

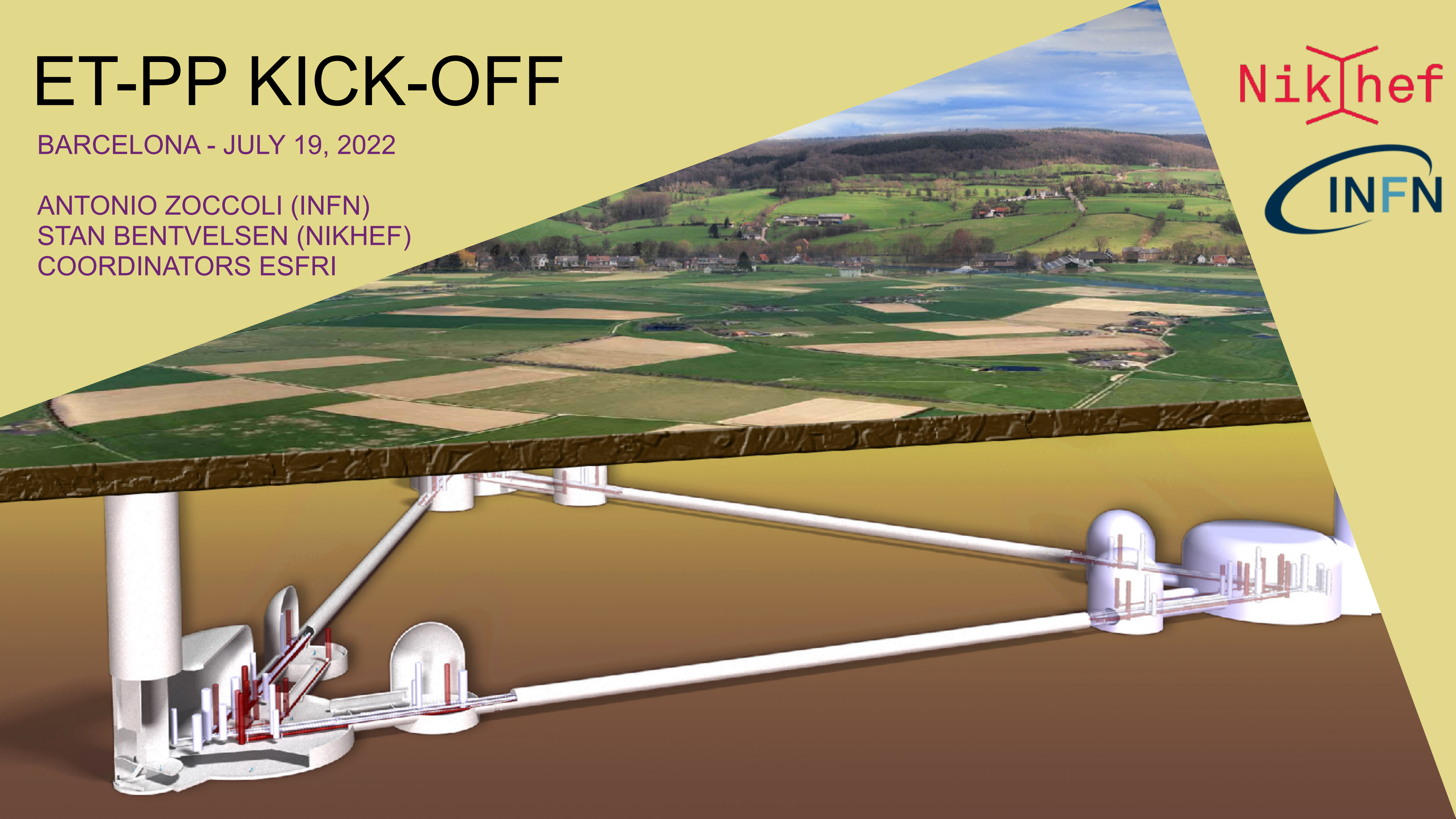
ET-PP KICK-OFF

BARCELONA - JULY 19, 2022

ANTONIO ZOCCOLI (INFN)
STAN BENTVELSEN (NIKHEF)
COORDINATORS ESFRI

Nikhef

INFN



TOWARD THE EINSTEIN TELESCOPE

APPEC: coordination of national research efforts in astroparticle physics

- Consortium of 19 funding agencies, national government institutions, and institutes from 17 European countries - see <https://www.appec.org/>
- Roadmap 2017 - 2026
 - “Strongly supports Europe’s Einstein Telescope (ET) project, in developing the required technology and acquiring ESFRI status”
- Roadmap mid-term update: “Town Meeting” in Berlin, 9 and 10 June 2022



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2020 ESPPU

2020 Update of the European Strategy for Particle Physics


- CERN has taken responsibility for technical coordination and design of one of the most expensive components in 3G observatories: the ultra-high vacuum system for the beam pipes

CERN collaboration with GW community

- MoU Nikhef-INFN-CERN for Einstein Telescope
- CE with support from NSF

ET is now a 'recognized' experiment at CERN



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Synergies with neighbouring fields

A. A variety of research lines at the boundary between particle and nuclear physics require dedicated experiments and facilities. Europe has a vibrant nuclear physics programme at CERN, including the heavy-ion programme, and at other European facilities. In the global context, a new electron-ion collider, EIC, is foreseen in the United States to study the partonic structure of the proton and nuclei, in which there is interest among European researchers. **Europe should maintain its capability to perform innovative experiments at the boundary between particle and nuclear physics, and CERN should continue to coordinate with NuPECC on topics of mutual interest.**

