

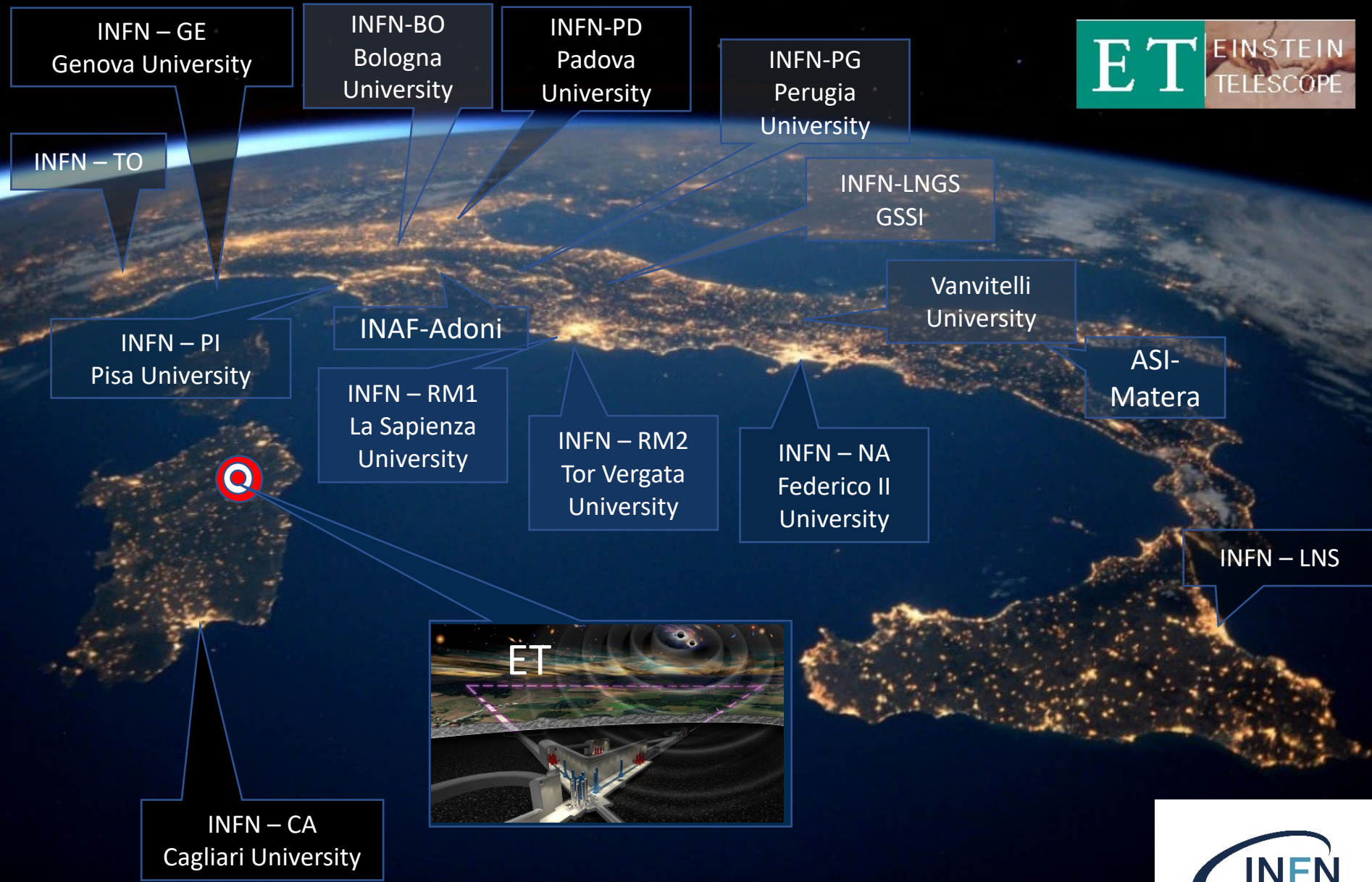
# SPB/WP4: Updates

September 19th, 2022

# News and updates from sites



# ETIC – Einstein Telescope Infrastructure Consortium



Next Generation EU  
Investment focused on ET  
enabling technology and  
Sardinian site candidature  
support

Leaded by INFN  
Partners: 11 Universities,  
INAF and ASI (Italian  
Space Agency)

