World Climate Research Programme
JOINT SCIENTIFIC COMMITTEE (JSC)
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Carbon Footprint Report

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1. Context

The extent of the climate crisis makes it clear that the World Climate Research Programme has an important leadership role in terms of ensuring that the carbon footprint of science is dramatically reduced. The climate science community has long recognized that this is needed, and some progress has been made, but so far it has been largely ad hoc and climate scientists who have taken individual step to reduce their carbon footprint have done so independently.

According to the IPCC Sixth Assessment Report (AR6) Special Report on Global Warming of 1.5°C (IPCC, 2018), model pathways with no or a limited overshoot of 1.5°C require that global net anthropogenic carbon dioxide (CO_2) emissions decline by about 45% from 2010 levels by 2030 (40–60% interquartile range), reaching net zero around 2050 (2045–2055 interquartile range).

In line with the science, WCRP should commit to reduce the CO2 emissions related to its activity, setting an ambitious target, defined by a given level of emission reduction to be achieved over a given period of time. The least ambitious target would be 50% reduction by 2030 relative to current, but a more ambitious target should be adopted, given the large current emission level of WCRP (when compared to the world average per capita CO2 emission)**.**

Here we propose a target of 75% reduction by 2030.

One important area of carbon emissions for WCRP is travel. It is recognized that the carbon trade-off is only one, albeit increasingly important, aspect that determines the format (face to face versus online) and location of a meeting and that other factors must be considered. However, the current structure and organizational aspects of WCRP activities are essentially based on communication approaches and assumptions about the business of the meeting that are 2 – 3 decades old (that is, we need to do everything face to face, every time). There is a need to revisit this modus operandi. Reducing CO_2 emissions from travel must primarily come from a reduced need to travel (rather than moving all meetings to a central place, for example). This requires a strategic rethinking of WCRP scientific and programmatic activities and how they can operate efficiently.

2. Main recommendations

To achieve our ambition for WCRP to reduce emissions by 75% by 2030. We recommend to the WCRP Joint Scientific Committee (JSC) that:

- all WCRP activities to always consider virtual meeting as the first option. Face to face meetings should only be envisaged if virtual meeting would dramatically impact on the outcome of the meeting;
- all WCRP activities should use carbon emissions as a key deciding factor in determining the location and format of their meetings;
- In particular, the JSC should use carbon emissions as a key deciding factor in determining the location and format of the 42nd Session of the JSC in 2021;
- the JSC appoint a task team to develop a WCRP Carbon Strategy by December 2020 (see more below);
- all WCRP activities report their annual carbon emissions, to an agreed standard, to the WCRP Secretariat by March each year, beginning in 2022 (for 2021 emissions); and
- the JSC commit to reporting WCRP's carbon footprint (for the previous year) each year at the annual JSC Session, beginning in 2022, and also discuss progress and additional measures needed to meet its 2030 target.

3. WCRP Carbon Strategy Task Team

The WCRP Carbon Strategy Task Team would look at the following aspects:

- A strategy for travel to WCRP meetings (see Annex 1)
- A strategy for working with the World Meteorological Organization (WMO), who hosts the WCRP Secretariat, on the carbon footprint of the Secretariat
- A strategy of working with each of the WCRP IPO host organizations on the carbon footprint of each office
- Additional strategies as required

This must be developed as part of the implementation of the WCRP Strategic Plan 2019-2028 (WCRP, 2019).

4. Issues and challenges

Deciding on and implementing a Carbon Strategy aimed at reducing Programmatic carbon emissions will have issues and challenges, such as:

- How will the WCRP target of 75% carbon emission reduction by 2030 impact international partnerships and collaboration?
- What policy should be taken for offsetting of carbon emissions?
- How do we calculate one carbon footprint for the entire Programme when we have international project offices in several different countries and where host organizations may have different carbon strategies?
- Once a Carbon Strategy is in place, how do we ensure strong community support and engagement?

5. Carbon Cost associated with the WCRP JSC Session

At JSC-41 we will need to consider the location of the next JSC Session. The current geographical distribution of WCRP JSC members, IPO and Secretariat staff (27 persons) is as follow: Europe 15, Asia 5, North America 2, South America 2, Australia 2 and Africa 1.