B. Astroparticle physics, coordinated by APPEC in Europe, also addresses questions about the fundamental physics of particles and their interactions. The groundbreaking discovery of gravitational waves has occurred since the last Strategy update, and this has contributed to burgeoning multi-messenger observations of the universe. **Synergies between particle and astroparticle physics should be strengthened through scientific exchanges and technological cooperation in areas of common interest and mutual benefit.**

ESFRI AND EINSTEIN TELESCOPE

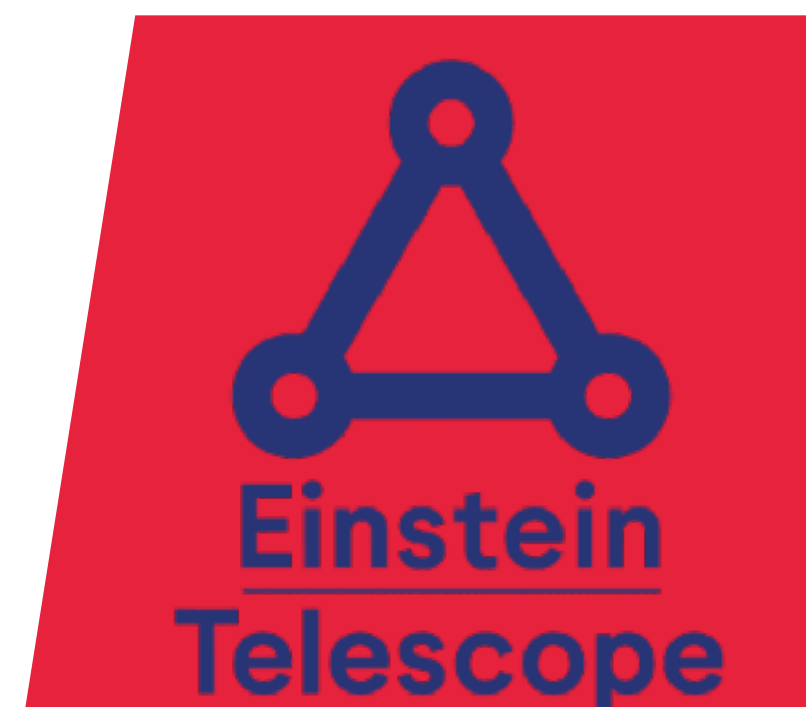
The European Strategy Forum on Research Infrastructures (ESFRI)

- Key role in policy-making on Research Infrastructures in Europe.
- See <https://www.esfri.eu/>

Einstein Telescope appeared on the 2021 ESFRI Roadmap

- Composed of 36 EU countries and countries associated with Horizon 2020.
- On December 7th, 2021, ESFRI presented the 2021 ESFRI Roadmap on Large Scale Research Infrastructures; see <https://roadmap2021.esfri.eu/>

“The Einstein Telescope (ET) responds to the desire from a broad scientific community to observe signals from across the cosmos to understand the very origins of our Universe. Despite their success, in terms of distances explored, the current reach of 2G observatories such as LIGO and Virgo is limited to a region that, on cosmological scales, is still our local neighbourhood, leaving much of the curiosity of scientists unquenched”



EINSTEIN TELESCOPE - ESFRI

ESFRI proposal

- Submitted by: *Italy, Belgium, Netherlands, Poland and Spain*
- Project and collaboration also include agencies and institutions belonging to *Austria, France, Germany, Hungary, Switzerland and UK*

Coordination

- Consortium (currently) coordinated by INFN and Nikhef

Funds

- Preparatory funds available in some countries (IT, NL, ...)
- EU INFRA-DEV proposal approved with a grant of 3.45 M€
- EU INFRA-TECH proposal just submitted

Site candidates

- Studies ongoing in Sardinia in Italy, B-G-NL border region, and Saxony



FOUNDATION ET COLLABORATION

XII ET Symposium in Budapest, Hungary

- Marks the official birth of the ET collaboration

A large collaborative initiative

- More than 400 scientists, out of more than 1200 members of the Collaboration, participated in the meeting in person or remotely.
- Status of the experiment, the technical challenges, the scientific case, and the scientific and technical progresses made by the ET boards.
- The ET Project Directorate presented the perspective of the funding agencies.
- Introduction of INFRA-DEV and INFRA-TECH

