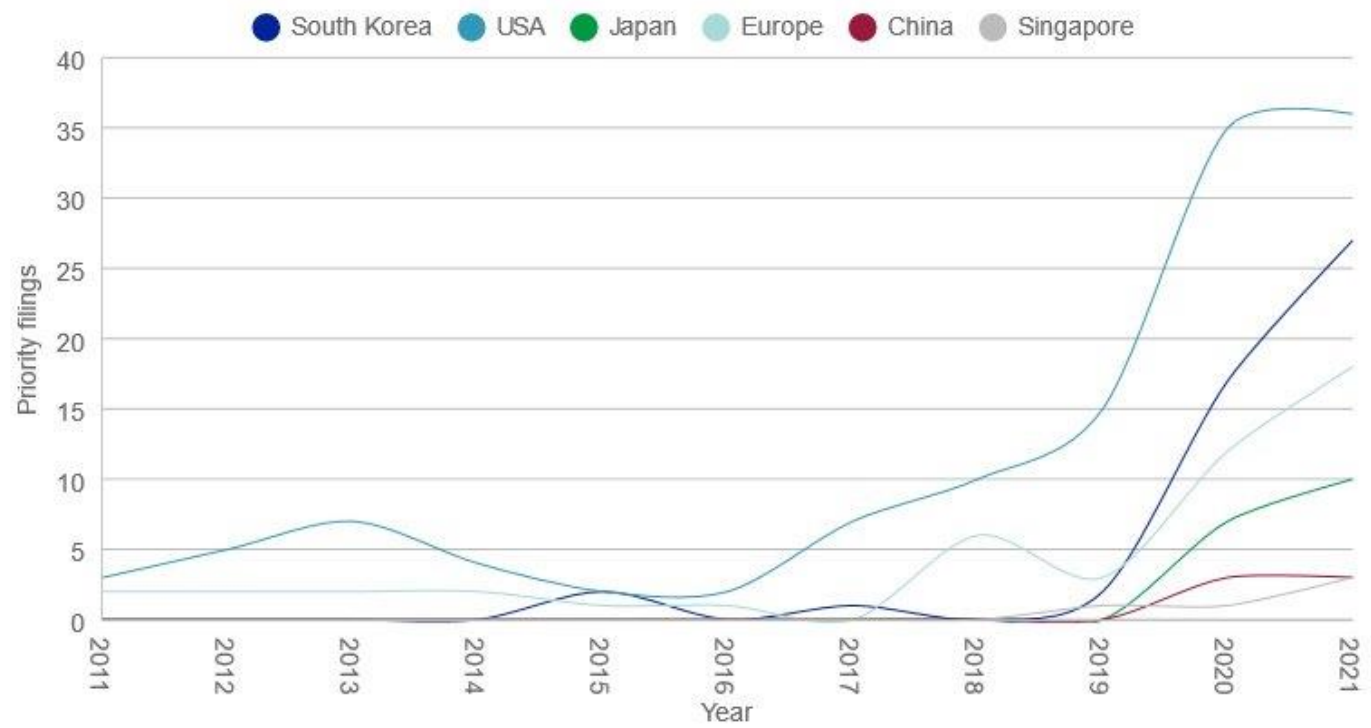
Figure 4: Twenty-year trend - global priority filings - floating wind turbines





