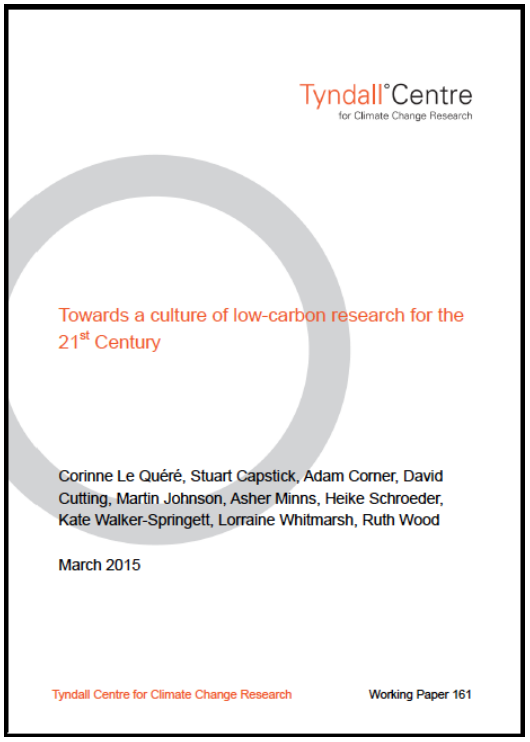
Developing a community roadmap to a low-carbon research space



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Tyndall Working Paper 161

A clean, green science machine

As the world warms and technology improves, researchers and institutions should look at their carbon footprints and question whether they really need to travel to academic conferences.