**Budget 50M€**  
**approved**



# News from Sos Enattos Site

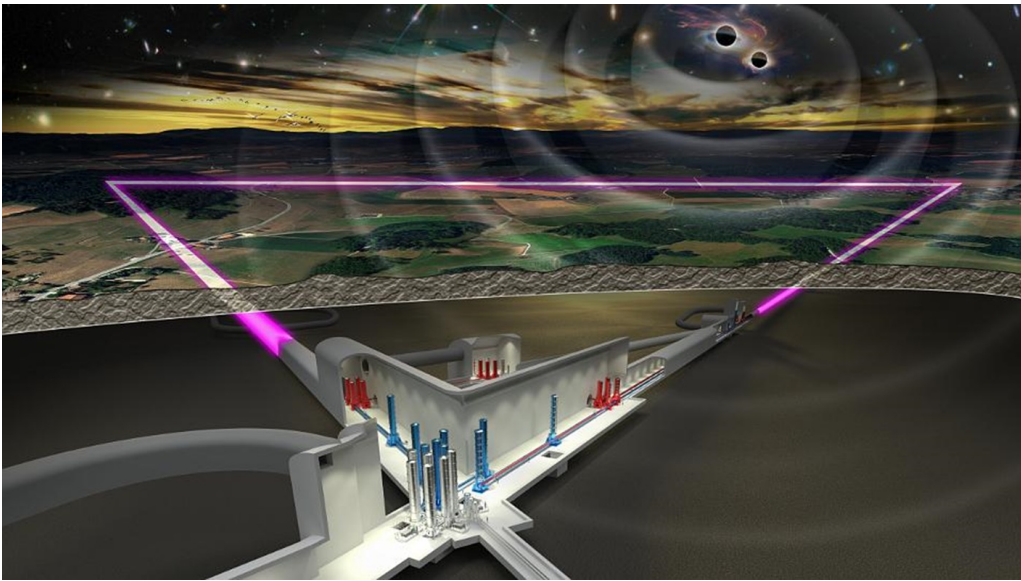


➤ ETIC (Einstein Telescope Infrastructure Consortium) project approved. **Budget 50M€**

Preliminary Design of ET infrastructure

Network of Laboratories for R&D dedicated to ET





# ET-PP/INFRADEV Progress report SPB Euregio Meuse-Rhine Site

## D4.1 – M10 *Scan of legal affairs*

Contract (~50 k€) awarded to Amberg & Tractebel-Engie to make inventory of legal/planological/environmental hurdles related to the realisation of ET in the EMR.

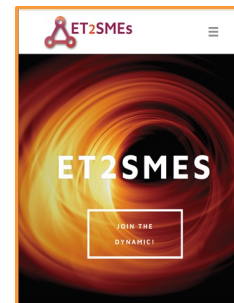
- *Kick-off meeting 31-August-2022*
- *Report expected early 2023*