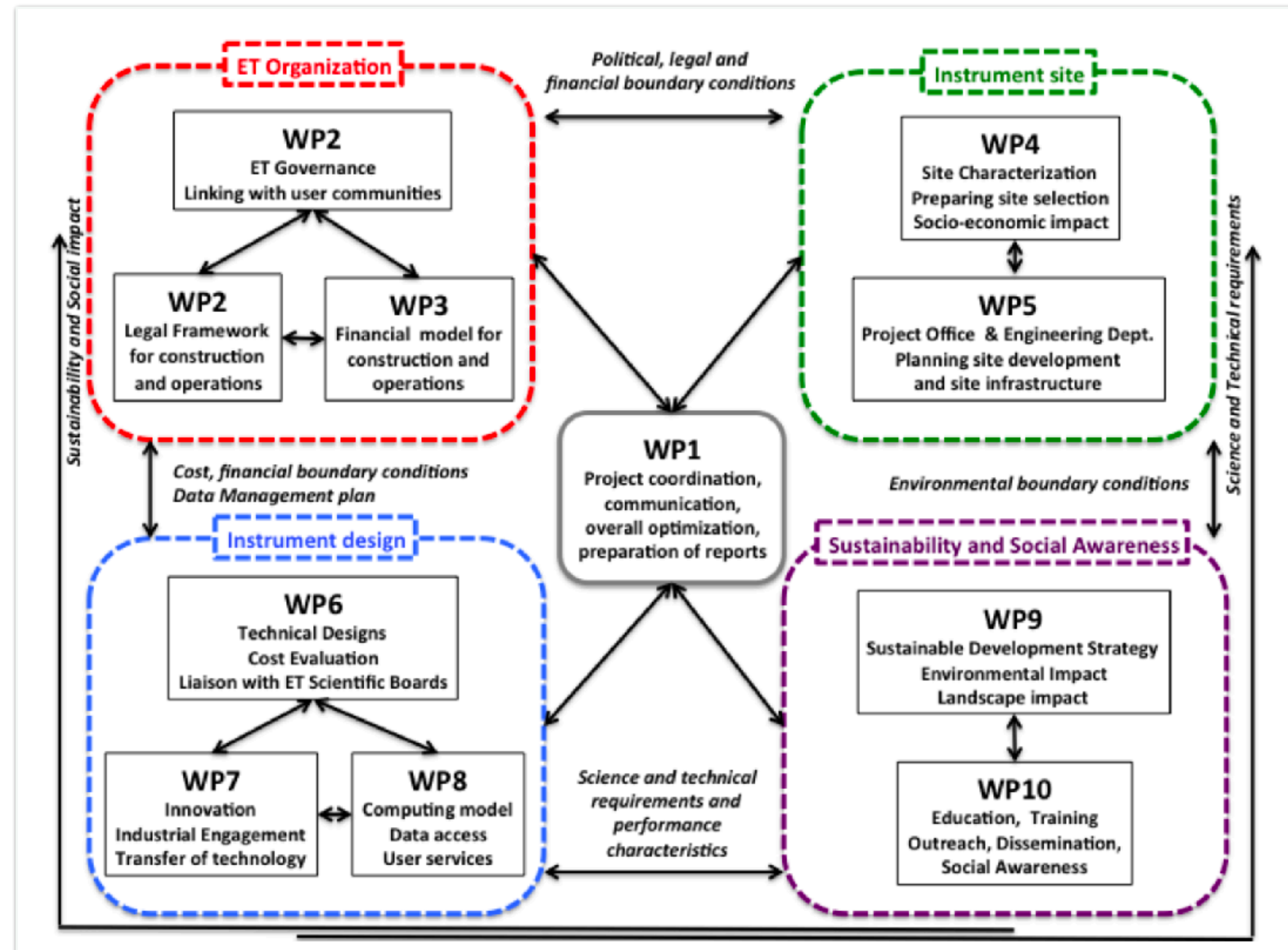


INFRADEV: ET-PREPARATORY PHASE

New phase of the ET: from concept to a real project!

