GCOS Steering Committee
Paris 28-31 October

# GCOS Goes Green – 2019

## GCOS Environmental Report

## Introduction

1. The report *GCOS Goes Green* (Version: 09/07/2019) asks for annual reporting to the GCOS Steering Committee on the environmental performance of GCOS. This is the first such report. This report provides estimates of the environmental impacts of GCOS (greenhouse gas emissions, water use and waste) as well as progress on the actions recommended in *GCOS Goes Green*. It has not been possible to collect all the required information for this report which, as a result, has a number of gaps and so this report presents the basis for future reporting.
2. It is not possible to separate all the impacts of GCOS from WMO as a whole, so this has been done for this report pro rata based on the GCOS staff in WMO. WMO reports its environmental impacts through the UN's *Greening the Blue*[1] process.
3. *GCOS Goes Green* asks for both the reporting of $CO_2$ emissions and also avoided emissions. However, the modalities for reporting avoided emissions are not straightforward and so an approach is outlined and discussed here. There are also practical constraints on what emissions can be included.

*Table 1 - Overall GCOS environmental impacts*

| | | | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|
| **Experts and Secretariat** | Air Travel | *tCO2eq/year* | | | | |
| | Other Travel | *tCO2eq/year* | | | | |
| **Secretariat** | Facilities $CO_2$ Emission | *tCO2eq/year* | 9.3 | 9.6 | 8.6 | |
| | Waste | *kg/year* | | 184 | 310[2] | |
| | Water Use | *m3/year* | | | 206.9 | |

*Table 2 – GCOS environmental performance metrics*

| | | | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|
| **$CO_2$** | $CO_2$ emissions per meeting | *tCO2eq/year* | | | | |
| | $CO_2$ emissions participant[3] | *tCO2eq/year* | | | | |
| **Other Metrics** | Number of teleconferences | | | | | |
| | | | | | | |
| | | | | | | |

[1] https://www.greeningtheblue.org/
[2] There appears to be in error – the large jump for the previous year cannot be explained.
[3] Here participant is the sum over the year, for each meeting or teleconference, of the total number of participants (expert, secretariat, Steering committee etc.)

4. Table 1 summarises GCOS's environmental impacts. Most of the GCOS emissions of GHG come from air travel.
5. Other emissions from the use of WMO facilities appear to be declining.
6. Table 2 will present some metrics that will aim to allow comparisons across years where the work varies.

## Estimation of Environmental Impacts

7. The overall impact of GCOS is summarised in Table 3.

*Table 3 - Estimated GCOS environmental impacts*

| | | | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|
| **Secretariat** | Staff | person | 5.75 | 5.75 | 5.75 | |
| | Facilities CO2 Emission[4] | tCO2eq/year | 9.3 | 9.6 | 8.6 | |
| | Air Travel | tCO2eq/year | | | | |
| | Other Travel | tCO2eq/year | | | | |
| | Waste[2] | kg/year | | 184 | 310[5] | |
| | Water Use[2] | m3/year | | | 206.9 | |
| **Experts** | Air travel | tCO2eq/year | | | | |
| | Other travel | tCO2eq/year | | | | |
| | Number of meetings | number | | | | |
| | Experts travelling to meetings | person/year | | | | |
| **Teleconference** | Number of teleconferences | number | | | | |
| | Number of experts participating | person/year | | | | |
| **Panels and Task Forces** | Number | number | | | | |
| | Total members | persons/year | | | | |

8. Notes on Table 2.
    a. The air travel is estimated from CWT estimates on air tickets for tickets purchased through CWT and using the ICAO estimation software for other flights. These give similar, but not identical, results.
    b. The ICAO methodology does not include the impact of the most modern fuel-efficient aircraft (the latest, most fuel-efficient Boeing and Airbus planes are not in the database used). The details of the methods used by CWT are being investigated.
    c. All all the GCOS Secretariat $CO_2$ emissions are offset through the UN system.
    d. Staff numbers include Caroline Richter, Catrina Tassone, Simon Eggleston, Valentin Aich, plus 50% of Katy Hill and 25% of Tim Oakley. Tim Oakley spends approximately 25% of his time in Geneva and the remainder in the UK Met Office in Exeter, UK. IN the future, consideration could be given to accounting for emissions from Tim's time in the UK Met Office as well.

