A Sustainable Royal Astronomical Society: Moving to Net Zero

RAS Council approved the creation of the Sustainability Working Group in 2020 to address the local and wider environmental impact of astronomy, space science and geophysics. Chaired by the RAS President, the Group includes current and past members of Council and other Fellows with an interest in this area.

To assess one aspect of our current position, the Group commissioned the specialist consultancy Alectro to carry out an audit of the carbon emissions associated with the work of the Society, looking at emissions for 2019 as the most recent full 'normal' year. Over that time a total of 283 tonnes of CO2 was emitted across Greenhouse Gas Protocols 1-3, significantly higher than the typical output for an organisation of our size.

One of the audit recommendations was that the RAS sign the UN Climate Neutral Now declaration, which we did in 2021. This is a public pledge that the Society will move to a minimum of a 50% reduction in CO2 emissions by 2030, and to net zero emissions by 2050 at the latest.

The Group then met to consider how to reduce Society emissions to 'net zero', or around two tonnes per employee per annum, focusing on the three largest sources of CO2 emissions, in supported travel, energy use at Burlington House and the production of the A&G magazine.

This policy document examines these areas in more detail, setting targets in Key (Carbon) Performance Indicators (KCPIs) to track progress over time, which can be reported to RAS Council and included in our annual report, as well as being embedded in our values and in our new strategy.

Carbon budget

The net zero level of carbon emissions is two tonnes per person. For the Royal Astronomical Society staff team this represents a more than six-fold reduction. We suggest that the RAS plans for a 10% decrease from the 2019 baseline each year, at least for the first five years, and reviews this approach in 2027.

The carbon budget for the Society would then be:

Year	**Annual Carbon Budget / tonnes CO2**
2022	254.7
2023	226.4
2024	198.1
2025	169.8
2026	141.5

In 2020, a somewhat exceptional year, Society activities led to CO2 emissions of around 65 tonnes, and 2021 is likely to be even lower, so these are not appropriate baseline years to assess our progress.

Transport

CO2 emissions associated with transport usually make up by far the largest component of our carbon output, amounting to 63.6% of emissions in 2019, or 180 tonnes. These are from staff travel and from travel supported by grants awarded by the RAS, for example to attend conferences. In 2020 the Covid-19 pandemic led to a dramatic reduction in travel, with consequent emitted CO2 reducing to around 15 tonnes, a drop of 92% on the previous year.

The first Covid lockdown in March 2020 forced immediate changes in working practice across the UK economy, with many employees required to work at home, and in person meetings temporarily curtailed. In the nearly two years since, nearly all RAS meetings and events have been virtual, and we anticipate a slow move to hybrid events in 2022.

This is an opportunity for us to reassess how the Society can deliver its central goal of 'advancing astronomy and geophysics'. Reducing travel and making hybrid events permanent has benefits beyond cutting CO2 emissions, not least in work life balance for Society trustees, employees, volunteers, visitors and participants in our events, and in widening participation for disabled scientists and those based outside the UK.

It is timely for us to consider how we prioritise the nature and mode of travel for the future. With that in mind, we suggest the following are included in the RAS transport policy:

- When on Society business travel must be by the most sustainable practical means
- Within the mainland UK and continental Europe the Society normally expects travel it funds to be by train, coach and bus
- For remote locations where a car is essential the use of car sharing and hire via car clubs is encouraged
- The Society supports cycle use when appropriate, including for commuting to Burlington House. The shower in the building is available to staff choosing this option
- Staff are actively encouraged to use public transport or active travel (cycling and walking) to commute to work

RAS grants are currently awarded to early career researchers to enable them to attend scientific meetings. These conferences are key development opportunities allowing those researchers to present their work to a wider audience, and support for attendance is a priority for the Society. We suggest the following are included in the assessment criteria:

- Applicants should explicitly indicate how they will consider sustainability in their travel.
- Virtual attendance at meetings is allowed.
- *Where practical and economically reasonable*, applicants are expected to use sustainable forms of transport to attend scientific meetings.

A final cohort in receipt of RAS funds for travel are speakers invited to the NAM conference, to the Ordinary and Specialist Discussion Meetings, and to give public lectures. The meetings are enriched by guest speakers who are leading experts in their fields, travelling to the Society from around the world.

Despite the travel restrictions in place as a result of the Covid-19 pandemic, we have sustained a vibrant online programme of meetings. International guest speakers are on the whole very willing to take part in our events, not least as a result of no longer having to make long journeys to come to Burlington House. We suggest that the Society aims for a substantial reduction of at least 50% in international speakers attending in person, liaising with organisers of specialist discussion and ordinary meetings, and of Friends, public and school events.

Although the carbon footprint by others attending our meetings falls outside the Greenhouse Gas protocols for our activity, the Society nonetheless has a responsibility to minimise the impact of all our work. We therefore suggest that all scientific and public meetings are offered on a hybrid basis from now on, and that this is a condition of RAS support for meeting hosts both in Burlington House and elsewhere. This offer will also expand access to events for new audiences both in the UK and overseas, and we continue to encourage meetings and conferences outside of the capital.

