EuPRAXIA Preparatory Phase Project - M4.2 Draft report on legal and financial packages

A.Falone

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Abstract

This report summarizes the work performed by WP.4 in collaboration with WP.1 & WP.3 within the EuPRAXIA Preparatory Phase Project. It outlines the progress made so far in identifying the most suitable legal, financial and organizational model for EuPRAXIA as distributed research infrastructure and sets the upcoming issues to be solved in the next years. It also provides a road-map potentially suitable to drive the overall collaboration to the creation of a new legal entity.

1 Executive summary

This report provides a comprehensive overview of the activities carried out under WP 4 within the EuPRAXIA Preparatory Phase Project and it corresponds to the milestone M4.2 scheduled at M36 and it has to be approved by the EuPRAXIA Collaboration Board first and then by the Board of Financial Sponsors on M40.

The first section introduces EuPRAXIA as a whole, outlining its scientific and technological objectives as well as the roadmap towards full implementation of the research infrastructure. It then turns to financial aspects, presenting a preliminary business and financial model, together with an assessment of the current financial status and an outlook on both the implementation and operational phases. Particular attention is given to the ongoing fundraising efforts, which are already securing substantial resources and thereby enabling progress in the final definition of EuPRAXIA—both from a managerial and organizational perspective, as well as from a scientific and technical point of view—with the goal of consolidating and further increasing the Technology Readiness Level (TRL). The section also includes an estimate of the resources required for implementation at the two sites, along with a tentative evaluation of the expected running costs.

The second section of the report focuses on governance and legal issues. The EuPRAXIA collaboration is currently undergoing a transition from a grant-based project consortium to a self-sustaining legal entity capable of supporting long-term operations. In parallel, the asynchronous sequence of project lifecycle phases—where elements of the preparatory and implementation phases increasingly overlap—highlights the need for a dedicated Memorandum of Understanding (MoU). Such an MoU would provide an interim legal framework to guide and regulate the collaboration throughout the implementation phase, while also laying the groundwork for the formal establishment of the future legal entity. The report therefore discusses in detail the governance structure, the key legal considerations, and the steps required to secure a robust and sustainable organizational model for EuPRAXIA.

2 EuPRAXIA description

EuPRAXIA is a major European initiative dedicated to the development of groundbreaking technology in the field of plasma-based particle accelerators. Its overarching objective is to establish a distributed Research Infrastructure (RI) centered on plasma acceleration, enabling a broad community of users to access cutting-edge scientific instrumentation for conducting high-level experimental research. With a strong emphasis on innovation, EuPRAXIA aspires to play a pivotal role in coordinating research and development efforts across Europe in the field of plasma-based acceleration. The initiative aims to become the leading reference body for plasma accelerator and laser technology, fostering collaboration among research institutions, industry partners, and policymakers. The foundation of EuPRAXIA's scientific vision was laid out in the *Conceptual Design Report (CDR)*, published in 2019 and funded by the H2020 program. This extensive study identified seven flagship projects in which plasma-based accelerators could be successfully implemented in the coming years, demonstrating the transformative potential of this technology in advancing scientific discovery and innovation. The whole implementation plan is divided in two phases, Phase I covers the realization of a FEL and a Betatrone Radiation Source which are considered the baseline for the ESFRI Roadmap implementation plan.

- **Flagship 1 - Free Electron Laser**. EuPRAXIA will deliver free-electron laser (FEL) X rays with 10^9-10^{13} photons per pulse to user areas, covering wavelengths of 4nm and 180 nm (Phase I) and for a subsequent phase II down to 0.4 nm through different beamlines. The EuPRAXIA FEL pulses are naturally short (down to 0.4 fs) and will therefore provide users with tools for investigating processes and structures in ultra-fast photon science at a reduced facility foot print.

- **Flagship 2 - Betatron Radiation Source**. EuPRAXIA will deliver betatron X rays with about 10^{10} photons per pulse, up to 100 Hz repetition rate and an energy of 5-18 keV to users from the medical area. The much reduced longitudinal length of the X ray emission area (point-like emission) leads to an important improvement in image resolution compared to other techniques.

- **Flagship 3 - Positron Beams**. EuPRAXIA will deliver positron beams at energies from 0.5 MeV to 10 MeV and a repetition rate of 100 Hz for material science studies. Per pulse about 10^6 positrons will be produced in a time duration of 20-90 picoseconds on the sample, allowing time-resolved studies. EuPRAXIA will here advance the capabilities of existing positron sources in flux and time resolution.

- **Flagship 4 - e+ / e- beams**.EuPRAXIA will deliver electron and positron beams at energies from a few 100 MeV up to 5 GeV for high energy physics related R&D (detectors, linear collider topics). R&D goals include the demonstration of a linear collider stage, a "table top" HEP test beam and studies on positron transport and acceleration towards a linear collider.