## D4.2 – M15/INFN *Socio-economic impact*

*(this is the main motivation of our governments to support ET, I fear)*

4 studies performed of which 2 public (ESFRI annex)  
Industrial collaboration

2,2 M€



&



3,6 M€

+ 16 M€ Dutch NGF

# Site preservation: *Windturbines*



**Very popular, even more so with present electricity prices**

**Netherlands:- ban on new windturbines**

**- ban on other activities (like excavations)  
that risk to impact ET adversely**

**Belgium: - discussions ongoing with notably Engie  
(large windturbine supplier) regarding  
new initiatives.**

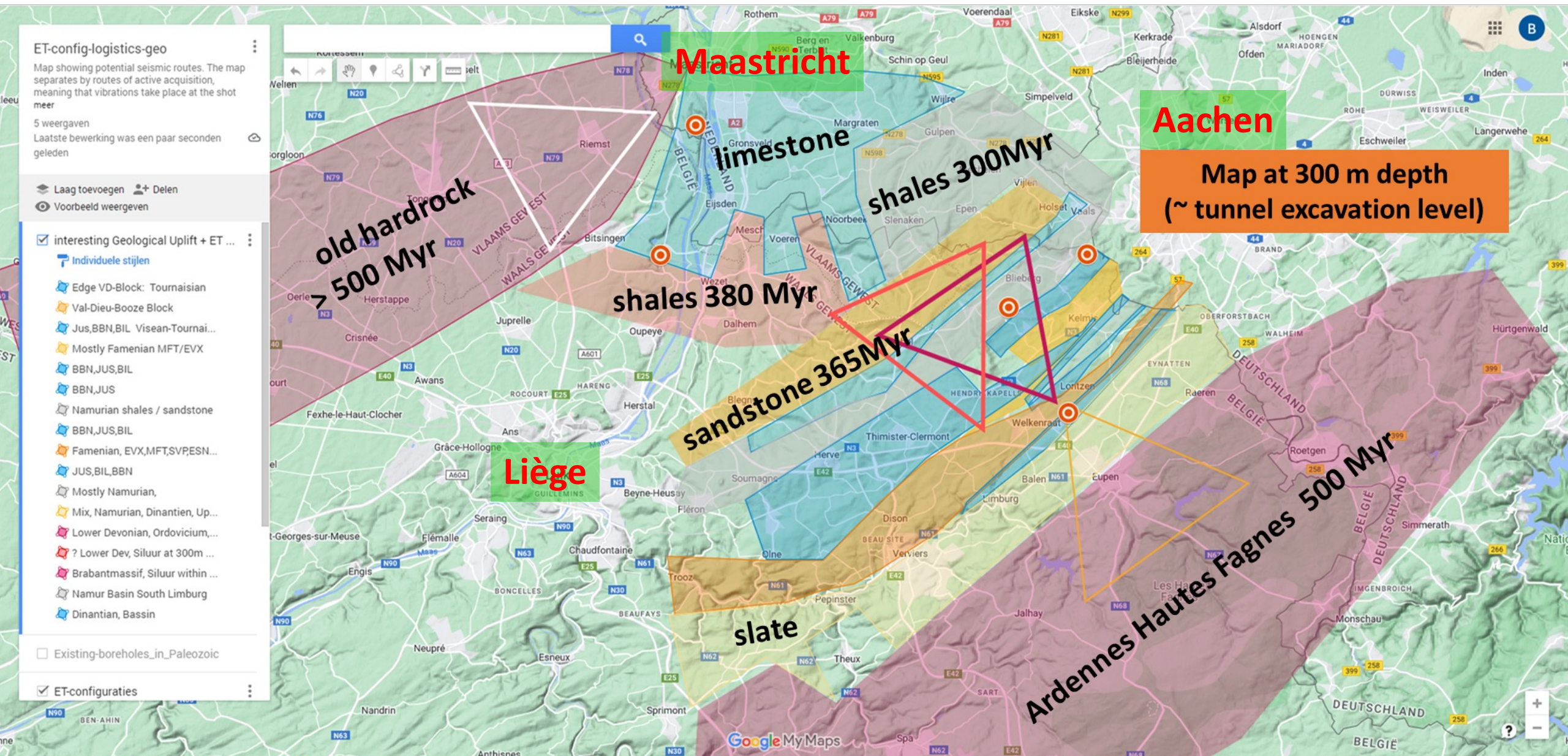
**Germany: - ?**

***More measurement campaigns in preparation (with Engie)***



# Main issue:

## Cost-effective location to build ET in EMR?



Map at 300 m depth (~ tunnel excavation level)



# Answer: *requires lots of geology studies*



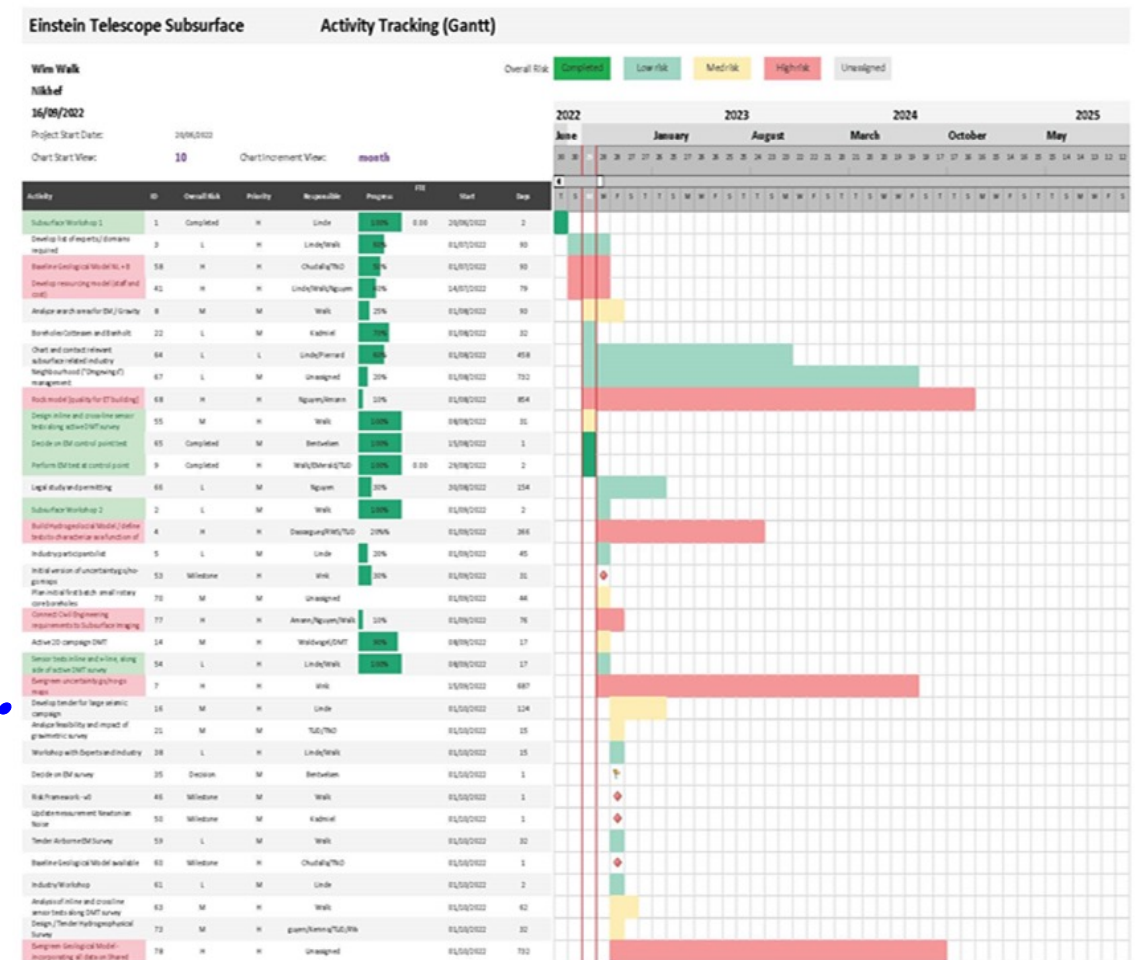
- Funding:
- about 7,5 M€ E-TEST (Interreg-EMR, capital+personpower, 2020-2023) (*boreholes, active seismic, ..*)
  - 18 M€ (Dutch NGF geology, mostly capital, 2022/2023-2025) (*more boreholes, lots of active seismic, ..*)
  - ? M€ from a to be submitted Interreg-NWE application focused on sustainability (2023-2025)