[4] Basel WMO estimates
[5] There appears to be in error – the large jump for the previous year cannot be explained.

e. Some of the estimates are from the overall WMO estimates pro rata by the number of staff, thus these are not in GCOS' control.

f. Emissions include the six Kyoto protocol gases ($CO_2$, $CH_4$, $N_2O$, HFC, PFC and $SF_6$) and are expressed in $CO_2$ equivalent (tonnes $CO_2$eq) according to UNFCCC reporting requirements.

g. It is not possible to include estimates of emissions from experts while they are working on GCOS activities away from meetings as:

   i. The energy use, resultant emissions, waste and water use are not recorded separately for each expert.

   ii. Even if the expert's institutions estimated these emissions and impacts it is probable that they would use different methods with different scopes so adding or comparing these would be misleading.

   iii. Generally, Experts do not precisely record the time spent on GCOS related activities.

h. As OOPC is a joint GCOS/GOOS panel and should spend half its effort for GCOS this only included 50% of the GOOS Experts' travel.

## Assessing Travel Avoided

9. One issue with interpreting the emissions data in Table 2 is that it does not indicate what is achieved through the travel. So, emissions may rise, even if travel is more efficient due to increases in workload (e.g. preparing the implementation plan) or fall even if travel is less efficient due to, say, a lack of available travel funds. Metrics such as emissions per person or per meeting would go some way to address this.

10. Assessing the avoided $CO_2$ emissions for all GCOS related travel is not straightforward. Some cases, e.g. where a joint meeting is held which reduces travel, are straightforward, however, in other cases where teleconferences are held it is not clear what the avoided travel is - whether or not the travel would have occurred without the teleconference is a matter of judgment. Metrics such as the number of people working for GCOS panels and task forces, and the number of teleconferences would help.

*Table 4 Summary of GCOS Activities*

| | | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|
| **Members of Steering Committee and Science Panels** | *person/year* | | | | |
| **Persons Attending Annual Meetings** | *person/year* | | | | |
| **Total Air Travel, Experts and Secretariat** | *tCO2eq/year* | | | | |
| **Number of Task Forces**[3] | *number* | | | | |
| **Total members of Task Forces** | *person/year* | | | | |
| **Number of teleconferences** | *number* | | | | |
| **Participants in teleconferences**[4] | *person/year* | | | | |

| **Recommendation** | How to assess travel avoided? |
|---|---|

11. *GCOS Goes Green* suggests that GCOS:

> *Use the savings on travel budget as an incentive (e.g. the panel saving travel money can bring ideas about an appropriate use of the corresponding budget).*

However, it is unclear how this could work. In practice, any monies saved through reductions in travel would remain in the GCOS Trust Fund for general GCOS activities. In practice, most of GCSO funds are spent on staff and on travel: increasing travel would be counterproductive.

## Meeting Planning

12. *GCOS Goes Green* also recommends that GCOS, in future, plans meetings to reduce $CO_2$ emissions from travel. The ICAO Green Meetings Calculator (IGMC)[6] allows estimates to be made of the flight emissions by the meeting participants identifying the location with the minimum emissions. However, the results seem to be in error. A simpler approach fining the point on the Earth's surface which minimises the distance form all the participants points of origin is shown in Figure 1. The result is close to Paris, just north of Geneva.

