

yHEP recommendations on improvement of environmental sustainability in science



Introduction

An increasingly important aspect of working and living conditions in current times is environmental sustainability, both concerning us as scientists as well as the planet as the basis on which we perform our research.

Being at the forefront of knowledge and innovation, as we all are in yHEP¹, we take our responsibility as drivers of change and innovation seriously – not only via the scientific research we conduct, but also for the way we perform the research. Future research should be excellent and reflect the responsibility for our planet at the same time.

This document describes the ideas and proposals of the yHEP community on improved environmental sustainability in our research. Ideas and proposals are sorted into several categories ranging from travel to environmental-awareness training and are discussed in the separate sections in detail.

Travel compensation / Green travel

Mandatory compensation of environmental impact of travel (CO₂-compensation)

Business travel in science should have a mandatory and transparent way of CO₂-compensation for any travel, in particular those undertaken by plane. This could either be handled by individual researchers selecting a CO₂-compensation method as part of the flight booking in case of direct booking of the flights by the researcher, or by a general annual or half-annual CO₂-compensation by the institution for all undertaken travel by researchers in the given time. In the latter case, it should be clear and transparent to researchers, e.g. by annual or half-annual updates, with easy accessibility of the reports, and by information on the travel expense information how large the CO₂-compensation was and where it went to. In both cases, the travel budget of the institute should cover for the extra costs of the CO₂-compensation.

Greenest means of transport and additional ways to travel

The most sustainable means of transport and not necessarily the cheapest option should be supported as the default for full travel expense refunds. This should correspond to travel by train (2nd class), as it often already is. Other means of transport should be ranked

¹ The yHEP association represents scientists with non-permanent contracts in the fields of astroparticle physics, hadron and nuclei, as well as elementary particle physics. yHEP aims to understand and improve the situation of young scientists, to strengthen their involvement in decisions about the future of the field, and to provide a network of PhD students, post-docs, junior group leaders, junior professors and other non-permanent staff in these fields.

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considering sustainability criteria, travel distance and accessibility. Planes (economy class) should only be considered for travel distances where other means of travel result in unreasonably long travel times - a guideline are distances that cannot be reached within around six to eight hours by train. For larger distances trains should still be encouraged wherever possible.

We support the idea of extended night-train coverage for connections within Europe that would allow researchers to travel conveniently over night, arriving in the morning. This should be an option, if sufficiently developed in the coming years in terms of coverage of destinations and the availability of the option to replace a night in an accommodation with a night-train ride.

Reduced travelling

In addition to greener travelling, it is important to reduce the amount of travelling done and required from researchers. While world-wide travel is one of the benefits of world-wide collaboration among researchers, it is not only the individual researcher's choice how many travels they undertake. Career development, international visibility, networking are important factors motivating travel, and individual choices against travels can harm career prospects. Joint efforts within the scientific community should be undertaken to think about alternatives for career development, improved international visibility, networking etc. without the need for (extensive) travel, and factor in these changes in hiring contexts. This should be clearly communicated within the community, reducing the influence of travel on perceived or actual career prospects.

Better possibilities to combine several business purposes in single trips, in particular for overseas trips, would allow to reduce travelling further. This includes intermediate stays between trips with refund possibilities of bridging hotel costs, if travel back and forth and the corresponding CO₂-compensation exceed the costs of the extended hotel stay. Improved combination with private travel, in particular for air travel, would allow reducing also private (air) travel and hence reduce the CO₂-footprint of researchers.

Dependent on the exact research and the necessity of in-person attendance at experimental sites and in-person discussions, air travel should be limited per researcher per year. Extensions should be possible, given a dedicated justification for the extra air travel. Examples for exceptions are difficult connections of the start or target locations of the trip to other means of transport, or unreasonably long travel times. The number of allowed air travel without special justification should be agreed upon at the institute level and be clearly communicated to researchers for planning. This limitation on business trips should only hold for air travel. More CO₂-friendly means of transport should only be subject to general travel budget limitations. Travel time, which might be longer for more sustainable means of transportation, should be considered work time.

Teleconferences

One means to reduce travel is to improve remote connection to conferences and hosting fully remote conferences. The world-wide travel restrictions given the ongoing Covid-19

pandemic provide a testing ground for new formats of remote conferences and remote conference contributions, including the social programme of conferences for networking and informal discussions with colleagues. To fully participate in a remote conference as if in-person, obligations in the home institution should be paused for the time of the conference, as they would for travel to a conference in-person. Focus on the conference might make working from home or another location at or near the institute or home necessary to ensure it. Similar to the travel request for conference attendance, a *conference attendance request* could be handed in before and signed by supervisors, to indicate the shift of obligations and approval of these during the time of the conference.

