

Military Emissions Gap Conference 2023

MILITARY AND CONFLICT GHG EMISSIONS: FROM UNDERSTANDING TO MITIGATION

Tuesday 26 September, University of Oxford, and online

**CONCRETE
IMPACTS**



**Conflict and
Environment
Observatory**



**Scientists
for Global
Responsibility**



**UNIVERSITY OF
OXFORD**



Queen Mary
University of London



The Minor Foundation
for Mass Challenges



**Loughborough
University**

Dr Duncan Depledge

Lecturer in Geopolitics & Security

International Relations, Politics and History (IRPH)

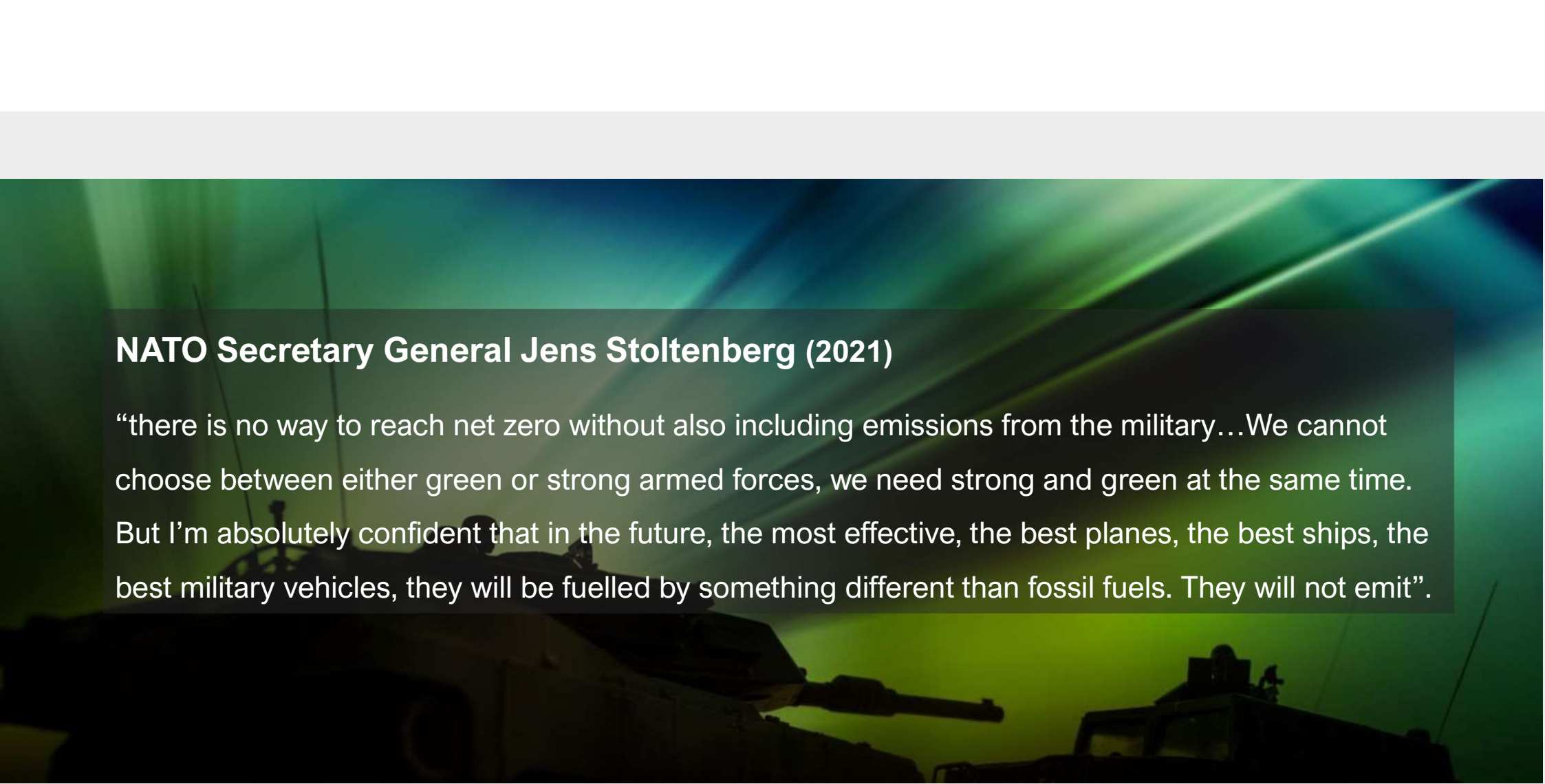
.....
#InspiringWinners since 1909

Will militaries decarbonise?



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University

.....
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NATO Secretary General Jens Stoltenberg (2021)

“there is no way to reach net zero without also including emissions from the military...We cannot choose between either green or strong armed forces, we need strong and green at the same time. But I’m absolutely confident that in the future, the most effective, the best planes, the best ships, the best military vehicles, they will be fuelled by something different than fossil fuels. They will not emit”.





Greening Defence....or Low-Carbon Warfare?



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Pathways to decarbonisation (The 4Rs)

Refuel

Repower

Redirect

Review



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UK Research
and Innovation

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Net Zero Militaries (NETZMIL): Retaining Operational Effectiveness in a Low Carbon World

Lead Research Organisation: [Loughborough University](#)

Department Name: Politics and International Studies

[Go back](#)

[Overview](#) [Organisations](#) [People](#)

Abstract

Defence is the single largest institutional consumer of hydrocarbons in the world. In the UK, the defence sector accounts for approximately 50% of central government greenhouse gas emissions. In 2021, responding to growing pressure from civil society and defence industry, both the UK Ministry of Defence (MOD) and NATO recognised that the carbon cost of military operations needed to fall. However, academics and policymakers have yet to meaningfully address the implications of 'Net Zero' ambitions for the future character of military operations.

NETZMIL aims to assess the actual and potential impact of the UK Government's Net Zero ambitions on military operations. The project has been co-designed through consultations with key stakeholders from across UK Defence and NATO. Using the UK as a case study, NETZMIL will illuminate key concerns, challenges and opportunities around how militaries in general can retain operational effectiveness whilst supporting the transition to a Net Zero world.



Dr Duncan Depledge



Dr Tamiris Santos

www.net-zero-military.org



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.....
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THANK YOU

Dr Duncan Depledge

d.depledge@lboro.ac.uk

@DMDepledge

[Connect on LinkedIn](#)

Depledge, D. (2023). Low-carbon warfare: climate change, net zero and military operations. *International Affairs* 99 (2): 667-685.
<https://doi.org/10.1093/ia/iad001>.

Depledge, D. et al. (2023). Low-Carbon Warfare. *Nature Climate Change* 13: 881-882
<https://doi.org/10.1038/s41558-023-01763-9>



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IMPACTS**



SAFE LANDING: Aviation Worker Perspective on Aviation Greenwash

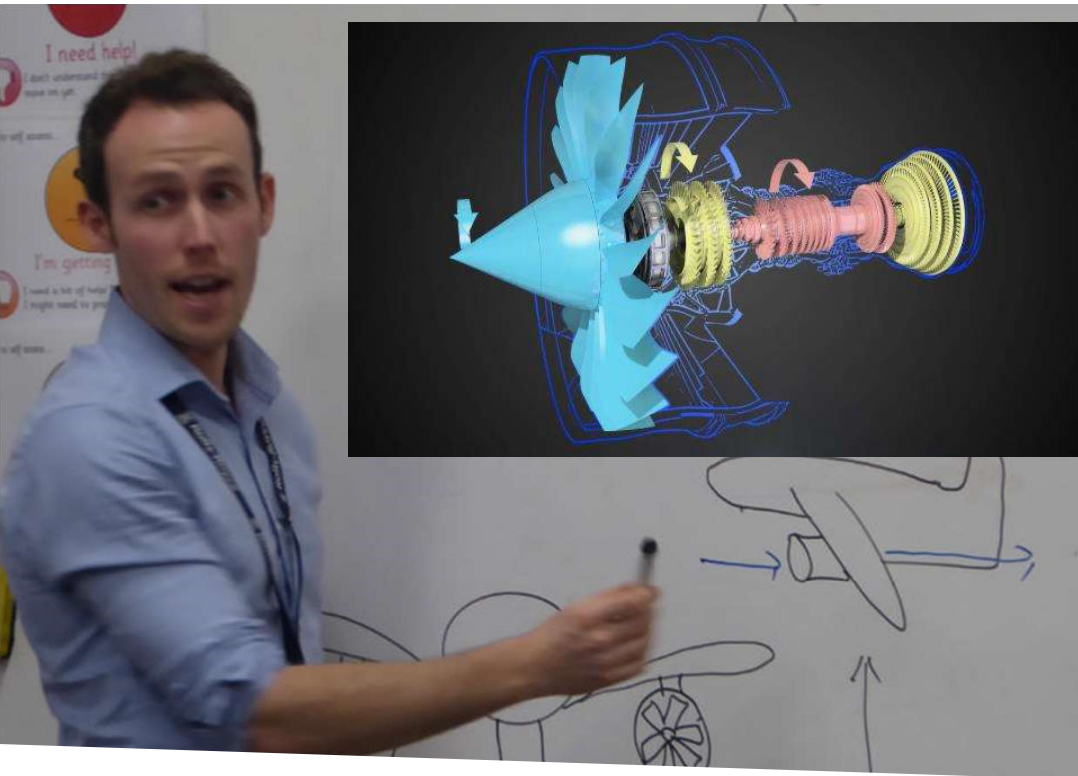


Safe
Landing

Finlay Asher

AGENDA

- **My background**
- **My organisation: Safe Landing**
- **Issues with aviation decarbonisation plans**
- **How this relates to defence**

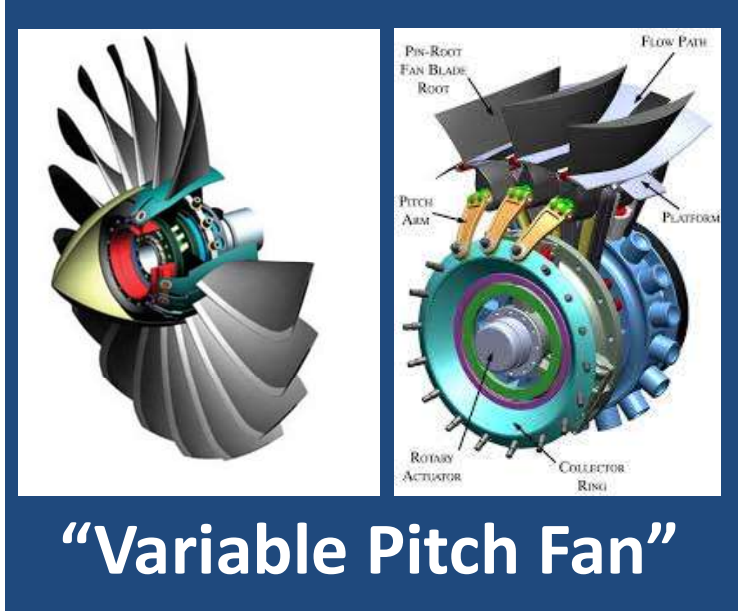
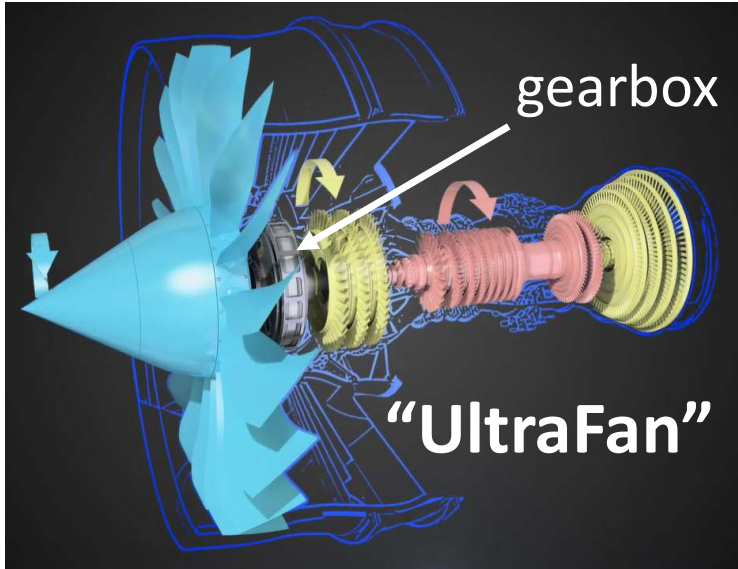


Finlay Asher

- Mechanical / Aerospace Engineer
- Co-founder of [Safe Landing](#) (aviation workers)
- 8 Years @ Rolls-Royce: Future Aircraft Engine Design



My Background: Future Concepts





Employee Sustainability Group



Safe Landing

AVIATION WORKERS
FOR A SUSTAINABLE FUTURE



www.safe-landing.org

info@safe-landing.org



Safe Landing

AVIATION WORKERS
FOR A SUSTAINABLE FUTURE

- LinkedIn:
<https://www.linkedin.com/company/safe-landing-org/>
- Twitter:
<https://twitter.com/ SafeLanding>
- Facebook:
<https://www.facebook.com/safe.landing.workers>
- Instagram:
https://www.instagram.com/safe_landing/

www.safe-landing.org

info@safe-landing.org

Our Demands



As aviation workers, we demand that our leaders:

1. **Be honest** about the total environmental impact of flying
2. **Be realistic** about the limits of technology to solve this problem
3. **Be transparent** about future regulations required to reduce emissions
4. **Have a plan** that accounts for this and supports workers during transition



Our positions:



As aviation workers, we believe that:

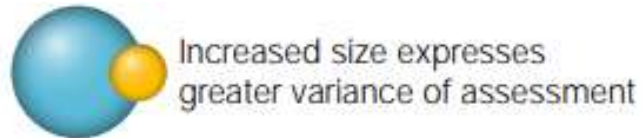
1. Flying has a **high environmental impact**, and is currently **highly inequitable**.
2. Technology **will not be available at scale** in the time required (10-15 years).
3. Future regulations **are vital**, and this includes **limiting air traffic**.
4. Acknowledging this, **and planning for this**, is in all of our best interests.



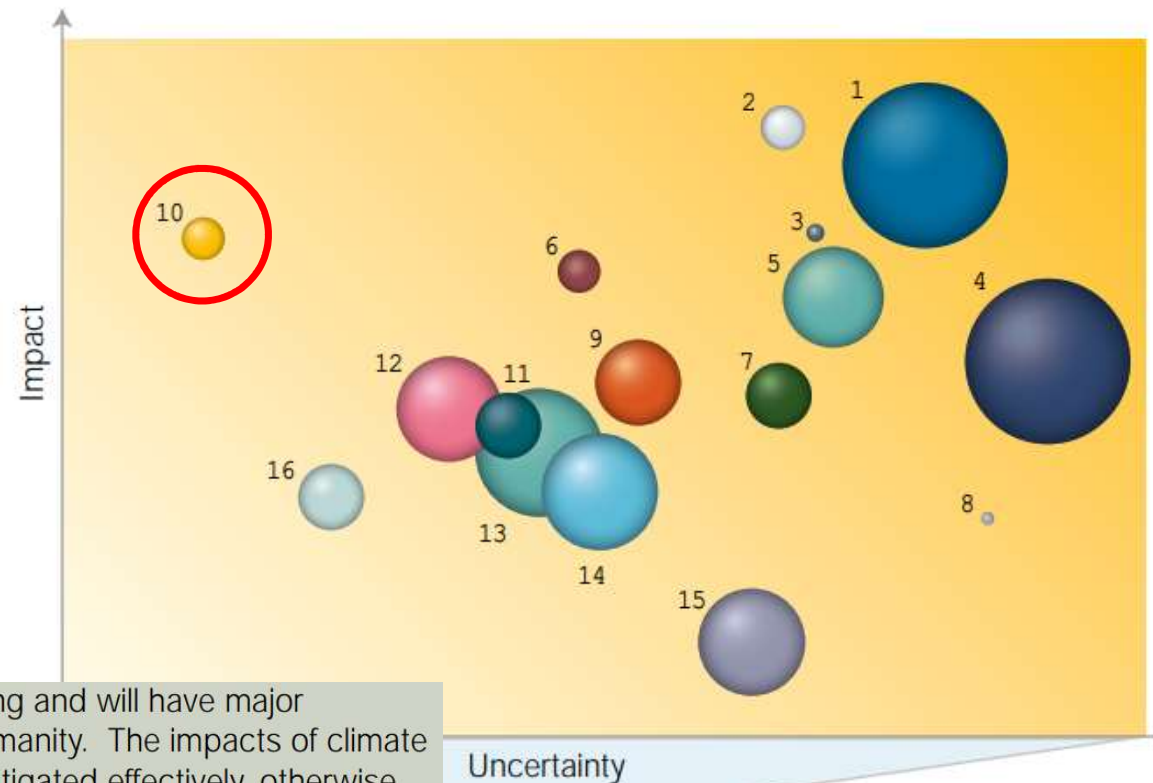


Ministry
of Defence

STRATEGIC SECURITY RISKS



Exploring uncertainty



- The climate is changing and will have major consequences for humanity. The impacts of climate change need to be mitigated effectively, otherwise it could act as a driver of instability and conflict with far-reaching humanitarian, economic and geopolitical consequences.

- Systems to mitigate food and water scarcity and disruptions to supplies need to be developed to avoid shortages and prevent instability.