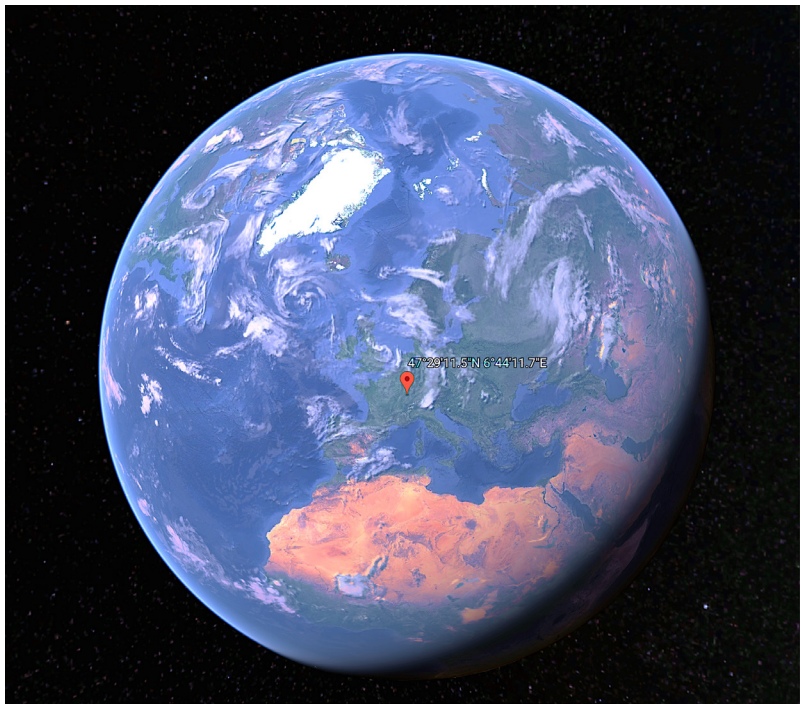


*Figure 1 Location on point that minimizes travel all participants for this Steering Committee Meeting (assuming travel as the crow flies).*

[6] https://applications.icao.int/igmc/(S(gvc24xseyotvlwjfp4aue3jd))/


*Figure 2 Similar to Figure 1 for the Joint Panel Meeting in Marrakesh, 2019, for all participants and for the 3 GCOS panels separately. OOPC is, appropriately, in the North Sea.*

13. This approach, if used to determine the location of meetings would currently tend to lead to meetings only in Europe as most participants are based there. However, if GCOS does attract a broader range of people then this may change. GCOS would not like to discourage participants form any part of the world. Meetings only in Europe may also convey the message that GCOS is less interested in other parts of the world, when, in fact, they are areas that may need most support.

14. For the regional workshops holding a meeting in the region minimises travel. See Figure 3. Here the meeting was actually held in Belize as we received an offer to host the meeting. This is an increase in the great circle distance of 20%, however, in practice, intra-island transport in this region is not easy with many participants travelling via Miami, so the additional distance so holding the meeting in Belize is smaller than this suggests. This highlights the limitations of this simple approach and also the need for a more sophisticated tool.

15. 


16. *Figure 3 Location of Caribbean Regional Workshop and central point for all the invited participants.*

17. In planning future meetings, the GCOS secretariat will:

    a. Continue to ensure that only meetings that are necessary are held. Meetings using teleconferencing is the first choice.

    b. Ensure that venues are chosen with minimising air travel as one of the criteria (noting that as a global programme there may be benefits in not having all meetings in one part of the world).

    c. Ensure meeting hosts are informed and, as far as possible, implement the GCOS environmental policy. This includes:

        i. Minimising energy use and local (ground) travel

        ii. Reducing/stopping the use of single-use plastic

        iii. Avoid single-use cups, plates and cutlery etc.

        iv. Holding paper-free meetings

| | |
|---|---|
| **Recommendation** | The GCOS secretariat should consider further the methodologies used to identify locations of venues with minimal emissions from air travel. |
| **Recommendation** | The GCOS secretariat should ensure meeting hosts are informed and as far as possible, implement the GCOS environmental policy. |

