

Sustainability workshop

Introduction to the Thursday November 16th session

Nicolas Arnaud

Maria Marsella

Florent Robinet

About 200 registrants (25% in-person and 75% online)

Stavros Katsanevas (1953-2022)



***WORKSHOP POSTPONED (DATE TO BE DETERMINED)* Sustainability Workshop for Einstein Telescope**

Nov 17 – 18, 2022
EGO - Italy
Europe/Rome timezone

Enter your search term

Overview

Timetable

Registration

Participant List

Venue/Accommodation

Contact

✉ caroline.Hello@ego-...

***** THE WORKSHOP WAS POSTPONED TO A DATE TO BE DETERMINED*****

This Workshop concerns the Workpackage 9, of the Einstein Telescope (ET) Preparatory Phase EU funded program, concerning ET Carbon footprint assessment and mitigation.

It will work on an

- Accurate evaluation of the ET carbon footprint during both its construction and initial operation stages. All power consumptions of the infrastructure will be considered (instruments, service plants, computing facilities) as well as those linked to the transportations (commuting, supplies, travels) by analysing all the scientific scenarios envisioned. Surveys made by large research infrastructures like CERN, other large Astroparticle and Astrophysics Infrastructures will be used as well, both for their methodology and as inspiration for our actions for ET.
- The definition of a responsible energy consumption policy. Optimization will be done separately for the three main elements of the on-site infrastructure – underground constructions, surface buildings and the local computing center – that all have different requirements to fulfil and challenges to meet.
- Assessment and minimization of the ET impact on its environment. Study the impact of different scenarios for the design of the underground structures (tunnels, shafts and caverns) to minimize interference with external surface infrastructure networks, urban and natural areas; the development of layout concepts for the foreseen surface infrastructures taking into account technical requirements, environmental constraints and connection with existing infrastructure and service plants; how to optimize the surface transportation network and design an underground transportation system for personnel and materials; by identifying the paths, the types of users, the vehicles needed, and also by considering the highest safety standards; the planning and management issues related to the definition of critical areas (safety and environmental) and to the necessary investigations to obtain the associated risk assessments; the development of integrated processes for environmental assessment evaluation in agreement with local regulations; study of the impact on biodiversity and on the hydrologic cycle; finally, a global approach for non-hazardous and hazardous waste management and recycling both during the construction and operation phases.
- A contribution to sustainable goals. ET will extend its sensibility down to the Hz range. It will be necessary to deploy surface and underground distributed or mobile monitoring networks to measure: low frequency seismic activity and other vibrations (e.g., sea waves), electromagnetic noise and atmospheric pressure variations that may have an impact on GW measurements, anthropogenic noise. ET as an interdisciplinary and technological hub open to geoscientists, atmospheric scientists, and data science experts, will contribute to the studies on natural hazards and climate change.

Starts Nov 17, 2022, 2:00 PM

Ends Nov 18, 2022, 1:00 PM

Europe/Rome

📍 EGO - Italy

📁 There are no materials yet.

🔍

Let's get inspired by others!

14:00	Introduction: welcome + goals of the workshop <i>100/-1-A900 - Auditorium Joliot Curie, IJCLab</i>	14:15 - 14:35
	Long-term sustainability of research infrastructures <i>100/-1-A900 - Auditorium Joliot Curie, IJCLab</i>	<i>Francesca Spagnuolo</i> 14:35 - 14:50
15:00	Labos 1point5: Reducing the environmental footprint of our research activities <i>100/-1-A900 - Auditorium Joliot Curie, IJCLab</i>	<i>Mélissa RIDEL</i> 14:50 - 15:15
	CERN's strategy for an environmentally responsible research <i>100/-1-A900 - Auditorium Joliot Curie, IJCLab</i>	<i>Sonja Kleiner</i> 15:15 - 15:40
16:00	Environmental sustainability in basic research: a perspective from HECAP+ <i>100/-1-A900 - Auditorium Joliot Curie, IJCLab</i>	<i>Jacopo GHIGLIERI</i> 15:40 - 16:05
	The environmental footprint of astronomical research infrastructures <i>100/-1-A900 - Auditorium Joliot Curie, IJCLab</i>	<i>Jürgen Knödseder</i> 16:05 - 16:30
	Coffee break <i>100/-1-A900 - Auditorium Joliot Curie, IJCLab</i>	16:30 - 17:00
17:00	The LIGO-Virgo-KAGRA climate change committee <i>100/-1-A900 - Auditorium Joliot Curie, IJCLab</i>	<i>Prof. Daniel Holz</i> 17:00 - 17:40
18:00	Discussion: how to use these (and other) initiatives for ET? <i>100/-1-A900 - Auditorium Joliot Curie, IJCLab</i>	17:40 - 18:30

Notes from today's session:

https://docs.google.com/document/d/1GE524FDqrBCgykqgFw_s8azvRumgulcKzhywZlhHUEE/edit?usp=sharing

Sustainability plans for ET (on Friday)