Source: [UK MoD, 2018](#)

2 KEY APPROACHES:

Risk Mitigation

- **Consider all potential scenarios and threats.**
- **Prepare for the worst, don't assume the best.**
- **Have multiple mitigation options, in case any fail.**

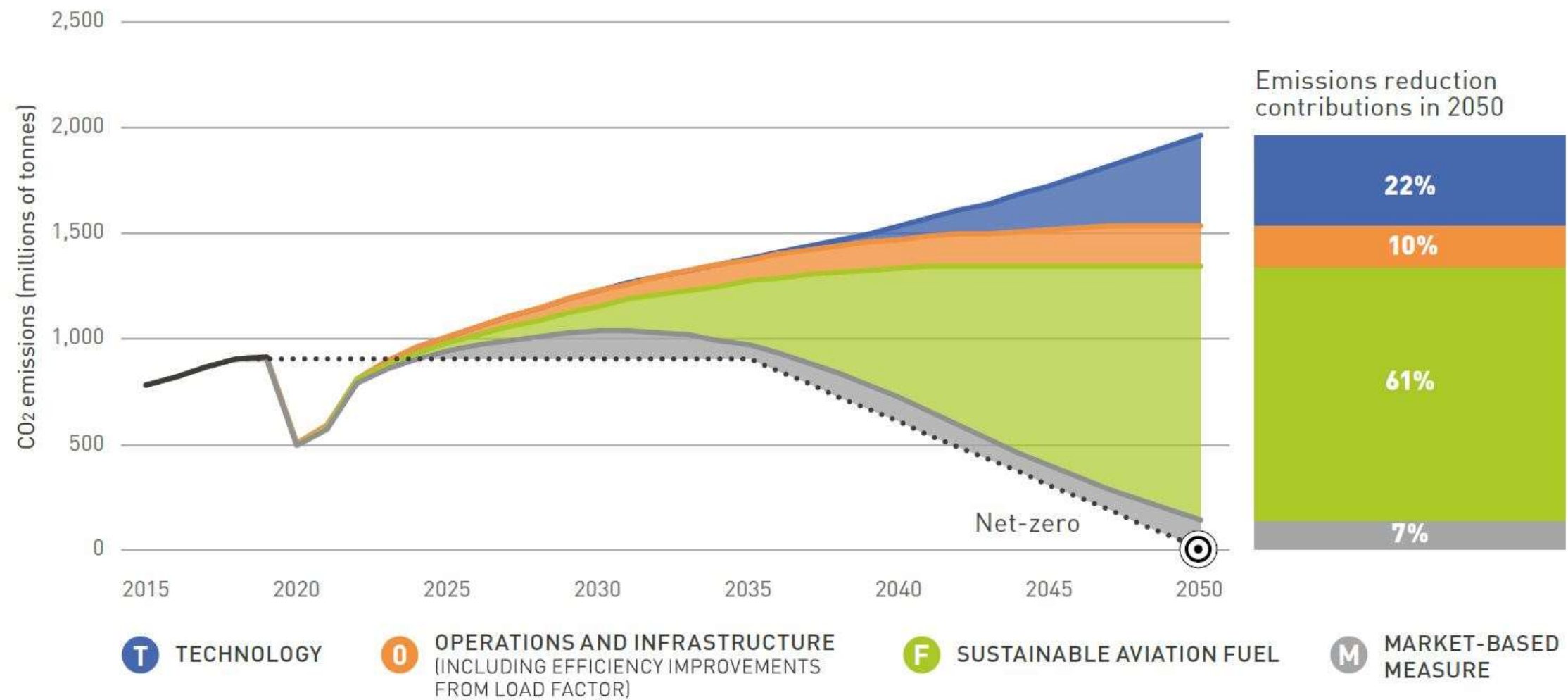
Systems Thinking

- **Perform robust requirements capture.**
- **Consider interactions with other systems.**
- **Consider changing requirements with time.**

Requirement 1:

CARBON BUDGET /

TIME

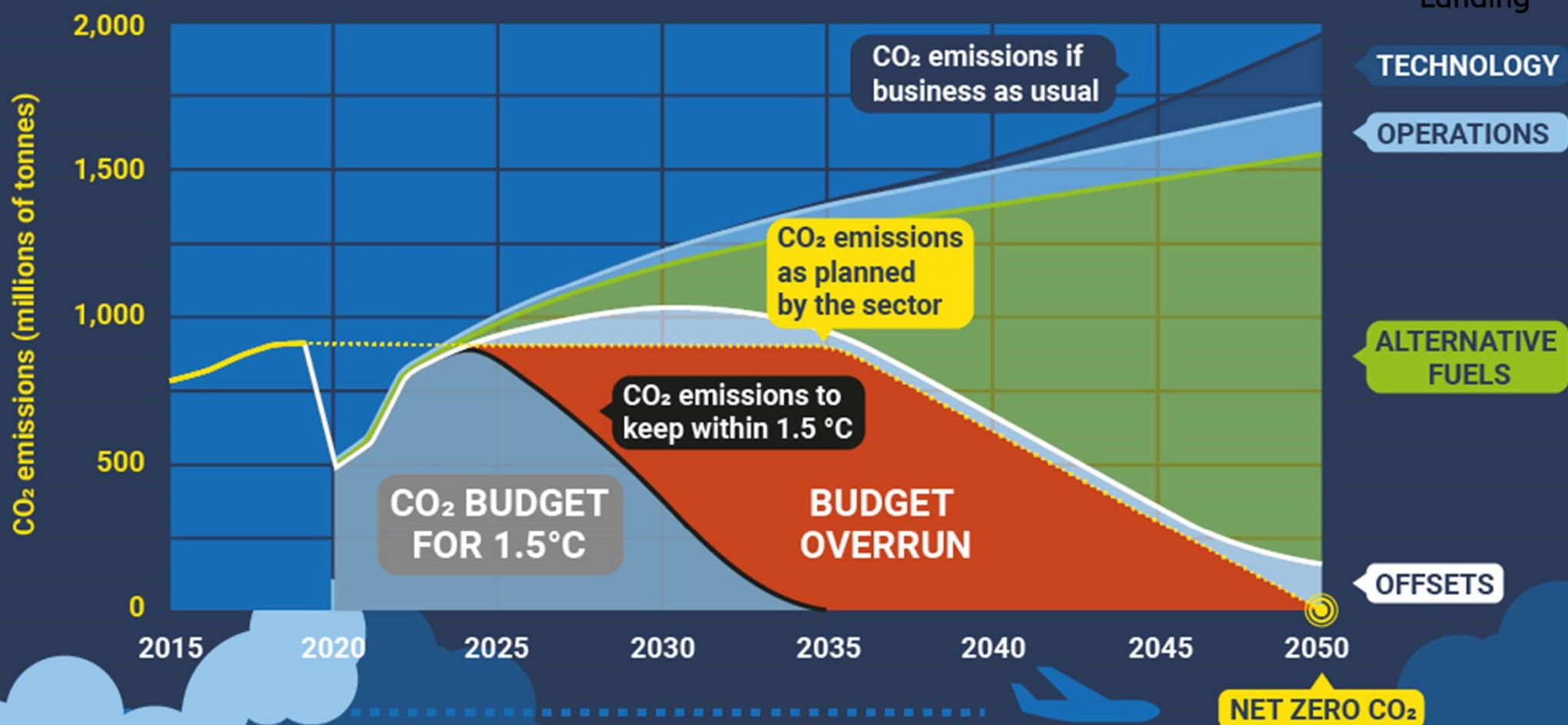


Source: [ATAG](#)

Sources:

ATAG(2021): <https://bit.ly/Waypoint2050>, Scenario 2 p. 25

UNEP (2021): https://bit.ly/Emissions_Gap, p. XXIII



Time:

We have very limited time before we blow our carbon budget for 1.5degC.

SOURCES:
[Stanford University](#)

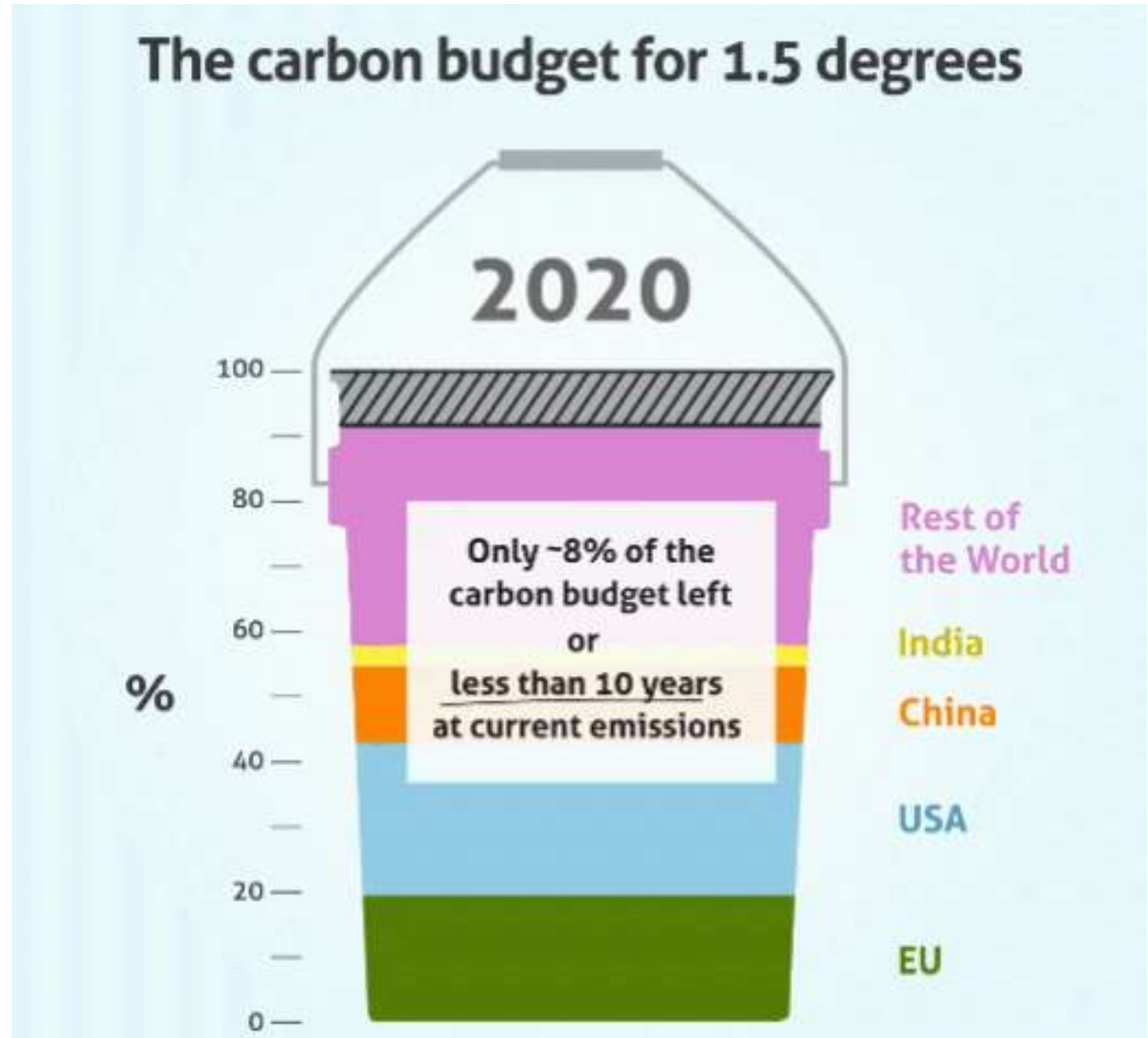
The carbon budget for 1.5 degrees



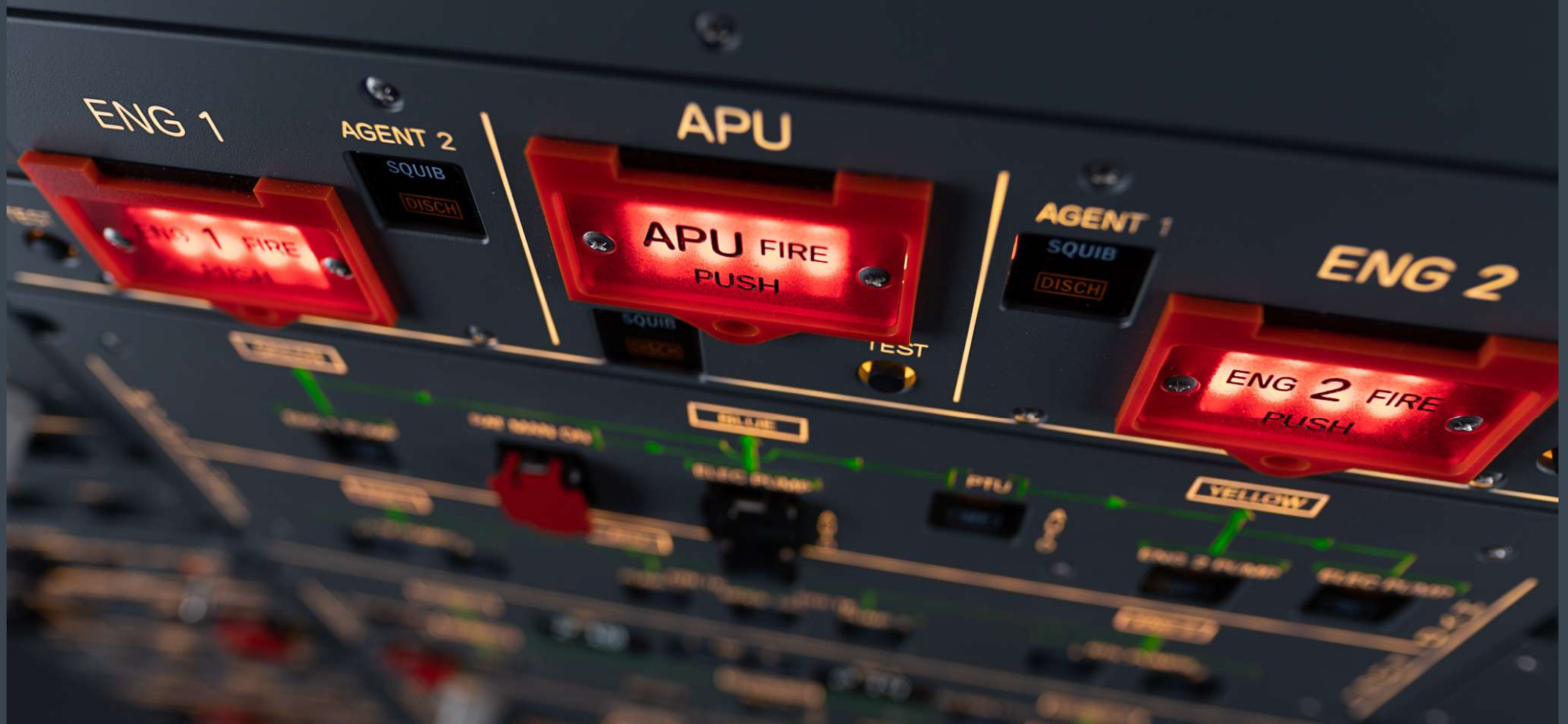
Time:

We have very limited time before we blow our carbon budget for 1.5degC.

SOURCE:
[Stanford University](#)



THIS IS AN EMERGENCY

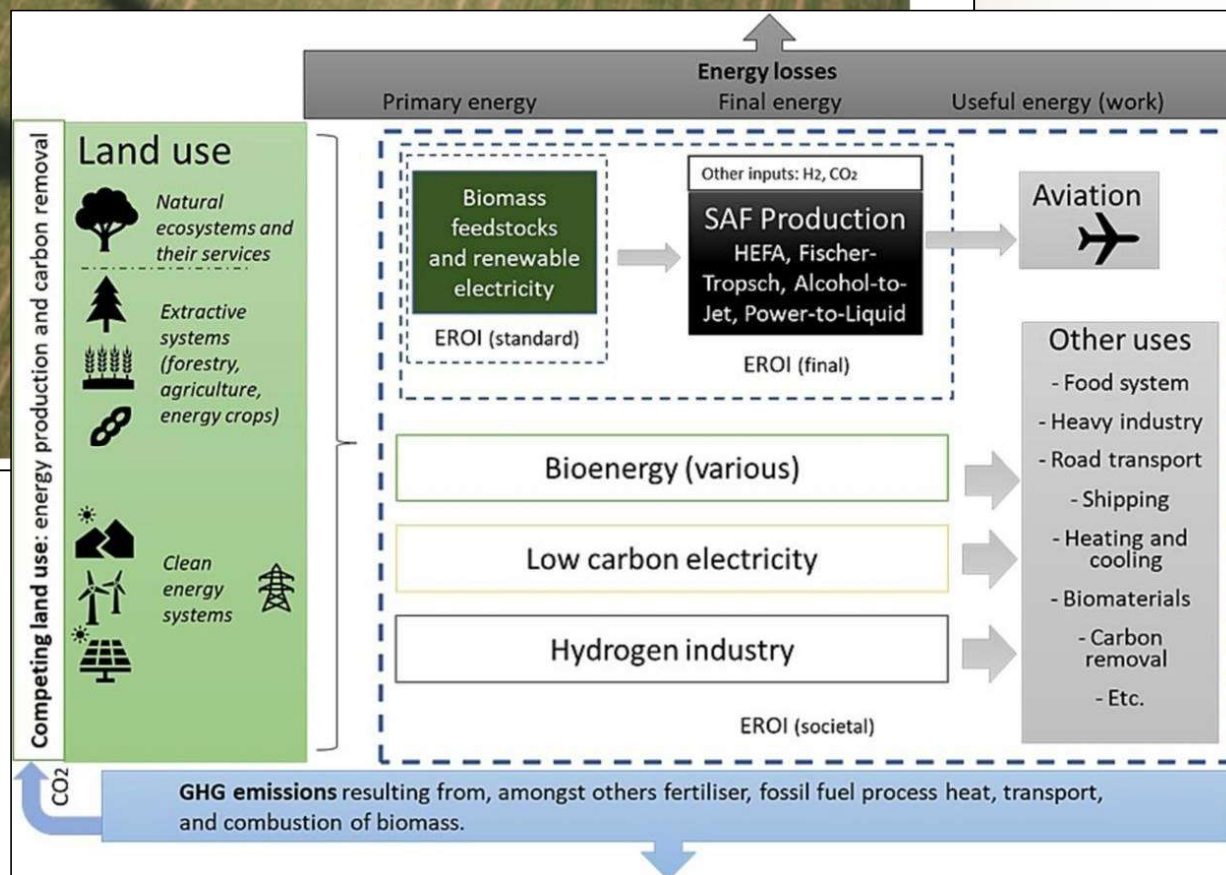


Requirement 2:

**LOW-CARBON ENERGY
RESOURCE / BUDGET**

Biofuels for net-zero aviation 'could require half of UK agricultural land'

28 Feb 2023
Professional Engineering

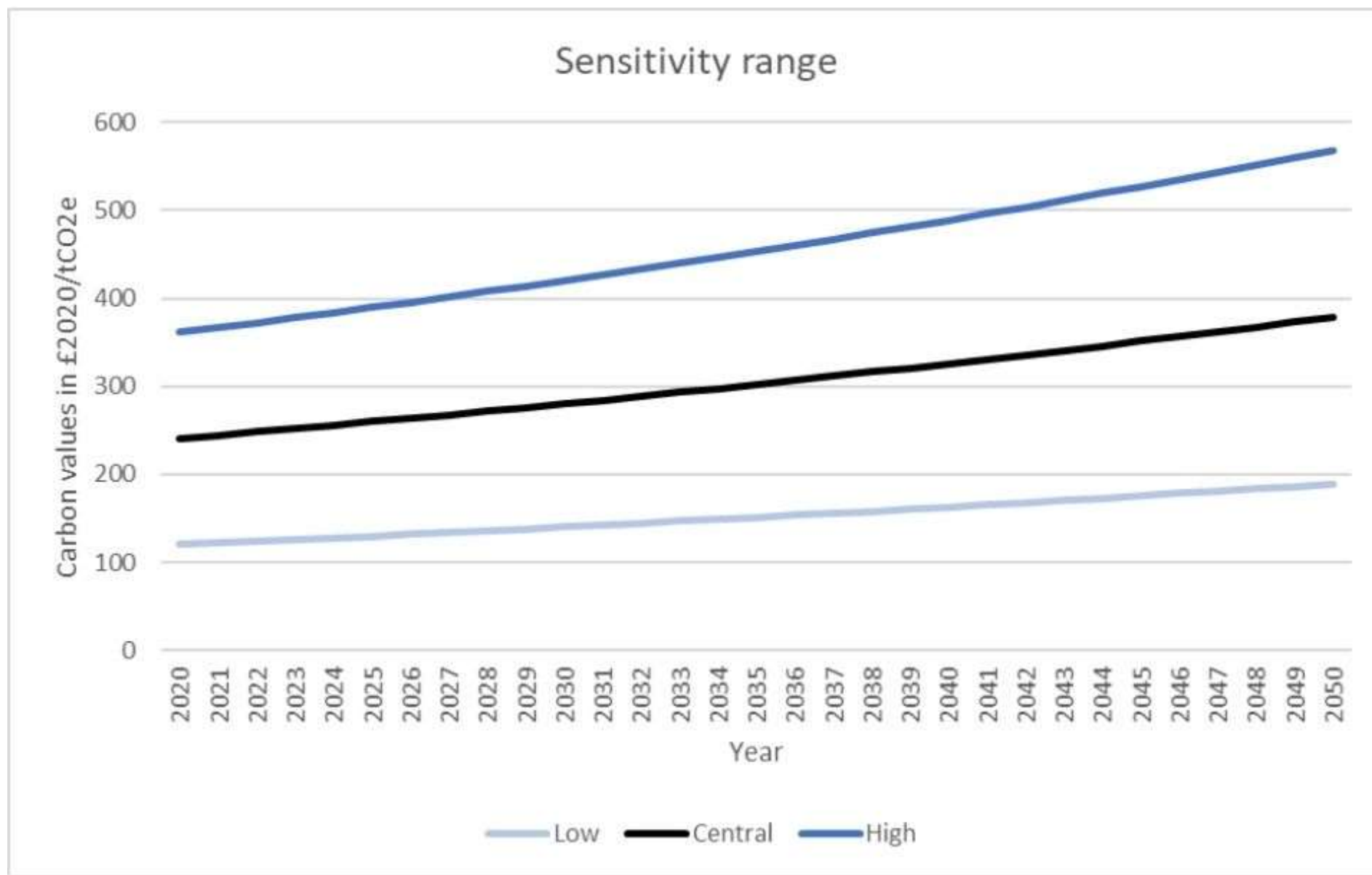


Source:
[Royal Society, 2023](#)

