

TG7: Societal and Environmental Impacts

Véronique Boisvert (b. 329.7 CO₂ ppm, Ken Bloom, Mike Headley
29 October 2021 (413.8 ppm))

<https://snowmass21.org/community/impacts>

Welcome to CEF TG7!

- The newest topical group in all of Snowmass! “Examine the ways in which the US HEP program affects the environment and communities in which we do our work, and develop recommendations to improve our relationships in those areas.”
- Launched by CEF leaders during the summer:
 - After the deadline for letters of submission
 - While Snowmass was still paused
- Timing has made it challenging to get things started, so we welcome your participation!

Activities so far

- Spawned based on suggestions from the D&I topical group, with several topics recommended:
 - Sustainable practices to minimize detrimental effects on the environment
 - Building mutually beneficial partnerships with communities affected by our projects
 - Issues related to computational ethics
- Held a kick-off town hall on July 22 with presentations on these three topics — great discussion, limited attendance

White paper plans

- Currently planning on three white papers following those topics:
- “Impacts of Particle Physics laboratories on local communities” (ed: Mike Headley)
 - Will draw on expertise at SURF and other labs
 - **Workshop to discuss this on 15th November**
- “Carbon emissions from large future energy frontier projects” (eds: Véronique Boisvert, Ken Bloom)
 - Planned deliverable: can we estimate the carbon impact of a facility being proposed within one of the other frontiers?
 - **Workshop to discuss this on 9th November**
- “AI and HEP: the Roles of Scientists in the ethical use of algorithms” (ed: Brian Nord, with Comp03)
 - Team already in place

Upcoming events: 9th November

Workshop on Carbon Emissions at Future Facilities



Tuesday 9 Nov 2021, 10:00 → 13:00 US/Central

Ken Bloom (University of Nebraska-Lincoln), Mike Headley (SDSTA - SURF), Veronique Boisvert (Royal Holloway, University of London)

Description The future of particle physics must be contemplated in its broader global context. That includes the established fact of human-driven climate change through the release of carbon into the atmosphere. We can anticipate that in the future, any major infrastructure project will have to be evaluated not just on its construction costs and societal impact, but also on its carbon footprint. Possible future facilities for particle physics are no exception.

The Snowmass Community Engagement Frontier Topical Group on Societal and Environmental impacts is charged with developing recommendations on how to improve our field's impact on the environment. We are holding a Workshop on Carbon Emissions at Future Facilities to learn about the field's current understanding of the carbon impact of the construction of HEP accelerator facilities and detectors, and of subsequent experimental operations, and to set directions for further studies. We invite Snowmass participants to join us in learning how we can contribute to this area, with the goal of establishing a better understanding of the issues and developing recommendations and best practices for the field in a contributed Snowmass paper.

10:00 → 10:20

Introduction

20m

Speakers: Ken Bloom (University of Nebraska-Lincoln), Veronique Boisvert (Royal Holloway, University of London)

10:20 → 10:50

CERN's first Environment Report

30m

Speaker: TBD

10:50 → 11:20

Energy recovery for plasma-based colliders

30m

Speaker: Marlene Turner (LBNL)

11:20 → 11:40

Coffee break

20m

11:40 → 12:10

CERN strategies to reduce GHG emissions in particle detection at the LHC experiments

30m

Speaker: Beatrice Mandelli (CERN)

12:10 → 12:40

Sustainability in experiment operations

30m

Speaker: Astrid Eichhorn (University of Southern Denmark)