Impact of regulations and policy – cultivated meat

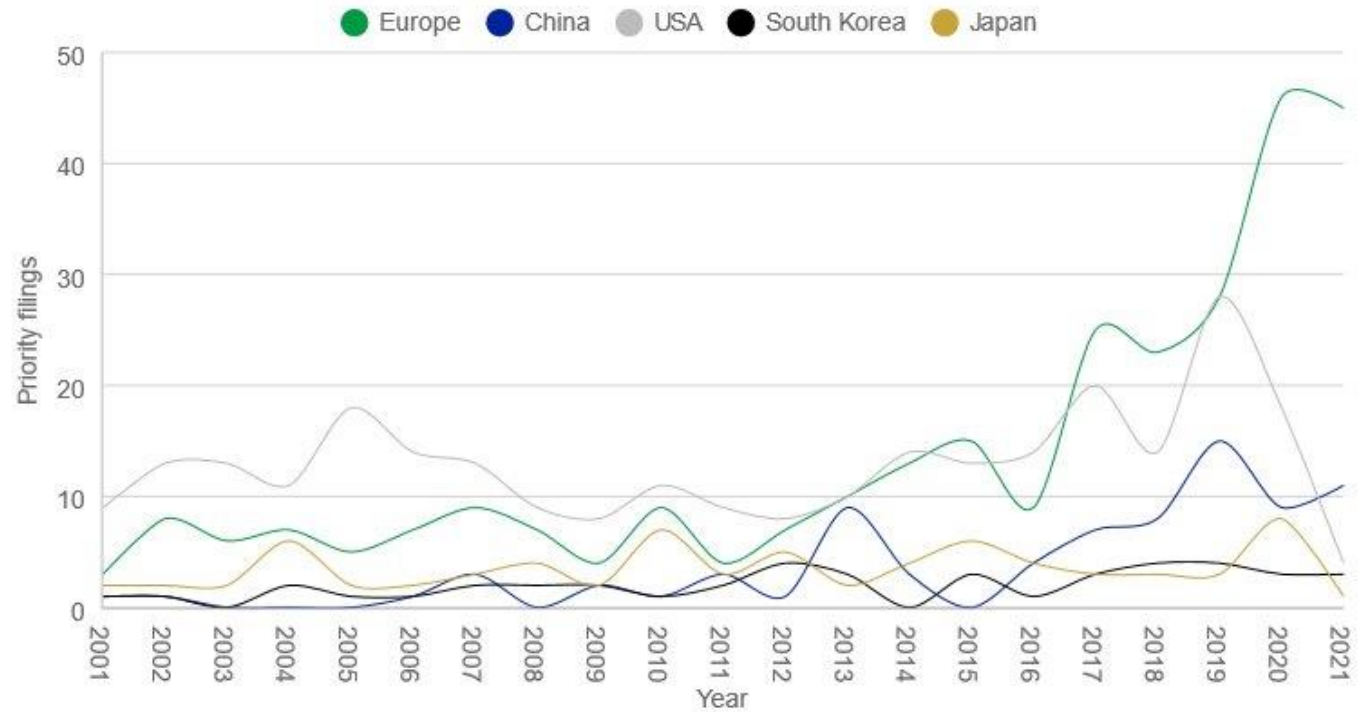
Cultivated meat (20-year trend by territory)





Impact of regulations and policy – insect protein

Insect protein
(20-year trend by territory)





Useful Links

- <https://www.appleyardlees.com/inside-green-innovation-progress-report/>
- <https://www.theengineer.co.uk/content/news/carbon-capture-and-storage-unlikely-to-cut-emissions-from-abated-oil-and-gas>



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**KE Matters:
Steve Davison,
Climate Champions Team**

April 2024

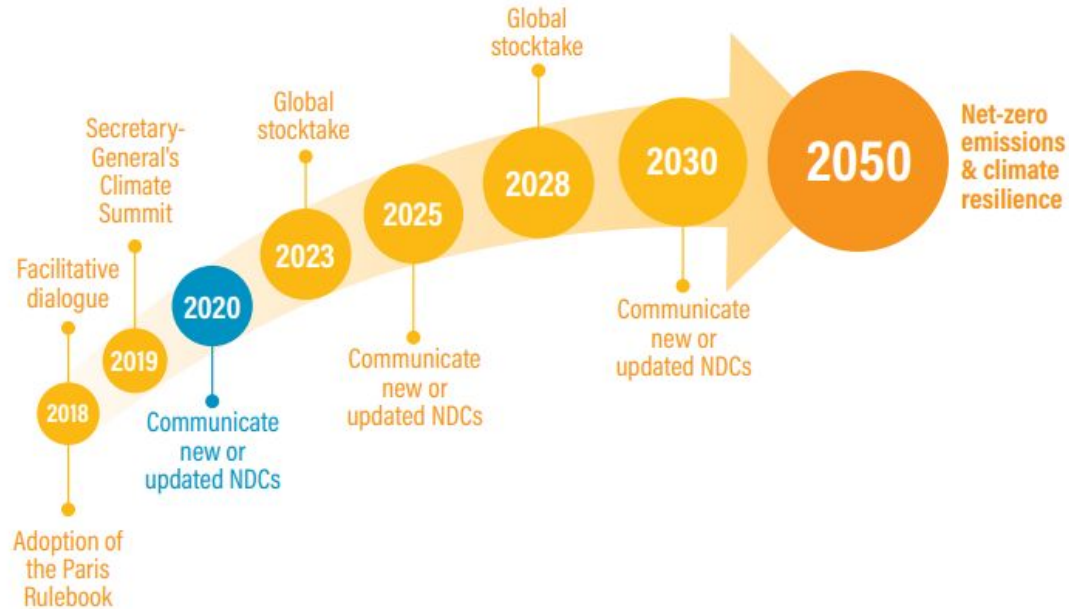
Climate policy tallwind: the 2030 target