- **Flagship 5 - Inverse Compton Scattering γ beams**. EuPRAXIA will deliver photons from an inverse Compton scattering (ICS) source. The photons of up to 600 MeV and with narrow-band spectrum will enable precision nuclear physics and highly penetrative radiography for users

- **Flagship 6 - High Repetition Rate Laser**.EuPRAXIA will provide access to a multi-stage, high-repetition rate plasma accelerator in the GeV range to users from accelerator science. This R&D platform will allow the testing of novel ideas and concepts, full optimisation of a plasma collider stage, certain fixed target experiments (also in combination with lasers) and performance studies of conventional versus novel accelerator technology.

- **Flagship 7 - Laser Technology**. EuPRAXIA will provide access to cutting edge laser technology with short pulse length in combination with high energy photon pulses and short electron/positron bunches. Novel schemes of pump probe configurations and ultra-precise timing will be researched, feeding back into laser science.

In order to implement the above mentioned flagships a substantial R&D work is needed and supported at various level both from EU grants and in-kind contribution. The EuPRAXIA project envisions a distributed European user facility offering open access to advanced plasma-based accelerators and beamlines. Beyond serving the scientific community, it acts as a hub for innovation, fostering collaboration between academia, industry, and technology developers. A key feature is its commitment to open innovation, driving the joint development and application of next-generation accelerator concepts.

2.1 EuPRAXIA Structure

EuPRAXIA emerged as a collaborative initiative across Europe and it is an intrinsic distributed research infrastructure which profits of the vast range of institutions, laboratories, universities and industries involved in plasma technology, laser, linear accelerator and photon science. This bottom up approach led to a large collaboration which evolved during the years keeping a core of institutes always engaged. The present technology suggests two different and complementary approaches for a full deployment of the plasma based accelerator namely:

- Beam Driven
- Laser Driven

Without delving into the scientific and technical details, this differentiation naturally led to the definition of the EuPRAXIA infrastructure based on two key **Implementation Pillars**, each hosted by institutions with expertise in their respective domains. The first organizational layer is therefore represented by these Implementation Pillars, which will be hosted by INFN-LNF (Frascati, Italy) and ELI-ERIC (Prague, Czech Republic).

Given the collaborative nature of the initiative, achieving the necessary technological maturity for EuPRAXIA is not feasible without the contributions of a broad network of institutions, universities, and industrial partners that are part of the collaboration. To ensure effective coordination and strategic guidance, each participating country is represented by a **National Node**—a leading research institution in the respective field—forming the second layer of the organizational model. The National Nodes are supported by various institutes within the same or different country, each responsible for specific tasks essential to the project's success. These institutes form the **Project Clusters**, which represent the third layer of the EuPRAXIA organizational model, ensuring a structured and efficient approach to research, development, and implementation. A sketch of the overall structure and its geographical distribution are presented in Figg.1 and 2.

