**4.4 Operational Emissions**

Research operations directly or indirectly cause GHG emissions (during their production or by usage). Excluding business travel (which we dealt with above) and building infrastructure and operations (which can only be dealt with at the ETH level), these include (their relative impact and thus saving potential is indicated in brackets):

* scientific machinery, lab equipment (high-medium)
* lab supplies and operations (high)
* computers, telecommunication, servers (medium-high)
* office supplies, printing (medium)
* electricity (low)
* catering (low)

There is an evident conflict of interest between reducing GHG emissions and carrying out a high quality and efficient research agenda, but there may be ways to achieve a high standard in both aspects at the same time.

Unfortunately, we do not have good quantitative emission data for most of the above categories even though some of them are estimated to be at an impact level comparable to business travel (high). The above qualifiers for each category provide such an estimate which we can use towards prioritisation. This is an important point as it gives us a handle: We may choose to maintain a high engagement in business travel if we agree to cut back more thoroughly on operational emissions, e.g. by installing experimental equipment which involves less grey energy (emissions due to production, packaging and delivery) or by replacing and upgrading our equipment less frequently. If these options are not desirable, we can do the opposite and make compromises on the amount of business travel. It is our choice.

It is necessary to take on measures for a more efficient equipment use, to raise awareness of the saving potential in everyday lab use. Suggestions for implementation can be found in the Green Guide.

**References**

Further information and details can be found in the following references:

* IARU Green Guide for Universities: <http://www.iaruni.org/sustainability/green-guide>
* collective “Labos 1.5” (based in France) focussing on operations at scientific laboratories: <http://labos1point5.org>
* Green Impact Award at Oxford: <https://www.greenimpact.org.uk/oxford>

**4.4.A Gathering Data and Monitoring**

Individual research groups monitor the emissions due to their operations. They gather and supply information (in CO2 equivalent) on the major contributions upon request.

Comments

* Laboratories are quite independently managed by the individual groups. The machinery required to run experimental and computational research varies widely with the research field. The associated grey emissions cannot be evaluated from above, only from within. To take an inventory of scope 3 emissions represents a substantial effort and should be done only when there is a clearly defined purpose and use for the gathered data. The latter may exist, but it is beyond the scope of this working group to define it.
* It would be useful to have a table to very roughly estimate grey emissions for given types of machinery:
  + Relevant data and references should be collected and maintained in a table within a departmental wiki resource.
  + Data and tables may exist in relevant resources; it is desirable to collect these references.
  + Companies should be asked for a quote when buying major equipment with unknown grey energy.
* Due to the use of electricity from renewable energies at ETH, one may use the comparably low conversion factor of 0.12 t[CO2eq]/yr/kW for the powering of equipment.
* The need for quantitative monitoring may become obsolete if some form of CO2 taxation or pricing is imposed by the federal administration.

**References**

Further information on monitoring can be found in the following references:

* The collective “Labos 1point5” plans to release a tool “GES 1point5” (around July 2020) to assess the climate impact of labs. This may be helpful (after adaption of parameters from French to Swiss situation): <http://labos1point5.org>
* Green Impact Award at Oxford: <https://www.greenimpact.org.uk/oxford>

**4.4.B Optimisation**

D-PHYS aims to keep the GHG emissions associated to its operations as low as possible, and more generally aims for fully sustainable operations. The focus is on aspects with a large sustainability impact. Aspects where smaller reductions can be achieved easily with minor side-effects are pursued as well.

Comments

* Electrical power consumption at ETH is allocated to renewable resources. This means that powering experimental and computational machinery causes only minor GHG emissions.
* Conversely, grey emissions due to the construction of equipment are sizeable.
* It therefore makes sense to plan for long-term use of equipment and to extend the use of existing equipment by upgrades and repairs.
* Modern computing and communication equipment can well be used for 5 – 10 years.
* Decisions on how labs and experiments are run broadly and in detail are taken at all organisational levels. Consequently, the need to pay attention to aspects of sustainability should be discussed with all involved scientists and personnel.