We considered five potential locations for a JSC session: Geneva, Sydney, Washington D.C, Cape Town, and Lima. For Geneva, two options were investigated for European participants, travelling either by airplane or by train, with all non-European participants travelling by plane. For all other locations, all participants are assumed to travel by airplane (except for participants from the host country). Table 1 summarizes the CO_2 emissions for each location (round trip).
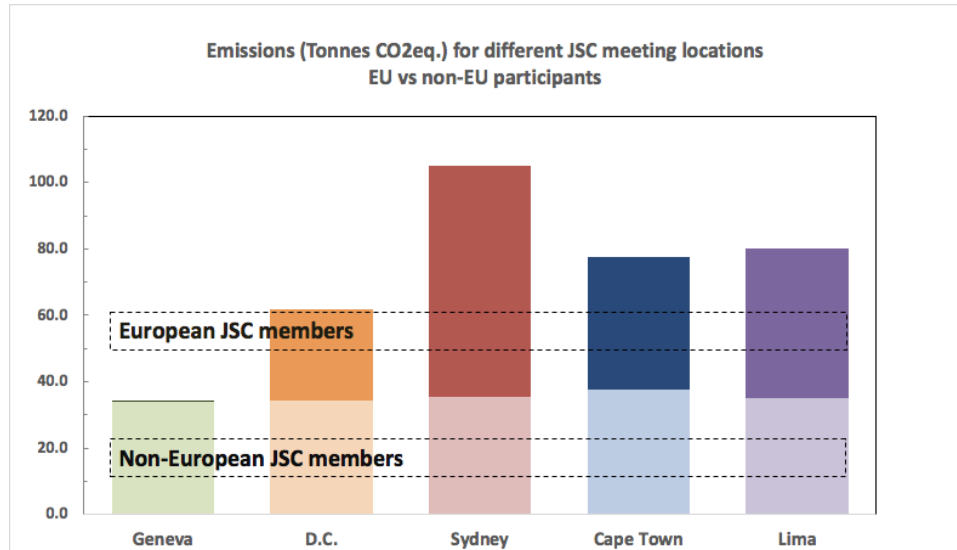
Table 1: Tonnes of CO_2 for travel to and from five proposed JSC host locations

	GENEVA	WASHINGTON D.C	SYDNEY	CAPE TOWN	LIMA
EUROPEAN PARTICIPANTS	1	27	70	40	45
NON-EUROPEAN PARTICIPANTS	34	34	36	38	35
TOTAL	35	62	105	78	80

The calculation shows that a JSC Session in Geneva reduces the overall CO_2 emissions by more than 40% compared to any other location (Figure 1a). The two main reasons are: (1) participants geographical distribution, as 15 out of 27 participants are from Europe all have a shorter distance to travel to Geneva; and (2) a small reduction (~2 tonnes CO_2) in CO_2 emissions where European participants can travel by train (Figure 1b). The location of the meeting is not very critical for non-European participants, they contribute to 30-40 tonnes of CO_2 regardless of the location of the Session.

The CO_2 emissions averaged per participant for one annual JSC session is of the same order of magnitude as the world average per capita emissions of CO_2 (Figure 2). In other words, in one single JSC meeting a participant uses most of, or more than, their world-averaged annual carbon budget.
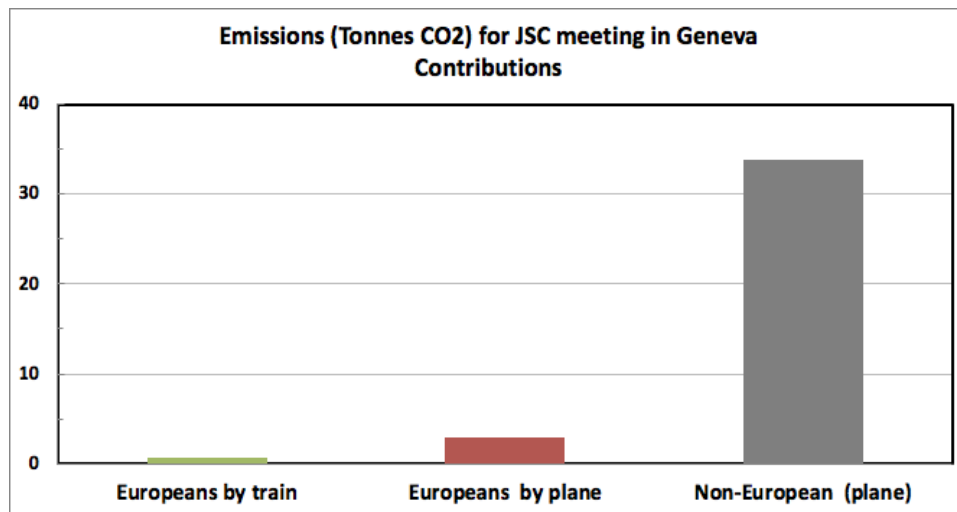
(a)