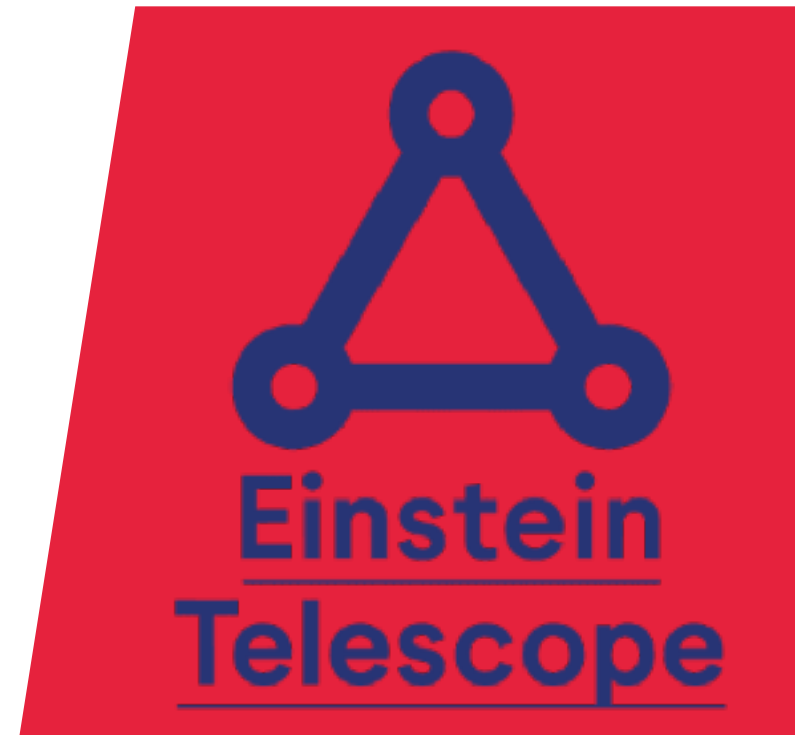
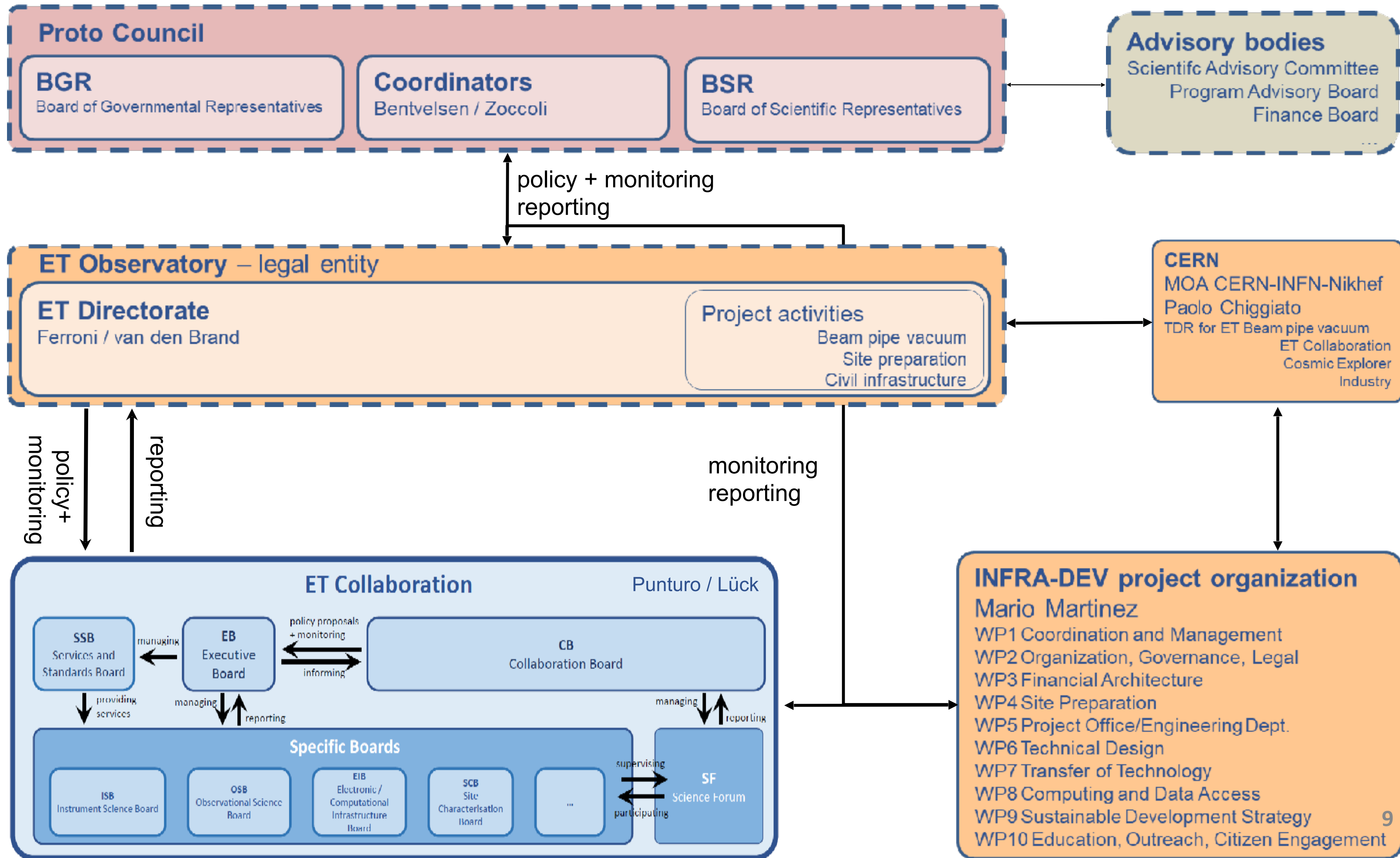
Many new challenges

- ET governance
 - Legal framework
- Site characterisation
 - Project Office & engineering
- Technical design
 - Innovation, computing
- Environmental impact
 - Sustainability, outreach