6 year sprint to limit warming to 1.5:

- Halve Global Emissions
- Triple renewables and double energy efficiency
- Increase resilience of 4 billion people from vulnerable communities



International climate policy - everything you need to know



Source: <https://www.wri.org/publication/ndc-enhancement-by-2020>

The Climate Champions: where I fit In



Ms Nigar Arpadarai

IMPORTANCE OF NON-GOVERNMENT CLIMATE ACTION (COP21, 2015)

Countries agreed on the importance of mobilising climate action from cities, regions, businesses, investors and other non-state actors (**NSAs**). Each COP Presidency appoints a High-Level Champions to connect the work of governments with voluntary, collaborative climate action.

MANDATE IS RENEWED FOR 5 YEARS (COP25, 2019)

Countries acknowledged the importance of NSAs contributing to the goals of the Paris Agreement.

RACE TO ZERO IS BORN (2020)

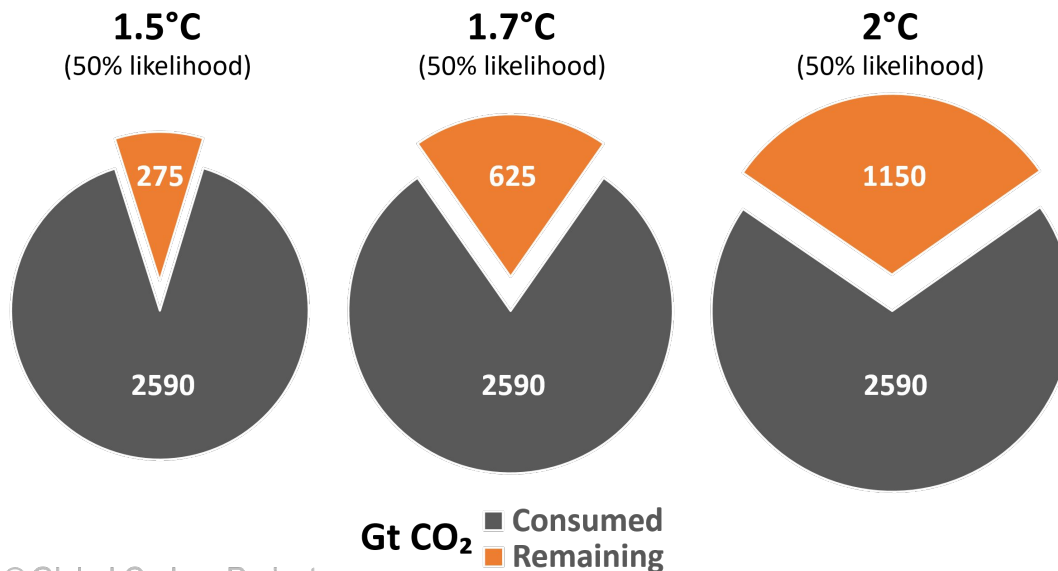
The High-Level Champions rally a group of leading actors that are ahead of the curve on their net zero commitments and implementation. It's sister campaign, the Race to Resilience, is launched shortly after.



HE Razan Al Mubarak

Remaining carbon budget

The remaining carbon budget to limit global warming to 1.5°C, 1.7°C and 2°C is 275 GtCO₂, 625 GtCO₂, and 1150 GtCO₂ respectively, equivalent to 7, 15 and 28 years from 2024. 2590 GtCO₂ have been emitted since 1850



© Global Carbon Project

The remaining carbon budgets is the average of two estimates (IPCC AR6 and Forster et al., 2023), both updated by removing the most recent emissions. Quantities are subject to additional uncertainties e.g., future mitigation choices of non-CO₂ emissions
 Source: [IPCC AR6 WG1](#); [Forster et al., 2023](#); [Friedlingstein et al 2023](#); [Global Carbon Project 2023](#)

2030 In policy

1. UEA Consensus
2. Climate Action agenda (2030 Solutions & Breakthrough)
3. Troika



Setting the agenda for national policy making

“With only six years to go to until 2030 we stand at a critical juncture in the global climate and development agenda.”