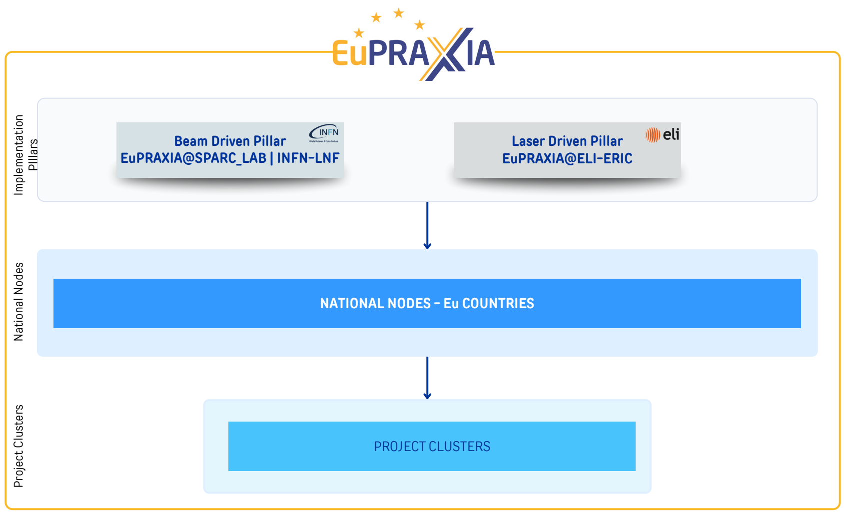

Figure 1: EuPRAXIA Architecture

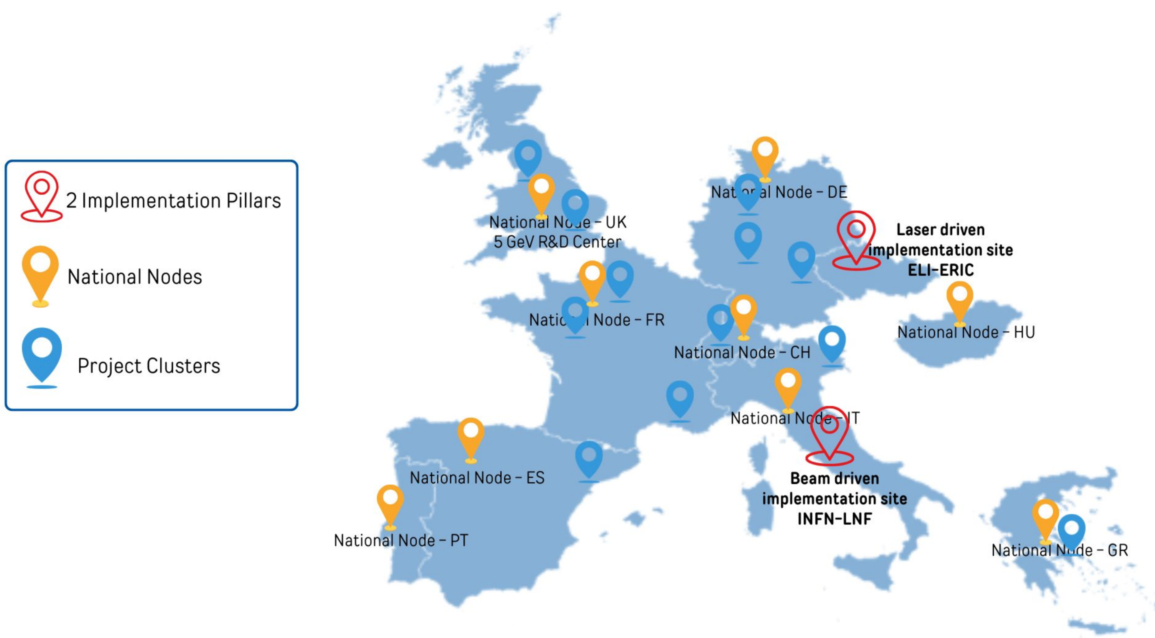

Figure 2: EuPRAXIA implementation pillar, national nodes and project clusters - Tentative

This multi-stakeholder scenario balancing the collective interests with respect to individual interests requires a multi-faceted management approach. The governance of the future RI has to resemble the overall architecture taking into account a fair representation of the scientific community while emphasizing the role of the Implementation Pillars and the National Nodes. This aspect will be considered in the next section.

3 Roadmap & lifecycle

The usual lifecycle of a RI as elaborated by ESFRI is sketched in Fig.3.It is important to note that the seamless succession of different phases represents an abstraction. In practice, some degree of overlap is inevitable. In the case of EuPRAXIA, the implementation phase partially overlaps with the preparatory phase, requiring a dual governance framework and an appropriate funding model. This overlap is reflected in the high-level timeline, developed since the ESFRI Roadmap application and presented in Fig. 4.