Nature, Editorial

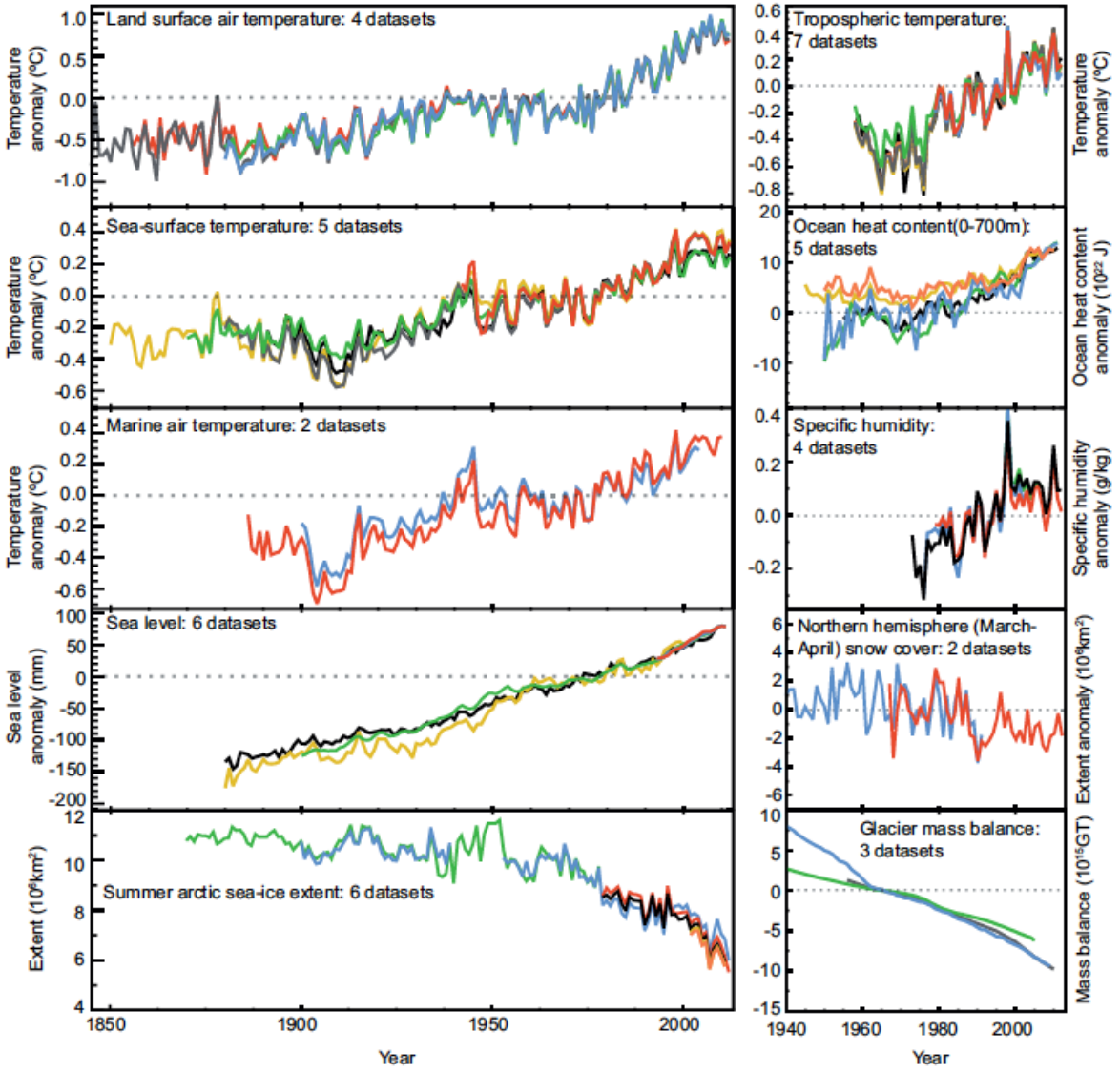
SNAPSHOT

Travel responsibly

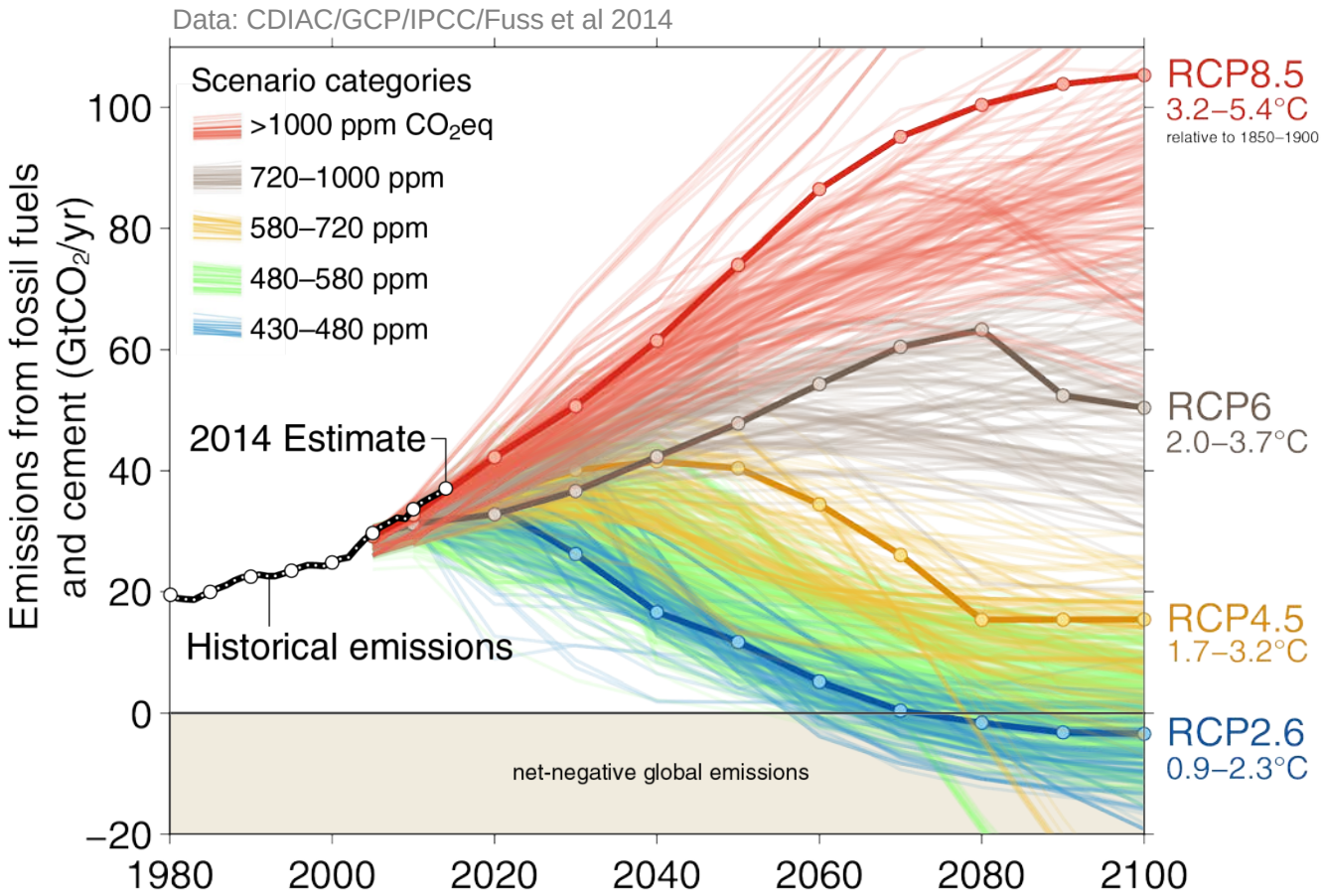
Nature Climate Change, Snapshot

University of East Anglia

“Warming of the climate system is unequivocal”
IPCC AR4 & AR5