Source:
[S. Becken et al, 2023](#)

Requirement 3:

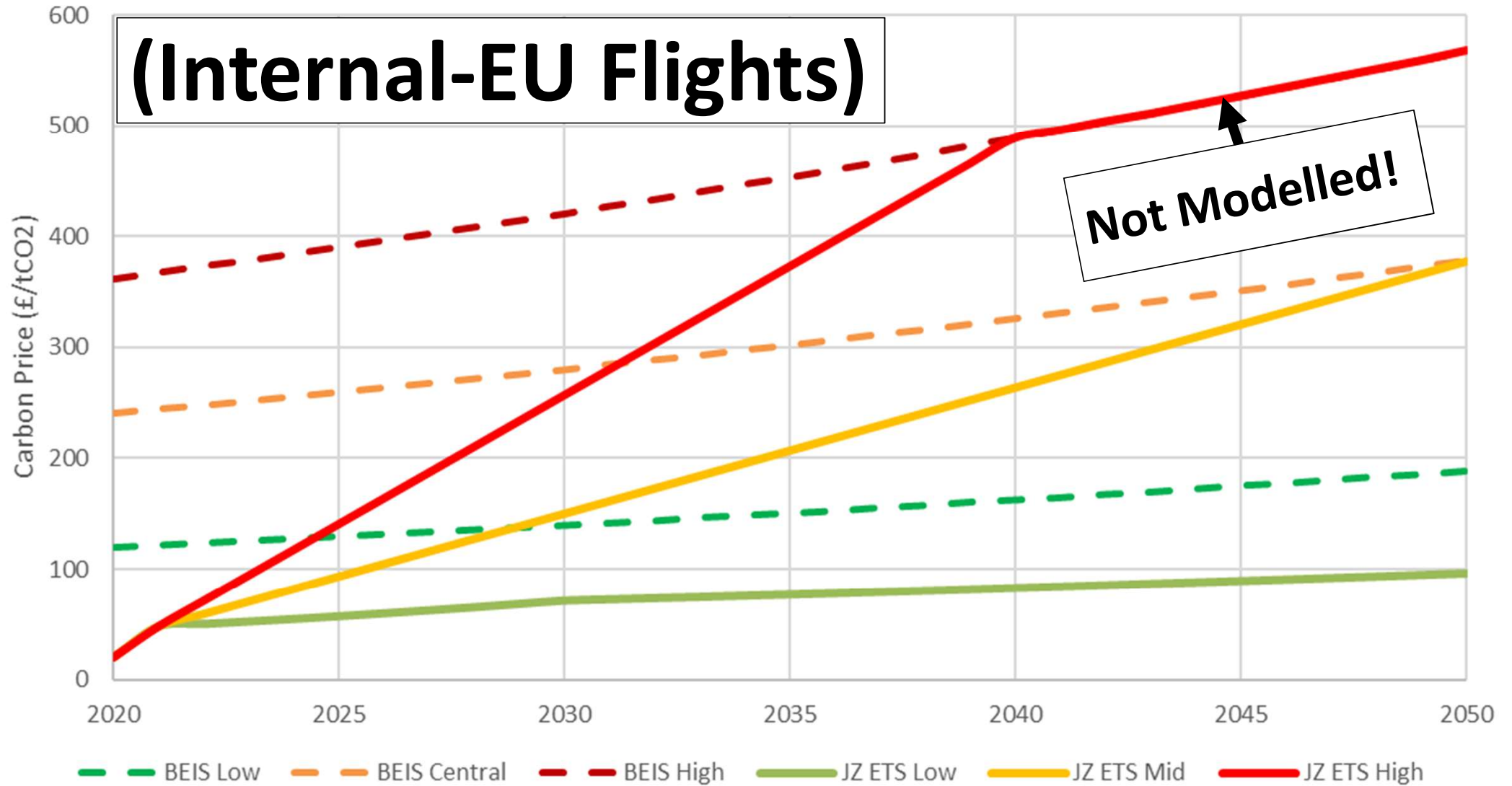
**PRICE OF
CARBON / EMISSIONS**



Source:
[UK Gov,](#)
[2021](#)

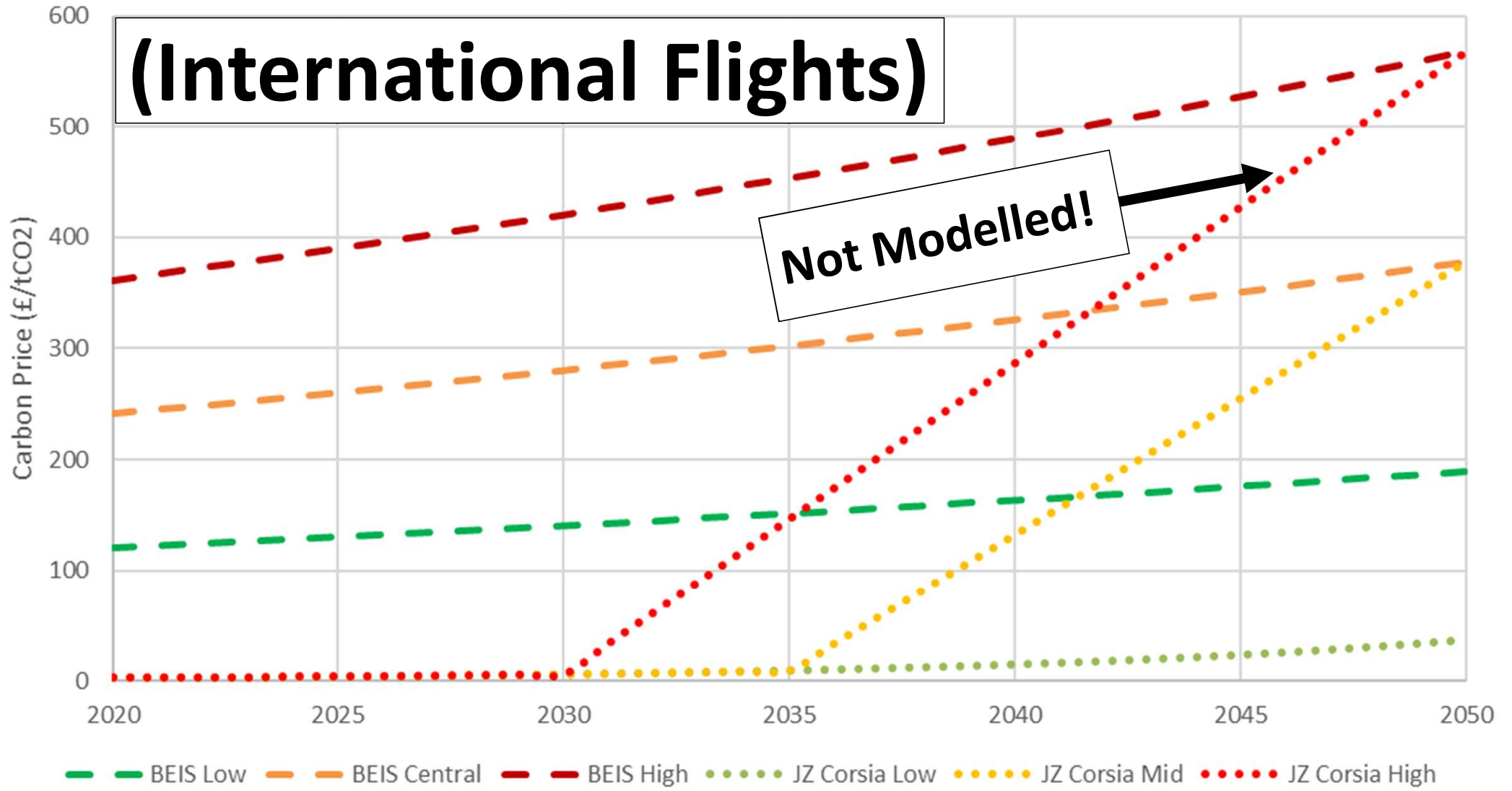
Carbon Price Comparison: BEIS Values vs. Jet Zero 'ETS'

(Internal-EU Flights)

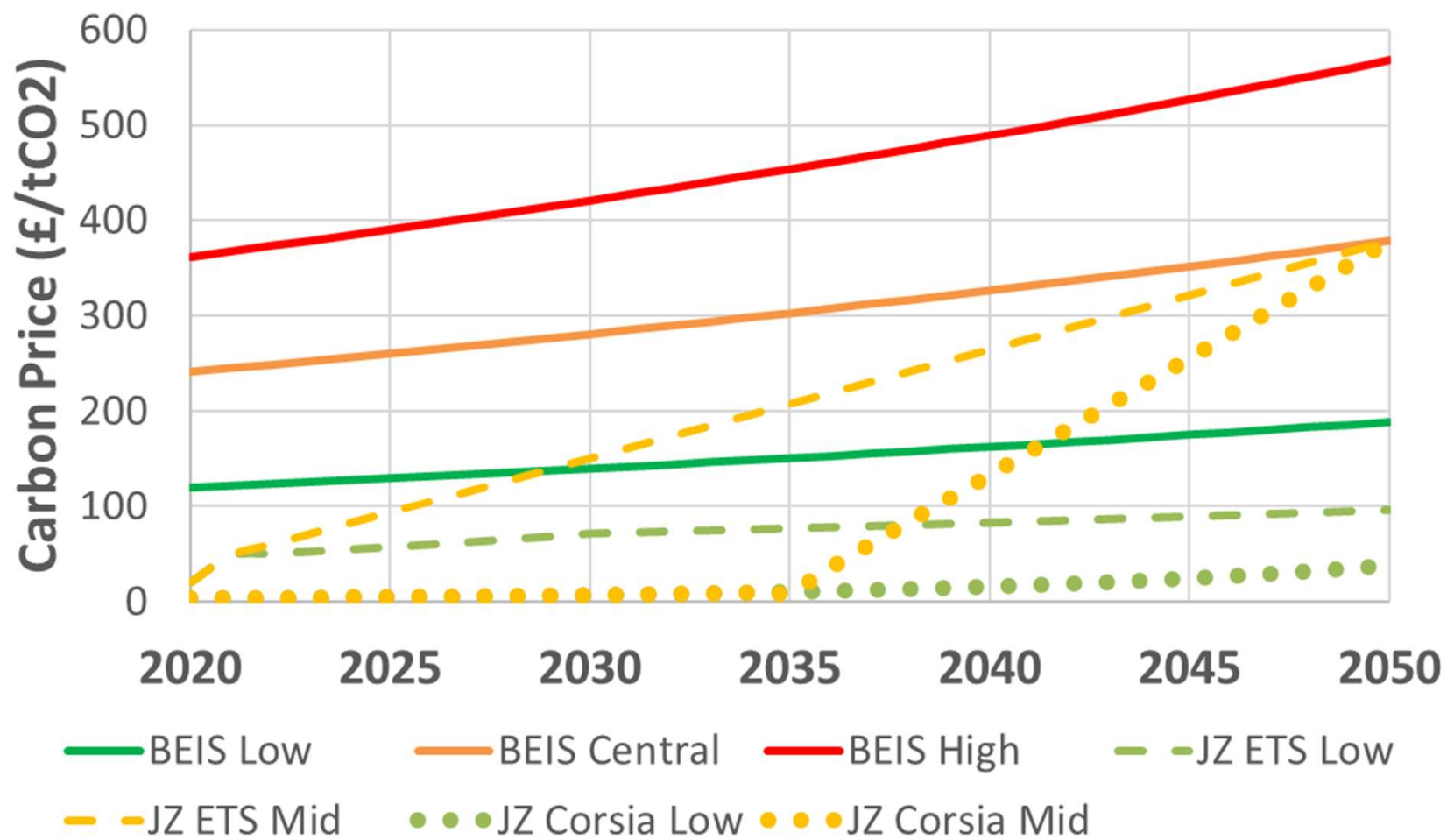


Carbon Price Comparison: BEIS Values vs. Jet Zero 'CORSIA'

(International Flights)



Comparison: BEIS Carbon Values vs. Jet Zero 'ETS' and 'CORSIA' Prices

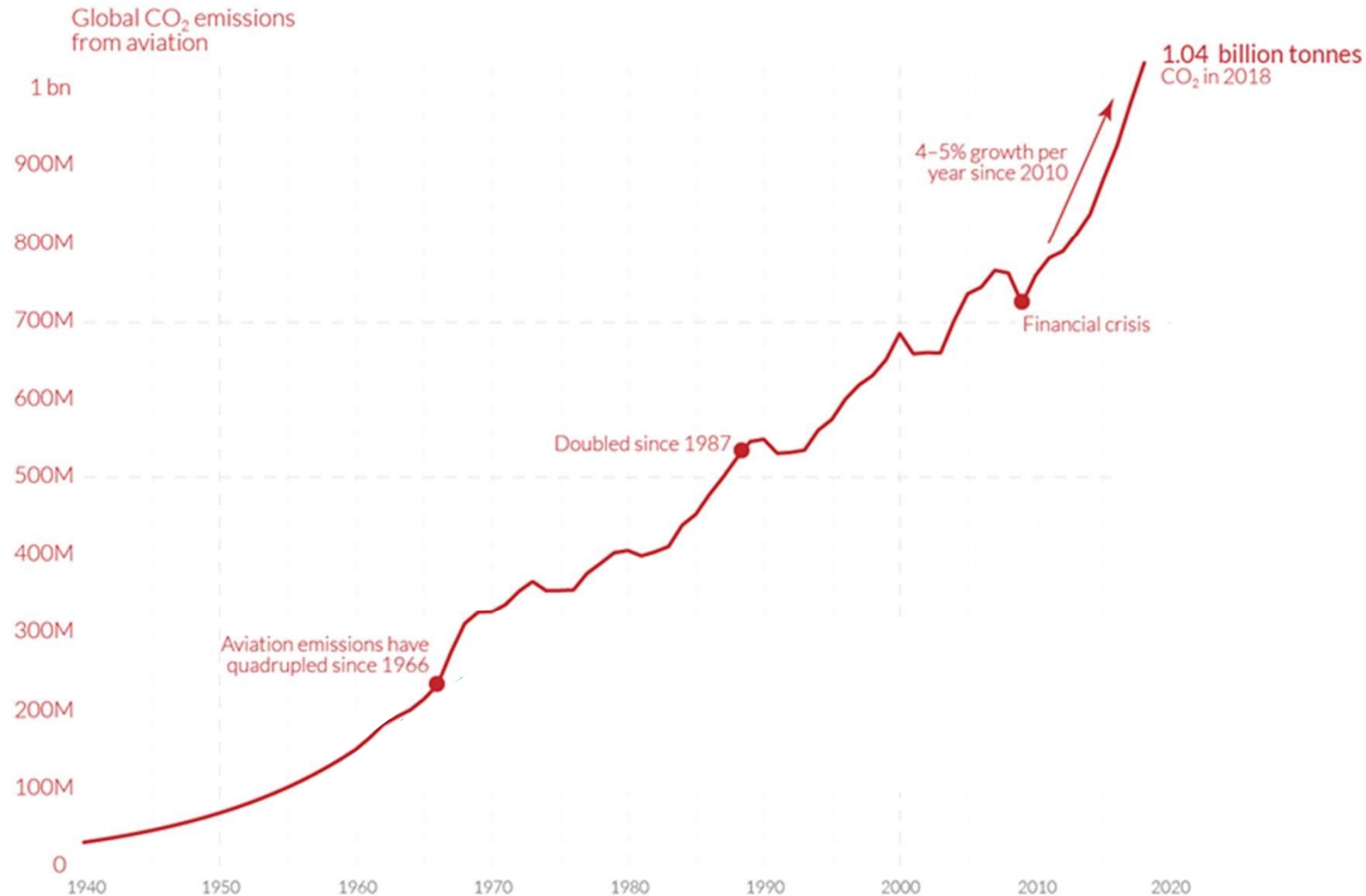


AVIATION EMISSIONS GROWTH

Global carbon dioxide emissions from aviation

Aviation emissions includes passenger air travel, freight and military operations. It does not include non-CO₂ climate forcings, or a multiplier for warming effects at altitude.

Our World
in Data



**Safe
Landing**

“Our industry is on a dangerous trajectory: we need to set a new flightpath”

OurWorldinData.org – Research and data to make progress against the world’s largest problems.

Source: Lee et al. (2020). The contribution of global aviation to anthropogenic climate forcing for 2000 to 2018; based on Sausen and Schumann (2000) & IEA.

Share of global emissions calculated based on total CO₂ data from the Global Carbon Project.

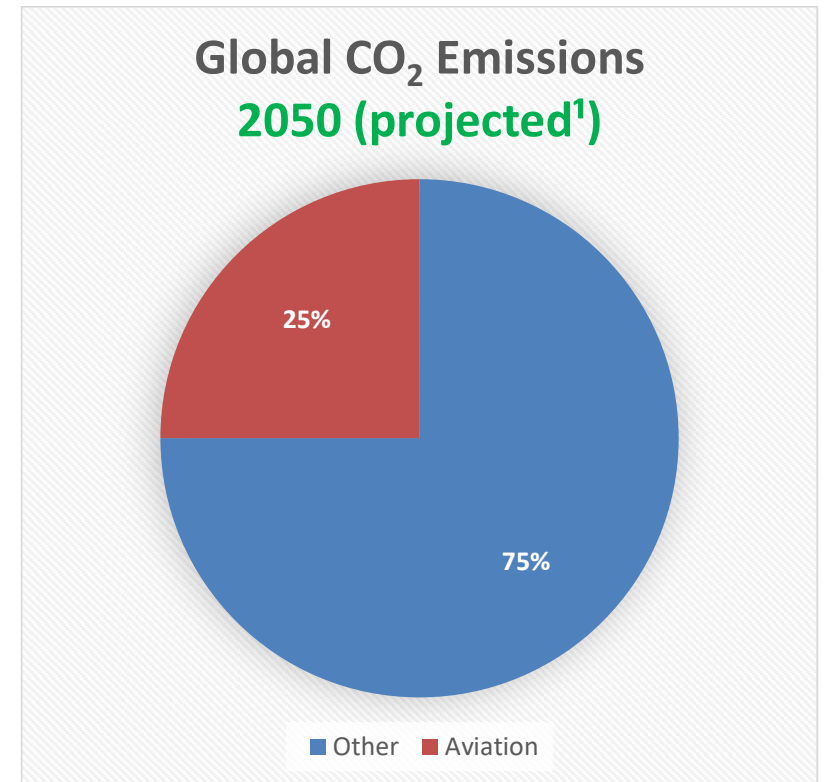
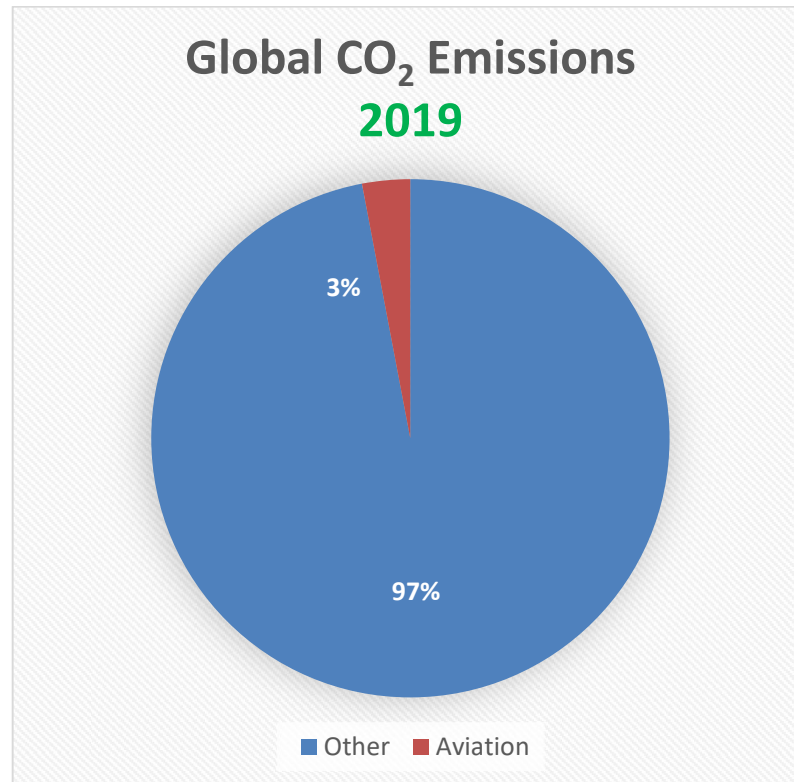
Licensed under CC-BY by the author Hannah Ritchie.

