Tyndall Centre®
for Climate Change Research

Tyndall Travel strategy

Guidance note for phase I (2013-2014): understand and monitor

21 July 2014

Foreword: Limiting climate change requires substantial and sustained reductions of greenhouse gas emission. The Tyndall Centre for Climate Change Research acknowledges its share of global emissions, particularly from emissions related to flying to conferences and meetings. While travelling helps advance research, options are available to limit travel emissions by reducing the distance travelled, switching travel model, and using alternative modes of communications. The Tyndall Travel Strategy under development aims to help individual researchers and the Centre as a whole to reduce its emissions through time.

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

Simple: there is enough administrative burden associated with travel. Our researchers want a simple system that provides them with feedback on their performance compared to themselves (through time) and to others.

Self-guided: there is such a diversity of researchers with different views on the usefulness of travel for research that we ask our researcher to evaluate themselves the rationale for their travel emissions. We provide a look up table with the general principles. Interested researchers can sign up to the strategy (it is not compulsory).

Assisted self-monitored: we offer a way to report your emissions through a simple monthly survey. We will feed back information every three months to compare your travel emissions to those of colleagues at the Tyndall Centre.

Open and transparent: we want the public to know that we are taking our emissions seriously and acting to reduce them. For this, we plan to make public our emissions when the system is established.

Driven by an overall goal: we acknowledge the benefits of travelling for research, and the necessity to scale up the effort or emissions reductions throughout the entire community. We are working with the international community to establish targets for the global research community, and to develop alternatives to travelling, by: (1) writing a paper discussing alternatives to travelling with moderns modes of communications, (2) making efforts ourselves to develop and use the web-based research space, and (3) engaging discussions through the Future Earth science committee. The fundamental basis for the Tyndall travel strategy should be grounded on the UK government's target of reducing emissions by at least 80% from 1990 levels by 2050, as stated in the Climate Change Act.

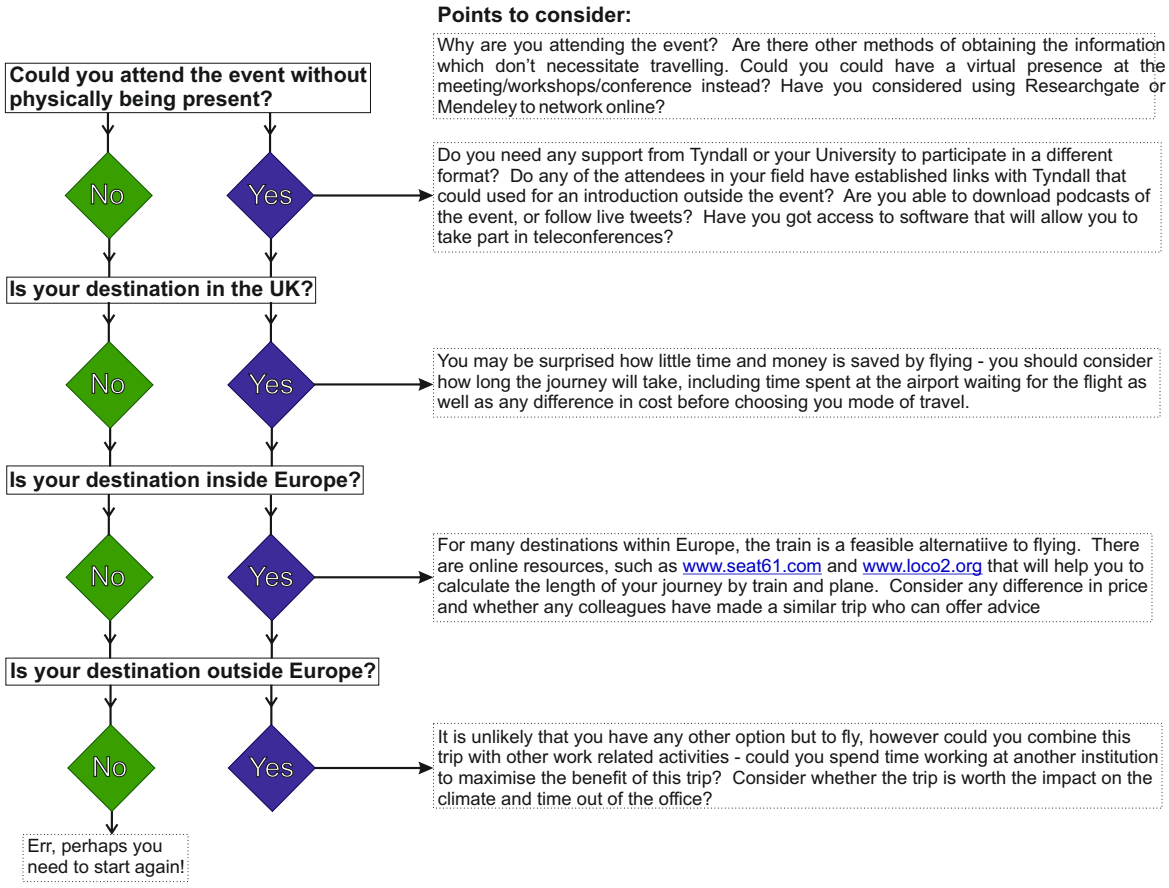
This document aims to kick-start our strategy for reducing the travel emissions of researchers at the Tyndall Centre. This year, we will work to better understand why we travel, what are the low-carbon alternatives, to establish a system to help monitor our own emissions through time and establish where we stand compared to our peers, and to decide on the levels of commitments that we want to encourage