12:40 → 13:00

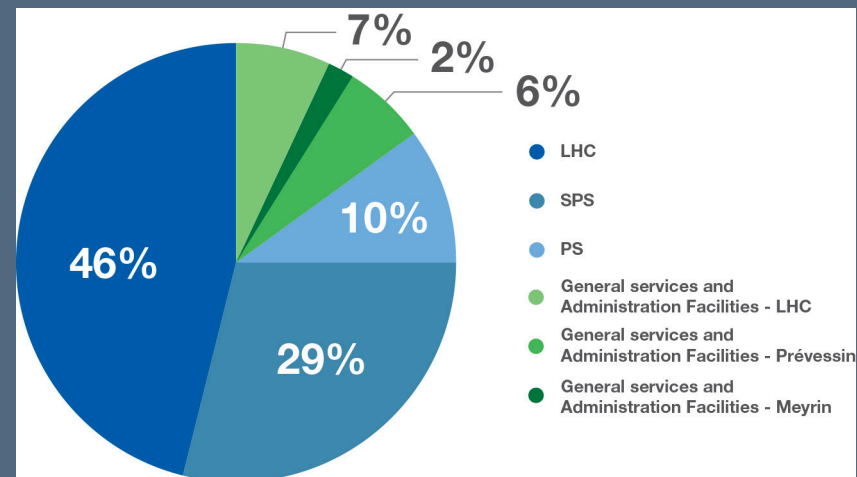
Discussion

20m

Carbon footprint of PP experiments

- CERN peak power: ~180 MW (~ 1/3 of Geneva)
- Per year: ~ 1.2 TWh (~ 2% of Switzerland, 0.03% of Europe)
- Electricity mainly comes from France: 88% carbon free (2017)
- District heating:
 - From 2022 hot water from LHC cooling at Point 8 will heat 8000 homes in Ferney-Voltaire, CERN also looking at Point 2 and 5, and Point 1 could heat CERN building on Meyrin site
- Since 2011 series of workshops: Energy for Sustainable Science at Research Infrastructures, 6th one: March 2022 at ESRF
 - USA participating??

Electrical power distribution 2018

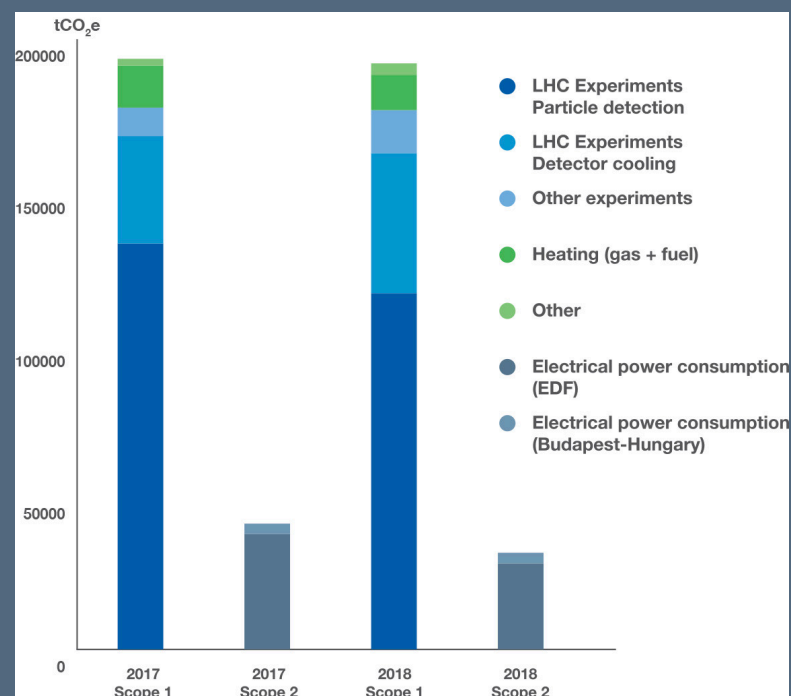


Carbon footprint of PP experiments

CERN environmental report 2017-18

- Dominant CO₂e emissions from CERN: gases used in experiments!
- Gases vented to atmosphere or leaks (10%)
- When LHC detectors designed: replace CFCs with HFCs but large Global Warming Potential (GWP) now replace those with CO₂ or HFO (LHCb) with lower GWP than CO₂
- Some gases are banned, or about to be banned, resulting in low supply/price volatility
- Efforts for alternative gases: [article 1](#), [article 2](#), [article 3](#)

GROUP	GASES	tCO ₂ e 2017	tCO ₂ e 2018
PFC	CF ₄ , C ₂ F ₆ , C ₃ F ₈ , C ₄ F ₁₀ , C ₆ F ₁₄	61 984	69 611
HFC	CHF ₃ (HFC-23), C ₂ H ₂ F ₄ (HFC-134a), HFC-404a, HFC-407c, HFC-410a, HFC R-422D, HFC-507	106 812	96 624
	SF ₆	10 192	13 087
	CO ₂	14 612	12 778
TOTAL SCOPE 1		193 600	192 100



Possible Topics

- 3) Carbon footprint of PP researchers
 - Travel, buildings, food
 - Sustainable practices in our labs/universities
 - Eg Sustainable HEP workshop June 2021

Sustainable HEP

28-30 June 2021
 Zoom
 Europe/Zurich timezone

Enter your search term

- Overview
- Timetable
- Call for Abstracts
- Contribution List
- Speaker List
- Book of Abstracts
- Registration
- Participant List
- Talk Recordings
- Closing Statement

Closing Statement

Workshop "Sustainable HEP"

Closing Statement (status: 14th July 2021, 403 signatures)