## NGF: 2 full-day workshops, June 20 & September 1

*Participants: TU/Delft, Liège university, RWTH-Aachen, KNMI, TNO, Antea, Implenia, Limburg province, geological survey Belgium, Royal Observatory Belgium, Nikhef, Bonn university, ..*

## Objectives:

- Update on recent and upcoming activities
- Discussion on Urgent/Critical Activities
  - Construction of hydrogeological model (critical)
  - Establish baseline geological model (keep it up-to-date!), including universal data access – shared drive, etc.
  - Geophysical mapping of subsurface: seismic, EM, gravity, ..
  - Establish critical/minimum subsurface requirements/characteristics in view of excavations
- Activity planning & resourcing collaboration towards aligned goal(s)



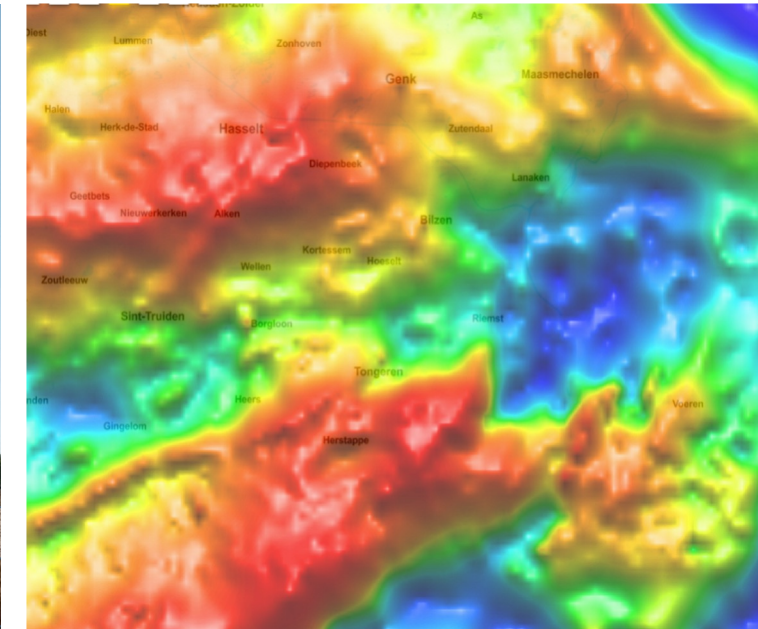
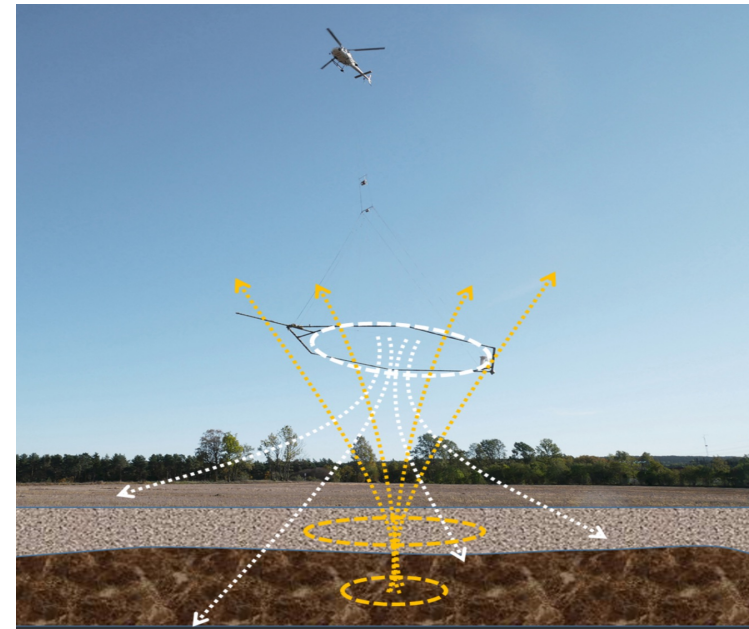