among our affiliated members. This guidance note includes a 'Decision tree' to help make decisions at the moment of travel, and a 'Scoring tool', that provides a professional score for your travel this year. The Scoring tool is experimental and may change with time.

Scope: This strategy refers to travel emissions undertaken for work activities only. It does not include personal travel or commuting to work.

I – Decision tree:

The decision tree aims to help you identify low-carbon travel alternatives, and help you maximize the benefits of your travel emissions.



II – Scoring tool:

You will be asked to fill a simple monthly survey to record your travel. The survey asks you to report where you have been and why, to justify your trip (see below), and to report the numbers of hours you spent moving in a car, bus, train and plane. Your emissions will be computed directly from this information. In addition, we developed a scoring tool that aims to give you a professional score independent of

your career stage, and can thus be used to monitor your emissions through time and to compare your habits with that of others. This is an experimental score that will need to be revised as results come in.

Your score is the product of a 'Weight' corresponding to the rationale associated with your travel (Table 1), times the emissions E normalized to the corresponding emissions per km train travelled ($Emissions_{norm}$, Table 2), times the number of 'Hours' in motion.

$$Score = Weight * Emissions_{norm} * Hours \quad (1)$$

The score is provided in hours-equivalent (h_e). For a well-justified trip (Weight=1), h_e can be converted to tCO_{2e} by multiplying by 0.01. The score of a well-justified trip lasting 10 hours made by train would be equivalent to 10 he or 10 $kgCO_{2e}$. The score of a well-justified trip lasting 10 hours and made by plane would be 80 h_e or 0.8 tCO_{2e}. The score of a poorly justified trip (Weight=4) lasting 10 hours and made by plane would be 320 h_e.

III – Commitments:

Once the monitoring is in place, you will be signed up to a minimum commitment and invited to opt out or strengthen your commitments if you wish. You can commit to (to be discussed):

- cap your score
- reduce your score by X in the next year
- do no more than X hours of flying

These could be presented in the form of a bronze, silver and gold commitment. We could set an institutional target at a later stage if there is support for this, and with time if other institutions sign up we could also compare across institutes.

Disclaimer: The Tyndall travel strategy is in progress. It aims to provide a general view of the travel emissions of our researchers, but it will not be very precise as a carbon footprint tool because we have opted for simplicity in reporting. For a deeper analysis of your emissions please consult with other web sites available. We aim to improve the way we report our emissions and feedback to members through time, and revisit this overall strategy once a year at the time of the Tyndall Assembly (usually in September).

Appendix

Table 1: Weight associated with different types of travel to be used in Equation 1. We refer to research stages as follows: Stage 1: Early Stage Researchers (for example

up to 2 years after PhD); Stage 2: Intermediate Stage Researchers (for example, up to about 10 years after PhD); Stage 3: Established Researchers (for example, in permanent positions with over 10 years since PhD).

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. And for Stage 1: Present and promote own research. Establish contacts. Attend and present work at project meetings.
2	Useful but with potential for using alternative options. Stage 1: Attend a workshop not directly related to own research. Stage 2: Travel to present own work and promote own research. Stage 3: Travel to explore new topics. Could lead to important research or funding for own or group/institute research. Travel acts to move projects or significant collaborations forward (e.g. Fudan).
3	Less well justified with much potential for using alternative options. Good value mainly for low-emissions travel. Stage 3: Travel to present own work and promote own research. Travel to establish or maintain own collaborations. Invited guest lectures.
4	Poorly justified emissions. Good value only for low-emissions travel. Travel to keep up to date or renew connections with colleagues. No results presented. Little pre-travel arrangements made to optimize the usefulness of the meeting.