## Progress on Actions in GCOS goes Green

*Table 5 Progress on Actions in GCOS Goes Green*

| | Action | Comments |
|---|---|---|
| 1 | The GCOS Secretariat monitors all $CO_2$ emissions and costs of travel of GCOS | Done. This document provides the results |
| 2 | The GCOS Secretariat keeps track on travels that have been avoided in order to reduce the footprint. | This document provides suggestions on how this can be done and provides some initial results |
| 3 | The GCOS Secretariat will request the average per capita use of energy as well as waste production from WMO on an annual basis. | See table 1 above |
| 4 | The statistics for air travel and the avoided $CO_2$ emissions for all GCOS related travels as well as energy and waste production of the GCOS Secretariat will be presented annually to the GCOS Steering Committee. | This report |
| 5 | The GCOS Secretariat will support the planning of future meetings based on air miles scenarios (e.g. joint meeting place A versus place B or joint meeting versus regional meetings linked through virtual sessions). | ICAO has a tool[7] for this, and the results of this steering committee meeting are provided. However, it may not be in line with WMO policy where cost is a consideration. |
| 6 | Plan the need for joint and virtual meetings in view of the upcoming reporting cycle (GCOS Status Report Update in 2021, GCOS IP Update in 2022). | We will have many telecons, but some more intensive/extended workshops are anticipated that cannot be replaced by telecons. |
| 7 | Conduct the work of subsidiary bodies (working groups, task teams etc.) through flexible means which will allow reduction, or even elimination, of travel by use of videoconferences, interactive shared document writing, delegated work tasks etc. | This is already the case, with some exceptions where a lengthy face-to-face discussion is needed over more than one day. |
| 8 | Use the savings on travel budget as an incentive (e.g. the panel saving travel money can bring ideas about an appropriate use of the corresponding budget). | Not clear how this would work. This is discussed above. |
| 9 | All GCOS bodies are challenged to come up with proposals during each meeting until the 50%-reduction goal for this panel, working group or task team is reached | 50% reduction implies large reduction in travel. However, this is disconnected with what we hope to achieve: global involvement in a global system. |
| 10 | All GCOS Secretariat staff attends the online tutorial of "Greening the Blue"[8]. | Underway |
| 11 | The GCOS Secretariat implements and promotes several immediate measures: hold paperless meetings; ban plastic bottles and non-recyclable coffee/water cups; Encourage vegetarian and regional catering during meetings; and Encourage hosts to avoid using disposable plates, cups and bottles during meetings | Done |
| 12 | All members of GCOS' bodies, particularly newly designated ones, will be made aware of GCOS' reduction goals and the GCOS Goes Green strategy. They will also be encouraged to attend the online tutorial of "Greening the Blue". | Underway |
| 13 | Address the topic and present a summary of the strategy in all meetings of its bodies; present the strategy as well as highlighted efforts and achievements on a dedicated page on the GCOS website; and present and address the strategy in GCOS publications and reports. | Underway |

[7] The ICAO Green Meetings Calculator (IGMC) https://applications.icao.int/igmc/(S(gvc24xseyotvlwjfp4aue3jd))/
[8] http://portals.unssc.org/mod/scorm/view.php?id=9

## Summary and Conclusions

18. GCOS has started to monitor its Greenhouse Gas emissions as a first step in limiting its climate change impacts.
19. GCOS faces particular problems in reducing its gross emissions as the majority of emissions comes from air travel. GCOS already conducts most of its meetings electronically. Teleconferencing accounts for xx% of meetings. However, there remains a need for a few longer meetings with participants form around the global that cannot, currently, be replaced by teleconferencing.
20. Regional workshops are better held in the region concerned to minimise air miles. These efface-to-face meetings have led to invaluable discussions and to the development of the Global Basic Observing Network (GBON).
21. The net emissions for air travel are zero as greenhouse gas emissions are offset through the UN system. Therefore, reducing air travel will have little impact on mitigating air travel: reducing travel emissions reduces the need for offsetting.
22. GCOS has started to manage its activities in a more environmentally friendly way, considering greenhouse gas emissions, plastics and waste. Other impacts such as office electricity and water use are not in GCOS control and are managed by the WMO as a whole.