Sustainable Aviation:

the industry uses a
“sustainability play book”
to justify future growth



How big is the problem?

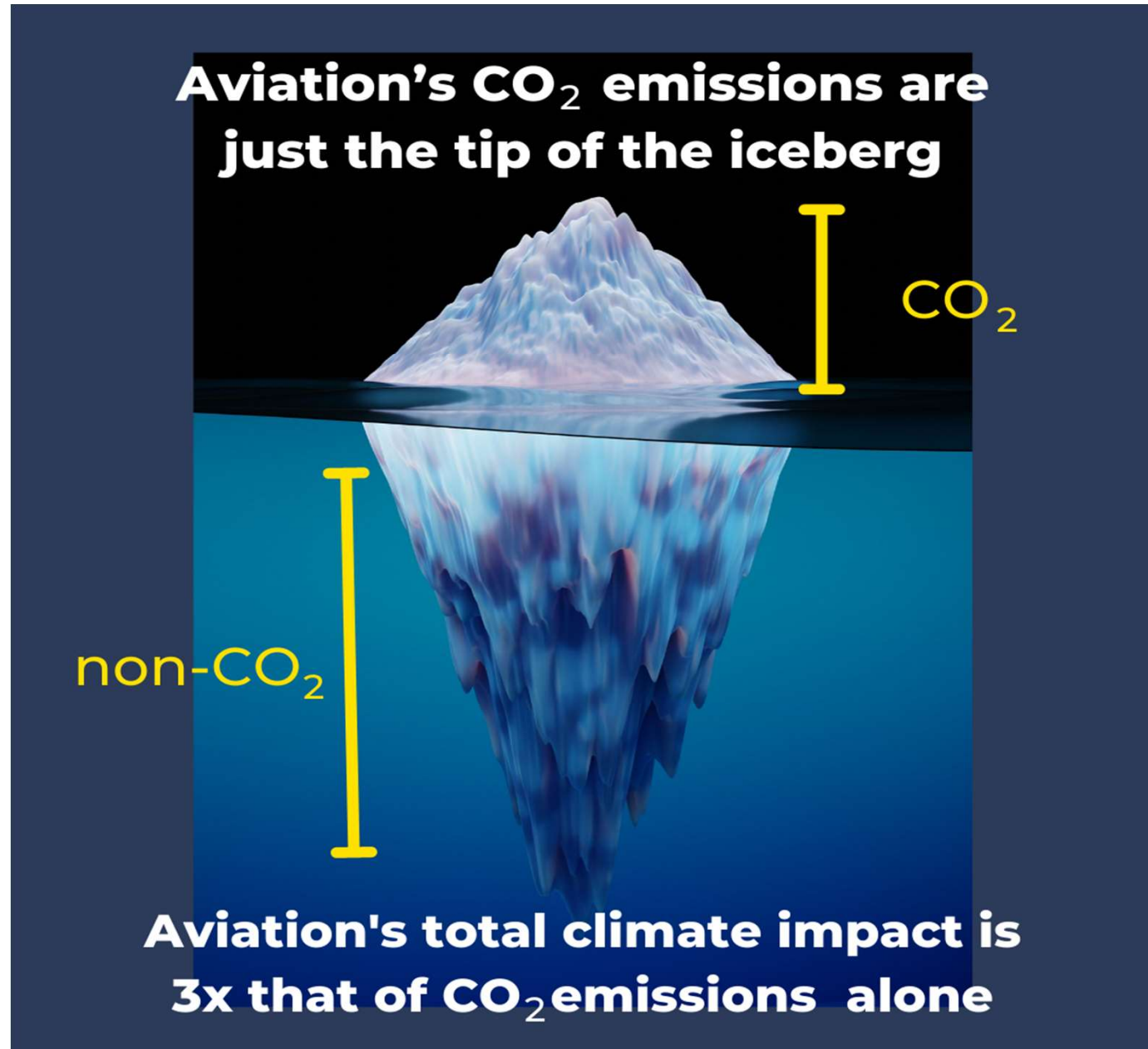


SOURCES:

1. [Rolls-Royce](#)
2. [CarbonBrief](#)

This also ignores aviation's Non-CO₂ emissions

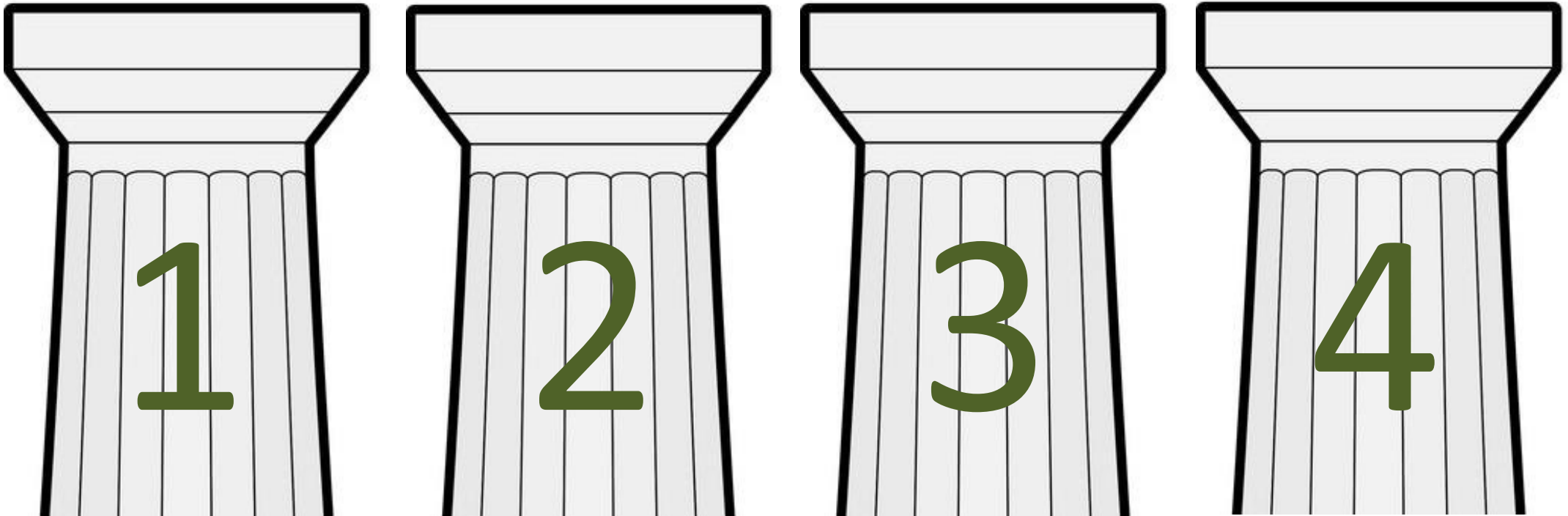
How big
is the
problem?



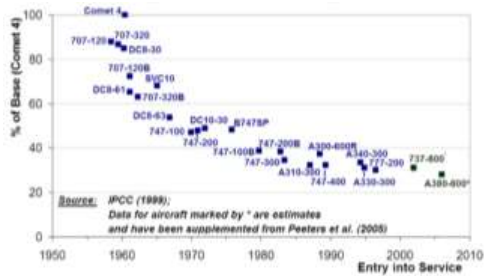
SOURCES:
[D.S. Lee et al., 2020](#)

Sustainable Aviation:

The 4 Pillars



Efficiency Improvements



“Zero Emissions” Aircraft



“Sustainable” Aviation Fuels



Carbon Offsetting



1

2

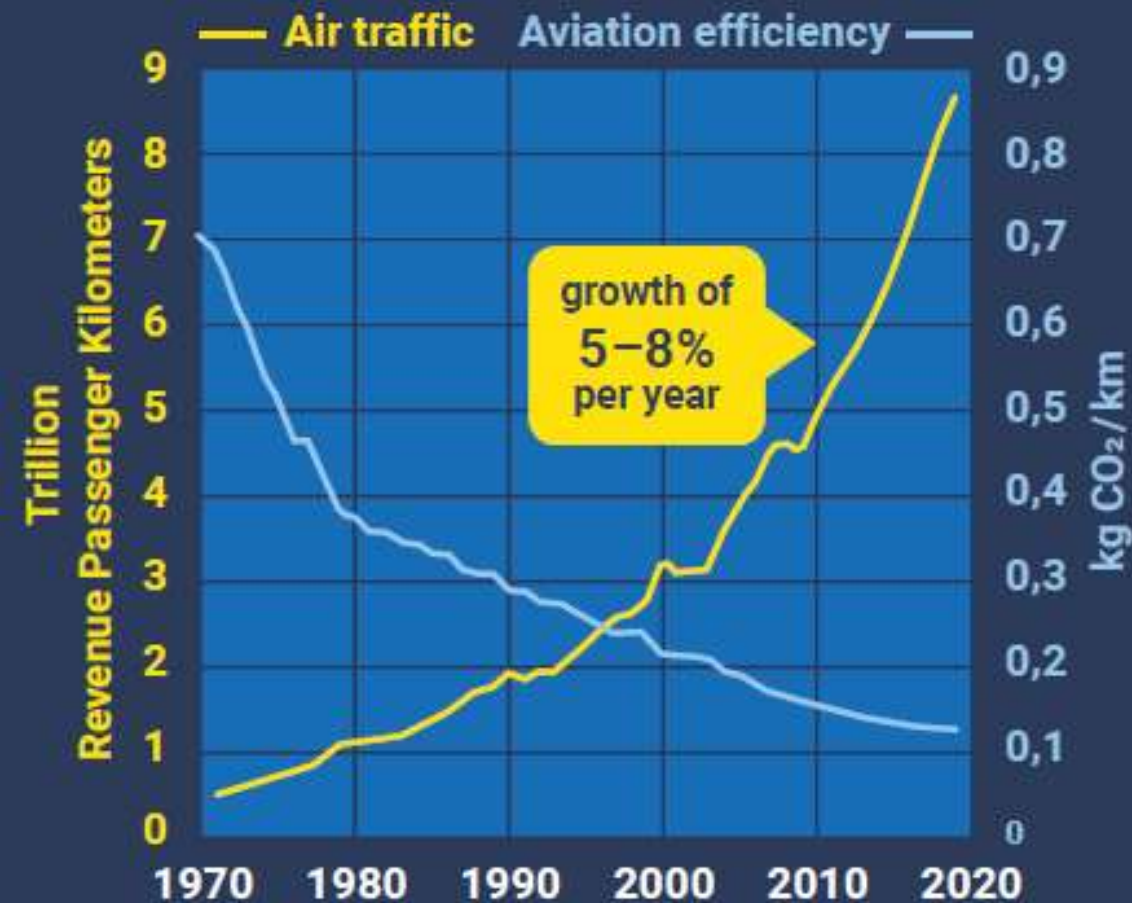
3

4

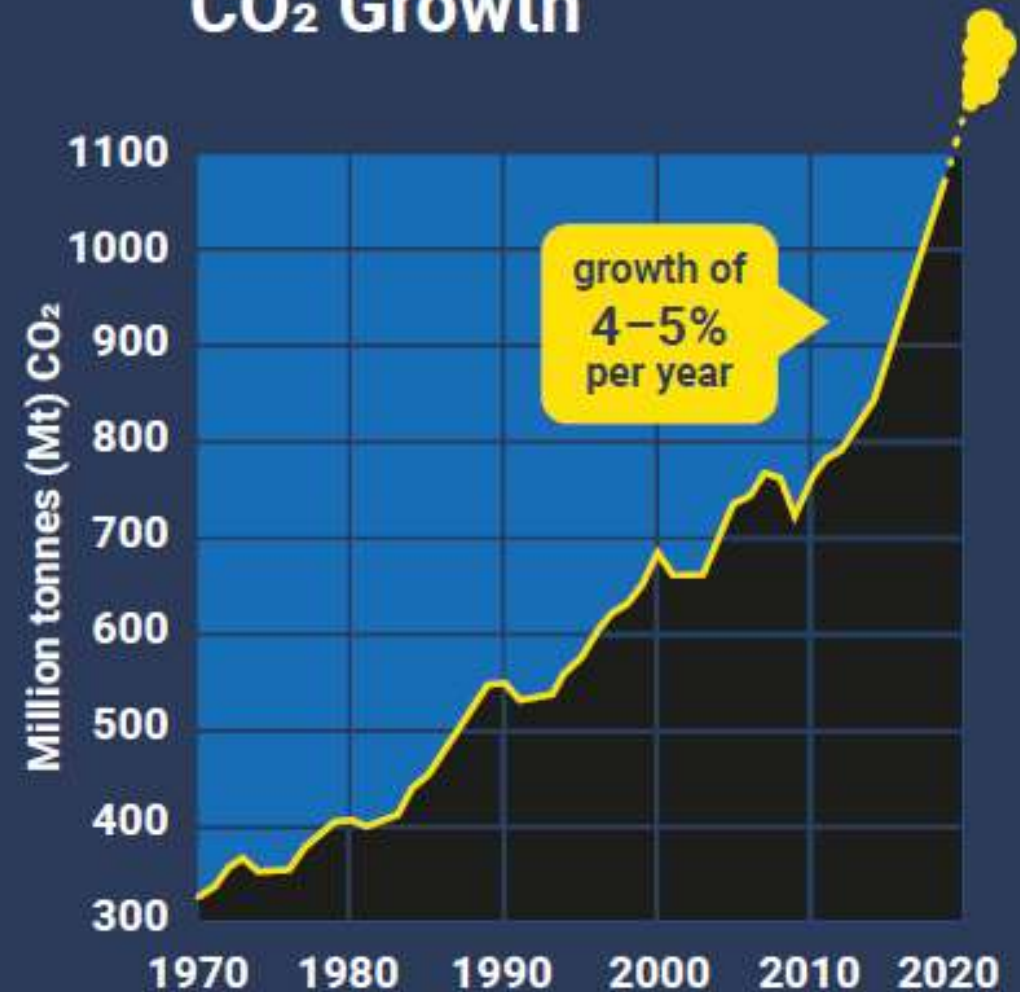
Aircraft Efficiency



Air Traffic and Fuel Efficiency

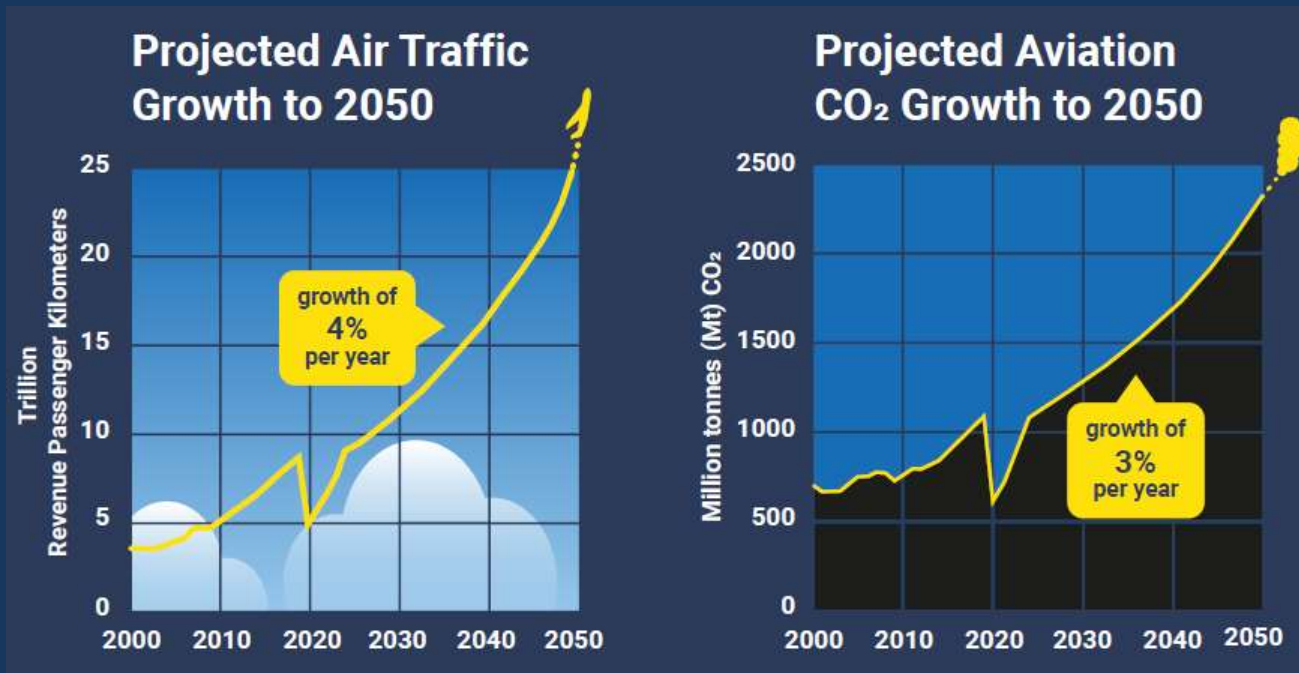


Aviation CO₂ Growth



Aircraft Efficiency

- Historical aircraft efficiency improvements have led to total emissions **increasing**, not decreasing
- This will continue into the future – unless **air traffic growth is constrained**



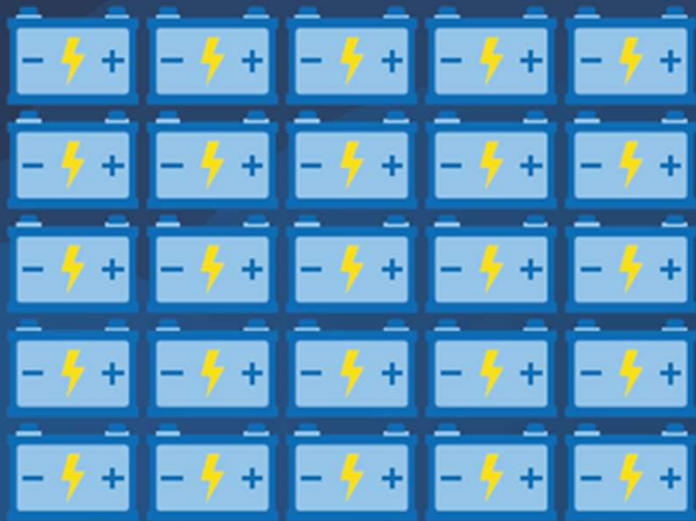
Electric Flight

*accounting for improved efficiency of electric motor vs. thermal engine



1 kg of fuel

=



25 kg of batteries *

... only viable for small aircraft, flying very short distances

... ground transport (trains, coaches, ferries) are a more efficient use of green electricity

eVTOL = electric Vertical Take-Off & Landing



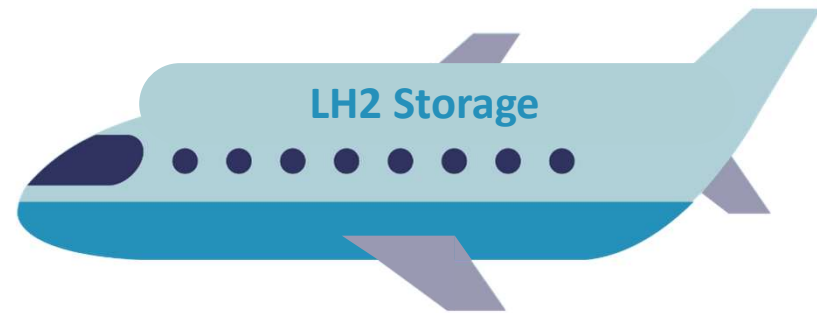
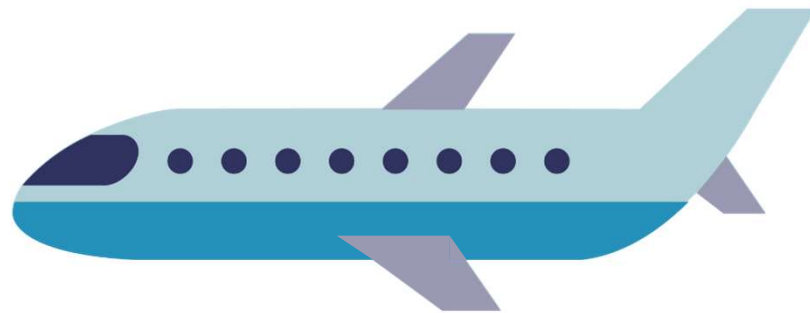
Very inefficient = even shorter range and payload capabilities.