Emissions (Tonnes CO2eq.) for different JSC meeting locations
EU vs non-EU participants

European JSC members

Non-European JSC members

| | Geneva | D.C. | Sydney | Cape Town | Lima |

(b)

Emissions (Tonnes CO2) for JSC meeting in Geneva
Contributions

| Europeans by train | Europeans by plane | Non-European (plane) |

Figure 1: (a) The CO_2 emissions (Tonnes CO_2 eq.) for different JSC Session locations for Europeans and non-Europeans. (b) The distribution of emissions for a meeting in Geneva (Tonnes CO_2 eq.).
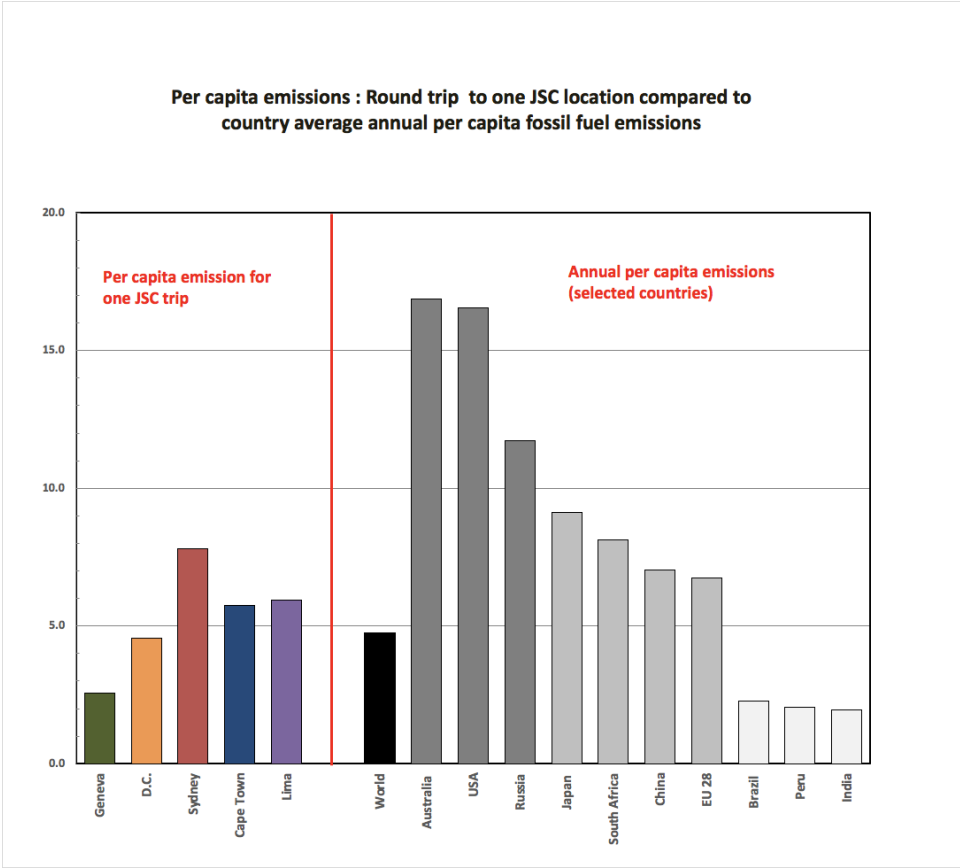
Figure 2: Per capita emissions (Tonnes CO_2 eq.) for a round trip to one JSC location compared to the annual per capita emissions from selected countries.

