Sustainable development strategy: WP9 topic and status

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https://indico.ifae.es/event/1671

WP status and plans

Stavros Katsanevas (1953-2022)

- We do miss Stavros a lot
  - The scientist and human being first
    - https://indico.in2p3.fr/event/29126
  - But also as ET-PP INFRA-DEV WP9 leader
- From his last WP 9 report (July 2022)

- ✓ Well aware that sustainability is a topic of growing importance in the society in general and thus for ET, in particular
- ✓ Work package reorganization is in progress by aggregating new interested groups, to identify a coordinator and recruite an environmental/energy engineers at EGO
- ✓ Seeing the present ET-PP annual meeting as the opportunity for a WP9 reboot with the ET-PP coordination and WP members

WP9 – INFRADEV

ET Sustainable Development Strategy

Main goals

- Minimize the **global carbon footprint** of the Einstein Telescope (ET)
- Evaluate **landscape, environmental and societal impact** and how to implement valorization and mitigation actions
- Contribute to **sustainable goa**ls (enforce a strong multidisciplinary approach by addressing other science-based targets for natural hazards and climate change mitigation)

Task 9.1

ET Sustainable Development Strategy

ET Carbon footprint assessment and mitigation (CNRS, EGO, INFN)

Estimate ET carbon footprint

- evaluation during construction and initial operation stages due to power consumption of instruments, service plants, computing facilities, and transportations (commuting, supplies, travels)
- based on existing studies GW detectors: LIGO (USA), Virgo at EGO (Italy) and KAGRA (Japan, underground) and simulation of running and computing needs for ET
- 3 ET element: on-site infrastructure – underground constructions, surface buildings and computing centers

Strategy for energy production and consumption optimization

- increasing the efficiency of all devices
- reuse energy as possible (e.g. heat from cooling systems)

Task 9.2

Landscape, environmental and societal impact

Landscape, environmental and societal impact (INFN, EGO, CNRS, Austria, KIT, ZAB)

- 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
- 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**; and optimize connection with existing infrastructure and service plants
- development of i**ntegrated processes for environmental assessment evaluation** in agreement with local regulations
- study of the **impact on biodiversity** and on the **hydrologic cycle**
- a global approach for non-hazardous and hazardous **waste management** and **recycling** both during the construction and operation phases

Task 9.2

Landscape, environmental and societal impact

ET Environmental Protection Strategy

- an **ET Environmental Protection Steering Board** to identify and prioritize environmental areas to be addressed and to propose programs of action, and
- an **ET Energy Management Panel** to monitor the ET energy consumption and identify measures to improve efficiency and promote energy re-use.
- actions will be developed in the framework of the **environmental protection regulations** of the ET hosting and member states

Task 9.3

Contribution to sustainable goals

As part of ET infrastructure 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.

Through these monitoring systems developed for the ET noise mitigation strategy other studies in **geosciences** and **atmospheric sciences** can be supported also developing specific machine and deep learning techniques for data analysis.

ET can become an **interdisciplinary and technological hub open to a variety of collaborations** with geoscientists, electromagnetic and data science expert and contribute to the studies on natural hazards and climate changes