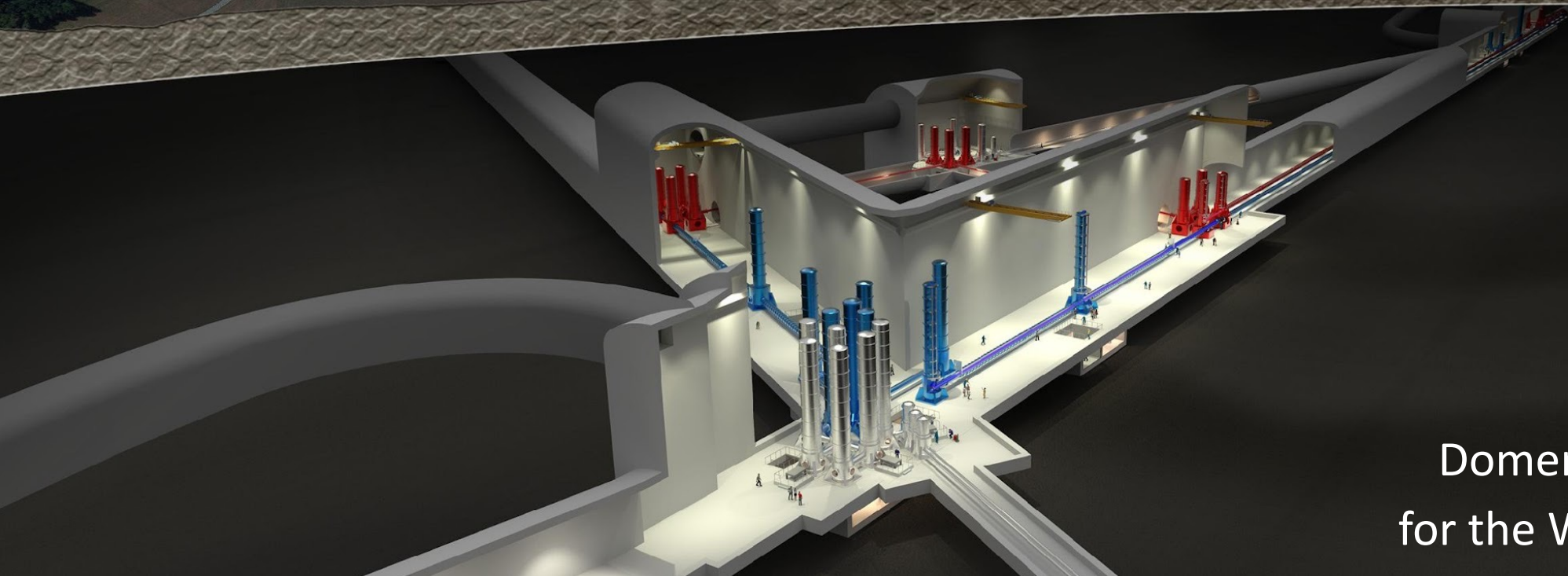


WP4 /Site Characterization & Preparation Board Introduction



Domenico D'Urso
for the WP4/SCB/SPB

Site Characterization in the ET

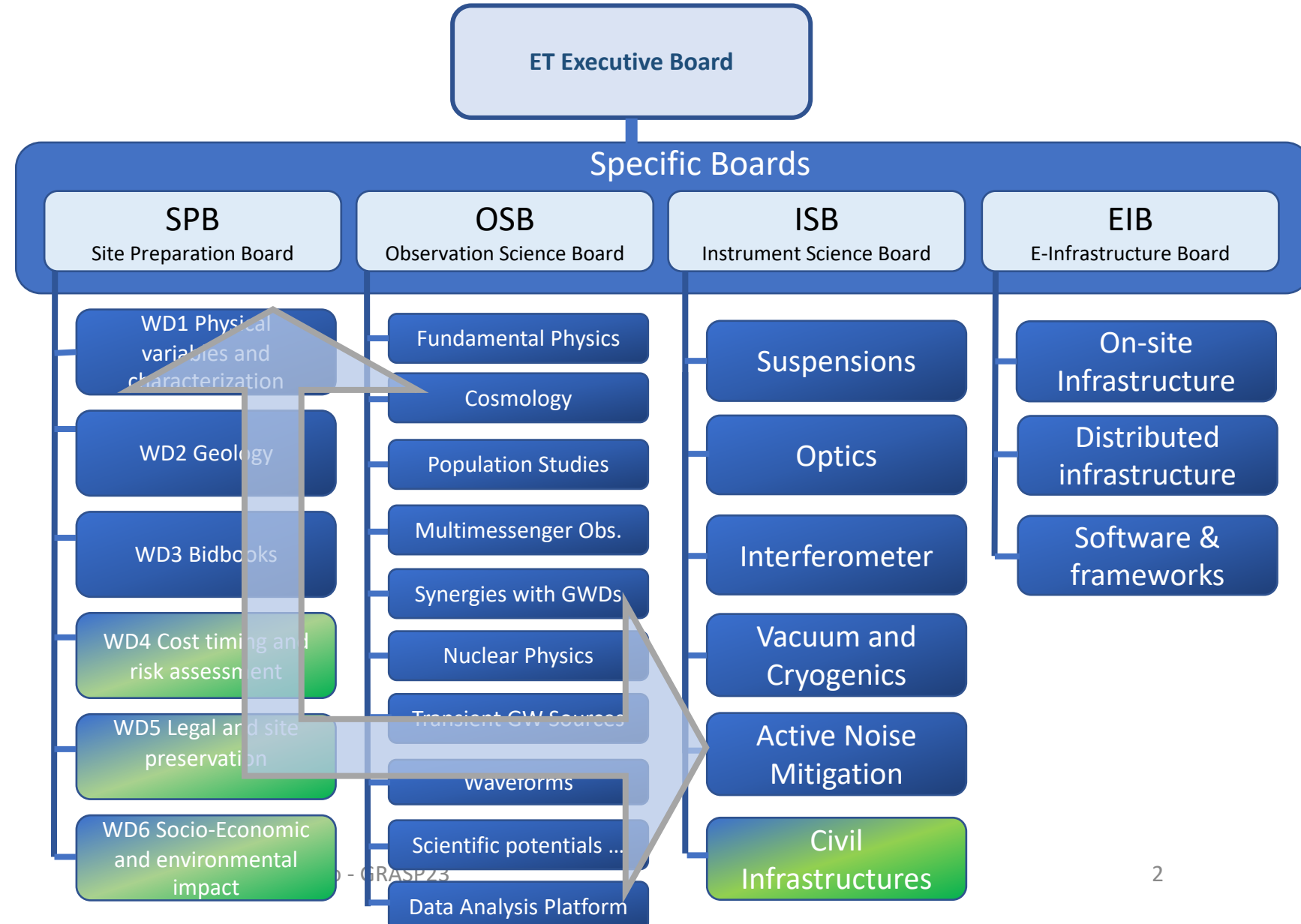
➤ **Site Characterization** coordinated in the framework of the **ET Collaboration: Site Preparation Board (SPB)**.

➤ Strong interaction with the Active Noise Mitigation division in the Instrument Science Board (ISB).