# Geophysical measurements

## 2D & possibly 3D active seismic

## Electro-magnetic (resistivity)

## Gravimetric



***Small area: 2019 in Terziet***  
***Large area: Sep/2022 ~40 km (E-TEST project)***

***Anticipated: 2023 ~400 km (NGF project)***

***Discussed since 2021 with Emerald Geomodelling (Sardegna & EMR)***

***First tests Aug/2022***

***Large air-borne campaign in future?***

***Considered***



# Electro-magnetic test campaign

August 2022



source coil

receiver coil

**Measurements at two locations each about few 100 × few 100 meters and at one smaller area location:**

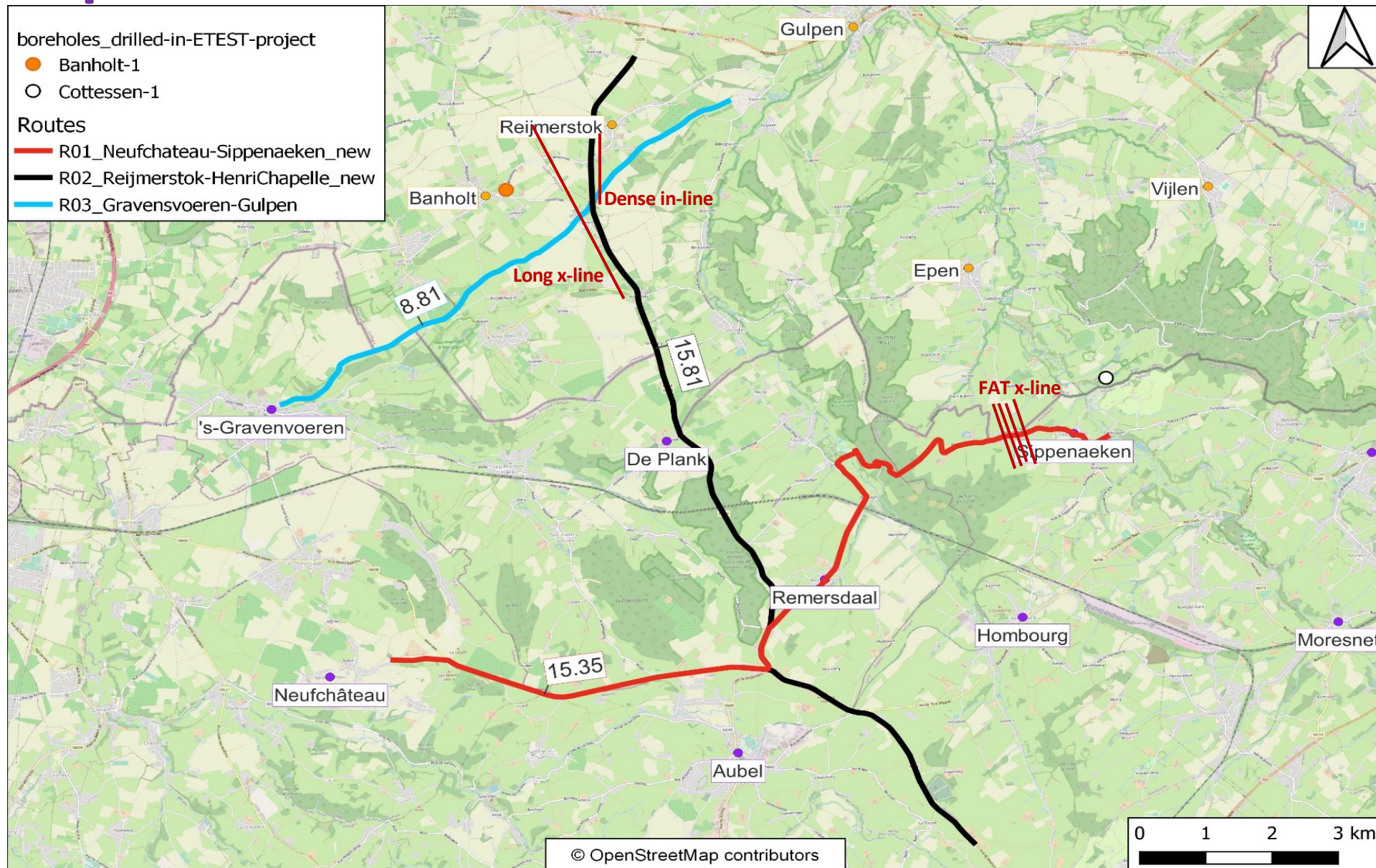
- *Moving setup (EM pulses every few meter) as shown in photo*
- *Stationary setup with a very large (about 40×40 m<sup>2</sup>) source coil 'WalkTEM'*
- *Report (Emerald Geomodelling) expected by the end of September. Hope to reach few 100 m depth*



# Active seismic campaign

## September 2022

3 lines, ~ 40 km total length  
Shots every 20 m (3 vibes)  
Receivers every 10 m