SOURCE:
[Joby Aviation S4](#)

Hydrogen Flight



Hydrogen requires 4x the volume of Jet Fuel
... to store the same amount of energy.



Jet Fuel



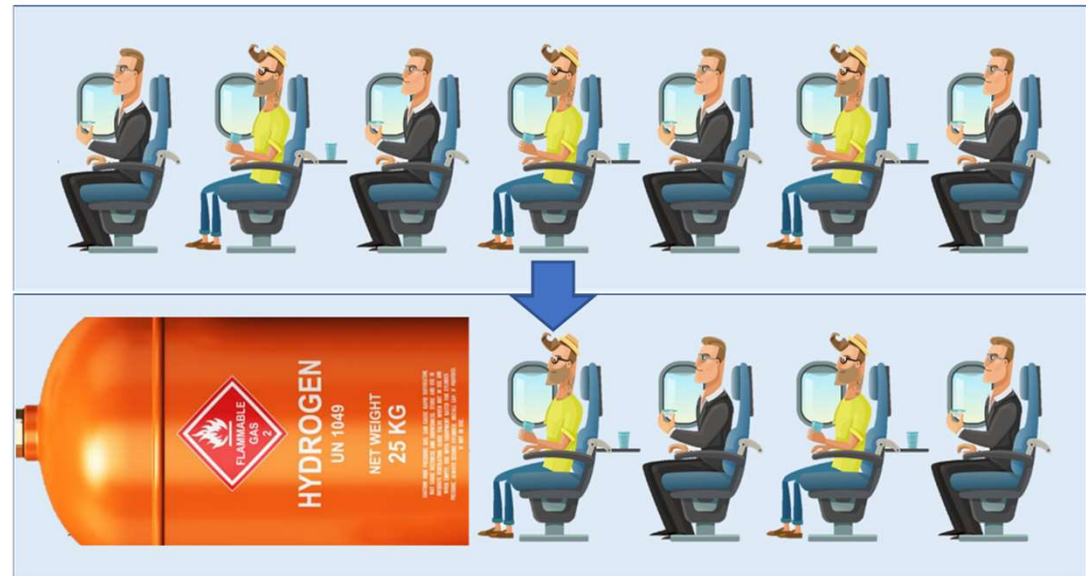
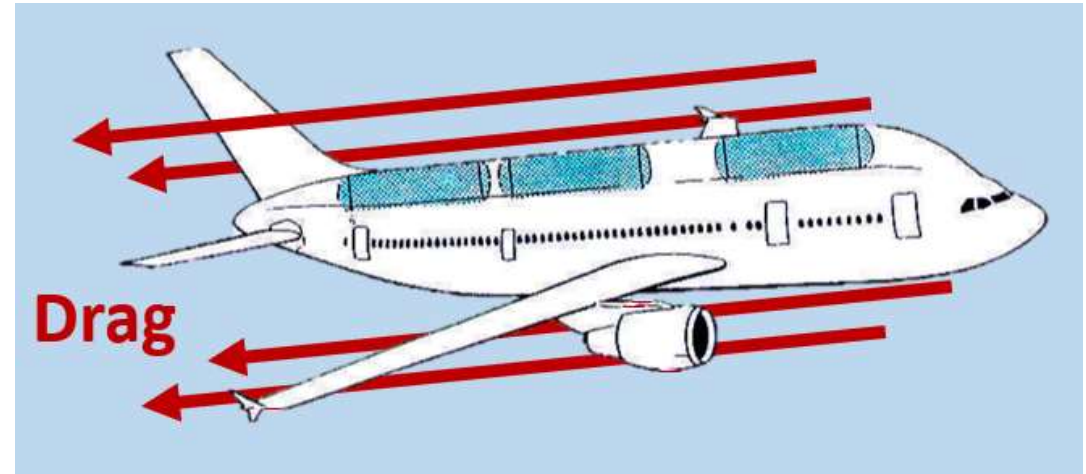
Liquid Hydrogen

Hydrogen Flight

The energy density of Hydrogen is terrible by **volume**:

Either:

- Increased aircraft size – increasing drag and weight:
- Identical aircraft size, but reduced numbers of passengers:



Hydrogen Flight



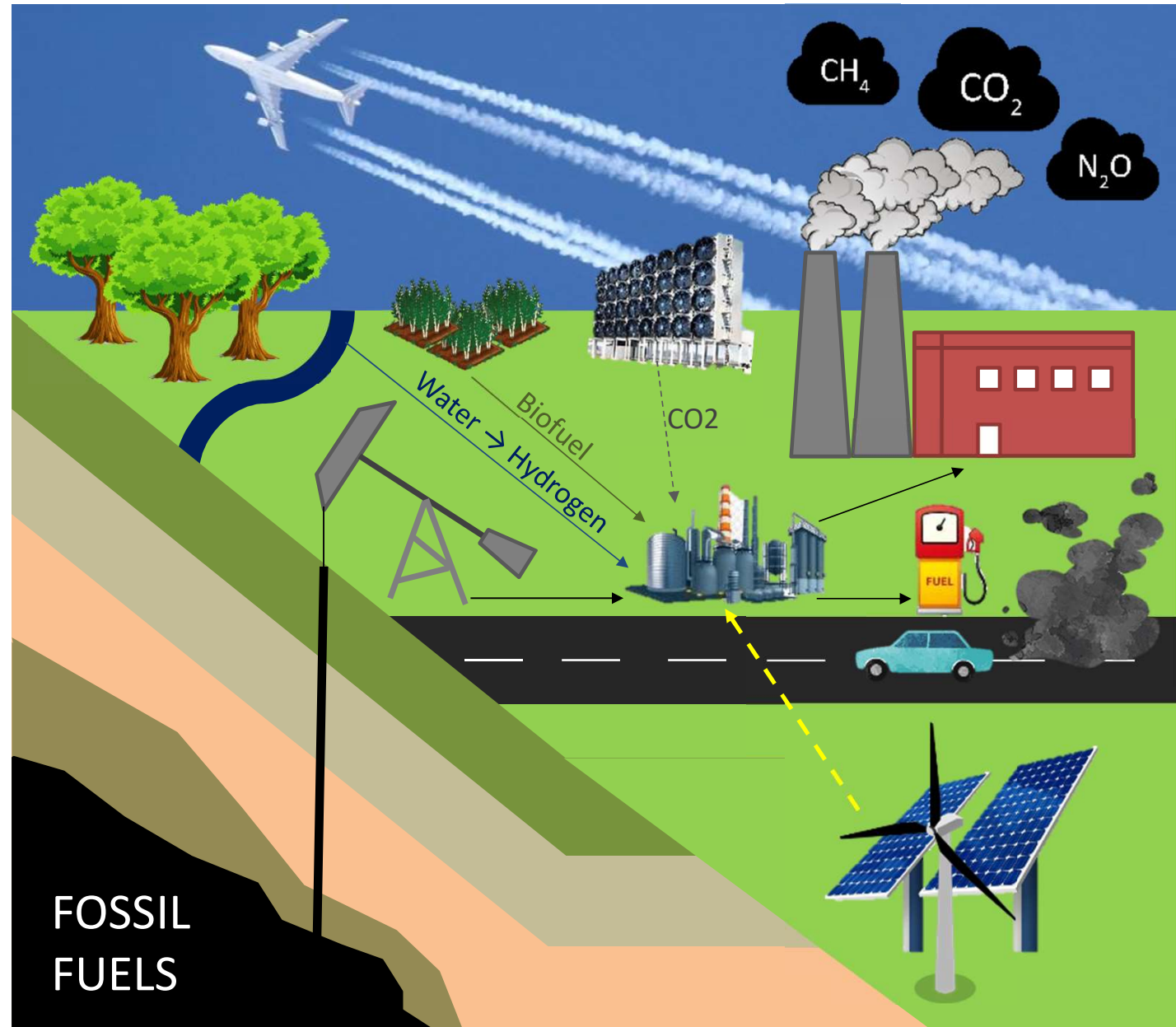
... likely viable for medium aircraft, flying medium distances

... will take 15-20 years to develop & certify first aircraft

Requires very different aircraft, airports – and huge amounts of energy

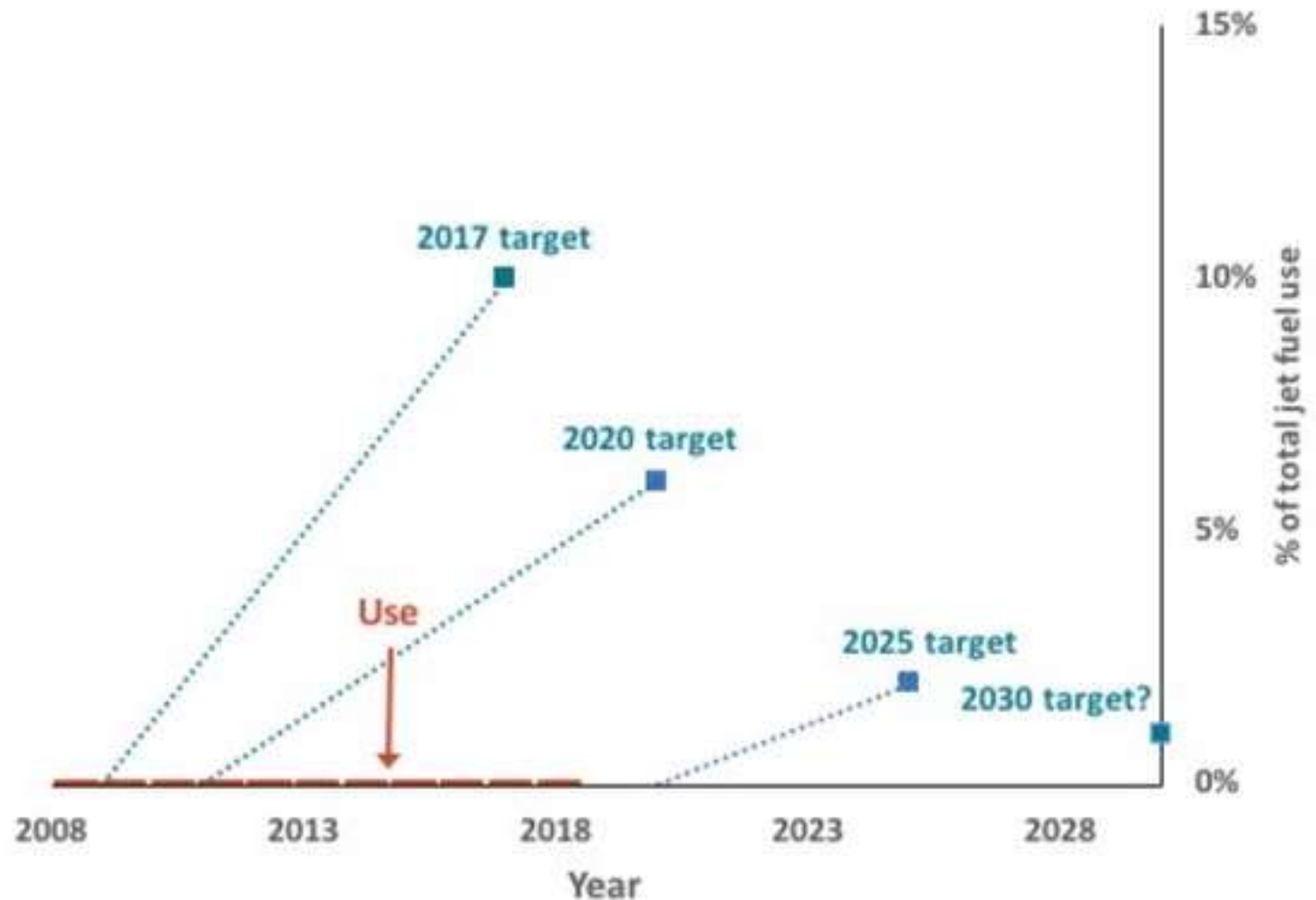
Alternative Jet Fuel

“Sustainable Aviation Fuels”



IATA alternative fuel goals vs. actual use, 2008 to 2030

Alternative Jet Fuel “Sustainable Aviation Fuels”



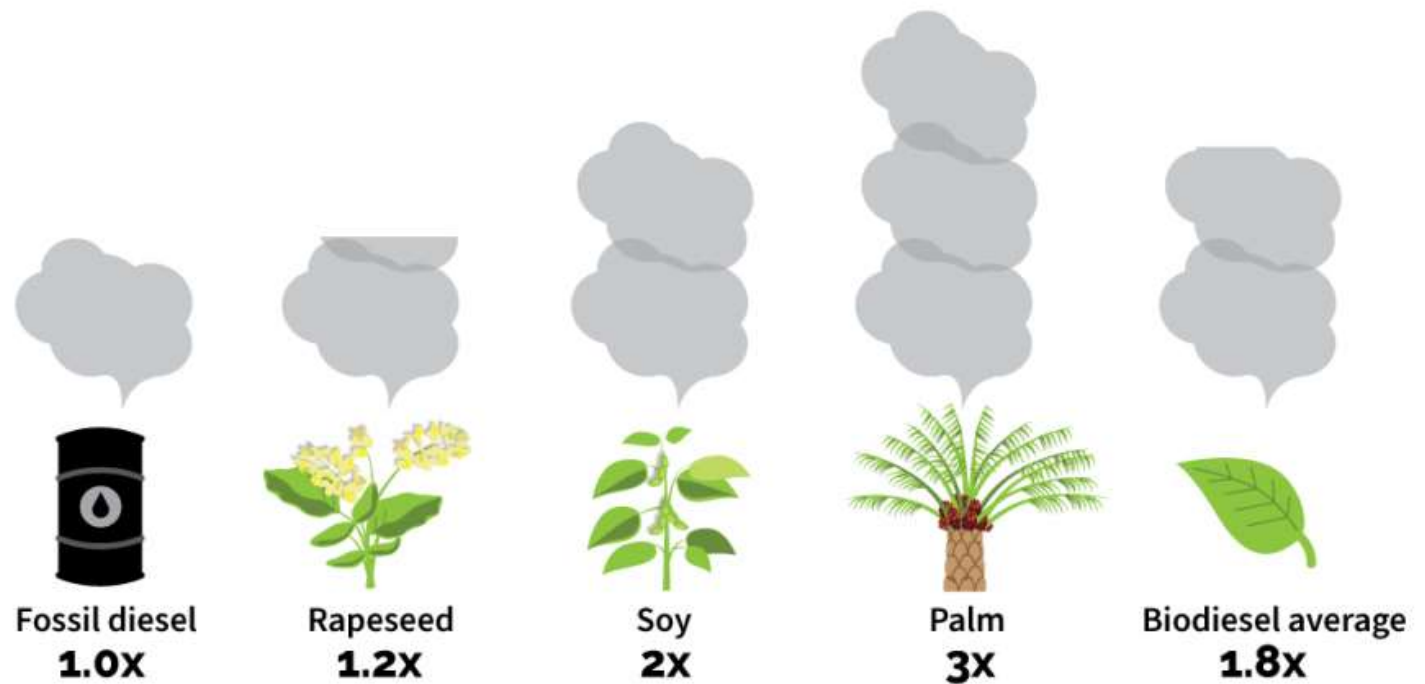
Biofuels



Alternative Jet Fuel Biofuels



The danger of 'fuel-from-crops' biofuels



SOURCES:
Transport & Environment

Alternative Jet Fuel Biofuels



SOURCES:
[Stay Grounded](#)

The danger of 'fuel-from-crops' biofuels

Producing food for
other people's
planes:
A case study on
the Omega Green
biofuel refinery in
Paraguay

PROHIBIDO
EL INGRESO A
PERSONA EXTRAÑA

STAY
GROUNDED

biofuelwatch

Heñói

STAY
GROUNDED

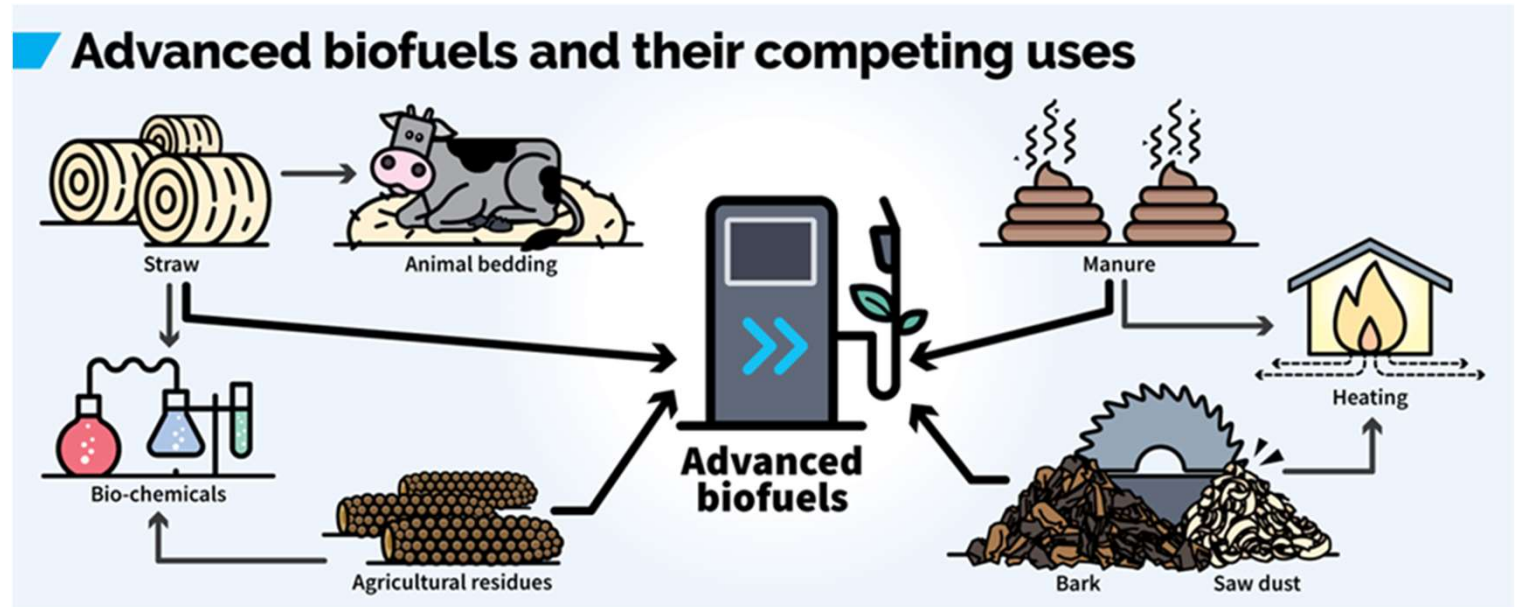
The Paraguayan Chaco suffers one
of the highest deforestation rates
in the world, losing around 800
hectares per day.