ET-LF

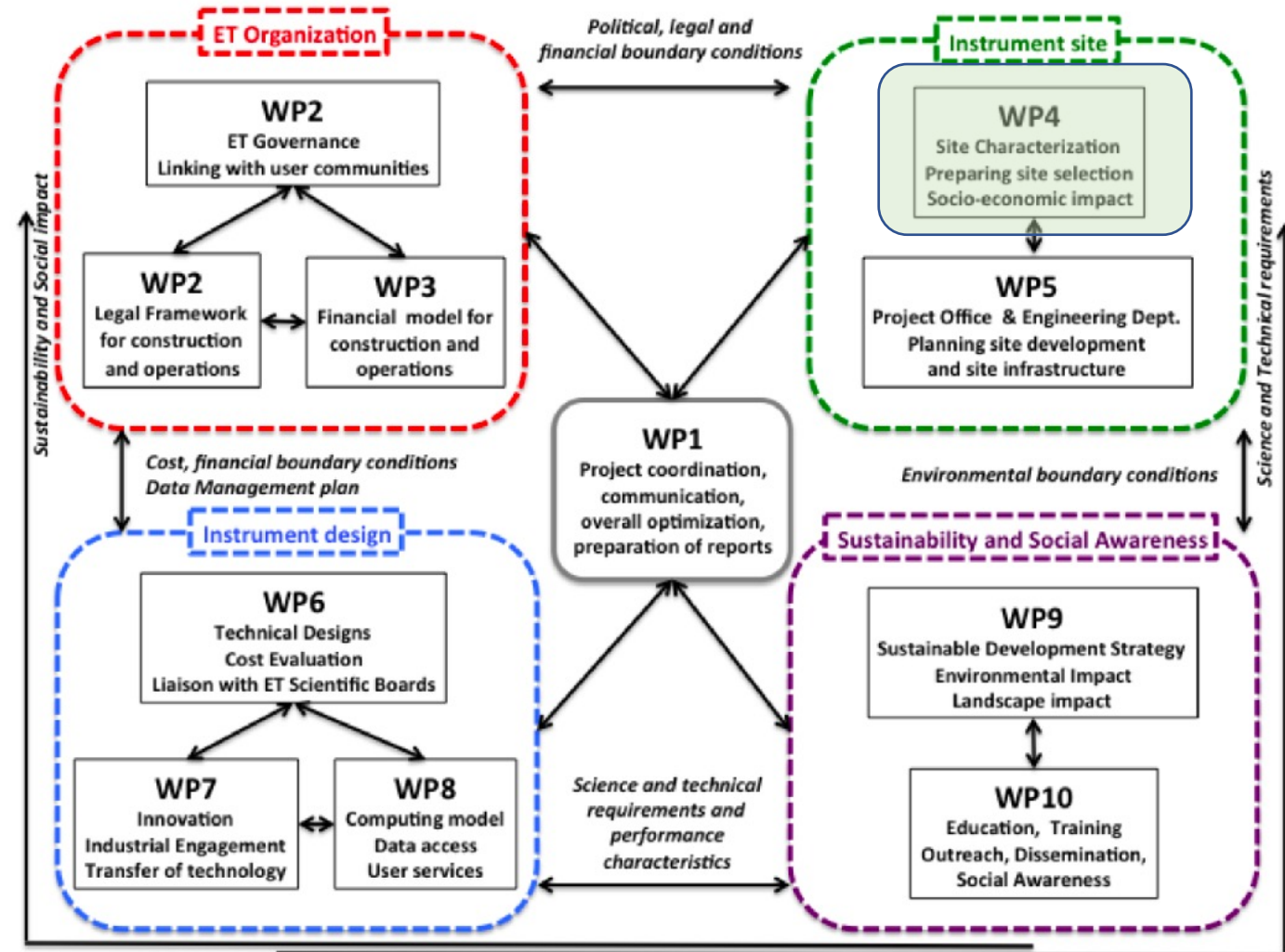


understanding of environmental noise effects and reliable mitigation systems



INFRADEV: ET-PREPARATORY PHASE

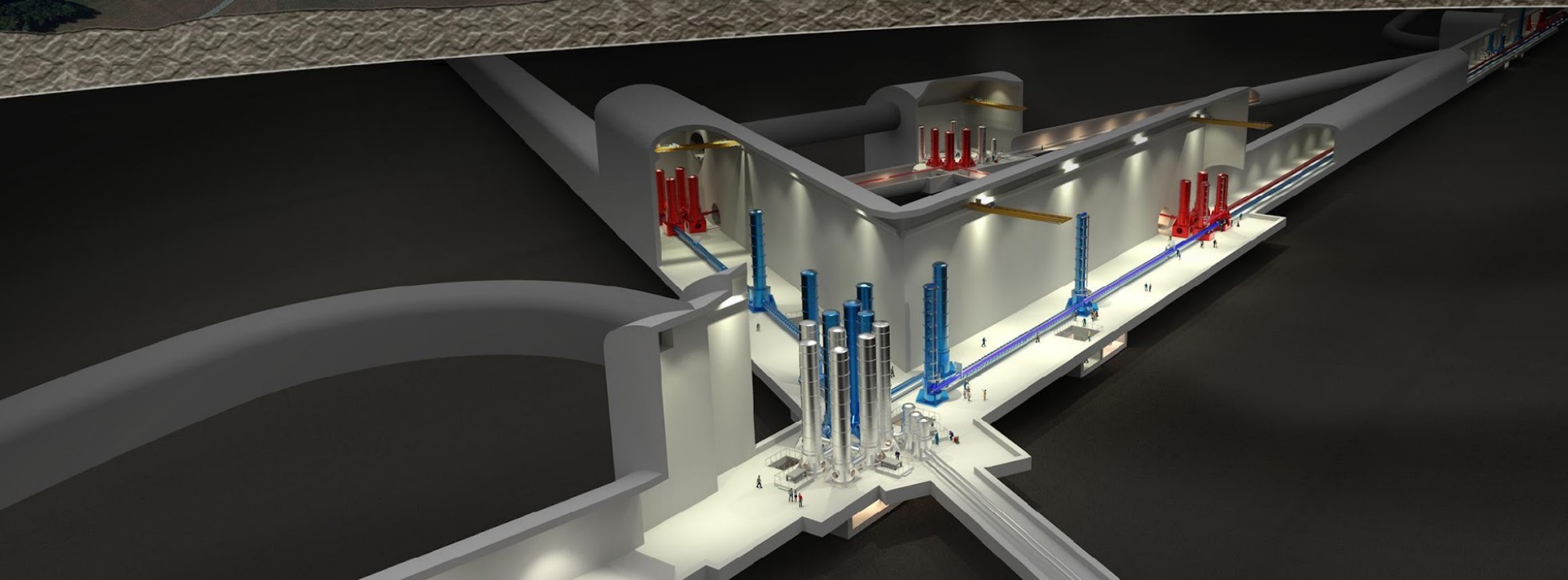
- ET governance
- Legal framework
- Financial Model
- **WP4: Site characterization**
- Project Office & engineering
- Technical design
- Innovation
- Computing Model
- Sustainability Strategy and Environmental impact
- Outreach



SPB Documents already produced

- **M1.1: physical variables:**
ET-0012A-23, discussed and finalized at the II SPB Workshop (Jan 2023)
<https://apps.et-gw.eu/tds/?content=3&r=18113>
- **M1.2: measurements recommendations and standards:**
ET-0013A-23, discussed and finalized at the II SPB Workshop (Jan 2023)
<https://apps.et-gw.eu/tds/?content=3&r=18114>
- **M1.3: data format standards and analysis tools**
ET-0270A-23, <https://apps.et-gw.eu/tds/?content=3&r=18398>
- **ET-PP M04.01:** “*Site-specific Characteristics impacting ET sensitivity and duty cycle*” (manly based on previous documents) ET-0252A-23, <https://apps.et-gw.eu/tds/?content=3&r=18379>

WP4 Milestones and Deliverables



WP4 Milestones & Deliverables

Milestone name – Date (in months)/Lead Institution

➤ **M4.1 – M3/UW** : *Document detailing the site-specific characteristics that impact ET sensitivity and its duty cycle => **REPORT*** **DELIVERED**

➤ **M4.2 – M10/UW** : *Common methodology to estimate impact of site characteristics on ET sensitivity and operation and, if required, a scheme to compensate it => **REPORT***

(months from ET-PP start date, Sept. 1st)

- Discussion with ISB on WDs and WPs
- Common working group is going to be set up and thematic meetings will be organized to eliminate differences between the different approaches.
- Dedicated Workshop including related WPs from ISB – December 6th-7th 2023 <https://indico.nikhef.nl/event/4820/> to discuss the status of noise understanding towards a definition of a common methodology (**Registration is required** for both in person participation and online participation)
- A document will be prepared to report a standardization on measurement methodologies and agreements on common tools to be used for noise estimation