Key recommendations for a travel strategy for WCRP meetings

1) Assess the need to travel

Quantify the need for a face-to-face meeting (Figure 3). Factors important for such decision are

- Expected outcome of the meeting (can they be achieved virtually)
- Balance between "management" vs "science"
- Ongoing or new activity (added value of face to face meeting)
- Other planned activities (outreach, policymakers, international partners), and whether these parallel activities woiuld involve most of the participants of the main meeting

The decision tree below is taken from the Low Carbon Tyndall report (Le Quéré et al., 2015). It would be useful if WCRP could develop such a decision tree better suited for WCRP activities.
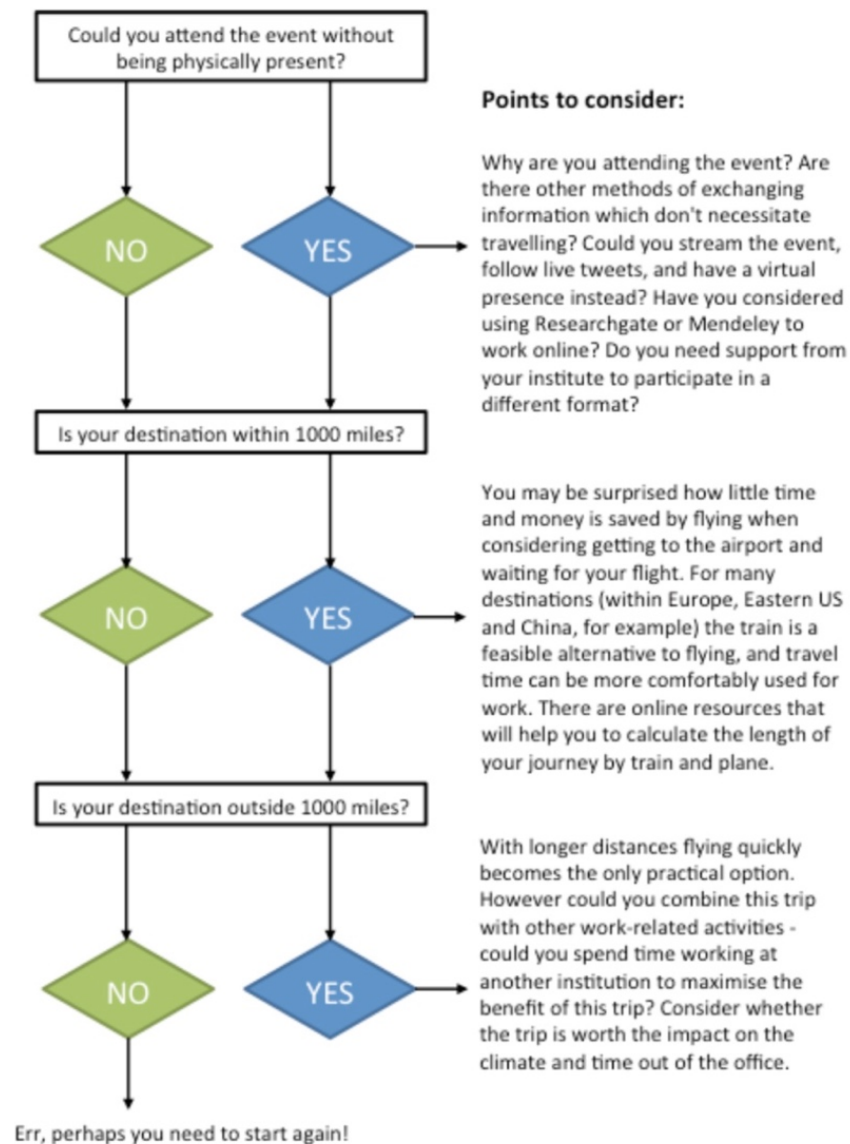
Figure 3: Decision tree (Le Quéré et al., 2015)

2) Consider all options for meetings

A wide range of meetings models exist for reduction of CO2 emissions , listed here from most CO2 emitting to least CO2 emitting (Le Quéré et al., 2015):

- "Augmentation" of traditional conferences, where webcasting and online resources tools should be available.
- "Nodal" meetings, where a meeting is distributed over numerous regional sites around the globe (ex. one node per continent) . Communication between nodes could happen during the meeting of after the meeting.
- Fully online meetings, where all participation are "home base".
- "Continuous" meeting, where discussion and decisions are on-going throughout the year using online documents, emails and specialist tools, rather than being intensive during short periods.