Troika letter to the parties
21 March, 2024

The action agenda: 2030 targets

Energy

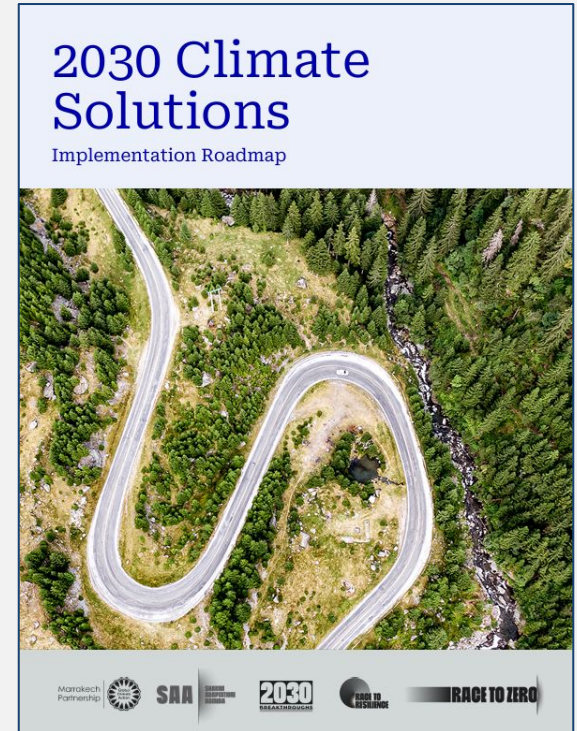
- Hydrogen: 430gw of operational electrolyzer capacity - equivalent to 50Mt of renewables-based hydrogen
- Batteries: Global grid investment doubled, including 359 GW of battery storage capacity. Zero emission vehicles (ZEV) are the new normal
- Wind: Solar and wind power make up at least 46%, and all renewables make up at least 68% of global electricity generation by 2030.

Food

- Plant-based Protein: increase the global consumption per capita of fruits, vegetables, seeds, nuts, and legumes by 1.5x, while also significantly increasing the share of alternative plant-based protein

Materials

- Plastics: 100% plastic packaging is reusable, recyclable, or compostable by 2025, and 2030 at the latest.
- Carbon capture: Over 20 cement plants with Carbon Capture Utilization & Storage.



Technology focus areas

1. **Continue exponential growth of renewable energy.** Continued cost reductions in wind and solar production, strengthening of the grid, electrification of heat, improvements in energy storage, interconnectors and demand response management.
2. **Continue exponential growth of EV adoption.** Rapidly scale up EVs and charging networks. This will require ongoing improvements in battery technology and considerations of the new politics of raw materials.
3. **Achieve cost tipping point for green hydrogen** to facilitate the decarbonisation of ammonia, steel, aviation and shipping fuel.
4. **Achieve cost tipping point for alternative proteins**, both lab-grown and vegetable. Requires technological development as well as behavioural change to grow adoption.
5. **Develop a portfolio of carbon dioxide removal technologies**

A report into the impacts of implementing the Grace on fossil fuel industry ties on Cambridge University's mission
Nigel Topping, July 2023

Conclusion: why do I care?

A 6 year sprint - what can be achieved in 6 years? Knowledge mobilisation and deployment

Specificity - clear pathways and targets identified. The needs are known.

Not just about technology - Importance of finance, social innovation, policy and planning

Not the whole picture - National agendas, market pressures, research serendipity

There is a feedback loop - Not just a one way process. Opportunities to inform through the NSA agenda

Reading List

1. [Global Stocktake Technical Dialogue Synthesis Report](#) (2023)
2. [UAE Consensus](#) (2023)
3. [2030 Climate Solutions](#) (2023)
4. [Breakthrough Agenda Annual Report](#) (2023)
5. [IPPC AR6 Synthesis Report - Summary for Policy Makers](#) (2023)