GOVERNANCE - IN EVOLUTION

Solid boxes: instantiated
Dashed boxes: work in progress

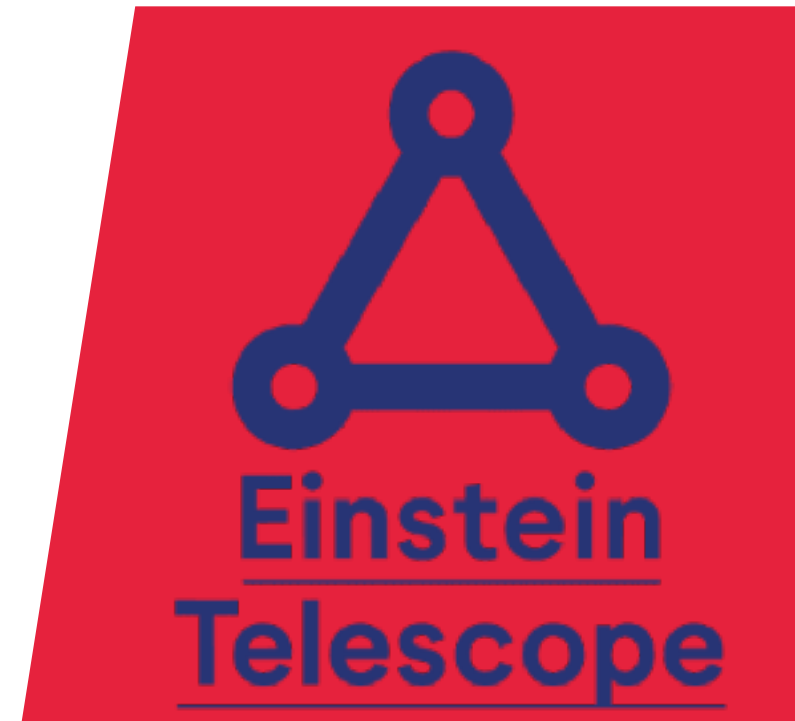
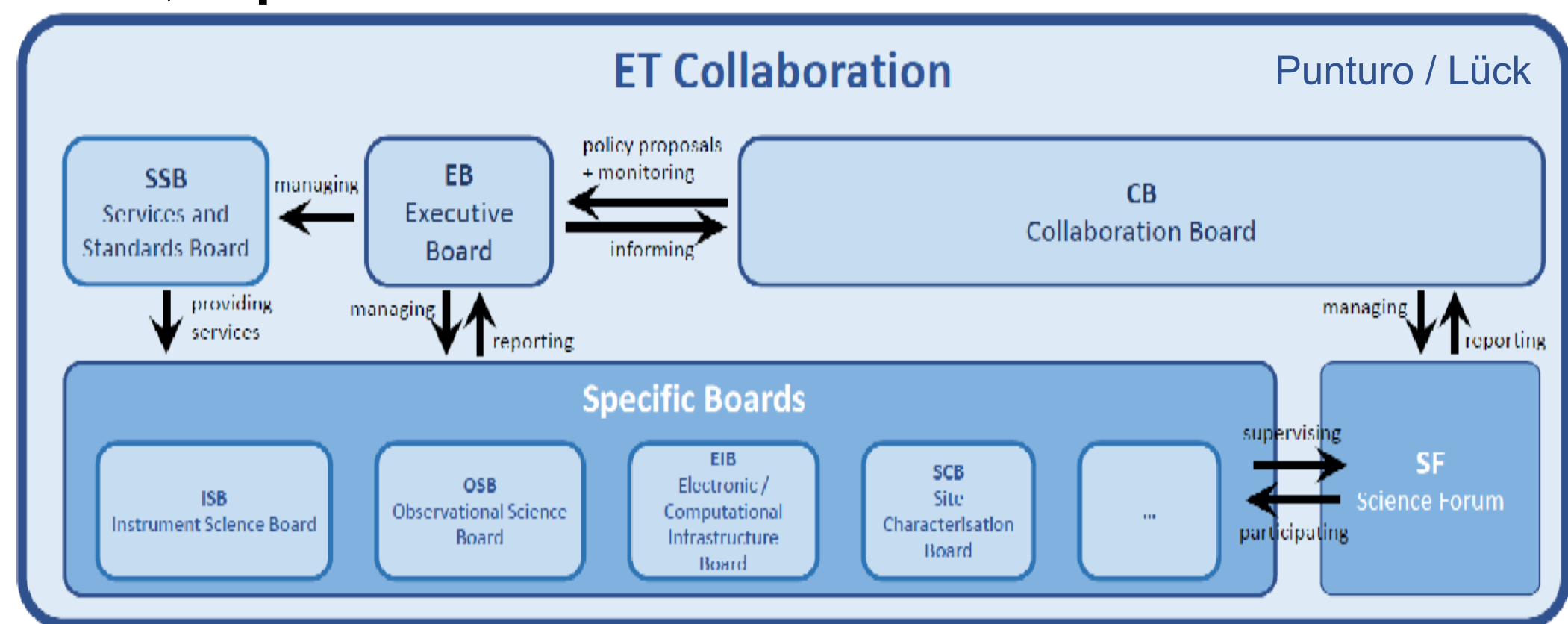


GOVERNANCE - IN EVOLUTION

Solid boxes: instantiated
Dashed boxes: work in progress



Andreas Freise (Nikhef, VU-Amsterdam)



BOARD OF GOVERNMENTAL REPRESENTATIVES

B/NL/P/S/UK/AU/D/IT/CH

BGR: Governmental representation for the ET

- Established as strategic forum to discuss the realization of ET
 - Perspective from ministerial delegates
- Terms of Reference:
 - Discuss and approve the documents for the setting up the legal entity
 - Aim to reach consensus on:
 - the procedure to select the host country for the ET (bidbook)
 - the legal model, governance structure and founding documents;
 - the financial plan and the draft internal financial rules;
 - policy papers
 - ...
- Valid until other interim or final ET governance boards are set up
- Secretariat: Job de Kleuver
 - Communication via ESFRI coordinators.

BOARD OF SCIENTIFIC REPRESENTATIVES

Board of Scientific Representatives (BSR)

- Established as forum to advice the ESFRI coordinators, and the BGR
 - Perspective from national science representatives
 - Representation of funding agencies (?)
- Scope of the BSR
 - Establish the Terms of Reference - a topic for the BSR later today
 - Reflect and discuss e.g. monitoring, initiatives, strategies, plans, ...
 - Commitments in pre-construction phase
 - E.g. financial commitments for the CERN activities on vacuum
- Valid until other interim or final ET governance boards are set up
 - Toward the 'scientific delegates of the proto-council'

ETIC – ET INFRASTRUCTURE CONSORTIUM

Next Generation EU investment proposed of 100 M€ focused on ET enabling technology and Sardinian site candidature support