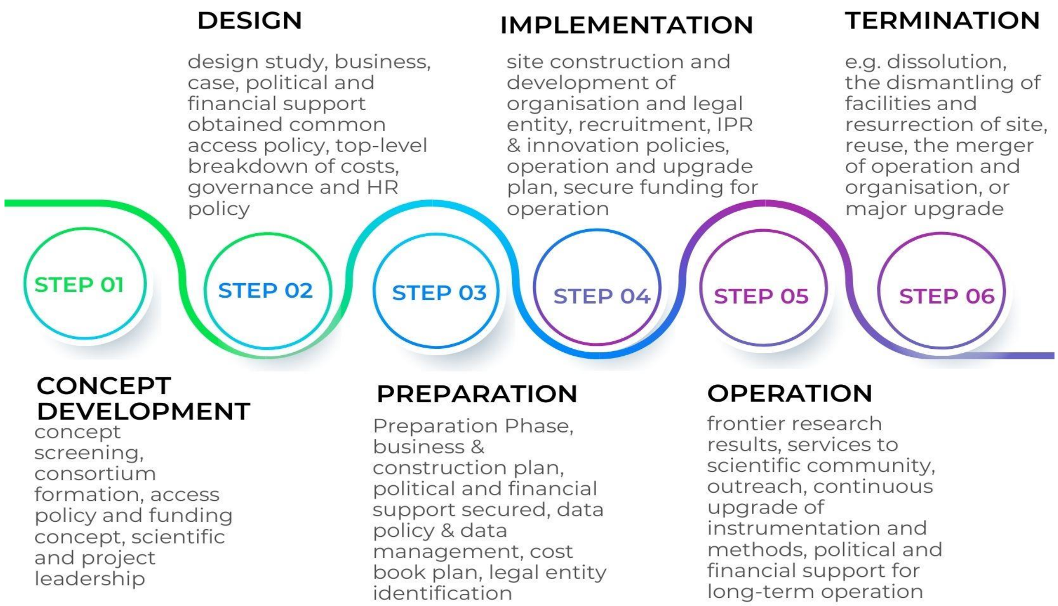

Figure 3: RI Lifecycle approach in the ESFRI Context

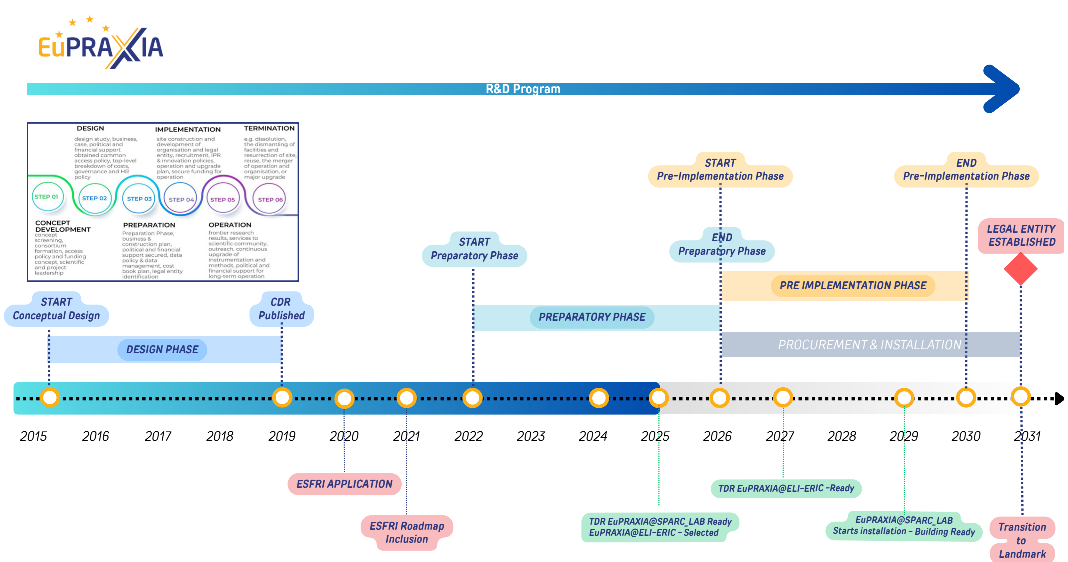

Figure 4: EuPRAXIA Time plan

It is important to highlight that the main constraint imposed by ESFRI is the transition to landmark within 10 years from the inclusion in the roadmap. This means that the facility should be in the operational phase by 2031 with at least a pilot user by that date. This scheduled is constrained by several dependencies and critical milestones to be achieved. First of all the building construction at INFN-LNF that will host the beam driven pillar. It is a massive investment for the lab that requires a large and well structured tender plus all the tenders for the construction of the Linac and ancillary equipments. The procurement and installation phase at INFN will go in parallel with the building construction and the first installation is scheduled to the second half of 2029. At the same time ELI-ERIC has established a clear roadmap to the finalization of a technical design report to be approved in 2027, while the implementation phase will start afterwards. ELI-ERIC will profit of a remarkable amount of IKC and the re-use of existing hardware and infrastructure. Each phase within the life-cycle of the project requires a dedicated governance and financial model as it will be presented in the next sections. The final milestones namely *Transition to Landmark* refers to the start of the operational phase (user access) and the establishment of the new legal entity and it is marked in correspondence to the end of the ESFRI Roadmap (2031). So far no significant delays have been identified. EuPRAXIA collaboration is moving forward according with the ESFRI timeline although several issues still need to be resolved.

4 Business and financial model

The successful implementation and long-term operation of EuPRAXIA necessitate a substantial allocation of financial, human, and technological resources. These resources must be carefully planned, effectively managed, and reliably secured to ensure the sustainability and growth of the research infrastructure. Given the scale and complexity of the initiative, developing a robust financial model and a well-structured business plan is essential. These two strategic tools play a crucial role in establishing credibility and demonstrating the feasibility of the project to funding agencies, policymakers, and key stakeholders. A comprehensive financial model allows for accurate forecasting of costs, revenue streams, and investment needs, ensuring that the project remains economically viable over time. Similarly, a well-defined business plan outlines the operational framework, governance structure, and potential funding mechanisms, providing a clear roadmap for achieving long-term sustainability. By integrating these financial and strategic planning tools, EuPRAXIA can strengthen its position within the European research landscape, attract investment, and secure the necessary support to drive innovation in plasma-based accelerator technology.