09:00	Introduction: ET-PP and WP9 <i>100/-1-A900 - Auditorium Joliot Curie, IJCLab</i>	09:00 - 09:20
	Topical discussion: sustainability of the ET site infrastructure <i>100/-1-A900 - Auditorium Joliot Curie, IJCLab</i>	<i>Elisabeth Hauzinger et al.</i> 09:20 - 09:45
	Topical discussion: sustainability and the ET instrument design <i>100/-1-A900 - Auditorium Joliot Curie, IJCLab</i>	<i>Harald Lueck et al.</i> 09:45 - 10:10
10:00	Topical discussion: sustainability and the ET computing <i>100/-1-A900 - Auditorium Joliot Curie, IJCLab</i>	<i>Nicolas Arnaud</i> 10:10 - 10:35
	Topical discussion: sustainability and the ET communication & outreach <i>100/-1-A900 - Auditorium Joliot Curie, IJCLab</i>	<i>Nicolas Arnaud</i> 10:35 - 11:00
11:00	Coffee break <i>100/-1-A900 - Auditorium Joliot Curie, IJCLab</i>	11:00 - 11:30
	Organization of the sustainability work in ET <i>100/-1-A900 - Auditorium Joliot Curie, IJCLab</i>	11:30 - 12:00
12:00	Conclusions of the workshop and next steps <i>100/-1-A900 - Auditorium Joliot Curie, IJCLab</i>	12:00 - 12:30

Notes from tomorrow's session:
<https://docs.google.com/document/d/1tR7u7HEHnPEGcVS8wAcSVuoXjv2DOPDoi81b9cZvm9A/edit?usp=sharing>

ET-Preliminary Phase WP9 Milestone 9.1: Preliminary sustainability plan



Preparatory Phase for the Einstein Telescope Gravitational Wave
Observatory

Milestone 9.1

Preliminary sustainability plan

Lead beneficiary: 8-EGO
Delivery Date: 31/10/2023
Dissemination level: public
NAME : ET-PP-Milestone-9.1
Version: 1.0



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- 31/08/2025: ET CO₂ footprint assessment and mitigation strategy

Next milestones

- 29/02/2024: ET sustainability workshop + report
- 31/07/2026: ET Final sustainability plan

Open questions (I)

(hopefully we will answer some of these before the end of the workshop)

- Carbon footprint
 - Methodology to evaluate the ET carbon emission over the entire project?
 - What sub-categories should we consider (e.g computing, travels...)?
- Energy
 - Use a green energy provider?
 - Produce energy on site?
 - How to minimize energy consumption?
- Construction
 - How to minimize the impact on the environment? How to compensate?
 - How to choose the best materials, technology?
 - Should we consider environmental issues to best choose the ET site?

Open questions (II)

(hopefully we will answer some of these before the end of the workshop)

- Computing
 - Optimize the computing around the globe?
 - Optimize algorithms: profile analyses? train physicists? code reviewed by experts?
 - Optimize the analysis workflow, remove redundant analyses, select the best application to perform a task, run analyses only once, run analyses only when the energy is the "greenest".
- Expenses
 - How to fold the environmental impact in purchases?
 - How to limit expenses?
- Work conditions
 - What is it like to work (and live) in Europe in 2050?
Do we need to select a time of the year to operate the detector?
 - Can we limit the number of travels? How?
 - Can we prefer low-emission transportation?
 - Local population acceptance?
 - Impact on the society?

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Long-term sustainability of research infrastructures

Francesca Spagnuolo

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Labos 1point5: Reducing the environmental footprint of our research activities

Mélissa RIDEL

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CERN's strategy for an environmentally responsible research

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Jacopo GHIGLIERI

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The LIGO-Virgo-KAGRA climate change committee

Prof. Daniel Holz

100/-1-A900 - Auditorium Joliot Curie, IJCLab

17:00 - 17:40

Discussion: how to use these (and other) initiatives for ET?

18:00

100/-1-A900 - Auditorium Joliot Curie, IJCLab

17:40 - 18:30

Francesca Spagnuolo is a staff member of the European Gravitational Observatory (EGO), the site of the Virgo gravitational-wave detector. She is coordinating the participation of EGO to EU programs. She will talk about **long-term sustainability of research infrastructures**.

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Mélissa Ridel is assistant professor and deputy dean of the science and university college of the Sorbonne University, in charge of environmental issues. She is working on the ATLAS experiment at CERN. She is a member of the steering group of "Labos1Point5" ("Labs1Dot5"), the collective that she will present us today. As their website says "**Labos 1point5 is an international, cross-disciplinary collective of academic researchers who share a common goal: to better understand and reduce the environmental impact of research, especially on the Earth's climate.**"

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Sonja Kleiner is a CERN staff member. She is the lead of the **Environment group** at CERN (HSE-ENV), which is part of the **"Occupational Health & Safety and Environmental Protection Unit"**.

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Jacopo Ghiglieri is a CNRS researcher at the Nantes IN2P3 lab, Subatech. He is a particle physics theoretician. He is one of the authors of the document "**Environmental sustainability in basic research: a perspective from HECAP+**" that he will report on today. HECAP+ stands for "**High Energy Physics, Cosmology, Astroparticle Physics, and Hadron and Nuclear Physics**".

