

LVK Committee on Climate Change

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Credit: Storm Colloms

Who am I?

- Population astrophysics/standard siren cosmology
- Chair of the Science and Security Board of the Bulletin of the Atomic Scientists: we set the Doomsday Clock
- Founding director of the UChicago Existential Risk Laboratory (XLab)
 - US\$700k in funding for building university programs studying and mitigating existential risk
 - Summer research fellowship, minor in xrisk, ...



History of LVK committee on climate change

- Suggested by Steve Fairhurst in Oct. 2019
- Committee constituted Nov. 2019
- Initially composed of 12 individuals from across the LVK
- In 2022 committee opened up to full LVK membership as a working group

Charge

The LIGO, Virgo, & KAGRA Collaborations acknowledge the scientific consensus regarding the existence of climate change, as well as the dangerous impact of greenhouse gas emissions from human activity. This committee will evaluate activities of our community in light of climate change and sustainability. We will examine the collaboration's carbon footprint, and identify potential steps to mitigate our impact. We will explore scientific exchange between the gravitational-wave and the climate research communities. We will also strive to build awareness of this critical topic, both within and outside of our collaborations.

Focus Areas

- Evaluate and minimize the LVK's carbon footprint
- Inform LVK members about climate issues
- Serve as a role model for scientific collaborations
- Educate LVK members to become climate advocates both within the scientific community and in the greater world

Activities

- Committee meetings, face-to-face meetings, presentations at LVK collaboration meeting plenary sessions
- Estimate of LVK carbon footprint
- Articles/regular column in LIGO magazine
- Carbon-weighted queuing system?
- Survey of LVK membership
- Lecture about climate change at LVK meeting

Open to everyone within the LVK

Wiki page:

https://wiki.ligo.org/Climate_Sustainability/WebHome

Mailing list:

https://sympa.ligo.org/wws/info/climate_change

Mattermost channel:

https://chat.ligo.org/ligo/channels/climate_change

Carbon Footprint (very rough!!)

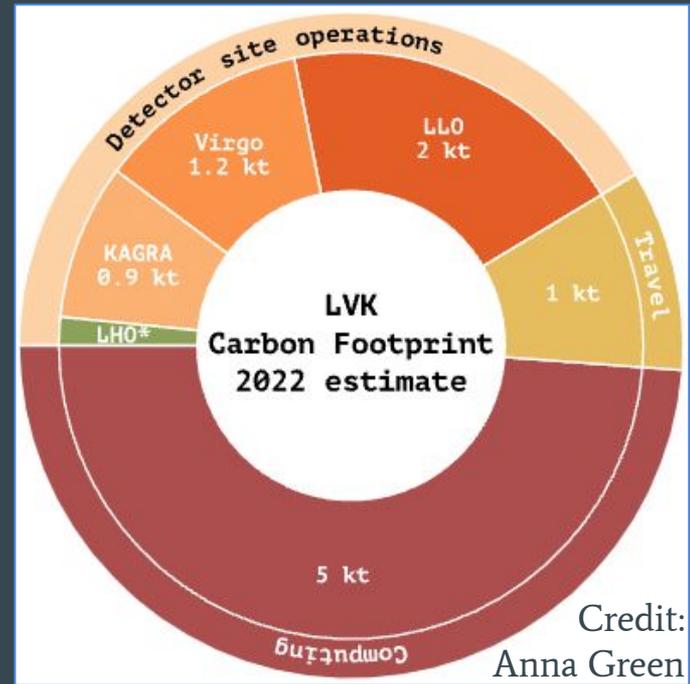
- Power at sites: 4,000 tons CO₂ per year
- Travel (pre pandemic): 1,000 tons CO₂ per year
- Computing: 5,000 tons CO₂ per year
- For reference, per capita CO₂ in 2021:

17 tons Saudi Arabia 5 tons UK, Italy, France

15 tons USA, Australia 2 tons Brazil, India

8 tons Japan, Germany, China

78,000 tons CERN total



LVK per capita contribution:

~5 tons/person/year

Carbon footprint from Computing

Estimate for:

- top 3 clusters (i.e., where is most of our computing happening?)
- top 3 subgroups/activities in terms of CPU usage (i.e., what analysis is using the most resources?)
- top 3 codes/executables (where should we focus efficiency improvements?)
- top 3 users (whom should we contact and work with?)
- estimate carbon footprint of storage (as opposed to computing)
- Include CO2 emission alongside CPU usage/storage tables

See <https://accounting.ligo.org/report> and [230316 minutes](#)

Preliminary recommendations

Reduce computing/increase efficiency

Switch LLO to renewable power once the current contract is finished (2024?)

Reduce the number of international collaboration meetings. Maybe one per year? Increase online meetings

Use our technological know-how to solve relevant problems (better batteries, advocate for heat pumps, etc.)

Address possible perception of hypocrisy

Training for LVK members in science advocacy

Education of LVK members about climate issues: what is climate change, what will happen, and what can we do about it?

Engagement with other collaborations to magnify our impact

Reduce individual climate impact (not just for LVK work!)