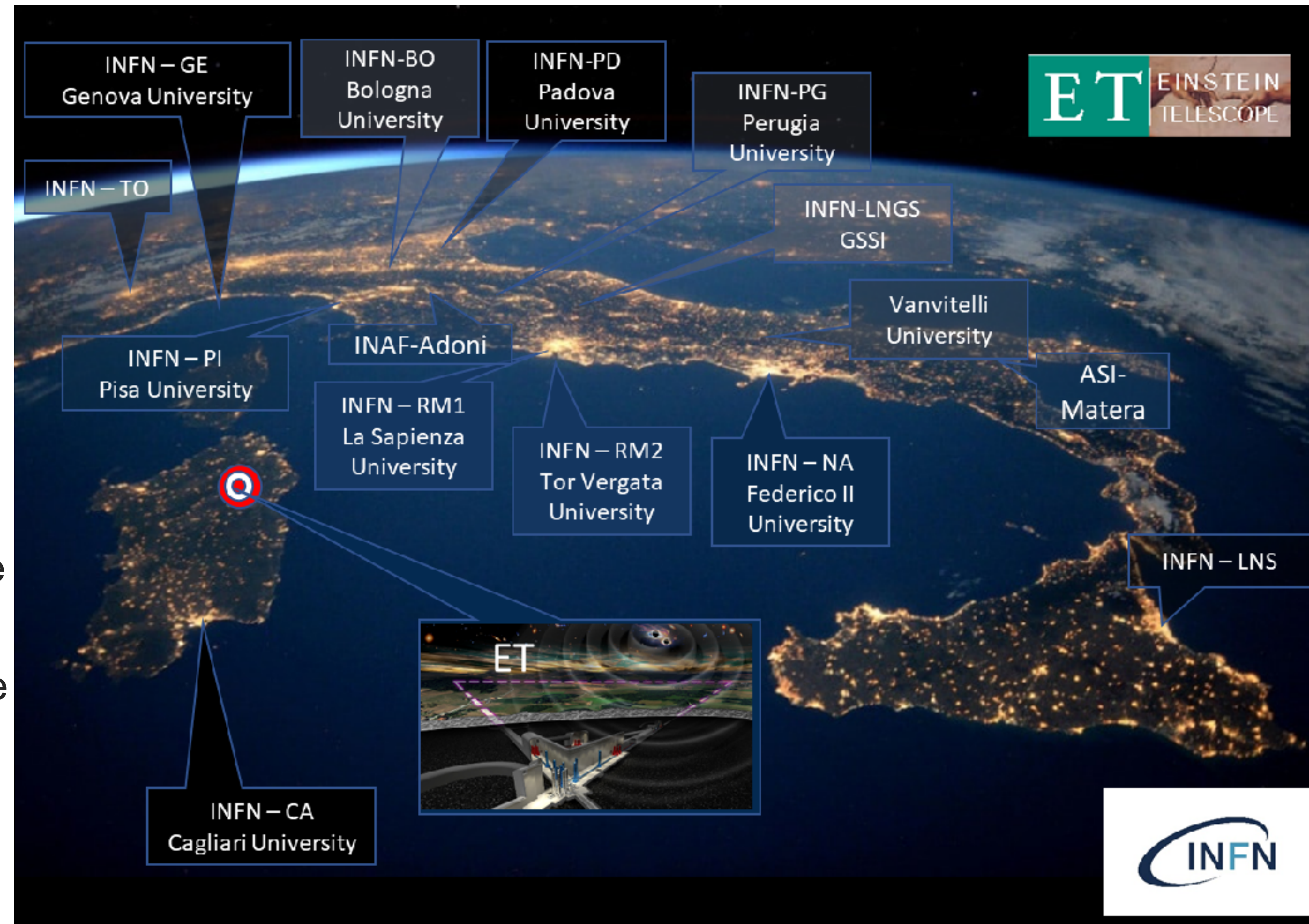
Support for

- 8% Human resources
- 30% Scientific apparatuses
- 12% Distributed infrastructures
- 28% ET design
- 12% Training

Additional 5 M€ funding on the same framework for the site characterization

Feedback expected in June 2022

Discussion ongoing on an Italian share toward ET realization



ET IN EUREGIO MEUSE-RHINE (EMR)

Dutch National Growth Fund for ET

- 42 ME (conditionally) awarded now
 - 19 ME: connections to industry for research and innovation: 'the aim of this programme is to optimally position [...] in particular Dutch industry, for R&D and orders related to Einstein Telescope'
 - 23 ME: 'for the preparation toward the realisation of the underground infrastructure [...]', project organisation and management
- 870 ME have been reserved for the construction of the ET infrastructure
 - If the EMR site is selected as the location for ET



INFRADEV: ET-PP

Einstein Telescope is an European project

- ET needs commitment from all partners and from all countries to make it a success!



Together, lets bring realism to the Einstein Telescope

- After many years of preparations, with ET-PP lets make a start toward its realisation!