Emissions factors and rational for the choices made

Table 2. Emissions factors used in the conversion of the emissions from the hours travelled to the $kgCO_{2e}$. The $Emissions_{norm}$ (Equation 1) is shown in the last column.

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

[1]Assumptions used here.
[2]Reported by IFEU (2010) based on statistics provided to them by the International Union of Railways.
[3]Direct and WTT CO_{2e} emissions per Wh from EU average electricity generation, transmission and distribution (DECC and Defra, 2013). The direct CO_2 figures have been increased by 0.7% to account for non-CO_2 emissions, following the UK's direct electricity generation CO_2:CO_{2e}.
[4]Direct and WTT CO_{2e} emissions per passenger km for modes other than European rail (DECC and Defra, 2013) or based on energy consumption figures (IFEU, 2010) and European grid average emissions (DECC and Defra, 2013).
[5]Average passenger car, unknown fuel, 1 passenger (DECC and Defra, 2013).
[6]Average all ferry passengers (i.e. foot or car; DECC and Defra, 2013).
[7]Short haul, average passenger figure includes radiative forcing from uplift.

All the emission factors reported here are taken from DECC and Defra (2013) with the exception of international rail travel. The international rail emission factors reported by DECC and Defra (2013) are based on the Eurostar and this figure is not representative of the emissions associated with travel by train across the rest of Europe, due to differences in the electricity mix across Europe. Instead we have estimated an emission factor based on the power consumption per passenger km of European rail travel as reported by the IFEU and UIC. The figure is derived from a combination of datasets published by the UIC and reported by IFEU using a) power consumption by train by route type (high speed, intercity or regional) b) seat numbers by route type for each EU country and c) load factors by route type using survey data from selected countries from which a weighted average for Europe is used. The emission factor reported is a combination of the European average power

consumption for rail travel per passenger km coupled with the EU average electricity emission factor reported by DECC and Defra (2013). Figures are provided for high speed, intercity electric or diesel and regional electric or diesel.

Emissions included in the accounting

For each travel mode the direct and well to tank (WTT) CO_{2e} emission factor per pax km is reported, this figure represents the emissions directly emitted by the transport mode from fossil fuel combustion for propulsion and emissions associated with the extraction, refining and transport of the fuels to their point of use – the car of coach engine or power station. Well to tank emissions are sometimes referred to as 'Scope 3' emissions in some GHG reporting standards – they are not under the direct control of the transport / power station operator, but are emitted as a consequence of their demand for fossil fuels. For electrified transport, this is the CO_{2e} directly emitted by the appropriate electricity generation source and the upstream emissions associated with fuels used for electricity generation – either UK or the European average. Note that only CO_2 is reported for European electricity generation transmission and distribution in their direct emission factors, omitting the contribution of non-CO_2 greenhouses gases associated with combustion of fossil fuels during electricity generation. For consistency, the non-CO_2 emissions for EU electricity generation are assumed to be the same proportion (0.7%) of CO_2 emissions as for UK electricity and this figure is included in Table 1.

The aviation emission factors presented here include an 'uplift' to take into account non-Kyoto defined GHG radiative forcing associated with flights. In addition to emitting greenhouse gases, aircraft also have an additional radiative forcing impact on the climate associated with their release of NOx, sulphates, soot and water. While there is no comparable CO_2 global warming equivalent for this impact, an uplift factor is provided by DECC / Defra to reflect this additional radiative forcing from flights. Currently DECC and Defra recommend multiplying aviation CO_2 emissions by 190% to reflect this impact.

Data sources

DECC and Defra (2013) UK Government conversion factors for company reporting. AEA Ricardo and Carbon Smart for the Department for Energy and Climate Change and the Department for Environment, Food and Rural Affairs, London, UK. Available at: http://www.ukconversionfactorscarbonsmart.co.uk/

IFEU, 2010 EcoPassenger environmental methodology and data, IFEU, Institut fur energie und umweltforschung, Heidelberg Germany. http://www.ifeu.org/index.php?bereich=ver&seite=projekt_ecopassenger