By 2020 about 40% of the natural
forest cover had been lost, and it is
estimated that in 10 years about
70% of the forest will be gone.

Alternative
Jet Fuel
Biofuels



Can 'fuel-from-waste' biofuels scale?

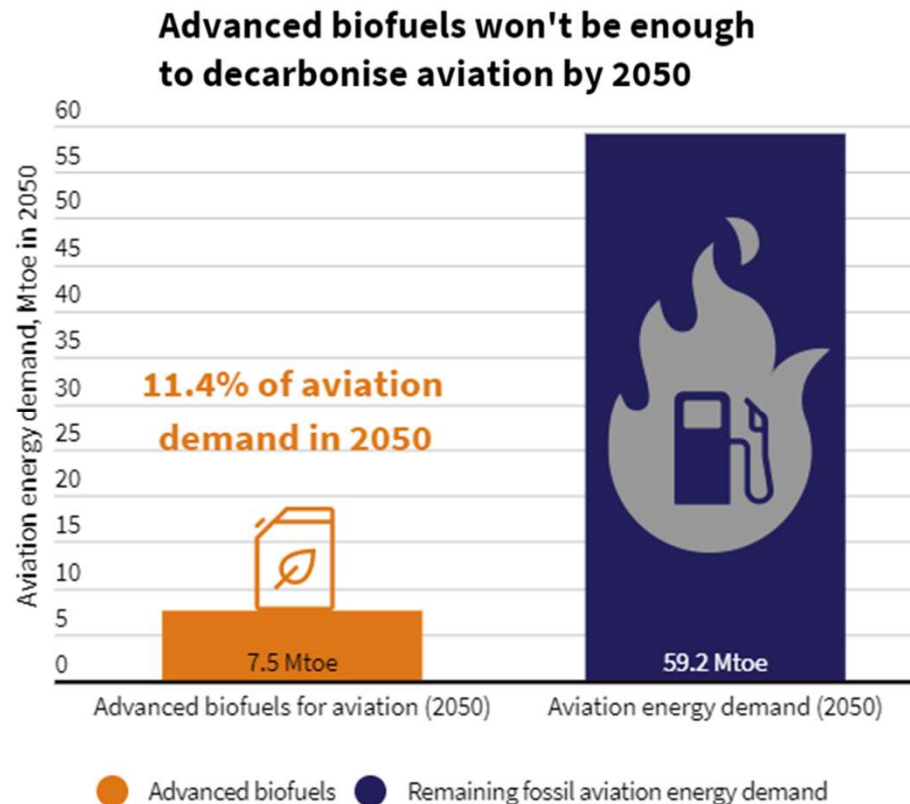


Alternative Jet Fuel Biofuels



SOURCES:
[Transport & Environment](#)

Can 'fuel-from-waste' biofuels scale?



Competing uses:

- Non-fossil fuel fertiliser
- Heating and industry
- Bioenergy Carbon Capture & Storage
- Road transport fuels
- Shipping fuels
- Bioplastics

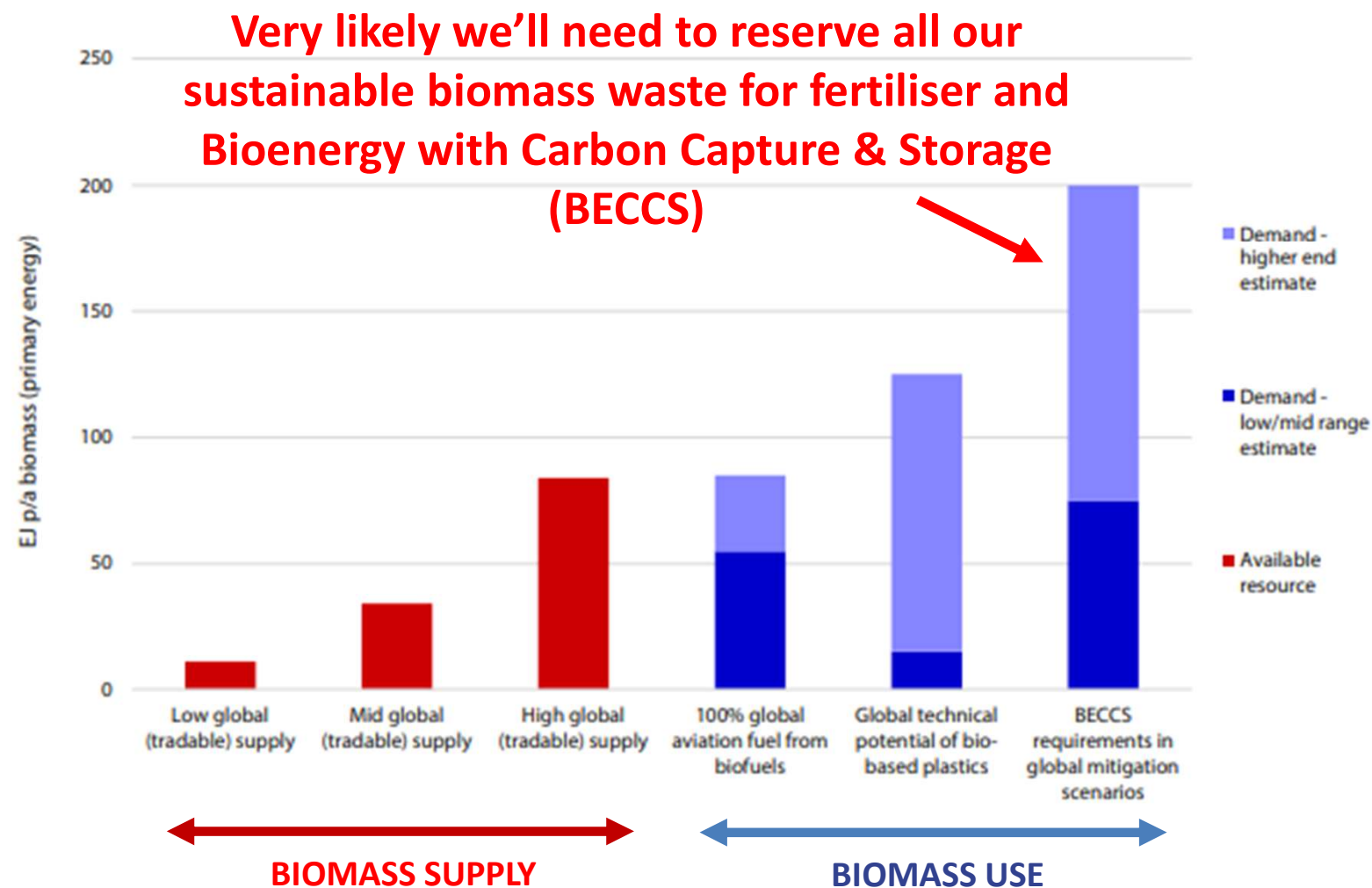
Lack of cross-sector analysis and prioritisation of resource

Alternative Jet Fuel Biofuels



SOURCES:
[Climate Change Committee](#)

Figure 5.1. Potential global demand for sustainable biomass by key end-use applications in 2050



Source: CCC analysis.

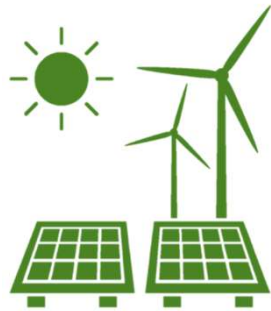
**Alternative
Jet Fuel**
Electro-fuels
“E-fuels”



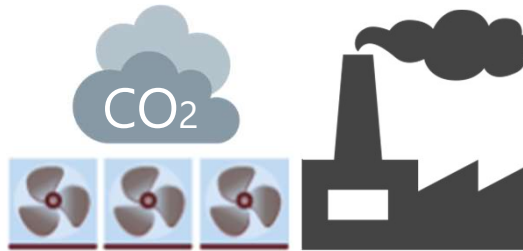
Water



Renewable
Power



Carbon Capture
e.g. “Direct Air Capture”
(or “Industrial Carbon Capture”)



Electricity



Electrolysis

Hydrogen



Synthesis

CO₂



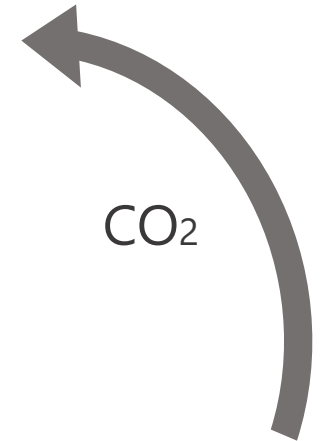
E-fuel



Aircraft

Non-CO₂
emissions not
re-captured.

CO₂



100% Synthetic E-fuel Calculations

UK civil aviation emissions in 2018 = **38.2 MtCO₂** [[source](#), page 6]

1kg fuel = 3.15kg CO₂ [[source](#), page 17]

UK jet fuel consumption = 38.2Mt/3.15 = **12.1 million tonnes** of jet fuel.

Energy conversion for jet fuel = 12kWh/kg [[source](#) page 14] = 12,000 kWh/tonne

12,100,000 tonnes jet fuel x 12,000 kWh/tonne = **~145 TWh** of jet fuel

100% E-fuel: 145 TWh of jet fuel supplied from e-fuel (@ 45% efficiency) requires **323 TWh** of electricity.

UK electricity demand in 2020 was **330 TWh** [[source](#)], but only:

- **135 TWh** was from 'renewables' (includes bioenergy)
- **97 TWh** from wind/wave/solar/hydro combined (excludes bioenergy)
- **75 TWh** from wind
- **50-60 TWh** from nuclear

So: 100% e-fuel requires either:

- a similar quantity of energy to the entire UK electricity generation today (mostly non-renewables)
- > 3x current renewable generation (wind, wave, solar and hydro power)
- > 4x current wind energy generation

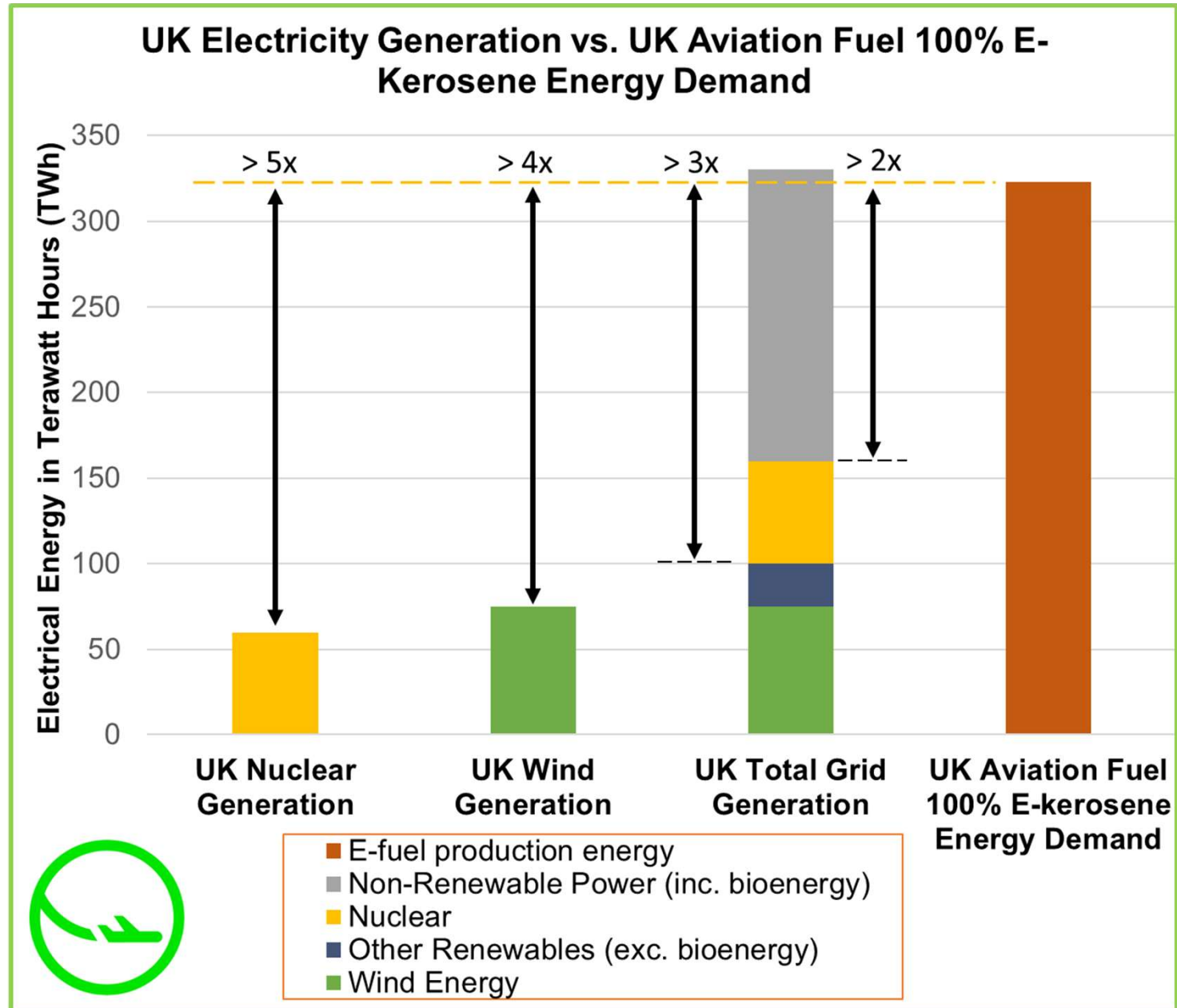
See:

<https://www.transportenvironment.org/discover/e-fuels-too-inefficient-and-expensive-cars-and-trucks-may-be-part-aviations-climate-solution/>

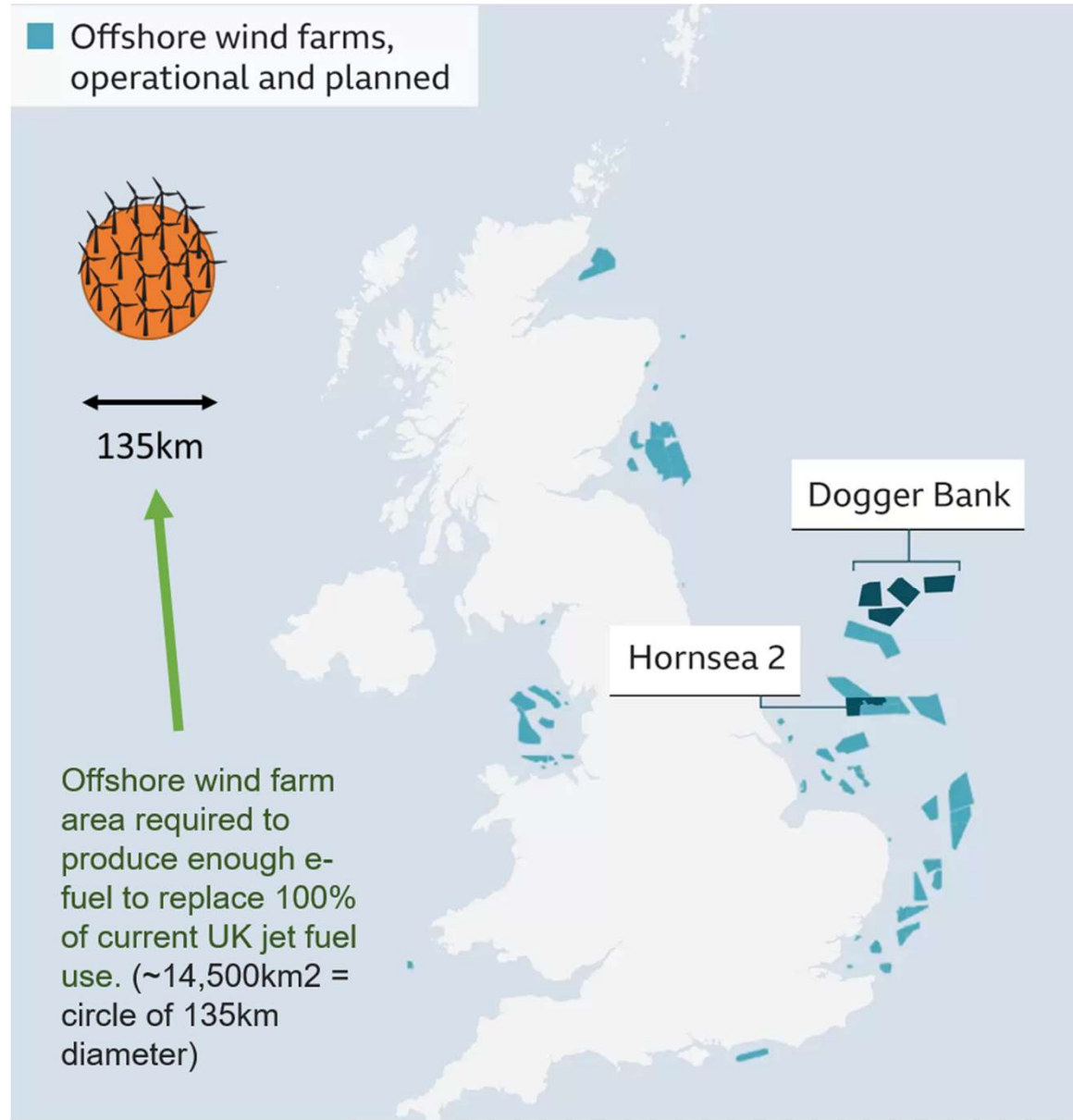
and also slide 12:

https://www.researchgate.net/publication/278686023_Power-to-Liquids_synthetic_fuels_from_a_sustainable_pathway

Alternative
Jet Fuel
Synthetic
Electrofuels
“Synfuels”
“E-fuels”
“Power – to
– Liquid”



Alternative Jet Fuel E-Fuels



Source: calcs on slide above

Source: Crown Estate

BBC

We have a finite supply of renewable energy available and this is far less than current global energy consumption (see figure).