4.1 Business model

The business model for a research infrastructure (and especially in the PSE domain) differs significantly from a private company for obvious reasons. However having a clear idea on the resource flow, the key partner and key user helps in defining the overall functioning features that the RI should have. One of the most used tool to identify the business model is the so-called *Business Model Canva*. The Business Model Canvas (BMC) is a strategic tool used to visually define, analyze, and optimize a business model. It consists of nine key building blocks, which together outline how an organization creates, delivers, and captures value. The BMC provides a clear and concise overview of an organization's business strategy, making it a valuable tool for decision-making, innovation, and strategic planning. The overall BMC is structured around the concept of **Value Proposition** which describe the unique benefit and solution that the organization offers. A graphical description of the BMC is sketched in fig.5.

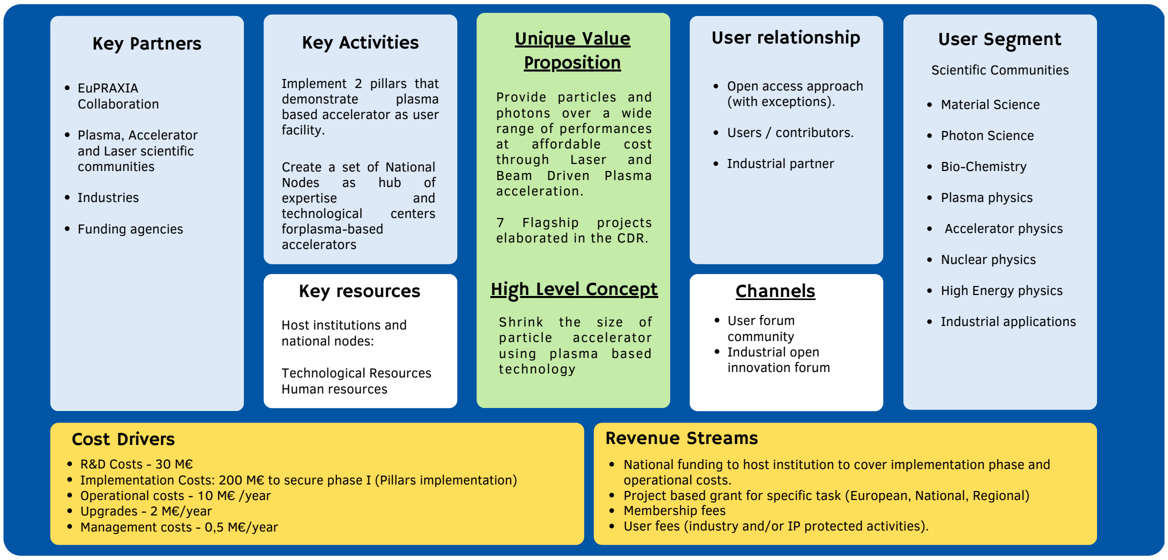

Figure 5: Business Model Canva

The *Value Proposition* is comprehensively explained in the Conceptual Design Report, and it consists in proving the technological feasibility of plasma acceleration in order to design, build and operate more compact, cheaper and energy savings particle accelerator. It is interesting to highlight the correlation between the key partners and the key users. There's a certain degree of overlapping between the two categories, which means that the main supplier can also be user, especially in the academic and research institutions. EuPRAXIA concept is essentially based as a demonstrator and hub for development of new technology in the plasma accelerator community, therefore a fraction of the beamtime will be devoted to internal development being compatible with the external user model. Also the open science / open access approach plays an important role in defining the business model. No fees for experiments will be requested if the result of the research will be open access. Exception will be made to industrial user that have a different strategy concerning IP rights. The BMC model also highlights the main cost drivers. The implementation phase is expensive and the operational costs can be significant as well. This means that a full commitment from key stakeholders must be secured since the inception of the implementation phase. One of the key elements that must be reinforced is the user-base consolidation. EuPRAXIA as innovative project may unlock still unexplored application, but it is imperative to consolidate the already vast existing user base. The BMC helps in defining the financial model and resource stream across the organization and how the resources can serve both users and key partner.

4.2 Financial model

The financial model of EuPRAXIA largely is structured according the lifecycle of the project with a substantial in-kind contribution. The typical project lifecycle of an ESFRI project is sketched in fig.3. For each phase a predominant financial model emerges. The design and preparatory phase has been substantially funded by European grants (Horizon 2020, Horizon Europe and the upcoming FP10 framework program), providing a remarkable amount of resources to the collaboration. In addition matching funds from countries not participating in the EU framework program (UK and CH) contributed and supported the participation of associated partner of the collaboration. In the implementation phase national funding agencies play a crucial role in providing the required resources.