Continued development of teleconferencing software, accelerated by the world-wide travel restriction due to Corona measures, will greatly improve the experience of remotely participating in a conference, be it an in-person or a remote conference. Speakers at any conference should be allowed to give their talk remotely, and if bandwidth allows, speakers should be encouraged to send their video in addition to their voice to give the audience a better connection to the talk. Improvements in the software like *raise-hand buttons*, possibly even split into *direct response to previous question*, *question on different topic*, etc. would help to better engage remotely in the discussion.

Conference organisation

In-person conferences taking place should consider environmental sustainability as an important factor for consideration during the conference organisation.

This implies e.g. a reduction of conference goodies, considering what might go to waste immediately after the conference, a reduction of plastic used for cups, plates, etc. during coffee breaks or meals, and an enhanced focus on vegetarian options during coffee breaks or for included meals. If possible, regional, seasonal and healthy food options should be preferred, provided conference goodies and other conference material should fulfil environmental sustainability criteria.

Canteens

Canteens at universities and research centres often are the closest and fastest location to have meals at for researchers, students and other university/research-centre employees. As such, changes towards more healthy, balanced and vegetarian options affect and benefit large numbers of people eating at these canteens every day. In addition, it will improve the environmental footprint of the university or research centre. Heads of canteens and cooks in canteens should receive corresponding training to improve the quality of vegetarian, vegan and other balanced, healthy food options. In the same context, smaller portions should be an option at the canteens to reduce food left-overs, but with low-priced or free refill or top-up possibilities, in case larger portions are wanted.

Concerning drinks, canteens at universities or research centres should install free (tap) water supplies for people eating at the canteen. Reusable glasses or recovered-paper cups (no single-use plastic cups) should be provided with glasses washed by the canteen caterer.

Contracts with caterers should be adjusted accordingly. Selling pure bottled water should be highly discouraged.

Free water fountains which allow drinking at the fountain or refilling a bottle should be provided around the university or research centre campus to further reduce waste from plastic bottles. Water fountains, similar to ones in airports, possibly with a foot pedal switching on the water flow, should be hygienically safe even in times of the Covid-19 pandemic.

Computing and buildings

Another important factor for energy consumption and hence CO₂-emissions, that is often forgotten, is computing power usage - in particular in times when research heavily relies on large computing farms, cloud computing or supercomputers. Awareness should be raised twofold - among the users and among the administrators. Awareness among users refers to the equivalent in CO₂-emissions of the computing power usage of conducted computations. Information on this should be added to every computation report as part of the calculation statistics - extending e.g. currently provided information on CPU time, etc. This will provide motivation to reduce unnecessary computing usage and encourage more stringent testing before large scale computations to keep the CO₂-emission from computing at the minimally-required level. Awareness among administrators refers to the use or purchase of more energy efficient systems. Energy efficiency and environmentally-sustainable production should be important considerations for the purchase of new equipment or maintenance of existing ones.

Making additional use of the computing power usage and the related heat production, architects for future research buildings and for renovation measures should think about possibilities to use this thermal energy for the heating of the building.

Purchases, funds and resource management

Power is where the money is. Therefore, choices in the selection of the funds, investments or purchases can have a significant impact on the economical implications of the interactions of universities and research institutes with the private industry and general society.

University or research-centre funds should adhere to highest standards of sustainable investment, be it in the choice of bank accounts or stock investments. For purchases in university or research institute contexts, criteria of reparability or sustainability in the production, use or disposal of research equipment should be considered in the choice of the vendor, allowing for higher prices if those criteria are met.

To obtain an overview of the resources used by universities and research centres, a resource management system should be mandatory for every university and research centre. Information on the resources used per year should be published annually by the university or research centre on their webpages and efforts should be made to reduce and at best eliminate unnecessary usage of resources without unreasonable restriction on the actual research or teaching performed at the university or research centre.

Environmental awareness training

Finally, environmental awareness should be raised among researchers and employees as is done with standard safety measures at the workplace. Environmental awareness training should become a part of the standard safety lectures followed regularly by employees of universities and research centres. For students, mandatory environmental awareness training should become part of the introductory courses at the start of the studies, discussing general issues for possible personal measures, but also informing about measures taken by the university and research centres to improve environmental sustainability as an institution.

Part of the environmental awareness training, but also part of the annual resource management report - as discussed above - should be information on the carbon footprint of various items relevant in the practical research context such as flights, office lights, computing, purchased equipment, etc. This will allow to base personal decisions of behaviour or habits on factual considerations of their environmental impact, in line with other points discussed previously at the university or research-centre level.