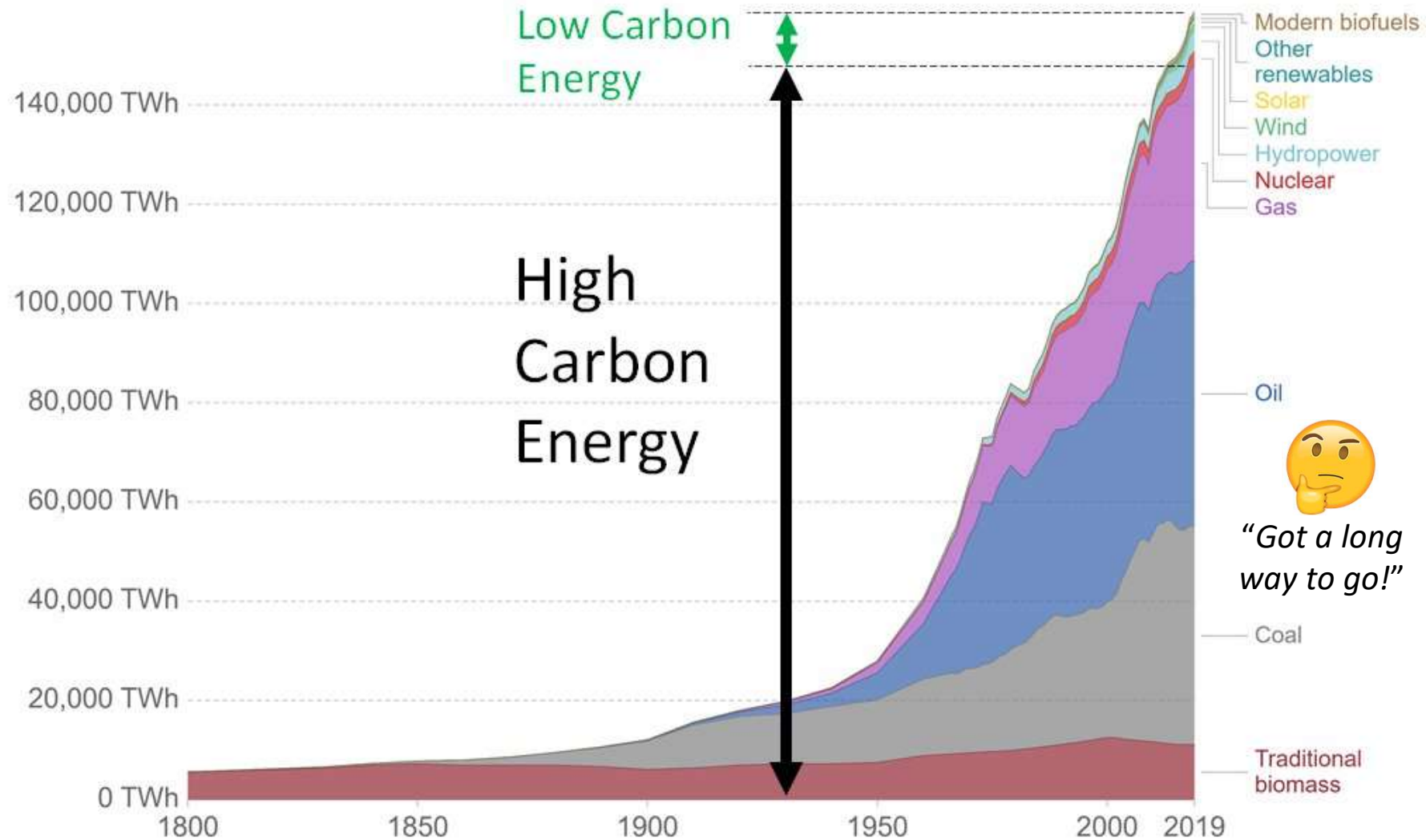
The difference is provided by burning fossil fuels.

It's very important that most green electricity produced isn't wasted through inefficient activities, e.g.: flying and 'e-fuel' production.

Global direct primary energy consumption

Direct primary energy consumption does not take account of inefficiencies in fossil fuel production.

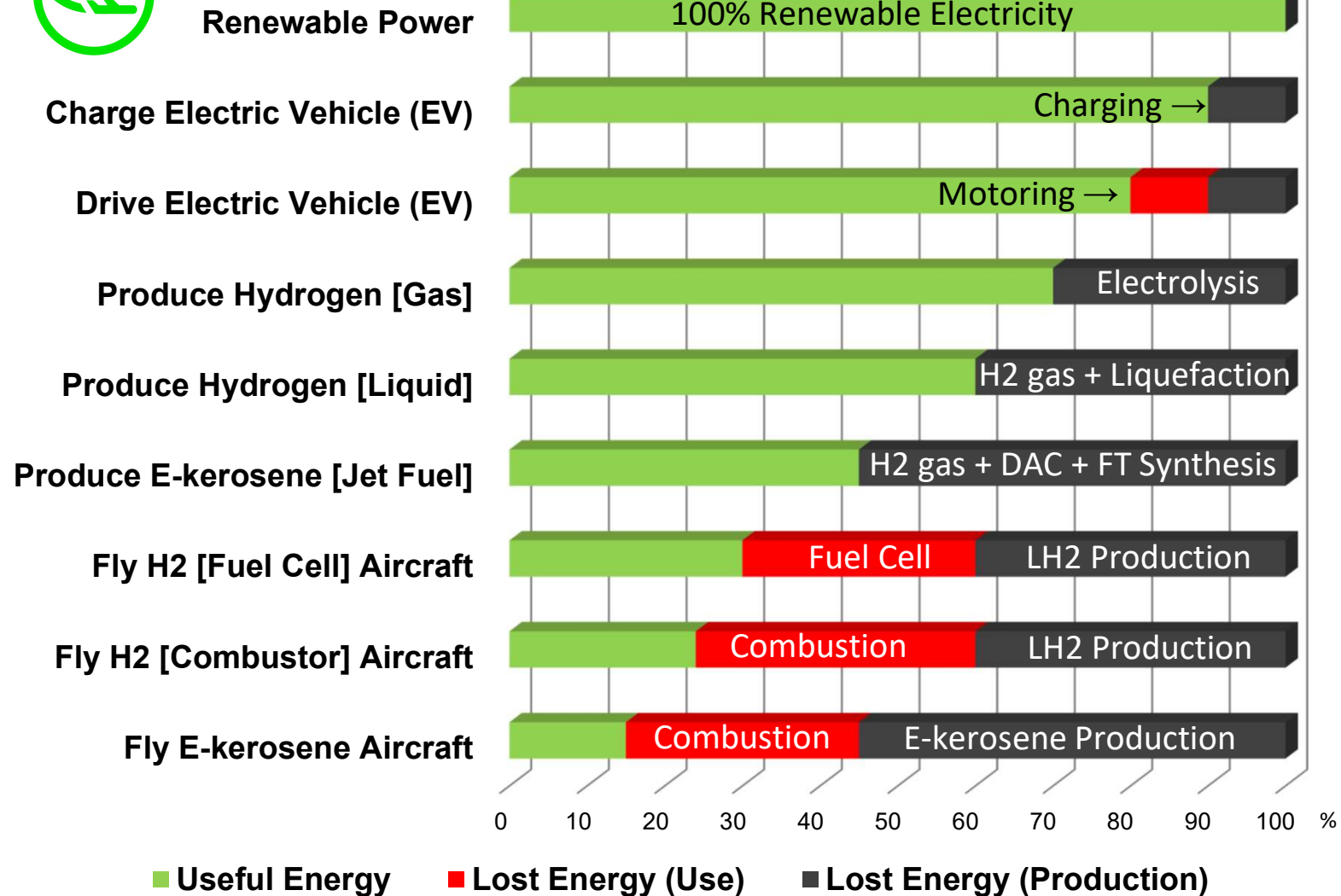
Our World
in Data



Source: Vaclav Smil (2017) and BP Statistical Review of World Energy

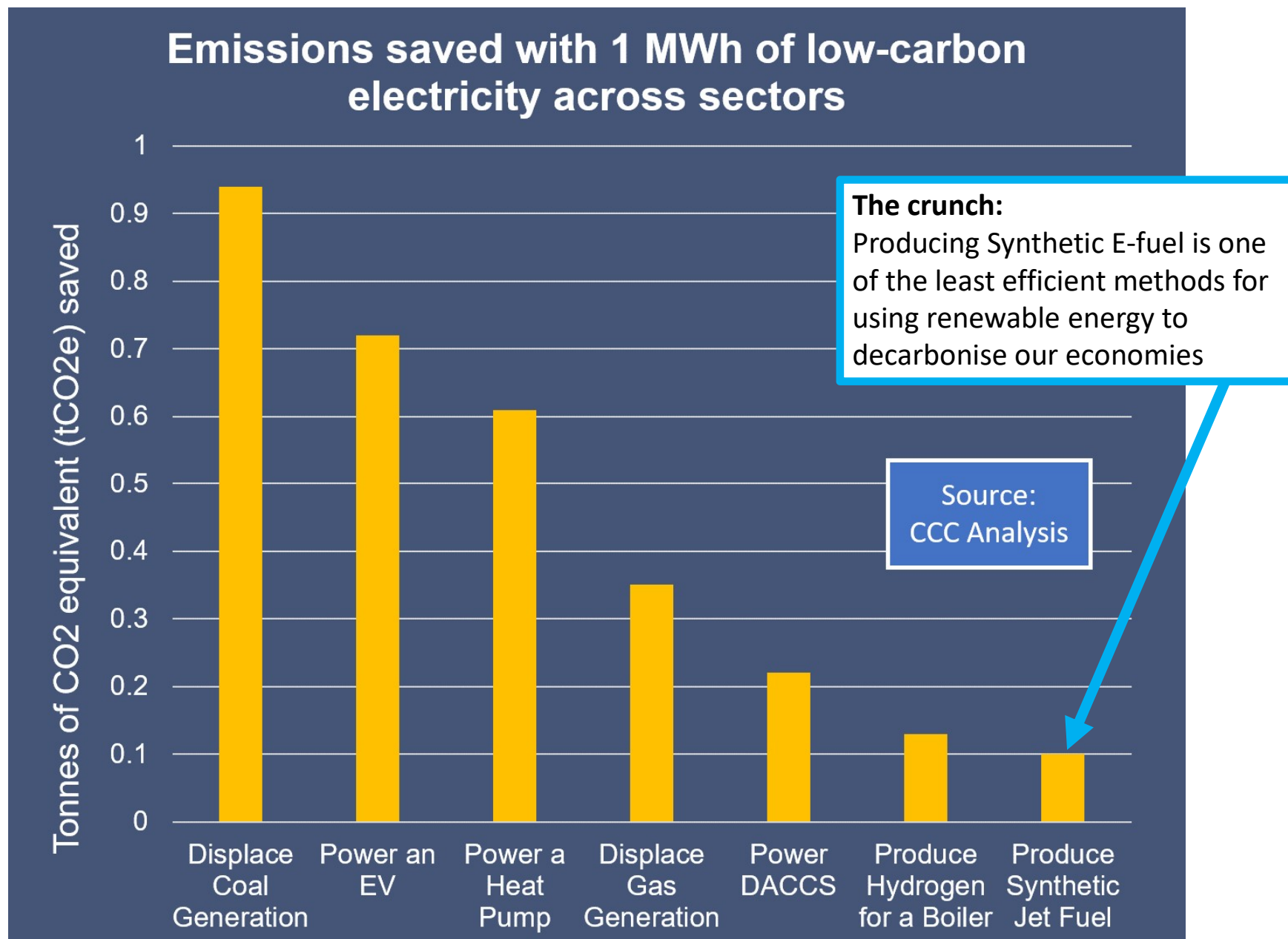
OurWorldInData.org/energy • CC BY

Energy Efficiency of Transport Activities



Alternative Jet Fuel E-Fuels

Source: [UK
Climate Change
Committee](#)



Carbon
Offsetting



CARBON OFFSETTING IS FUNDAMENTALLY FLAWED

CEO of United Airlines:

***“Covering entire planet in trees
= 5 months of global emissions”***

Source: <https://www.youtube.com/watch?v=b9x67JN-9hQ> (45-46 mins in)



End of Pack – Thanks

[#ShowYourStripes](#)

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Tuesday 26 September, University of Oxford, and online

**CONCRETE
IMPACTS**



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Panel 4: Military carbon footprints: how do we decarbonise?

Dr Karen Bell

University of Glasgow

Decarbonising and diversifying defence in the US & UK



Highlights the views of a cross-section of current and former defence workers on transitioning the defence sector to environmental sustainability in the United States (US) and the United Kingdom (UK).



Fifty-eight interviews were carried out with current and former defence sector workers in the US and the UK between October 2021 and March 2022.



Two trans-national focus groups were also conducted: (1) An 'International Expert Dialogue' and (2) an 'International Trade Union Dialogue'.



The project was supported by an advisory committee with representatives from defence companies, government, NGOs, academia and trade unions in the US and the UK.



Funded by British Academy

Terms and scope of presentation



Decarbonisation: 'The process of reducing the carbon emissions which contribute to climate change'



Diversification: 'The broadening of defence sector business to non-military business fields'



Presentation focuses on the latter – multiple environmental crises

Diversification



Some opposed to all forms of diversification



Some want diversification to broaden defence company business to encompass civil



Some want a general scaling back of operations and production

Defence sector is essential for responding to threats

- *I think it's [diversification is] irrelevant to the defence sector and counterproductive to the entire reason of defence. The entire reason of defence is to protect the nation. We can't do that without the tools necessary to do that job.... if we diversified from defence, ... we would basically have no defence. We would lose our capabilities in order to defend ourselves and our interests both at home and abroad. That would, basically, not only render the nation mute but it would make them vulnerable to attacks that go on on a day-to-day basis, both in the cyber infrastructure and on the ground when we're trying to protect our interests (UK002: male, white, current government defence service).*
- *...a strong defence is what you have to have in order to show the world that you can take them on, and the United States ... some people would like to call it 'the protectors of the world' ... (US007: female, white, current defence manufacturing).*

Defence has high standards that would make transitioning to civil uneconomic

...we are inclined in our industry to understand that we're not making cars, we're not making toasters, we're not making washing machines. The products we make, people's lives depend on, they have to work every time they're used, every time they're used, no exceptions... So the quality of what we produce is very, very good, but it comes at a very high cost ... (US014: male, white, current defence manufacturing union leader).

The defence and commercial are not the same. One is basically, you're working at ... speed and, when you're working in defence, it's more you're pushing quality a lot harder. Making sure that you're not putting soldiers' lives in danger. With commercial, I would say that management's focus is on "We have planes on the ground, there's customers waiting for them, and we need to get this out right now" (US023: male, Latin American, current defence manufacturing).

Broaden defence company business to encompass civil

I think it probably goes back to that 'spreading the risk' so, if we take an organisation in the supply chain, is it sensible for them to invest in other, or try and bid for, other work that isn't defence related? I think that's probably a good decision. You don't want to put your eggs in one basket (UK018: male, white, current defence manufacturing).

...there's the benefit that, if they diversify, they're not going to be dependent only on government funding. With different administrations funding gets either cut or they get increased so they're not going to be totally dependent on that (US023: male, Latin American, current defence manufacturing).

Impose limits on arms production and sales

Do we really need any more weapons? I don't think I can answer that...I think we do need, given the current state of play with the world, I think we do need some kind of defence but, in the same token, are we producing too much? (UK005).

...do we really need to update all our ICBMs [Inter-Continental Ballistic Missiles]? Don't we have enough to blow up the world three times over, or five times over? (US008: male, white, ex-military).

Money currently spent on defence could be repurposed to meet social needs

- *So, if we weren't spending as much [on defence] or if we were taking that money and putting it towards social needs, those could have a great impact on the quality of life for most Americans in terms of stuff like national healthcare and a lot of the safety net things that, say, most countries in Europe take for granted because they don't spend as much money on weaponry as we do US011: male, white, current defence manufacturing).*
- *... the biggest one is the amount of resources that are taken up, like 40% of the discretionary budget of the US is military... taking up enormous amounts of resources that could be transferred to mitigating the causes of war (UK019: male, white, ex-military, current defence manufacturing).*

Some felt uncomfortable about their work

- *I am uncomfortable working in the defence industry at large so I am looking to make that move already because I'd rather be working for a business that's good for the planet (UK022: male, white, current defence manufacturing).*
 - *I guess, it's funny because one of the reasons that I didn't wanna come to work at [ANONYMISED defence company] was because of the defence industry. I didn't wanna work in a factory and I didn't wanna work in something that supported making machines of war. Obviously, over time that's worn away but I've always said to people here that if something happened and we didn't have to have war anymore and we didn't have to make, you know, military engines and, you know, that kind of thing, I would be happy to lose this job and find another. And, if it was in a renewable resource, research or job, that would be fantastic. ...I would feel better about my life if I did that. ... I feel that it's important that I do my job properly in order to keep people safe.... Would I prefer to do something that was more relevant for the world? Absolutely! (US013: female, white, current defence manufacturing union leader).*
-

BARRIER: Other jobs appear less attractive

- *I think that's part of the hesitation in transitioning, because these jobs are so good and secure and they pay well and especially the ones that are protected through collective bargaining. I mean, this is a job for life and, in the civilian sector ... it's impossible to find anything like that. So I think that's the major stumbling block towards a transition, in my experience. ...Even if I would rather be doing something that there is more of a public good involved, people aren't as selfless as they would need to be to just walk away from this (US015: male, white, current defence manufacturing).*
- *...defence workers get paid high wages, we get paid high wages because the work is very sophisticated and difficult to do, so if everybody goes from making an engine for the Joint Strike Fighter to making toasters, well toasters just don't bring the same price, so what's the impact on wages of that? There has to be some kind of figuring out of that part of it US011: male, white, current defence manufacturing).*

BARRIER: Worker identity

- *...people there are extremely proud of that product which they fully know is the most technically complicated and advanced manufacturing product ever made, even more than a rocket. So, they had that pride and by telling them that they're making weapons of war really, you know, insulting them, isn't really the way to go at this. But, beyond the pride, they have pride in their skill and they all want to make good things.. It becomes more complicated when you go to defence workers and you say, "well we're going to cut out these weapons because we need more nurses and teachers and we need more highways" or something, because we're not nurses and teachers or construction workers US011: male, white, current defence manufacturing).*

BARRIER: Vested interests

- *... defence is easy money for companies and doing anything else is risk ... it comes down to the money thing and the incentives. So if the country and the government wants the defence industry to diversify, there needs to be incentives that minimise the risk for them to do that so, whether that's funding support, whatever, that needs to be there ...the defence industry, from my point of view, is essentially a magic money tree. There is always money available no matter what ...they almost need to be made less dependent on that to make them do other things...I don't think it's a priority for the defence sector because I think it is more lucrative to be in the defence sector and be paid public money to develop defence products than it is to be in private sector and take the risk with no guaranteed return (UK022: male, white, current defence manufacturing).*
- *...defence work is essentially state run. It's a state-run industry and the majority of the funding is through the taxpayer. So, for the defence industry to branch out, you'd probably have to have an equal amount of investment from state governments to justify it. ...the private sector is so focused on short term reward that they're not really going to be interested in putting in the type of investment it would take to transition entire sectors into something out of the defence industry. ...they don't care where their money comes from as long as they make their money. So, if they can see the same type of profit margin through renewable energy then maybe they will invest as much in that as they have in aviation in the past, but the problem is with defence work it's kind of like a blank cheque (US015: male, white, current defence manufacturing).*

BARRIER: Profit motive

*...it's a very lucrative business for a start.
I mean, I think when you have a permanent arms industry that has to make lots of money and sell arms then you're going to have a dynamic to fight wars (UK019: male, white, ex-military, current defence manufacturing).*

... there's people who live off war and war based industries and you would have to overcome that barrier ...If you can convince them, I think, that they could make as much money in another field, that would be the barrier that would have to be broken (US013: female, white, current defence manufacturing union leader). .