On 28th–30th June 2021, the workshop "Sustainable High Energy Physics" took place by videoconferencing means with more than 350 registered participants from around 45 countries and five continents. The aim of this workshop was to initiate a community discussion on how to align the scientific operations within this particular subfield of physics with requirements of climate sustainability. Achieving the latter is a most pressing global issue for the present decade (as evidenced by the [IPCC reports](#)). The main focus of the workshop was on the scientific travel culture and the virtualisation of scientific exchange. The following topics were highlighted at this occasion:

- characteristics of the climate crisis
- best practice examples on the virtualisation of scientific meetings
- challenges for research institutions to improve their climate sustainability
- improvement of global inclusiveness in scientific exchange through virtualisation
- domains of action for large scale experiments to improve their climate sustainability

We are organisers and participants of the workshop as well as members of the High Energy Physics community or related fields of physics. We understand that the climate impact of certain aspects of our field of research is a cause of concern and we assert that there is a need for determined action to align these with the goals of the Paris climate agreement and, more generally, with the needs of a sustainable society. Our aim is to trigger a discussion on how HEP can live up to its responsibility in the global transition to a sustainable and climate-neutral world, while maintaining the high quality of research and international scientific exchange. In this context, we highlight increased inclusiveness as a crucial co-benefit of online formats.

We thus encourage members of our community to discuss and enable suitable implementations of sustainable development for our field. We stress that this is a call to develop a balanced and deliberated approach that brings together the needs of a global HEP community with the needs of climate sustainability. We call on research and funding institutions to adjust the general framework for research accordingly and to facilitate a transformation towards sustainable means. Consequently, we invite the formation of working groups to continue the discussions initiated at the workshop and to conduct further installations of the workshop on related topics of sustainability that deserve discussions in a broader setting.

Signatures

The following persons have signed the statement as individuals on their own behalf. Please note that institutions are mentioned merely to identify the signatories' current scientific affiliations. This statement does not (necessarily) reflect the opinions of these institutions.

[sign here](#)

workshop organisers:

- Niklas Beisert (ETH Zürich)
- Valerie Domcke (CERN/EPFL)
- Astrid Eichhorn (CP3-Origins, University of Southern Denmark)
- Kai Schmitz (CERN)


workshop participants:

Sign the [Closing statement!](#)

Also: white paper for Australian Astronomy: ["The imperative to reduce carbon emissions in astronomy"](#)

Upcoming events: 15th November

Workshop on Local Community Impacts

 Monday 15 Nov 2021, 10:00 → 13:00 US/Central

 Ken Bloom (University of Nebraska-Lincoln) , Mike Headley (SDSTA - SURF) , Veronique Boisvert (Royal Holloway, University of London)

Description Particle physics facilities have the potential to have a significant impact on their surrounding local communities. The Snowmass Community Engagement Frontier Topical Group on Societal and Environmental impacts is hosting a zoom workshop on local community impacts on Nov 15 from 10am to 1pm CT (<https://indico.fnal.gov/event/51648/>). This workshop is focused on discussing examples and lessons learned from impactful work being performed by particle physics laboratories to partner with local communities and regional Tribal communities and other underserved populations.

We are hopeful this workshop will inspire others to find innovative ways to work alongside the communities in which they are located including underrepresented groups. We invite Snowmass participants to join us in learning how we can foster relationships with our local communities and underrepresented groups to create innovative approaches to community engagement and develop recommendations for the field in a contributed Snowmass paper.

10:00 → 10:10 **Introduction**

Speaker: Mike Headley (SDSTA - SURF)

 10m 

10:10 → 10:40 **SURF Local Impacts**

Speaker: Rochelle Zens (SDSTA/SURF)

 30m 

10:40 → 11:10 **Fermilab Local Impacts**

Speakers: Alison Markovitz (Fermilab) , Rebecca Thompson (Fermilab)

 30m 

11:10 → 11:30

Coffee Break

 20m

11:30 → 12:00 **LBNL Local Impacts**

Speakers: Faith Dukes (LBNL) , Jennifer Tang (LBNL)