Financial resources can come from national funding agencies as cash contribution (especially from the countries hosting the implementation site) and through the national nodes for IKC. Also in this phase European grants might be used. In the operational phase the management cost for running the EuPRAXIA legal entity shall be covered by the membership fees of the member institutes. The running cost of the implementation sites will be covered (at least in large part) by the corresponding host institutions. An overall sketch of the emergent funding model for each phase is represented in Figg. 6, 7 and 8.

4.2.1 Design & Preparatory Phase

The design and preparatory phase along with the necessary R&D and training program are essentially funded by EU Grants with own in-kind contribution that each partner allocate accordingly (mainly manpower or matching funds). Those resources distributed among the EuPRAXIA beneficiaries through dedicated grant agreement (see Fig.6).

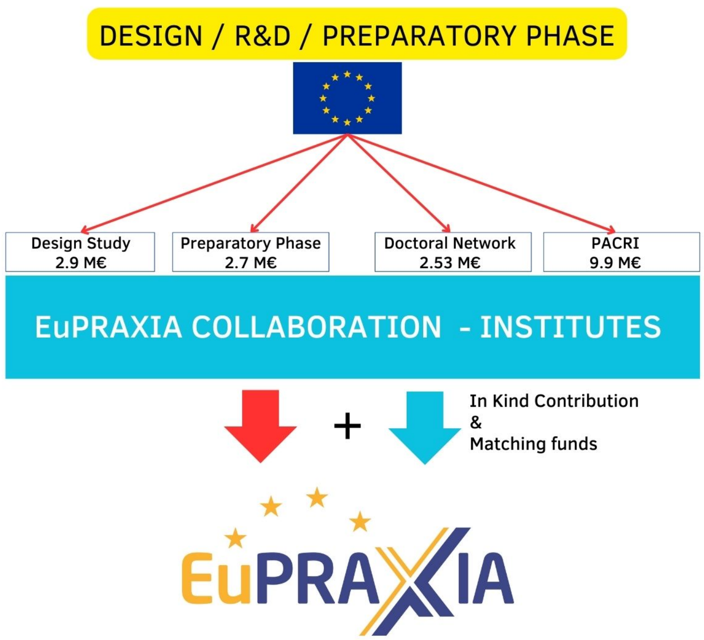

Figure 6: Financial Model Design Phase

4.2.2 Implementation Phase

The implementation of the two pillars is resource demanding (see section5.2 for a detailed breakdown). Resources are generally coming from National Funding lines and managed by national funding agencies. Implementation pillars host institutions put a remarkable amount of own in-kind in terms of manpower, existing infrastructure, laboratories and R&D programs to support the implementation itself. A possible additional source of funding might come from in-kind contribution from third party. Although this is a scenario that has to be considered for a complete implementation of the sites, it is still premature to make any projection. A tentative graphic representation is shown in Fig.7.

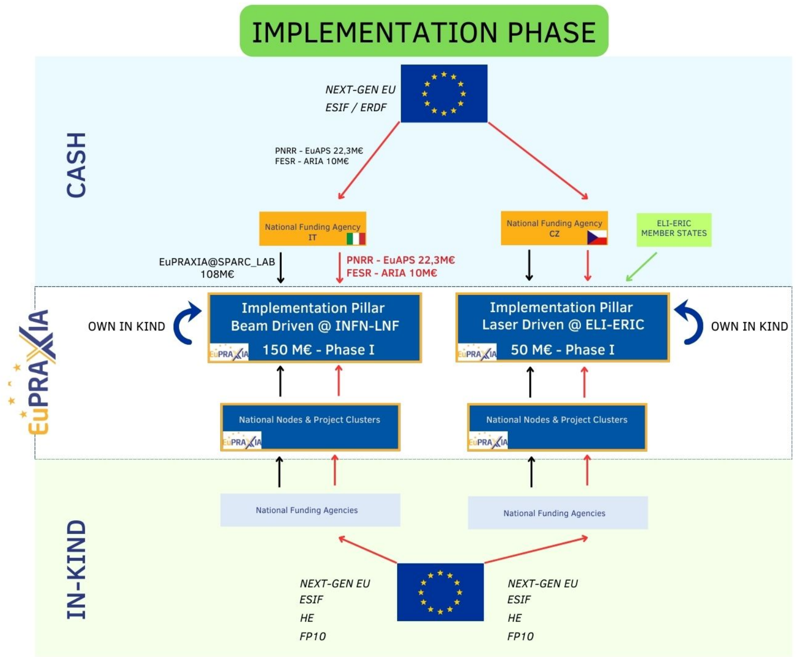

Figure 7: Financial Model Implementation Phase

4.2.3 Operational Phase

The funding model of the operational phase relies on the commitment of the host institution to cover the running cost of the infrastructure while they retain the ownership of the assets. In addition to that the running cost of the future legal entity has to be considered: it will be covered by the member institutions through membership fee mechanism as shown in Fig.8.