BARRIER: The power of the defence sector

- *Well, the major barrier is this, for Trident, the only reason they have got it - ...- the only reason they have got it is to keep a seat at the top table of the Security Council at the UN and it's a political thing. It's no' really a defence weapon, it's a macho thing. Britain is still the imperial power or it thinks it is ... (UK020: male, white, ex-military).*
- *I always revert back to lobbyists because they're the ones controlling our politicians. If we can somehow take the money out of the voting system in the States, then we'll take the power away from lobbyists. ...We're under the guise of a lot of propaganda, unfortunately. ...if the lobbyists are still there to control the policy, they [the government] realistically won't do it (US019: male, black, ex-military).*
- *They donate to the parties, and also to the congressmen and senators themselves, and a lot of times they don't have to reveal those sources of where that money comes from, so there's a lot of dark money involved. There's so many ways of covering up what the sources are, or just hiding it, and they do their bidding (US006: male, white, ex-military).*

SOLUTION: government incentives

I guess if defence companies are finding that they're earning sufficient profit from just focusing on defence sales and defence technology then they're not, sort of, forced to change and look at other opportunities. Again, I suppose it's about incentivising companies to do that. I think there are probably lots of opportunities but they're not being pursued at the moment (UK007: female, white, current defence civil service).

We just need to reallocate our budget. Instead of investing in the same technology from [ANONYMISED] – or whoever you want to name in terms of the equipment we're using – we need to allocate it towards renewable resources, possibly even turning down our engagements in conflicts around the world (US019: male, black, ex-military).

SOLUTION : Government controls

- *I think what would make a difference is if Congress, or different countries around the world... the ones that control the purse strings, made it a requirement that a certain percentage of the money that's spent [on defence] has some [requirement to develop] some of these greener technologies to move away from fossil fuels. ... if they put a priority and said, "In order to get this amount of money to build these (US022: male, white, current defence manufacturing).*



SOLUTION: Collective organising

I just really want to stress that organised labour, I think, is the most powerful tool when it comes to shifting economies and industries and even politics. And so, in some ways, it's easy to be very pessimistic about the last several years but one thing that I am really optimistic about is just how angry workers are right now and how much more power they seem to have than they ever had before (US015: male, white, current defence manufacturing).

...this [defence products] is, basically, the last stuff that we're making around here. ...because of free trade and because of the lack of US industrial policy, we're lucky to have anything left. So the idea that we can go ahead and transition and be making something else when everything is going out the door for the past 30 years does not sit well with manufacturing workers. I mean, we know it's a lie. So, I think that trade agreements have to be addressed (Union Leader, Focus Group Participant).

SOLUTION: New approach to foreign policy

There are drawbacks in wars. Let's end wars. Let's stop selling weapons, especially machinery that requires fossil fuels. I'm a very young person. I'm only 28. ...Coming to terms of the reality that I'm born into and now having a son – and you're aware of where we could have been and that we had the technology to live in a different existence – it's kind of depressing. It's hard to swallow. We could do better (US019: male, black, ex-military).

... if we consider the investments that are going into the defence sector side, broadly into nuclear weapons and Trident renewal, for example, and what is the basis for real human security, which is dealing with the climate challenge, which we've got such a short time frame now to really make progress ...if you look at the Integrated Strategic Review and how Boris Johnson has positioned global Britain in the world and it's very much an imperialist and colonialist position that it's going to be back with greater investments in the defence sector and in arms and militarisation. The biggest increase in the defence budget for 70 years. Increase in nuclear war heads. I think that's a threat for all of us, and that's a threat for global security as well (Focus Group participant).

Recommendations

- *FOR COMPANIES:*

Set up structures and programmes to include workers at all levels to discuss the possibilities and issues in relation to diversification planning and implementation

- *FOR UNIONS:*

Create more opportunities for education and dialogue around diversification with rank-and-file defence workers

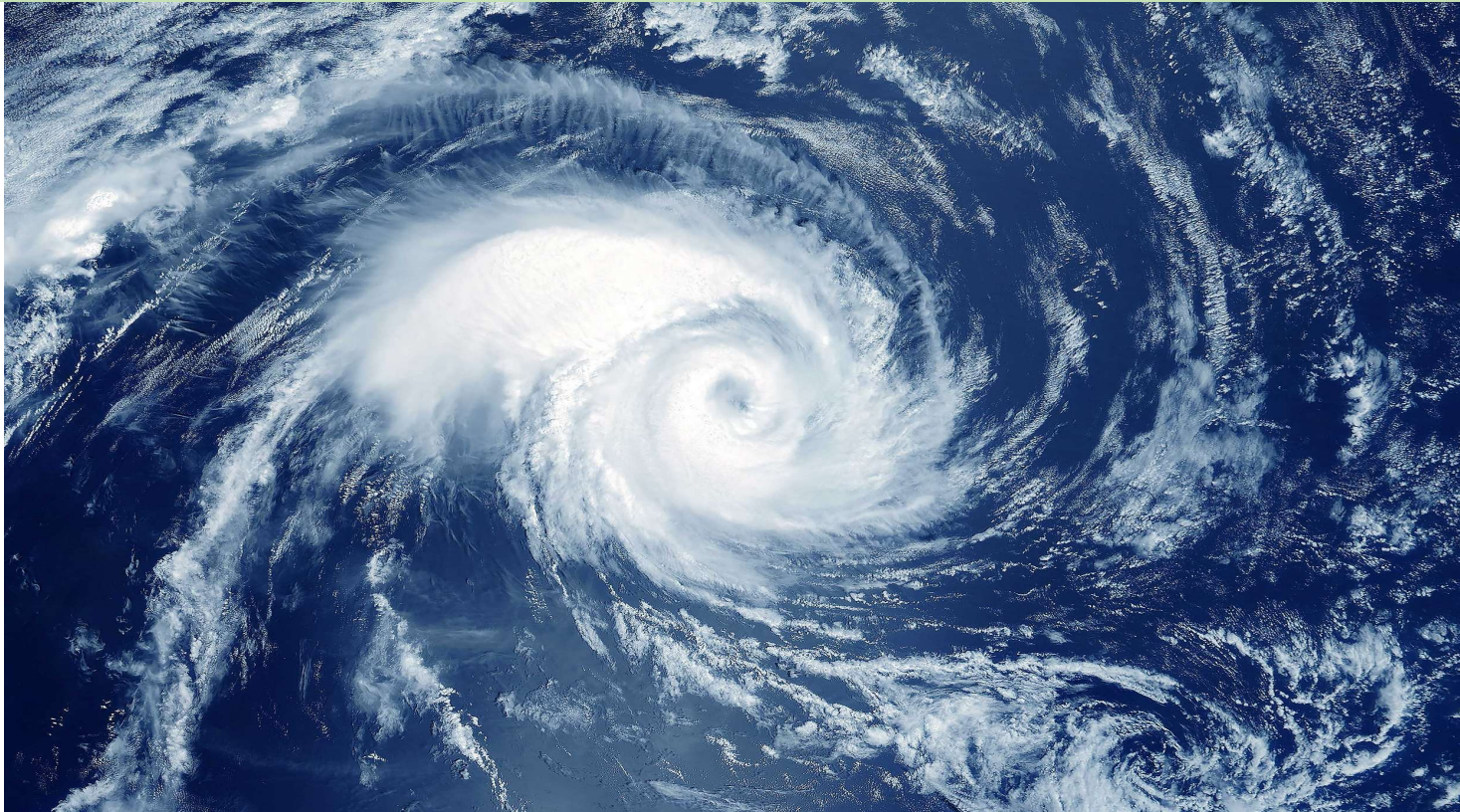
- *FOR GOVERNMENTS:*

Create a public dialogue on security policies and budgets. Is 'peace through strength' what is really wanted or does the public support a 'human security' approach, addressing the global and national poverty, inequality, health and environmental crises and investing in the jobs that would accompany this

- *FOR WORKERS:*

Propose diversification education and dialogue in your company and union

- For more information and to read the project reports, see [Decarbonising Defence \(decarbonising-defence.co.uk\)](http://decarbonising-defence.co.uk)
- Email: Karen.Bell.2@glasgow.ac.uk
- Thanks!



Military Emissions Gap Conference 2023

MILITARY AND CONFLICT GHG EMISSIONS: FROM UNDERSTANDING TO MITIGATION

Tuesday 26 September, University of Oxford, and online

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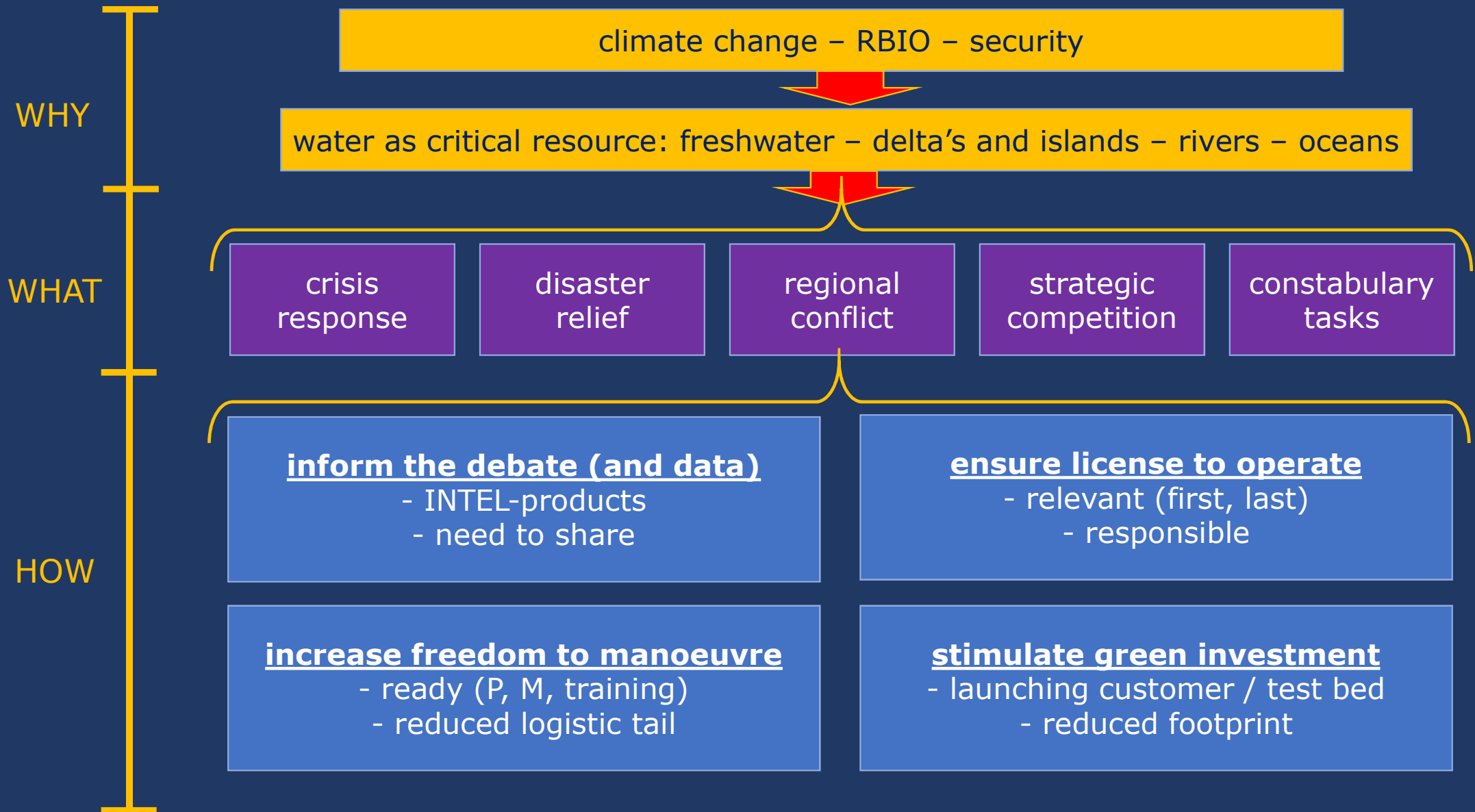


The Minor Foundation
for Mass Challenges

Decarbonising the military: a structural approach



Ben Bekkering
IMCCS



freedom to manoeuvre

(generate, train, operate with reach, autonomy, effect)

need to understand

(causes, character, region)

mission ready
(first – last)

interoperability

rules & regulations

launching customer

license to operate

(responsible, accountable, nett-zero)

reduced demand

Air
bio-fuels
unmanned

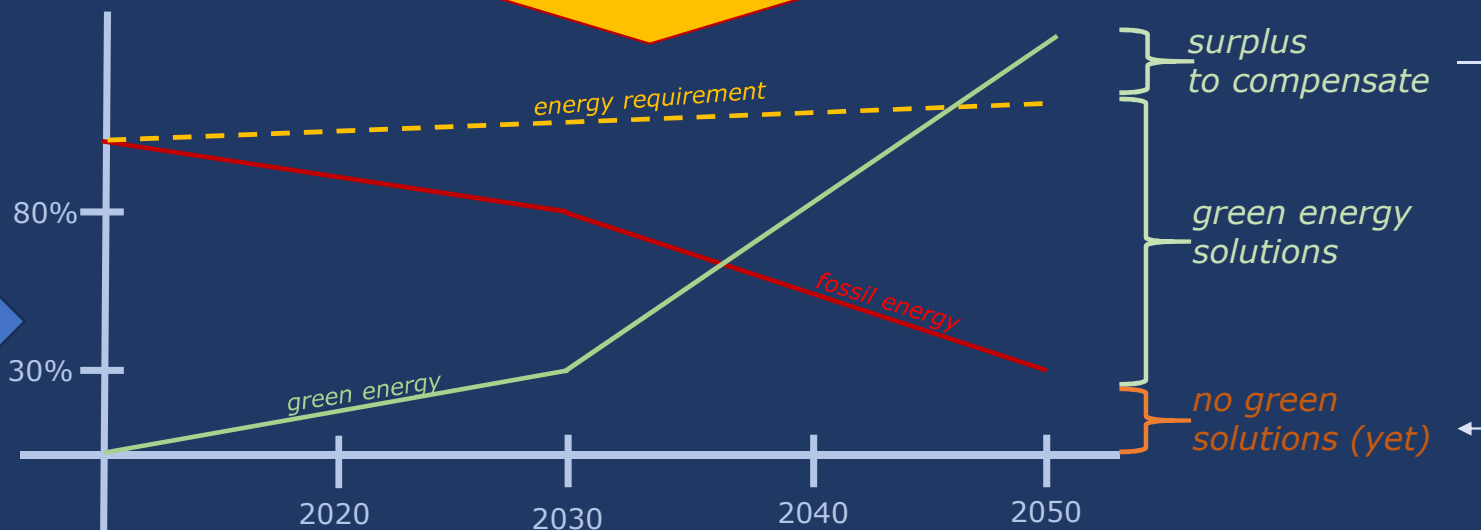
Maritime
hull vane
aux. vessels

Land
electric
vehicles

Base camps
nett-positive
private-public

organisation
new infra
etc.

rules
monitoring
reporting



solar

wind

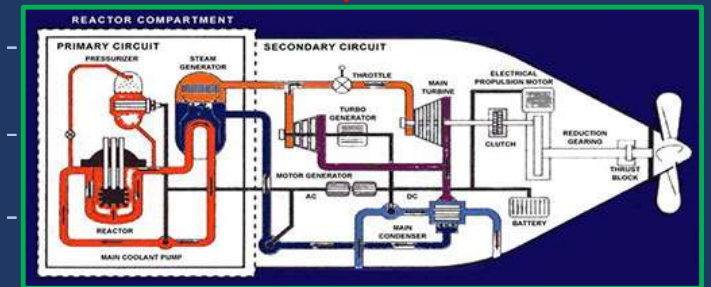
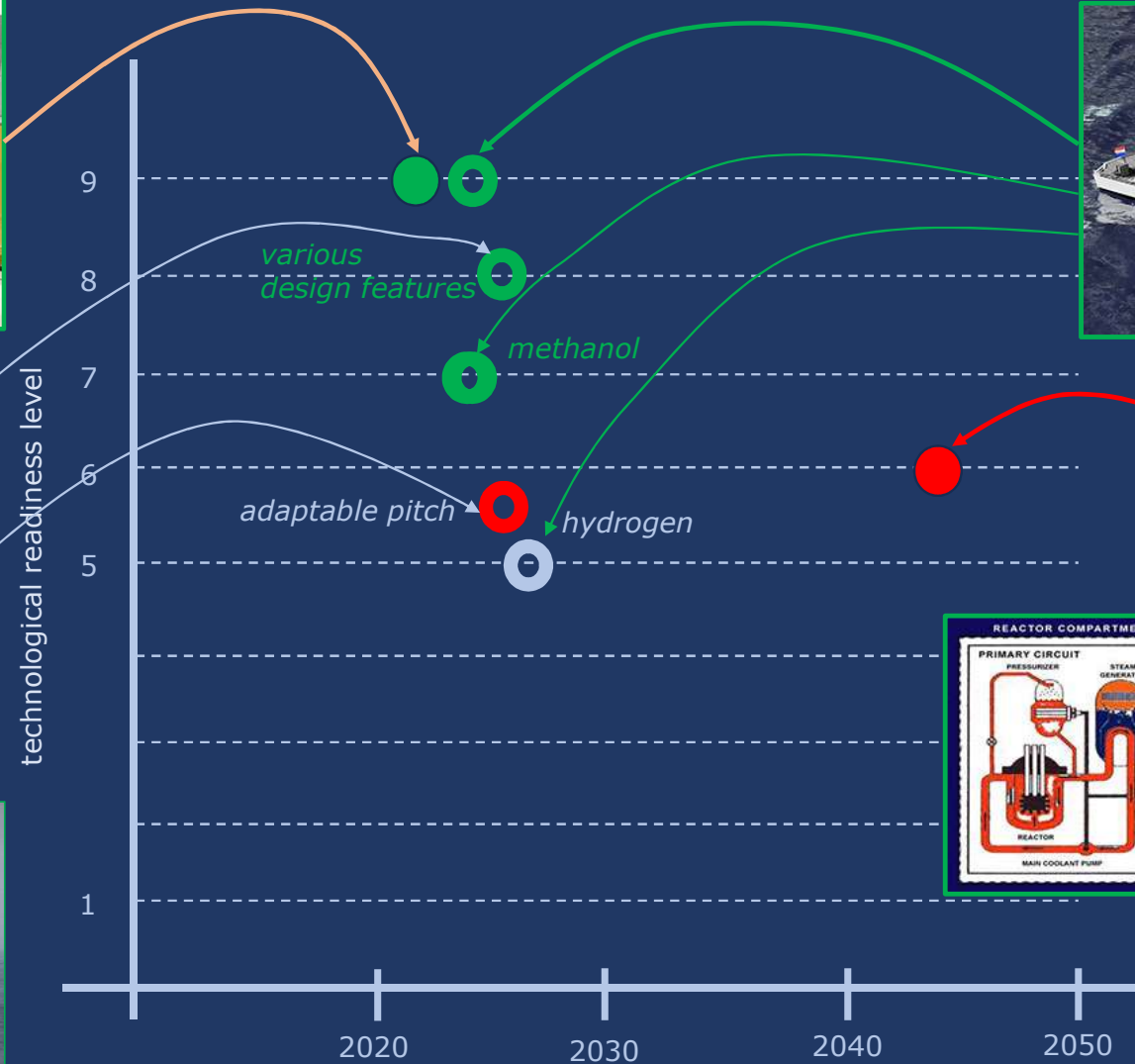
geo-thermal

tidal

nuclear

rules
monitoring
reporting

alternative supply



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