## ANNEX 1: Notes on Estimating emissions from air travel

23. There are a number of alternative calculators used for estimating emissions from air travel that use differing methods and assumptions, e.g. the estimates from CWT are similar but not identical to estimates provided by the ICAO calculator. An widely-used alternative calculator provided by atmosfair, gives emission estimates 50% higher for the trip from Geneva to Belize to attend the Caribbean regional workshop (Figure 1). One failing of the ICAO methodology is that it does not take account of the specific aircraft type used and does not include data related to the most modern fuel-efficient planes. While the calculator from atmosfair does include more modern aircraft it gives higher estimates. These calculators make a number of assumptions that may not provide a true estimate of the emissions and may lead to otherwise inexplicable differences in the emissions. These include:

    a. They assume a loading factor for the planes. This may be based on historic information, but it is not clear how this is done. Clearly the per passenger emission depends on the numbers of passengers. As airlines operate increasing fully loaded aircraft the per passenger emission should decline, this is not always reflected in the calculators.

    b. Emissions are also split between economy and other classes and between passengers and goods. This is often done in without consideration of the details of individual flights. ICAO doubles the economy emission for other classes.

    c. The estimates are often based on a great circle distance plus an allowance for manoeuvring at the beginning and end of the flight. Some airlines base their estimates on their knowledge of the actual fuel consumption.

    d. ICAO estimates emissions for a route from a knowledge of the mix of planes on that route. Atmosfair allows the input of the specific aircraft type for each leg of a journey. The ICAO database does not include the most modern planes and, while it includes more modern planes, the atmosfair database is incomplete.

24. These failings mean that some options for reducing GHG emissions will not be correctly accounted. So, for example, choosing aircraft types or routings with lower emissions (e.g. more direct) may not be reflected in the estimates. It should also be noted that GCOS has to follow WMO travel policy which emphasises lower costs above all other considerations.

| | |
|---|---|
| **Recommendation** | The GCOS secretariat should investigate the possibility of consistent estimates of emissions from air travel both for trip arranged by CWT and otherwise. |
| **Recommendation** | The GCOS secretariat should discuss with WMO the possibility of environmental considerations being included in the choice of travel. |

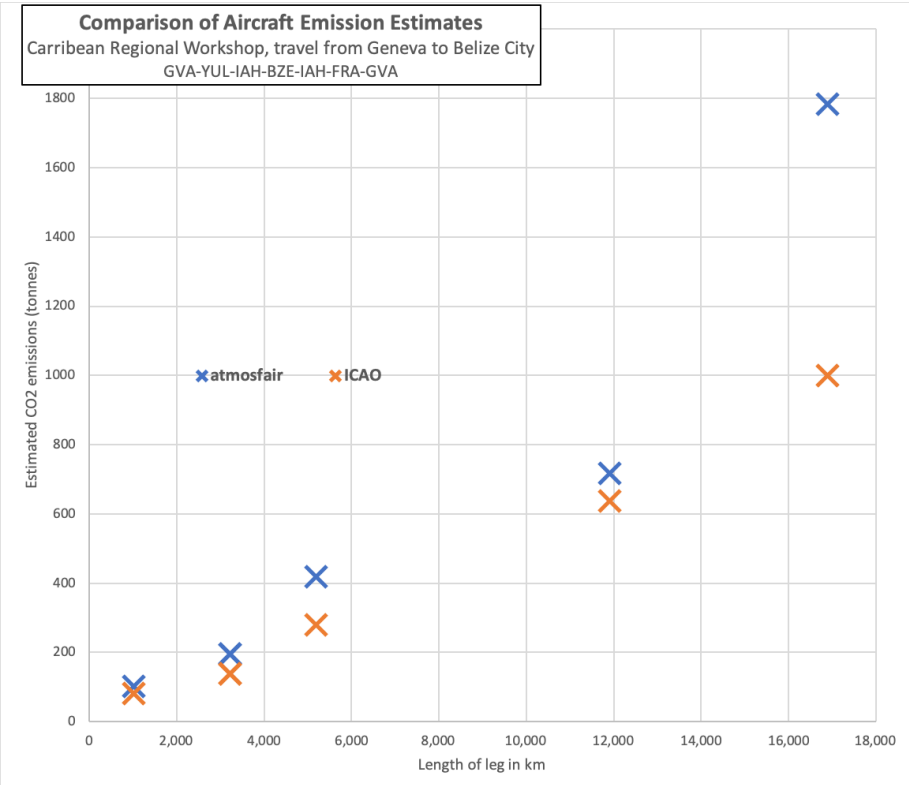


*Figure 4 - Comparison of estimates of emissions form ICAO and atmosfair. ICAO is consistently lower.*