 30m 

12:00 → 12:30 **Additional Presentation (TBD)**

Speaker: TBD

 30m 

12:30 → 13:00 **Discussion**

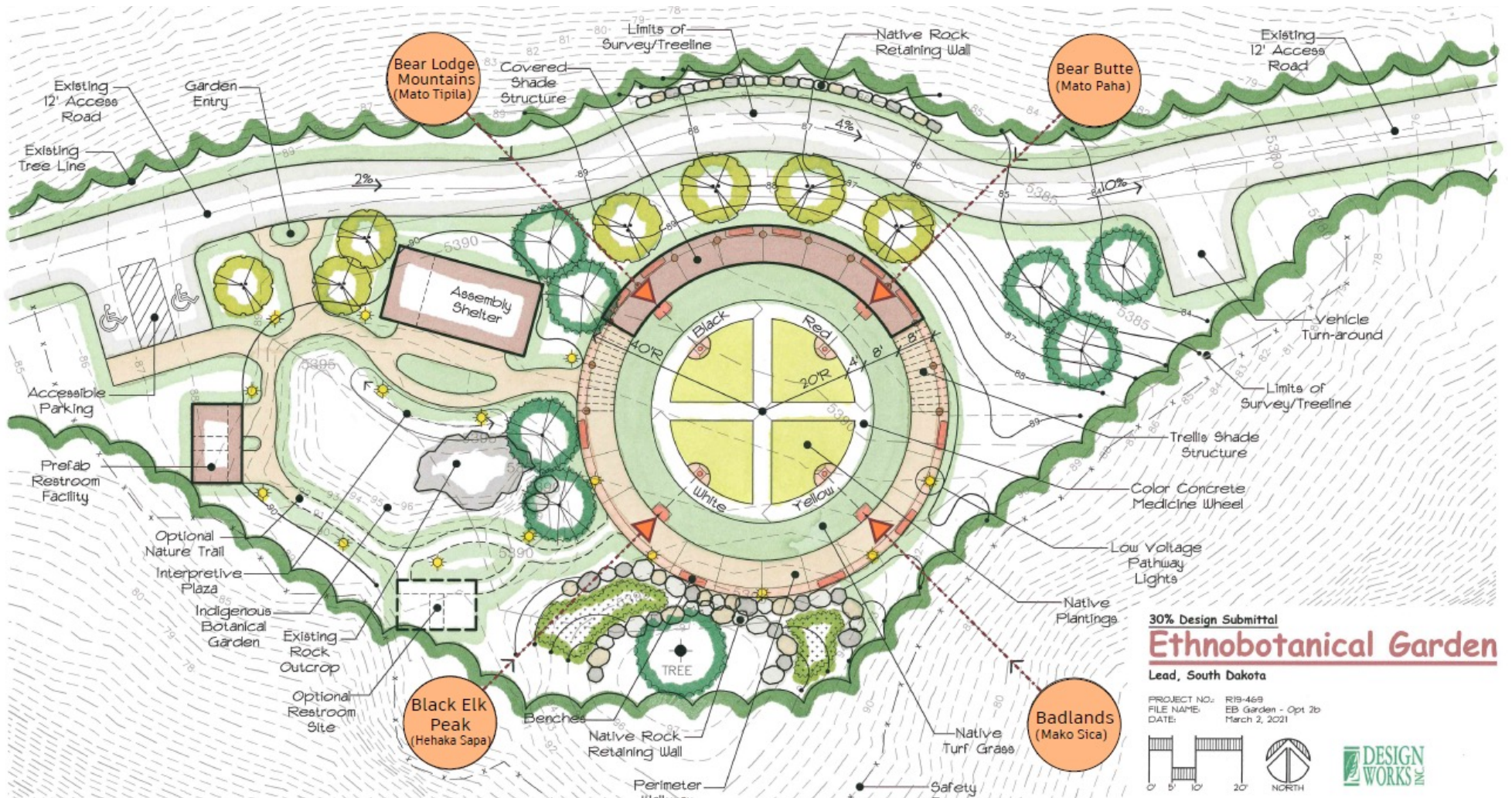
 30m 

SURF Working Alongside Region's Tribes

- The Black Hills are sacred to the Tribes of the region (“Paha Sapa” or “hills that are black”).
- Beyond federal legal requirements, SURF has placed high priority on Tribal relations and building strong partnerships from the start.
- SURF’s efforts include:
 - Commitment to treat sacred lands with respect.
 - Regular interactions with Tribes—with staff dedicated to this purpose.
 - Public outreach efforts focusing on Native culture and history.
 - K-12 STEM education outreach efforts with Tribal schools in region.
 - Construction of ethnobotanical garden planned for 2022 called the “Sacred Circle Garden” focusing on a Native American medicine wheel and native plants to share the heritage of the land.
- Next workshop planned for Nov 15 to explore similar efforts at other labs.

Cangleska Wakan (Sacred Circle) Garden

Construction planned for summer 2022 at SURF



Join us

- We are currently a bit longer on plans than people — it is not too late to get involved and have a significant impact in this area.
- With all due respect to the rest of Snowmass, topics in TG7 are literally matters of life and death. 😊
- The recommendations we make can have an impact on how we can carry out the science that we love in a just and sustainable way.