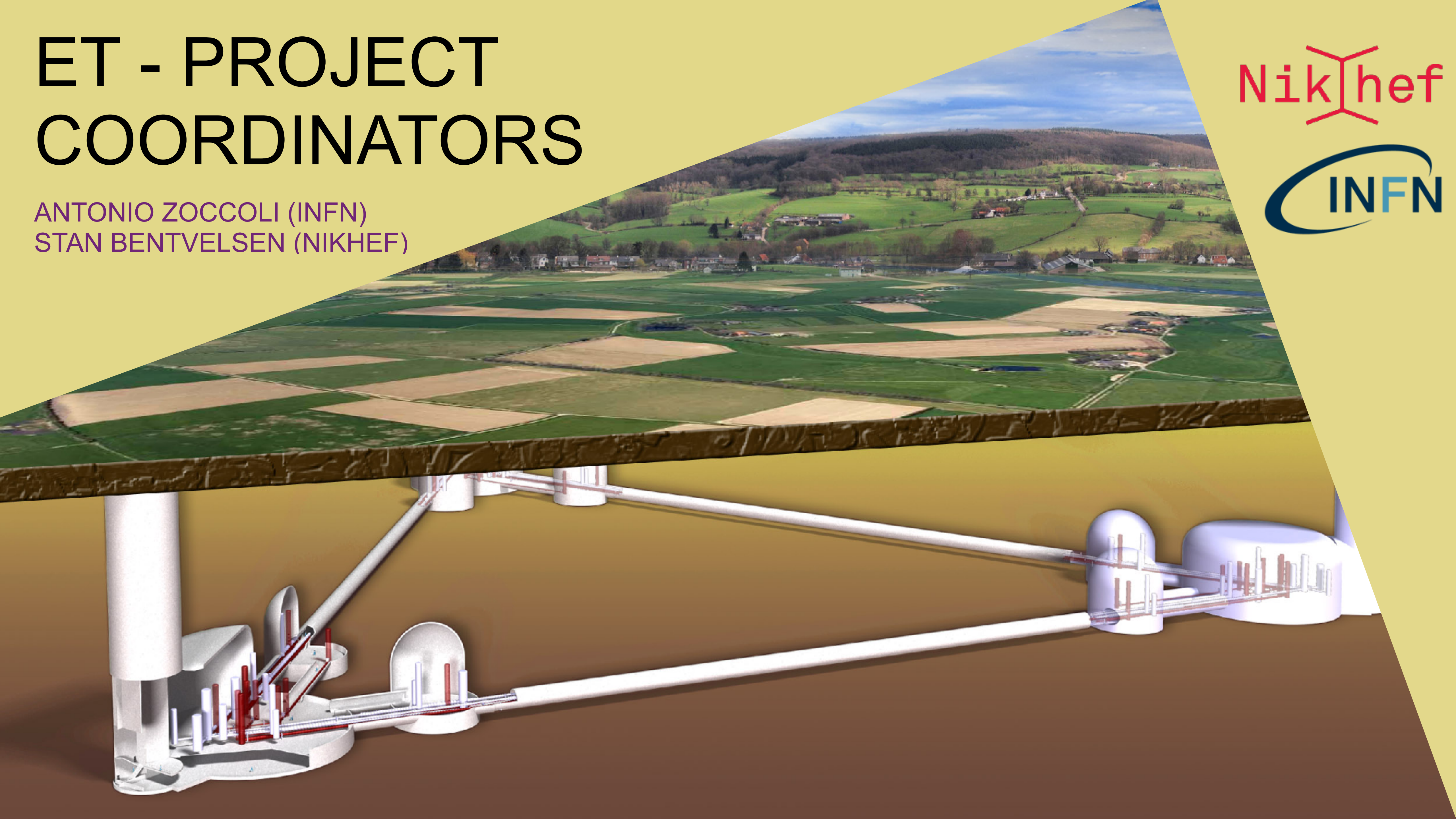
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ET - PROJECT COORDINATORS

ANTONIO ZOCCOLI (INFN)
STAN BENTVELSEN (NIKHEF)

Nikhef

INFN



GRAVITATIONAL WAVES

Large world-wide intellectual activity to understand gravity

- Theoretical: combining GR + QFT, cosmology, ...
- Experimental: astronomy (CMB,..), particle physics (LHC), DM searches (Xenon1T), ...