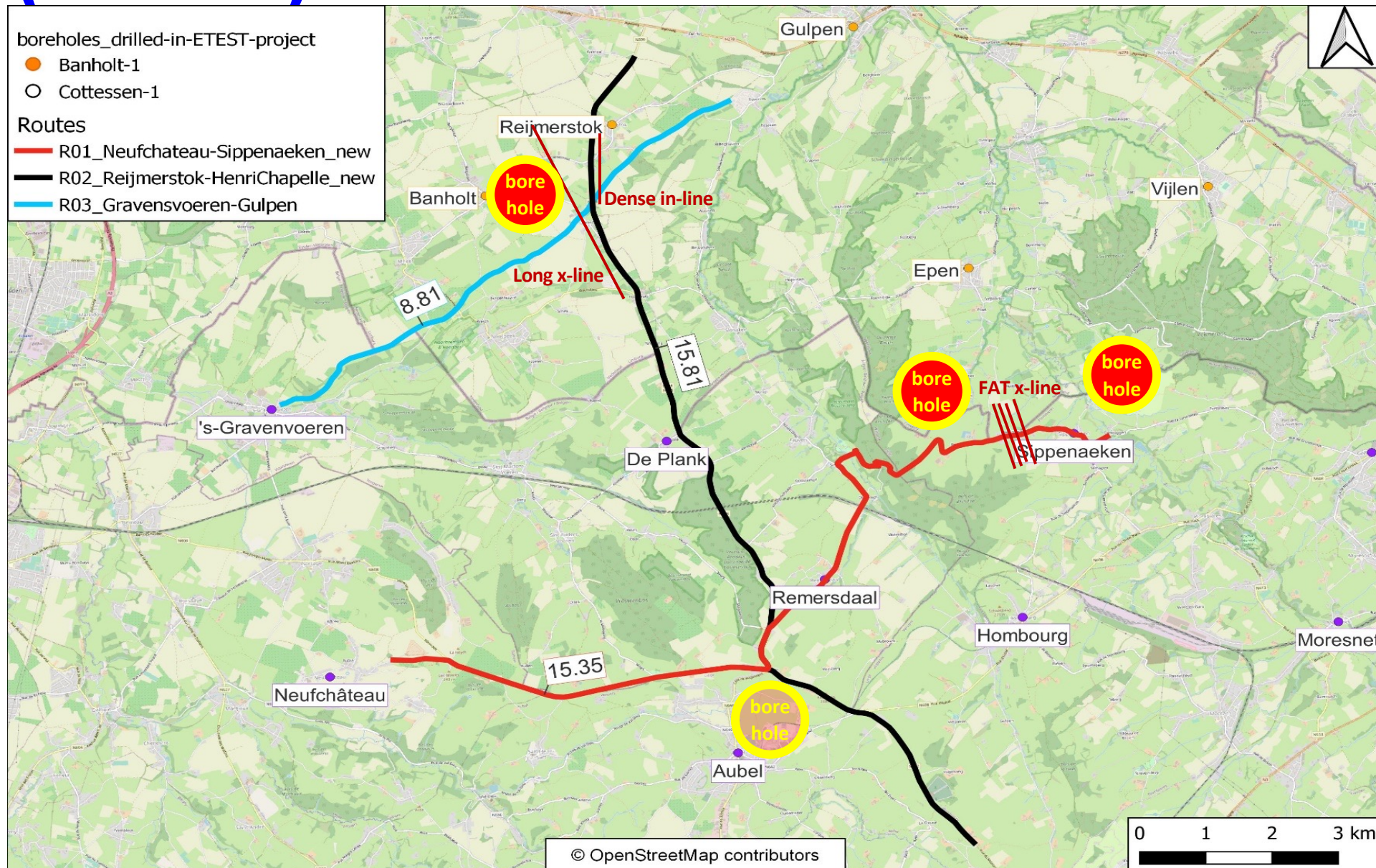
### Extra tests:

- **Study 3D potential:**  
*by adding 'cross' lines*
- **Best receiver separation:**  
*400 m line – 1 m spacing*



# Boreholes: 3 done, 1 planned (E=TEST)

3 lines, ~ 40 km total length  
Shots every 20 m (3 vibes)  
Receivers every 10 m