“Limiting climate change will require substantial and sustained reductions of greenhouse gas emissions”
IPCC AR5 WGI SPM



Over 1000 scenarios from the IPCC Fifth Assessment Report are shown

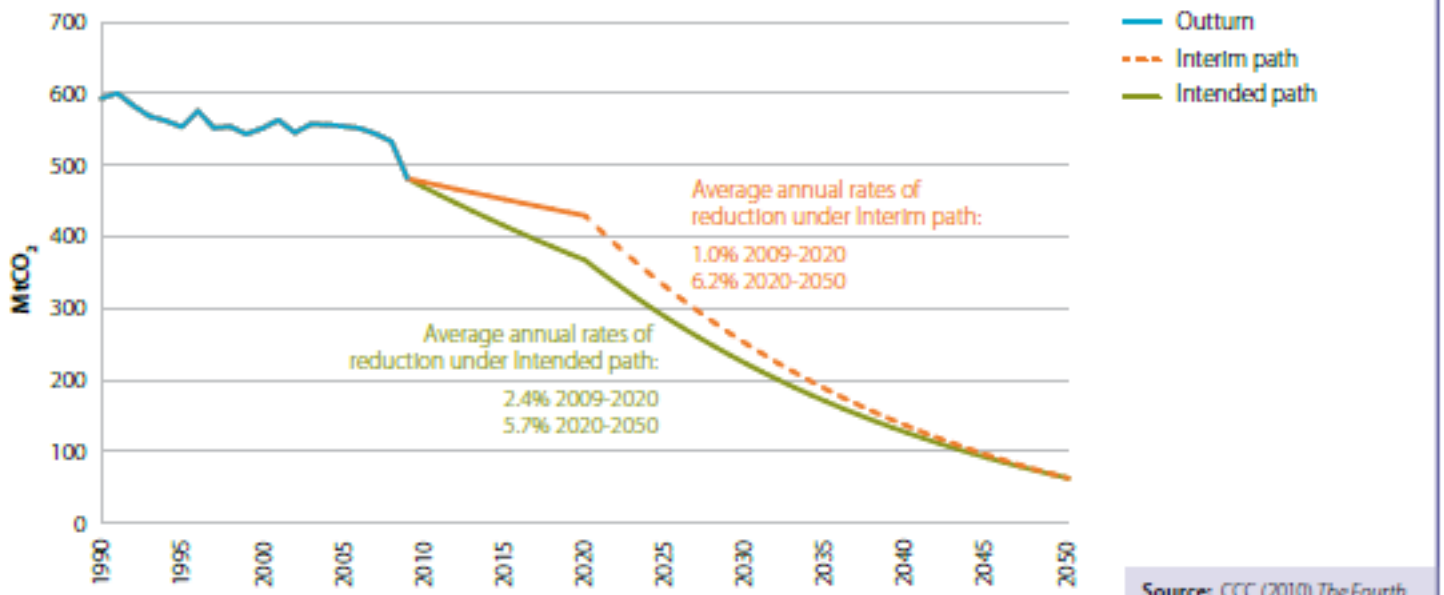
Source: Fuss et al 2014; CDIAC; Global Carbon Budget 2014