Gravitational waves entered the scene with high impact

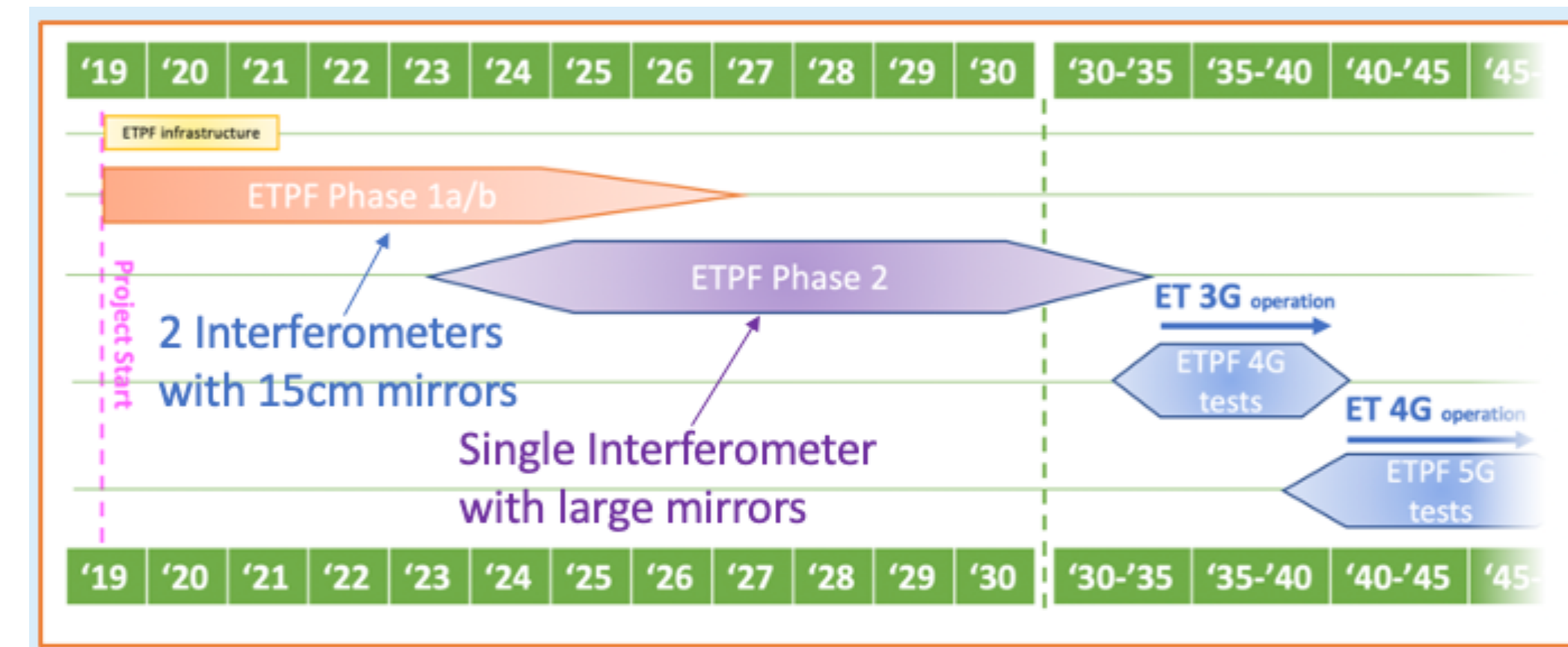
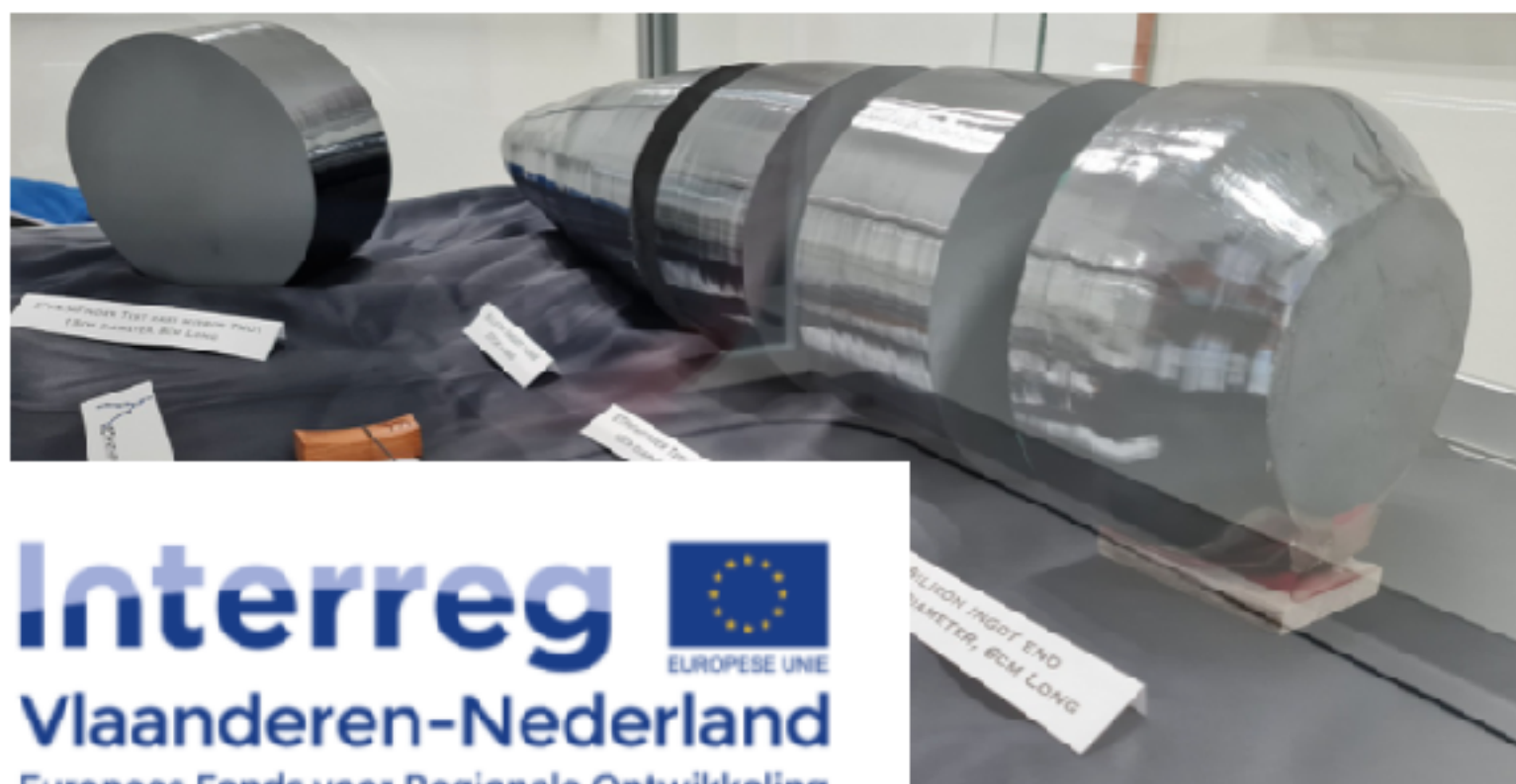
- Ideal information carrier; weak signals, so big detectors
- The entire Universe has been transparent for GWs, back to the Big Bang
- Fundamental physics, Cosmology, Astronomy & astrophysics

***The importance of GW research
has reached funding agencies***

ETPATHFINDER

ETpathfinder as a new R&D infrastructure - Maastricht (NL)

- testing innovative concepts and technologies for future gravitational wave observatories. Open for everyone interested to join. See <https://www.etpathfinder.eu>
- full interferometer setup for testing 'n+1' technologies
 - silicon mirrors, cryogenics, new wavelengths, coatings,...
- start with 2 FPMI: 120K and 15K
- 20 partners from NL/B/G/FR/SP/UK
- Initial capital funding of 14.5 ME



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BSR

Scope of the BSR

- Advies orgaan aan de BSR
- Members zijn agencies die in principe mogelijkheid hebben om te funden
- Relatie ToR met funding
 - stappen mensen weg van de tafel?
 - dan willen mensen iets te besluiten te hebben