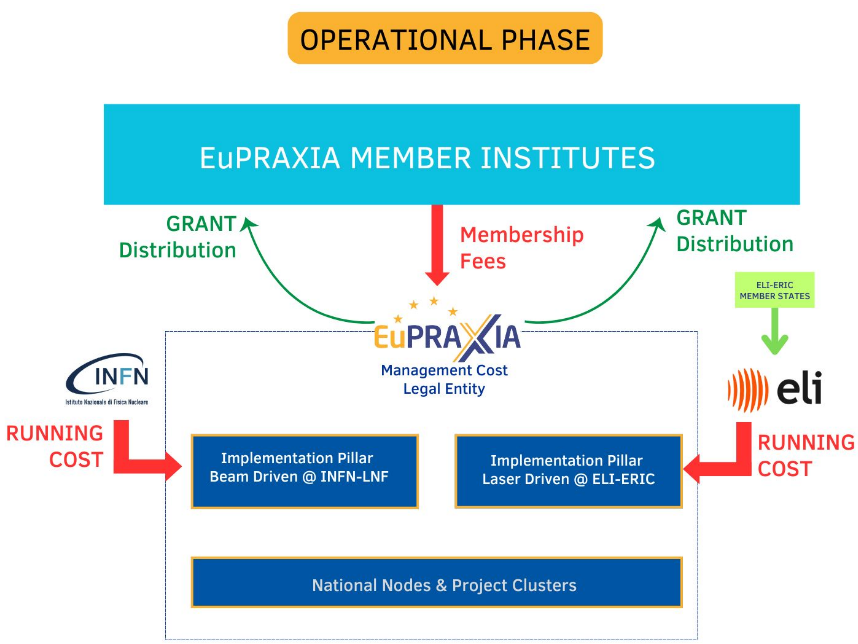

Figure 8: Financial Model Operational Phase

5 Financial status and perspective

The funding model of EuPRAXIA is closely aligned with its lifecycle phases and evolves accordingly as described in the previous chapter. Overall, it relies on a combination of European Union grants and national funding instruments, with a significant share linked to the European Regional Development Fund (ERDF) and complementary national co-financing schemes. This section reports on the financial status of the project and provides an outlook on the upcoming implementation and operational phase.

5.1 Current status

So far EuPRAXIA has shown a remarkable funding attractiveness being able to raise up to 130M€ approximately cash contribution mainly from Italy. The funding sources are mainly EU grants (13%) and National Funding (87%). Eu Grants are mainly allocated for design, R&D, preparatory phase and training, while the national funding are mainly allocated for the implementation as it can be depicted from Fig.9, Tab 1 shows the actual number for each different phase.

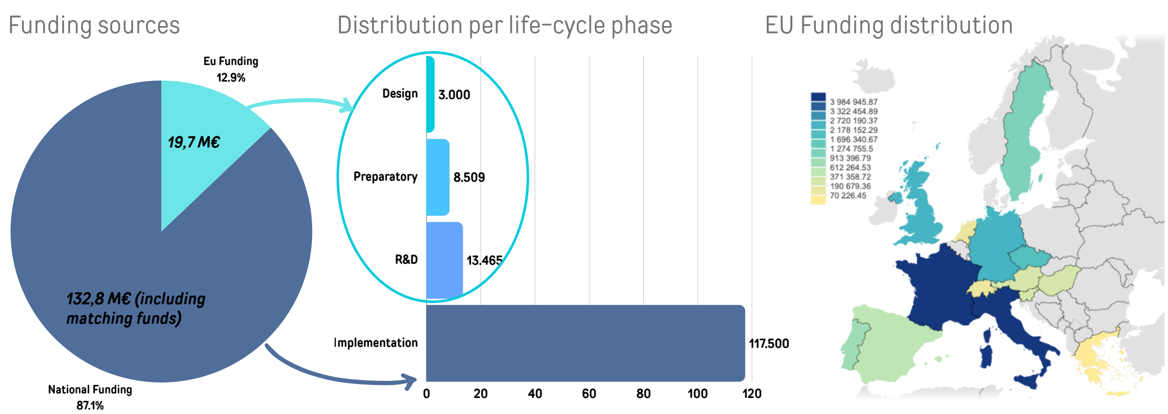

Figure 9: EuPRAXIA funding stats

Project Phase	Tot. Funds [EUR]	%
Design	2.999.900	2 %
Preparatory	8.508.799	5,6 %
R&D	13.465.133	8,8 %
Implementation	127.500.000	83,6%
Total	**132.786.880**	100 %

Table 1: Funding allocation by project phase

5.1.1 Eu Grants

The total amount of resources coming from various EU grants is around 19,7 M€ distributed across a large number of institutes and industries in Europe. In Tabs.2 and in Figg.10 the actual distribution is shown. It should be noted that some of these countries are not part of the EuPRAXIA Consortium. Moreover, in certain EU Grants, the United Kingdom (UK) and Switzerland (CH) were outside the Horizon Europe program and participated as associated countries through matching funds provided by their national funding agencies.