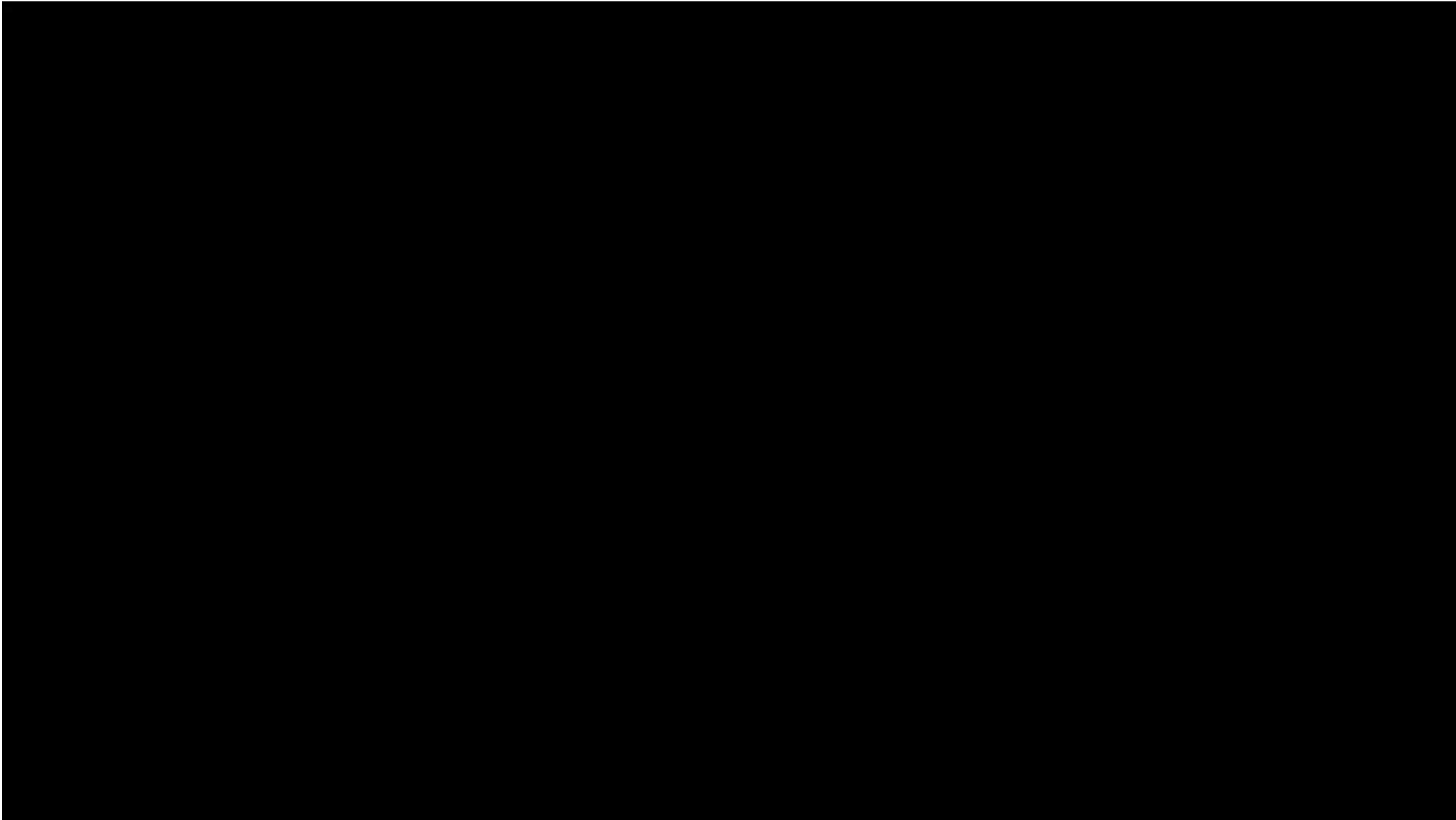


## Extra tests:

- *Study 3D potential: by adding 'cross' lines*
- *Best receiver separation: 400 m line – 1 m spacing*



# Active seismic campaign – September 2022



# Next SPB workshop: *January 2023,* *Maastricht?*



**3 days with optional excursion to experience the Euregio Meuse-Rhine and to visit ETpathfinder**



## 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***
- **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)*

## 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.*
- **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.*

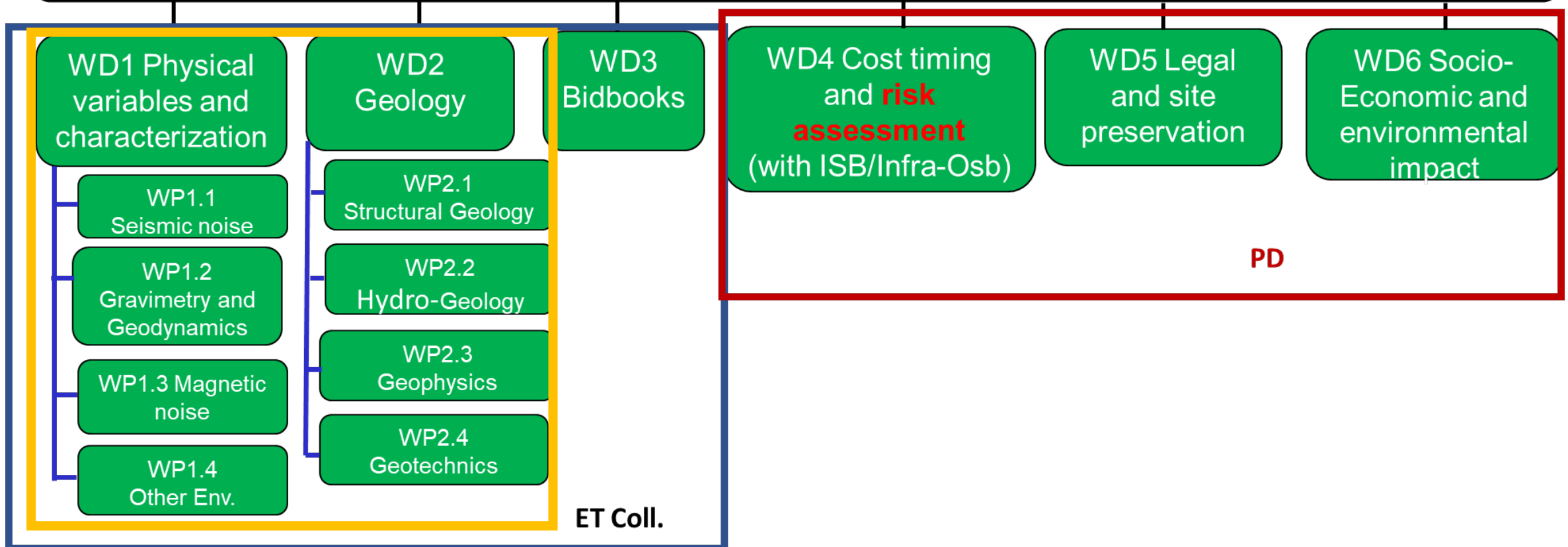
*(months from ET-PP start date, Sept. 1st)*