We have been heard…

UK, EU and USA all working towards 80% emission reductions by 2050

Example from the UK Climate Change Act:

Figure 1.22: Required CO_2 emissions reductions to 2050 under Interim and Intended budgets (1990-2050)



Source: CCC (2010) *The Fourth Carbon Budget: Reducing emissions through the 2020s.*

What about the research community?

Emissions from long-haul flights
completely dominate our carbon footprint

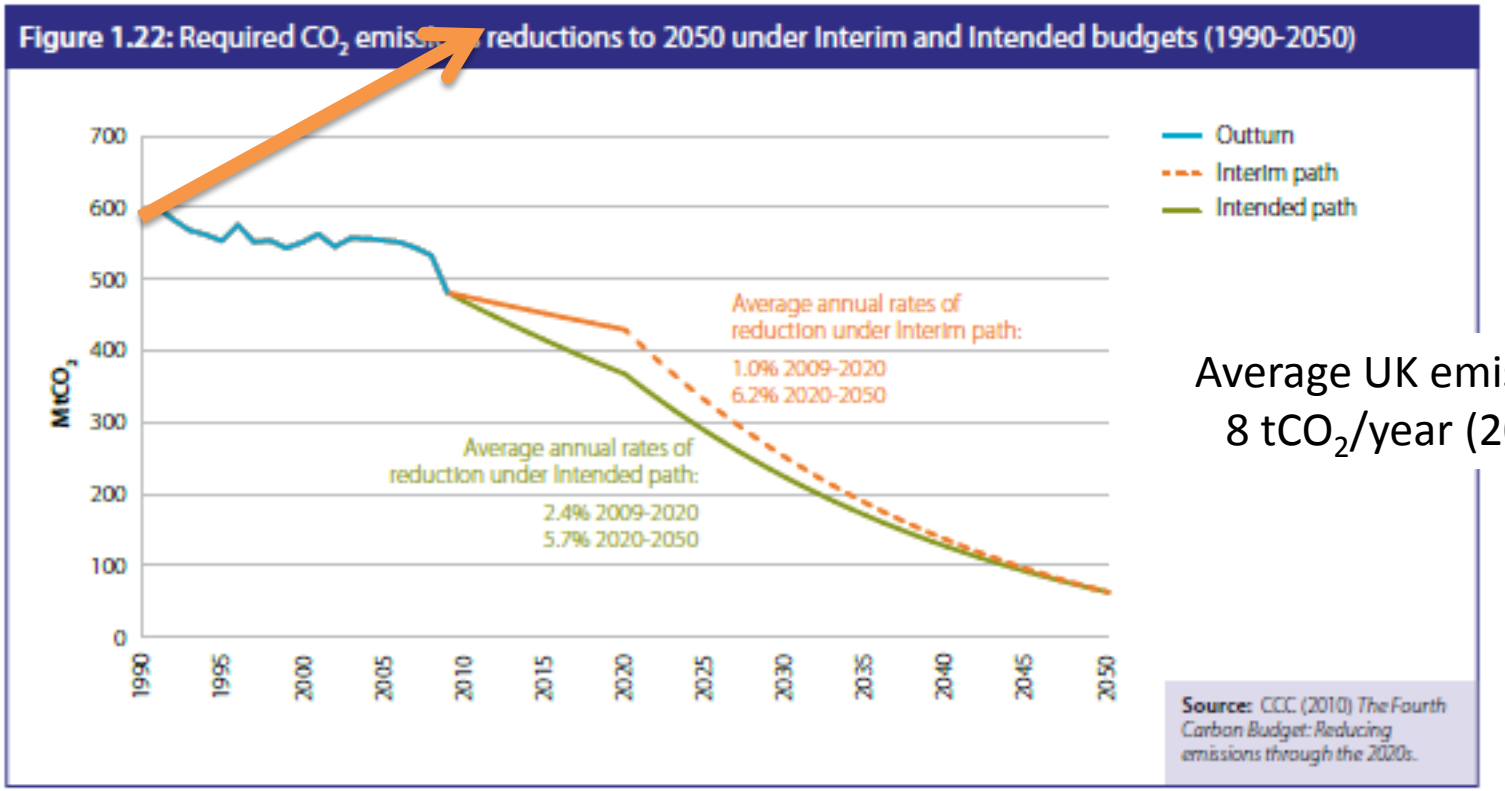
Transport mode	Kg CO_{2e} per 100 passenger-km
Car	23.0
Coach	3.6
Rail	5.8
Air	21.4