Suggested KCPIs for Society travel:

- From 2022-2027 reduce CO2 emissions associated with travel by 10% a year from 2019 baseline (review in five years)
- Minimum of 50% of plenary NAM, Ordinary Meeting and Specialist Discussion Meeting speakers from overseas to attend virtually
- Report CO2 emissions associated with all scientific meetings
- Support sustainable ground travel for conference grants within Europe (for European recipients), aiming for support for air travel to be no more than 25% of grants worldwide
- As a guide, a minimum of five days for attendance at events requiring long distance travel supported by the Society, and those travelling to be encouraged to participate in other collaborative activities such as seminars or additional meetings
- 50% of supported attendance at conferences only accessible by air travel to be replaced by virtual attendance
- All RAS-supported meetings to be run on a hybrid basis, and delegates who would need to travel a long distance to be encouraged to attend virtually, and to make use of meeting recordings

<u>Burlington House</u>

The RAS offices are in Burlington House, the home of the Society since 1874. The building is Grade 2* listed, prohibiting changes to its layout and façade, which restricts the introduction of energy reduction measures possible in modern premises.

Nonetheless, the Society has made progress in this area. The Alectro carbon audit identified the electricity tariff as unusually carbon intensive, and we moved to a renewable tariff in mid-2020.

In 2019 CO2 emissions associated with energy use in Burlington House were 25.5 tonnes for electricity, and 36.8 tonnes for gas. Switching electricity tariff reduced this to a total of 31 tonnes in 2020.

Further reducing CO2 emissions associated with the building is a challenge, and investment in this area depends on the certainty of our future occupancy. The RAS will need to examine the feasibility of alternative heating systems, such as ground and air source heat pumps, or electric boilers. Each of these could drastically reduce our CO2 output associated with heating, but their installation is expensive and may not be possible in a protected building.

Another approach is to improve insulation in the building, for example on the (solid) walls, which again may be prohibited by our listing.

Suggested KCPIs for building energy usage:

- Electricity supplied to Burlington House to result in 0 tonnes of CO2 emissions

Actions:

- Key RAS staff (deputy executive director, accountant, building manager) to investigate feasibility of moving to zero-carbon heating system in Burlington House
- The same group to investigate installation of insulation in listed buildings such as Burlington House

A&G magazine

The production and distribution of A&G and the RAS diaries generated 23.8 tonnes of CO2 in 2019, from areas such as printing, and transportation to Fellows and other subscribers around the world. At the time of the Alectro audit, the magazine was printed in Italy and then shipped to the UK for distribution.

The magazine is now printed in the UK, reducing the associated CO2 footprint by 4.2 tonnes, a reduction of 18%.

The next steps are to explore the feasibility of moving to online publication, particularly for subscribers outside the UK, and to ensure that the printed magazine uses sustainably sourced paper. Some international subscribers only receive the magazine after a long delay, so a move to an online edition could be beneficial, assuming they have good Internet access.

Both the RAS and OUP would require enhanced web development capacity to deliver options for a high quality online magazine, and it may be that the tendering of the publishing contract this year offers opportunities to explore this in more detail. We will also need to ask readers about their preferences, noting that in the most recent survey by the A&G editor in 2017 around three quarters of respondents preferred a print only magazine.

KCPIs can be developed after these initial steps are in place, and the shape of a digital offer is clearer.

Public Engagement

Our public engagement work can draw on the expertise of RAS Fellows working on climate science, part of the rich variety of 'geophysicists' among our membership, to develop a new offer.

Scientists also enjoy a high level of public trust, giving us an opportunity and a responsibility to foster engagement in wider issues deriving from the fields represented by the Society. We therefore propose to run two events a year, targeted at schools and the wider public, focusing on sustainability and how it connects to our understanding of the Earth and other planets.

Suggested KCPI for public engagement:

- RAS Education and Outreach team to run two events a year, centred on the theme of sustainability

Public affairs

We recognise that the environmental impact of the RAS is limited by our size, and that work supported by major funders in the UK, such as the UKRI bodies Science and Technology Facilities Council (STFC), Natural Environment Research Council (NERC), and the UK Space Agency, is much more important. One of the goals of the Society should then be to influence those organisations to embed sustainability in their work. At present they consider the environmental footprint of their employees.

This is a small part of the resulting impact of UKRI and UKSA supported research, most of which results from funded projects, for example in travel by researchers. Many, if not all, higher education institutions in the UK expect their staff to travel by the most affordable routes, without any consideration of resulting carbon emissions.

A possibly ambitious policy goal would be to influence funding bodies to embed sustainability into their criteria for awarding grants, along the lines of those proposed for the Society.

Suggested KCPIs for public affairs:

- RAS Policy Group to discuss how the wider astronomy and geophysics community can better embed sustainability into working practices
- Sustainability policy on agenda for Astronomy and Geophysics Forums for 2022, for discussion with STFC, NERC and the UK Space Agency

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