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Jürgen Knödlseeder is astrophysicist at IRAP in Toulouse and works in the field of gamma-ray astronomy. He is also doing research on the **environmental impact of astronomical research, focusing in particular on impacts of ground- and space-based research infrastructures**, which will be the topic of his talk today. He is also a member of the French Labos1Point5 collective.

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Daniel Holz is professor at the University of Chicago. His research focuses on gravitational waves and he is a member of the LIGO Scientific Collaboration. He is also a member of the Science and Security Board of the Bulletin of the Atomic Scientists, which helps set the hands of the Doomsday Clock. Today, he will present the **LIGO-Virgo-KAGRA climate change committee** he is chairing.

ET-Preliminary Phase WP9 Milestone 9.1: Preliminary sustainability plan



Preparatory Phase for the Einstein Telescope Gravitational Wave
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Sustainability figures of merit and methodology

Emission of greenhouse gasses

- Direct emissions coming from owned or controlled source
- Energy indirect emissions, including the generation of purchased electricity
- All the other indirect emissions derived from purchases (goods and services)

Sustainability of the site as a whole

- Treatment and reuse of the large amount of excavation materials
- Minimize the impact on ET on the natural environments and biodiversity
- Optimize the use of the available resources

Purchase policy

- Reduce misspends and environmental waste

Life-cycle analysis

- To be implemented

Sustainability topics relevant for Einstein Telescope

- Travels
 - To the site, to workshops & conferences, to labs and partner sites
- Computing
 - On site, data transfers, clusters, video conferences, etc.
 - Partners: other large research infrastructures, community as a whole, industry
- “Eco-design” after selection of the ET site(s)
 - Example of CERN’s FCC project
- Development of technologies for ET which may become a reference for the community
- Construction
- Energy system and sources
- Future work conditions on site to operate the detector

→ Different phases of ET: preparatory phase and design, construction, operations + upgrades, dismantling

Sustainability plan goals

- Provide recommendations to reduce impacts of all kinds
 - Without jeopardizing the ET scientific goals
 - Coming into the game after detector configuration choice and site selection
- Define set of standards and references
 - Assess the quality of the plan
 - Quantify what has been achieved
- Follow what others are doing in all related fields
 - Develop actions jointly, at the scale of the whole community

Open questions (I)

(hopefully we will answer some of these before the end of the workshop)

- Carbon footprint
 - Methodology to evaluate the ET carbon emission over the entire project?
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Open questions (II)

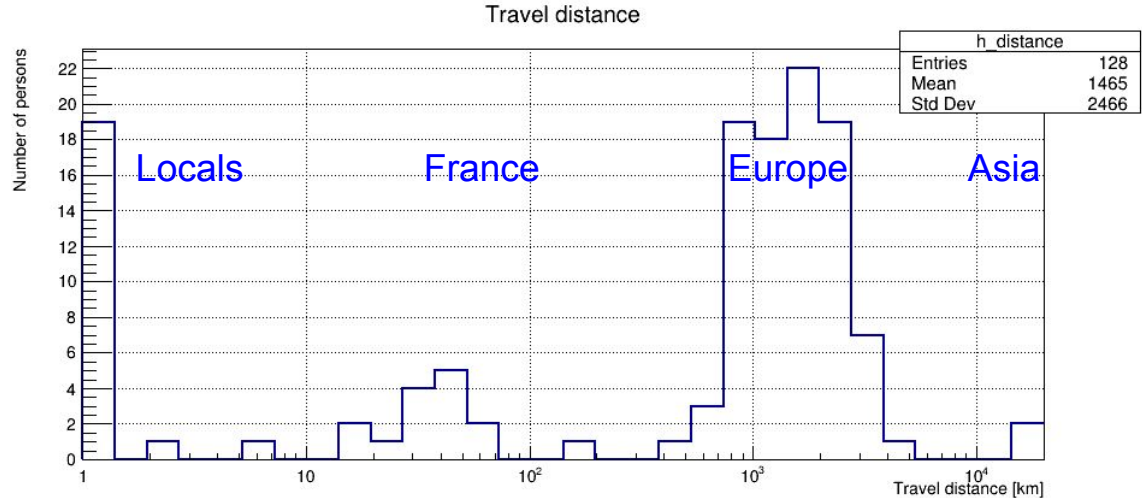
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 - Local population acceptance?
 - Impact on the society?

Travel carbon footprint

We have estimated the carbon footprint associated to travels for this ET collaboration meeting

Participants have provided the carbon footprint of their travel when they registered



146 participants

18 persons did not provide information about their trip

CO2 emission w/o contrails = 17717 kg → 19901 kg (extrapolating missing info)

CO2 emission w/ contrails = 31480 kg → 35361 kg (extrapolating missing info)

CO2 emission per person = 30000 kg / 146 = 205 kg for 4 days of meeting

In average a French person emits ~10 t / year of CO2 (2050 target: 2 t / year)
~ 27 kg / day (2050 target: 5 kg / day)