DECC/DEFRA statistics for UK average (2013) including 'well to tank'
Air travel include radiative forcing from 'uplift', which doubles (190%) direct emissions

Do as I say, not as I do…

My professional travel during 2011-2015: 12 tCO_2 per year

1990-2011 int. aviation +53%



Average UK emissions
8 tCO_2/year (2014)

aviation technology/carbon offsets not enough

Is science above all?

Do we need to fly to do good science?

	I'm travelling	I'm home
Generate ideas	exceptional stimulation	wider audience
Make connections	build trust	wider network
Assess progress	easy & fast	improving
Promote work	kudos	new metrics
Financial cost	limiting	free
Time cost	efficient	savings
Personal impact		better

What we need is a plan…

Moving towards a low-carbon research space

to walk the talk and strengthen the trust of the public in research

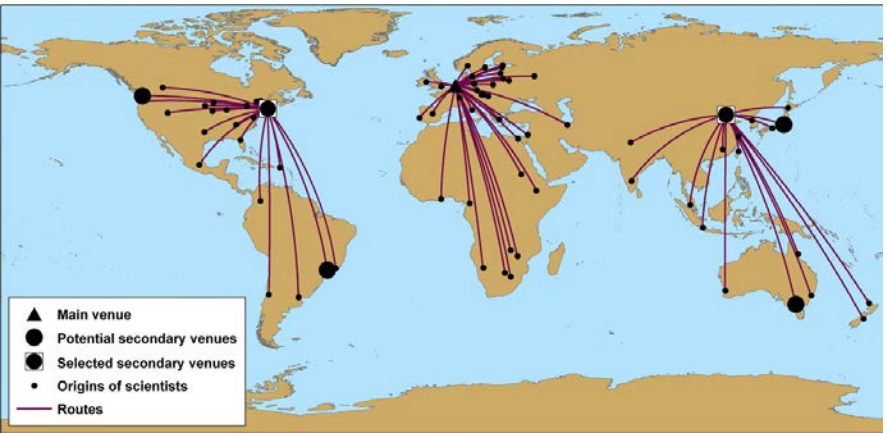
2 key elements of face-to-face interactions to preserve

- exceptional stimulation
- establish relationships of trust

Options for change

- chose the location carefully
- augmentation with webcasting
- nodal conferencing
- online distributed meetings
- specialised tools
- change the research culture!

resist the FoMO!
propose & prepare



Orsi et al. 2012

Here is a possible Code of Conduct for researchers

could we adopt something like this in our community?