3) Recommendations for face-to-face meetings:

- The carbon footprint of each WCRP meeting or workshop should be calculated in the planning stage. To enable this, WCRP should provide clear instructions on how to calculate the carbon footprint (ie what items to include), so that this is uniform across the Programme and so that a WCRP carbon budget can be estimated each year.
- Meetings in Europe lasting no more than 3 days should ideally start/finish on Tuesday/Thursday to maximise the option to travel by train on a weekday.
- Travelling by train should be considered as paid work time, with an advantage of zero distraction.
- WCRP (WMO) should prioritize/encourage train travel for journeys of 10 hours or less, even if the travel cost is higher[1].
- WCRP should optimise (i.e. minimise) meeting attendance (not everyone has to be there).
- WCRP should always allow remote meeting attendance to face-to-face meetings and provide all the tools necessary to support online participants.
- WCRP should ensure that the entire meeting package is as sustainable and low-carbon as possible, from the venue and catering options to how the meeting notes are shared. Particularly, organizers should look for local and vegetarian food choices, avoid single-use items or unnecessary merchandise and reduce waste as much as possible.
- WCRP should consider offsetting CO_2 emissions from travel with approved CO_2 emissions offsetting schemes.
- If it does not already exist WCRP should use (or develop) an online application that identifies the optimal locations for a potential meeting, given a list of attendees.

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[1] Currently, WMO will only fund the cheapest and/or most direct travel route, regardless of the carbon footprint. For example, for a journey from Geneva to Hamburg by train (10-hour trip and around 450 CHF return) or by plane (a 1.5 hour flight and around 250 CHF return), WMO will only cover 250 CHF. If one decides to travel by train, they would need to pay for the difference (200 CHF) themselves.

4) Recommendations for online and regional hub meetings:

Meetings can be totally online or can connect a number of regional hubs, where participants gather face-to-face and connect to the other hubs by internet connection.

- WCRP should make full use of the inclusivity of online meetings to increase the geographical distribution and support the gender balance of participants at its meetings.
- Online meeting software should be chosen for its functionality and ease of use, noting that one solution may not be appropriate for all meetings.
- Where needed, people hosting online meetings should be provided with training on how to effectively run such a meeting.
- The host organizations of regional hubs, for example WMO HQ if used as a European hub, should permit access to their buildings in the late evening/early morning to accommodate for time zone differences with the location of other regional hubs.
- When online meetings are global, some participants will need to attend at night. WCRP (WMO) should facilitate this by reimbursing participants booking into a hotel that is local to where they live so that they can sleep in the day and attend the meeting at night in the same way that they would reimburse them if they were to attend a face-to-face meeting.

5) Additional notes on virtual meetings:

We are aware that online meetings have three significant downsides:

1. Time zones – it is almost impossible to have global participation at meetings without some of the participants having to adhere to "vampire" hours. This can be addressed with some of the recommendations above, but it would be illusory to assume that an online meeting can run as a face-to-face meeting.
2. Virtual meetings may not be able to be as long as face-to-face meetings, as the attention span of participants in an online meeting is shorter (see all the recent articles on "Zoom fatigue," e.g. Jiang, 2020). Diethart et al. (2020) suggest that to maintain a high level of attention among participants and to give them the opportunity to get a cup of coffee there should be breaks every 45 to 60 minutes.
3. Virtual meetings cannot fully replace the international community building that comes from face-to-face meetings and also from interactions outside of the scheduled meeting times.

In summary, the right balance between virtual and face-to-face meetings needs to be found, most likely on a case-by-case basis (decision trees could help), but inevitably, virtual meetings will have to become the default option. Face-to-face meetings should become the exception to the rule.

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SPARC carbon footprint

Members of the SPARC community have discussed the carbon footprint of their research activities. One of the elephants in that room certainly is meetings and workshops and in particular, the travel carbon emissions of the meeting participants.

A small group that participated in the SPARC workshop in Madrid have written down their thoughts on how the community could reduce its ecological footprint. These thoughts should be seen as a starting point for discussions, but also for taking action in the SPARC community and beyond. The article particularly addresses workshop organisers and provides some ideas what they should consider when setting up their meeting to reduce the carbon footprint.

We look forward to receiving more ideas from the community and insights from future workshop experi-ences. This shall lead to a binding guideline for setting up SPARC meetings in the future.

As a start to estimate our own footprint, we ask those of you, who have organsied a SPARC (-related) meeting or workshop in the past 2-3 years, to fill in a short questionnaire to estimate the carbon footprint of travel for those meetings.

Find questionnaire

Obviously, this cannot be an exact science, but it would really be helpful, if you take the time to fill in the attached questionnaire for any SPARC workshop/meeting/training school/… you have organised in the recent past (one questionnaire per meeting).

Please note, that this is voluntary, and the purpose is to get a broad idea of our meeting carbon footprint. We know, that any numbers provided cannot not be precise; a sound estimate is fine. We acknowledge that SPARC workshops and meetings vary in size, time, and location.