**References**

Further suggestions and guidelines can be found in the following references:

* ETH active environmental protection: <https://ethz.ch/services/en/service/safety-security-health-environment/environment/aktiver-umweltschutz.html>
* ETH guideline “Our Commitment”: <https://ethz.ch/content/dam/ethz/associates/services/Service/sicherheit-gesundheit-umwelt/files/umwelt/en/Our_Commitment_Our_Measures_web.pdf>
* ETH guideline “Green IT”: <https://ethz.ch/content/dam/ethz/associates/services/Service/sicherheit-esundheit-umwelt/files/umwelt/en/12283_Leitfaden_Green_IT_e.pdf>

**4.4.C Acquisition**

Aspects of sustainability (including CO2 emission estimates for production and operations) are a selection criterion when acquiring scientific machinery and office equipment.

Comments

* The first step towards achieving improvements is to understand the situation.
* The CO2 footprint of ordered machinery or goods should be enquired when asking a company for a quote. The company may not presently be able to deliver in this regard, but asking is free of charge and emphasises the importance of this aspect for future enquiries and production.
* When comparative bidding is required, key figures with regard to sustainability should be listed among the criteria.

**4.4.D Workshop Organisation and Visitors**

D-PHYS members assess the climate impact of the scientific events they organise (including visitor invitations) in their planning stages.

Comments

* Scientific conferences, workshops and schools attract a large number of external visitors, either by direct invitation of speakers or by creating an opportunity for scientific interaction. Travel to these events can generate significant amounts of GHG emissions depending on the international composition of its visitors (tens, hundreds or even thousands of t[CO2eq] to be compared to business travel at D-PHYS at a present emission rate of around 1450 t[CO2eq]/yr).
* It is important to understand the overall quantitative GHG impact of a planned event as well as a the impact on the ETH emission figures.
* It is noted that scientific meetings are initiated by individual researchers on behalf of the scientific community, while the share of crediting and responsibility is difficult to assess. To this end, D-PHYS members who serve as members of conference series steering committees and organising committees of scientific networks can have a significant influence on designing our scientific operations to be compatible with sustainability (e.g. in the choosing the geographic location of a particular event or by implementing VC elements).
* It makes sense to apply this guideline to external events co-organised by D-PHYS members: This will spread awareness of GHG emissions throughout the scientific community and thus facilitate a change towards sustainable operations.
* The choice of supplied food (lunch breaks, conference dinner) has a direct impact and an indirect impact on the GHG emissions by the workshop: Vegetarian and vegan meals have significantly lower effective GHG emissions than corresponding meat-based dishes (there are also other significant reasons to do so). Supplying such delicious meals in high quality may inspire participants to choose more climate-friendly food options at home or as an organiser of future events.
* Avoiding waste products, e.g. by using ceramics cups and plates during breaks and meals or by minimising the amount of give-aways, has a positive impact on overall sustainability. Besides, it emphasises the highest quality standard of Swiss hospitality and it helps by transmitting a consistent message of environmental concern.
* The Pauli Center implemented this guideline in 2018 as a requirement for proposals to support workshops.

**References**

Further suggestions and guidelines can be found in the following references:

* ETH guideline sustainable events: <https://ethz.ch/content/dam/ethz/associates/services/Service/sicherheit-esundheit-umwelt/files/umwelt/en/2018-06_Guideline%20sustainable%20events_ETH.pdf>
* ETH guideline sustainable catering: <https://ethz.ch/content/dam/ethz/associates/services/Service/sicherheit-gesundheit-umwelt/files/umwelt/en/Guidel-Sustainable-Catering_UZH_ETH.pdf>
* ETH online tool sustainable events: <http://nachhaltige-events-eth.ch/?&language=en>
* Practical tips for sustainable events: <https://ethz.ch/services/en/news-and-events/internal-news/archive/2020/01/sustainable-events.html>