Code of Conduct to support a low-carbon research culture

1) **Monitor and reduce.** I will keep track of the carbon emissions of my professional activities, and set personal objectives to reduce them in line with or larger than my country's carbon emissions commitments[a].

2) **Account and justify.** I will justify my travel considering the location and purpose of the event, my level of seniority, and the alternative options available.

3) **Prioritise, prepare and replace.** For activities that I organise, I will chose the location giving high priority to a low carbon footprint of travel of the participants, and I will encourage, incorporate and technically support online speakers and webcasts to reduce unnecessary travel.

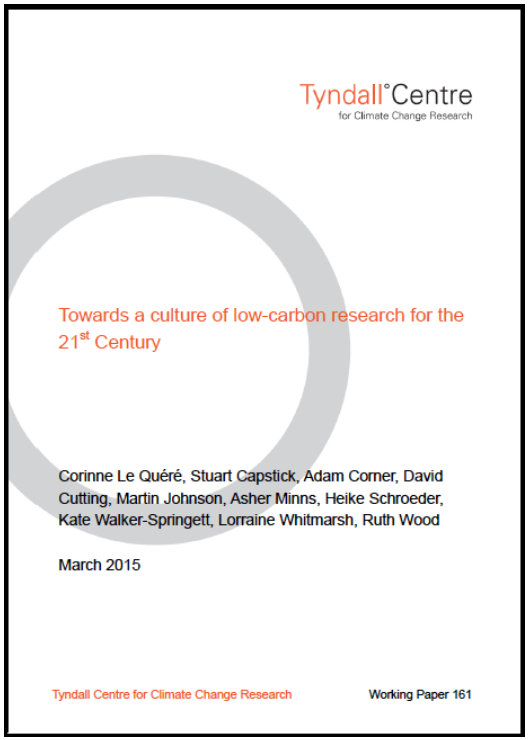
4) **Encourage and stimulate.** I will resist my own FoMo (Fear of Missing Out) from not attending everything and work towards sensitizing others to the need of the research community to walk the talk on climate change.

5) **Reward.** I will work with my peers, Institute and Funders to value alternative metrics of success and encourage the promotion of low-carbon research as a realisable alternative to a high-carbon research career.

[a] For the UK, following the UN Climate Change Act on the 'intended path' means an initial effort to cut my aviation emissions by at least 50% compared to 2010-2015 level, and then to cut all my travel emissions by at least 2.4% per year during 2015-2020 and 5.7% per year during 2020-2050.

Tyndall°Centre
for Climate Change Research

Toward a culture of low-carbon research



It is not because we cannot do everything that we should do nothing

It matters what scientist *say* and *do*

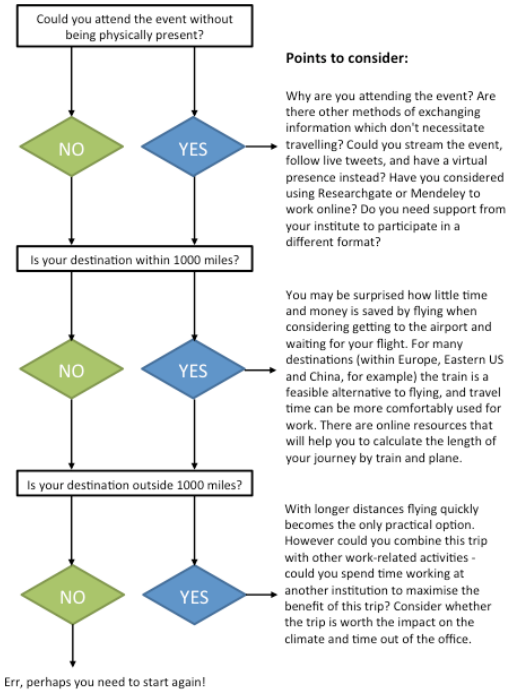
Discussion here today 2h-3h

Tyndall Carbon Reporting Tool and Travel Strategy

http://www.tyndall.ac.uk/travel-strategy

General principles: *the Tyndall travel strategy should be simple, self-guided, open and transparent, and driven by an overall goal.*