# SPB/SCB WBS

Division structure within the SPB WBS:

## Site Characterization/Preparation Board





# Issues to be addressed soon

- Timeline review (on going)
- Discussions with ISB/OSB on relevant parameters/requirements (Jan Harms workshop July 11<sup>th</sup> a very good start)
- ET basic geometry definition i.e.  $\Delta$  versus  $L$  (urgent, next ET Symposium will be devoted to that)
- Approach to update notably civil engineering with or without the involvement of engineering parties
- Bidbook approach

ET-PP INFRADEV kick-off Meeting – Barcelona 19-20 July 2022

# SPB-ISB Interactions



- Sept. 19<sup>th</sup> : preliminary call SPB-ISB (organized by L. Naticchioni)
  - ❑ WD1 Div. Chairs, ISB Div. Chairs (Active Noise Mit., Interferometer, Suspensions)
  - ❑ Update of physical variables to be measured
  - ❑ Common methodology to estimate impact of site characteristics on ET sensitivity
  
- Talk and meeting on Site characterization @ ISB workshop  
17-21 Oct. GSSI L'Aquila <https://indico.ego-gw.it/event/465/>



# SPB-WD1: Physical Variables and Characterization



What we are measuring (or we plan to measure) for site characterization:

- **Seismic background:** broadband seismometers (10mHz-10Hz), geophones, gravimeters (<1Hz);
- **Magnetic noise** (MFS-06 type magnetometers, 0.1mHz-10kHz);
- **Acoustic noise** (B&K-GRAS type microphones, 0.1Hz-20kHz);
- **Barometric fluctuations** (Seismowave MB3a infrasound sensors type, 10mHz-28Hz);
- **Radon outgassing** (possible only in the Sos Enattos mine, Sardinia site) and **natural radioactivity**
- **Weather station** (Davis Vantage Pro2): wind, temperature, pressure, rain...

**Do we miss something important that could affect the detector performances (sensitivity, locking, duty cycle...)?**

e.g.:

Seismic measurements → ISB-SUSP

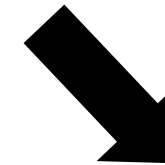
Seismic measurements → NN modelling → ISB-ANM-NN

Seismic measurements → glitchness → ISB-ITF

Magnetic noise measurements → ISB-ANM-MN

Environmental measurements → ISB-ANM-ES

...



ISB-ITF: sensitivity, duty cycle...



# SPB Re-Organization and Timeline review



- Today SPB meeting (Sept 21<sup>st</sup>) devoted to discuss plan and future activities of WD1 (Physical variables and characterization) and WD2 (Geology)

# ET Annual and monthly Meeting



➤ ET monthly meeting: first Tuesday of each month, 2 hours, from 4pm to 6pm

Start	end	duration	Board	Subject	Speaker
16:00	16:10	0:10	EB	Status of ET Experiment	M.Punturo
16:10	16:20	0:10	CB	CB board activities and election of the future CB chair	H.Lueck
16:20	16:35	0:15	ISB	ISB general talk	ISB chair
16:35	16:50	0:15	ISB	ISB specific Talk	
16:50	17:05	0:15	OSB	OSB General talk	OSB chair
17:05	17:20	0:15	OSB	OSB specific talk	
17:20	17:35	0:15	SPB	SPB general talk	SPB chair
17:35	17:50	0:15	SPB	SPB specific talk	
17:50	18:05	0:15	EIB	EIB general talk	EIB chair
18:05	18:20	0:15	EIB	EIB specific talk	

➤ ET Annual Meeting from 15-17 Nov., followed by the ET-PP Sustainability Workshop - EGO