WP4 Deliverables

Deliverable name – Date (in months)/Lead Institution

- **D4.1- M10/Nikhef:** *Scan of legal procedures, permitting and land acquisitions, i.e. the steps to be taken prior to starting excavations*
- **D4.2 - M15/INFN:** *Updated socio-economic impact studies. Scan of accessibility, quality of life etc.* **Delayed to Dec. 31st 2023**
- **D4.3 - M28/UW:** *Complete quantification of all the aspects impacting the ET performance for each site*
- **D4.4 - M30/INFN:** *Report on 3D geology, hydrology, etc. model with localisation of the ET infrastructure*
- **D4.5 - M42/Nikhef:** *Updated cost and schedule estimates of the excavations, including, if necessary: instrumentation for Newtonian Noise cancellation; costs of debris removal; costs of land acquisition, permitting, etc.*

(months from ET-PP start date, Sept. 1st)

- Host teams supporting the site candidature are implementing different organization strategies strongly affected by the national and regional fundings supporting the activities (42M€ for the EMR team and 50M€ for the Sardinia team).
- **EMR:** The legal scan is still being improved. A first study of the engineering, legal, and permitting aspects ordered by the University of Liège using core funding of ULiège, RWTH, Provincie Limburg (NL) and Nikhef is available and it will act as a foundation for a second, more specific and detailed study, currently in development.
Assumptions: ET is located in The Netherlands and Belgium, it has a triangular shape, the access to ET are vertical shafts, and the tunnels will be dug at least at a depth of 200 m, more likely at 250 m depth.
- **Sardinia:** a call for tender for “Preliminary studies to the feasibility study of ET infrastructure in Sardinia” using national funding will produce, within a wider framework where an engineering study and a geotechnical investigation will be produced, a complete scan of all the procedures, authorization and permits needed. Consequently, the final outcomes of the tender are expected in summer 2025. Given that such legal and permitting studies need to account for different regulations, and the possibility to obtain a new legislation tailored for the ET infrastructure, an introductory overview is given in the present document, while the final and most complete report will be delivered within the 31/12/2025.
Assumptions: ET is located in the area of Sos Enattos (NU, Italy), and it is considering both triangular (six interferometers inserted in a system of tunnels and caverns with an equilateral triangle layout on a side about 11 km) and L shape (two interferometers inserted in a system of tunnels and caverns with an 'L' layout on a side about 16 km) configurations.
- **The documents are only the starting point of the list of legal issues that should be faced to build ET in both geometrical configurations triangular or L shape**
- **Documents will be updated at the end of ET-PP, taking into account the results of further studies ongoing**

Open Issues for the SPB Workshop: Bidbook Scientific content

- **Common Template for scientific aspects!**
- Standards and best practices for site noise measurement and evaluation
- Evaluation of site characteristics on ET performances
- Site noise mitigation
- Scientific Risk assessment

Open Issues for the SPB Workshop:

Strategy and document validation

- SPB/SCP is producing documents with standards and measurement prescriptions
- Host teams are working hard trying to collect all the information to produce their “bidbook”
- Host teams are already producing outputs
- Missing the definition of a quality procedure in the site selection process
- Missing validation and approval procedure

- Tuesday Nov. 14 from 14:10 to 15:55
 - ❑ Introduction to Sardinia Candidature Activities
 - ❑ Progressing towards the 4D geological characterization of the Einstein Telescope site in Sardinia (L. Cardello)
 - ❑ Summary of site characterization activities at the Sardinia candidate site for the Einstein Telescope (M. Di Giovanni)
 - ❑ Review on Sardinia Measurements: data repository (A. Fiori)

- Wednesday Nov. 15 from 14:10 to 15:55
 - ❑ EMR General overview and Organization Introduction to EMR Candidature Activities (W. Walk)
 - ❑ EMR borehole drilling approach and schedule (B. Vink)
 - ❑ EMR Seismic and noise measurements (M. Kiehn)
 - ❑ EMR geomechanics and civil engineering (P. Lamas)
 - ❑ Discussions and Conclusions (Site Characterization strategy, Workshop, ...)

Conclusions

- Site characterization crucial to achieve the expected sensitivity at low frequencies
- SPB/SCB documents containing relevant site characteristics, standards and measurement procedures already available
- SPB/SCB sessions devoted to summarize the status of site characterization activities
- Dec 6-7 Workshop to discuss the status of noise understanding towards a definition of a common methodology
- Open issues for discussions:
 - Bidbook Scientific content template
 - definition of a quality procedure (document validation and approval)