think before you travel



justify your travel

Weight	Justification
1	Well justified emissions, for example: Conduct field work. Travel informs directly policy on climate change and global sustainability (e.g. IPCC). Travelling to meet contractual engagement (e.g. from research grants), with no alternative options available. Risk of job loss with refusal to travel. <u>And for Stage 1:</u> Present and promote own research. Establish contacts. Attend and present work at project meetings.
2	Useful but with potential for using alternative options.

esearch.
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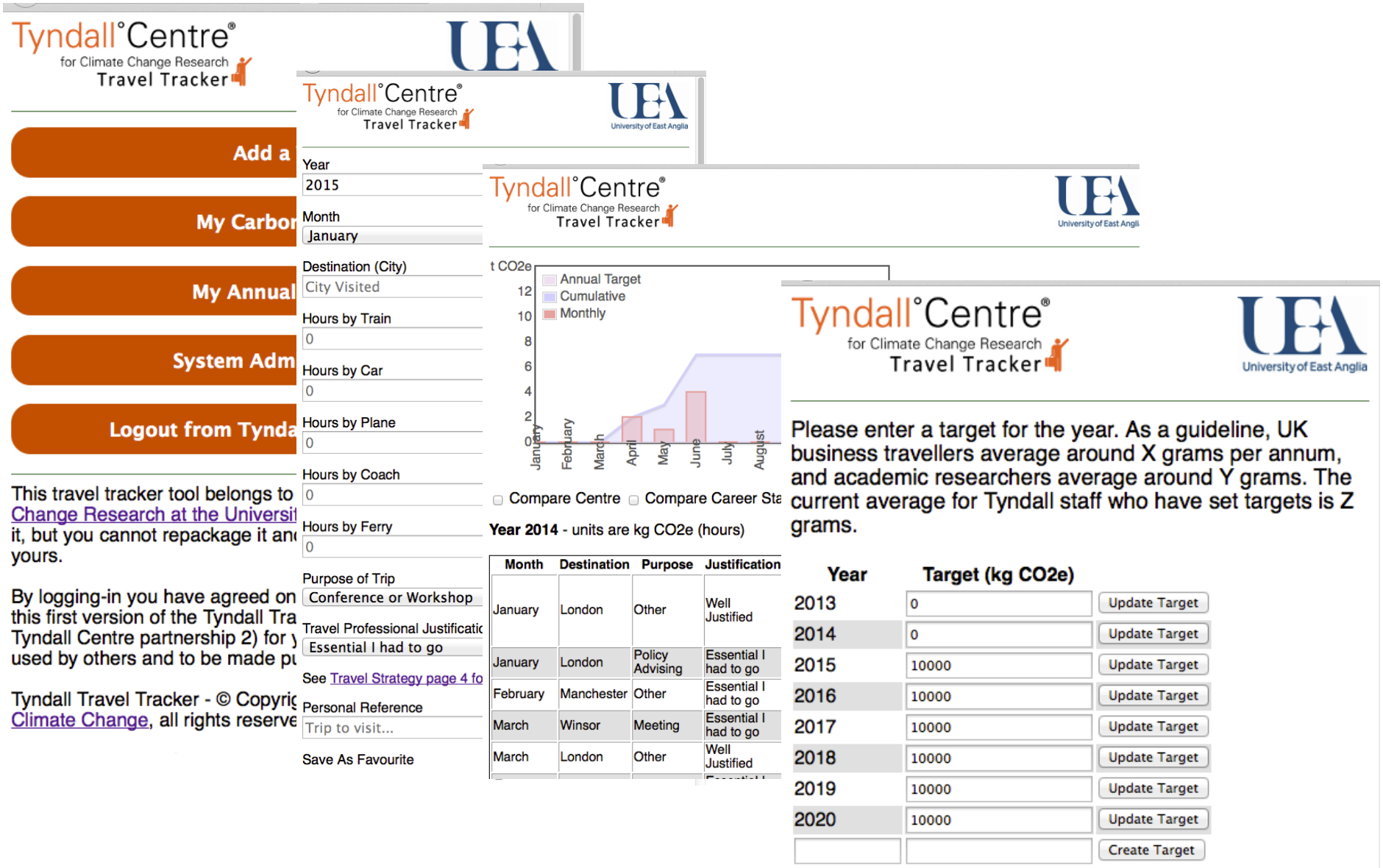
optimize the

Transport Mode	Km / hour[1]	Wh /pkm[2]	gCO_{2e} /wh[3]	$kgCO_{2e}$ /pkm[4]	$kgCO_{2e}$ /hour	Normalised to EU HS Rail (unit less)
Car	100			0.2296[5]	23	3.8
Coach	90			0.0355	3.2	0.5
Ferry	46			0.1378[6]	6.3	1
Rail						
European high speed electric	200	70	0. 4310	0.0302	6.0	1
European Intercity electric	160	77	0. 4310	0.0332	5.3	0.9
European intercity diesel	160			0.0657	11	1.7
UK average	150			0.0576	8.6	1.4
Air						
UK Domestic	850			0.3622	217	36
European	850			0.2135[7]	181	30
International	850			0.2512	214	35

account for your emissions in hours spent moving

Tyndall Carbon Reporting Tool

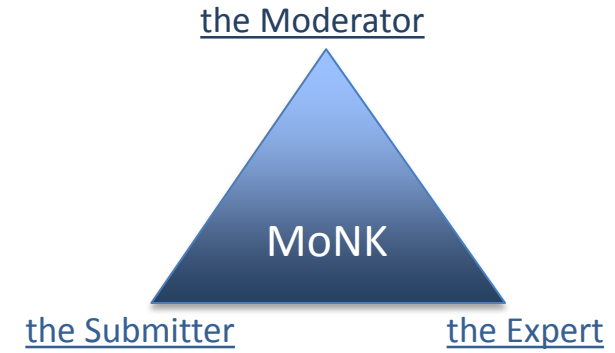
http://travel.tyndall.ac.uk



New **ScienceBrief** Platform in development to:

- ➔ facilitate scientific assessments
- ➔ increase transparency and timeliness
- ➔ strengthen consensus

Pilots under discussions: the Global Carbon Cycle; Pollination; Valuing Energy and Nature.



The observed reduction in surface warming trend over the period 1998 to 2012 as compared to the period 1951 to 2012, is due in roughly equal measure to a reduced trend in radiative forcing and a cooling contribution from natural internal variability, which includes a possible redistribution of heat within the ocean (*medium confidence*). [IPCC WGI SPM, Section D.1]

Map of Current Knowledge (MoCK)

demonstrates	mostly supports	informs	mostly challenges	contradicts

Guemas et al, *Nature Climate Change* 2013 – submitted by Corinne Le Quéré

Summary: The hiatus can be reproduced by models that are initialized with observed ocean observations.

Watanabe et al, *GRL* 2013 – submitted by Corinne Le Quéré

Summary (max 30 words): This paper explains why models tend to underestimate the hiatus and suggests an association with ocean variability.

Map of New Knowledge (MoNK)

Meehl et al, Nature Climate Change 2014 – submitted by Corinne Le Quéré

Summary: This paper shows that models successfully simulate the hiatus with the naturally occurring phase of the Interdecadal Pacific Oscillation.

Marotzke and Forster, *Nature* 2015 – submitted by Corinne Le Quéré

Summary: This paper uses an energy balance model to demonstrate that 15-year temperature trends are primarily indications of natural variability.

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