Country	Acronym	Funds [EUR]	%
Italy	IT	4.707.663	23,9%
France	FR	4.077.780	20,7%
United Kingdom	UK	2.596.540	13,2%
Germany	DE	2.515.516	12,8%
Czech Republic	CZ	1.924.177	9,8%
Sweden	SE	1.069.143	5,4%
Portugal	PT	893.301	4,5%
CERN	CERN	450.500	2,3%
Spain	ES	426.000	2,2%
Hungary	HU	275.348	1,4%
Austria	AT	270.331	1,4%
Slovenia	SI	242.179	1,2%
Netherlands	NL	138.750	0,7%
Switzerland	CH	79.725	0,4%
Israel	IL	10.000	0,1%
Greece	EL	10.000	0,1%
EUROPE	**TOTAL**	**19.686.953**	**100%**

Table 2: EU Funding distribution across European countries

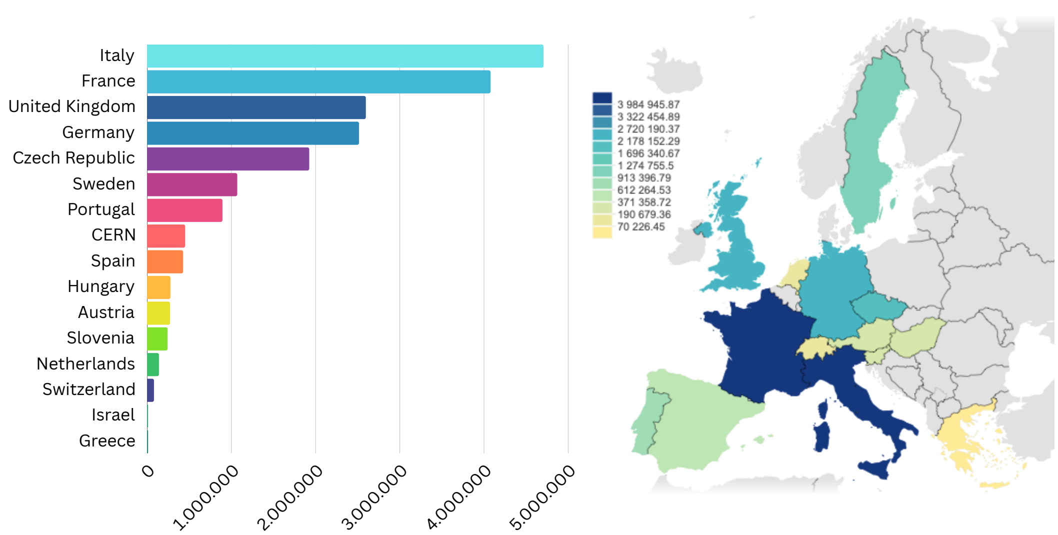

Figure 10: EU Funding distribution

5.1.2 National Contribution

National Funding have been allocated through different funding mechanisms essentially for the implementation phase and as matching funds for Eu Grants for those countries out of the Horizon Europe Program (UK and CH before 2024). Italian contribution is the largest one, a breakdown of the investment so far is presented in Tab.3. The total amount of national funding is largely allocated for the implementation and the rest as matching funds for R&D and preparatory work.

Project	**Funding Line**	**Funds [EUR]**
EuPRAXIA@SPARC_LAB Phase I	MUR	108
EuAPS Betatrone Radiation Source @INFN-LNF	Next-Gen EU	8
EuPRAXIA@SPARC_LAB ARIA Beamline	Reg.Lazio-ERDF	10
ELI-ERIC Inkind contribution	ELI-ERIC	58

Table 3: National Funding allocation

5.2 Outlook for implementation and operational phase

The implementation and subsequent operational phase of EuPRAXIA will inevitably require a significant commitment of resources. As a state-of-the-art research infrastructure, EuPRAXIA relies on highly advanced and inherently resource-intensive technologies. To ensure that the project can evolve towards full maturity and deliver on its ambitious objectives, it is essential that the Research and Development programmes continue to be supported with at least the same level of intensity and investment that has been allocated up to now, if not reinforced further.

5.2.1 Implementation phase

As already presented Implementation will be done in two different host institutions namely INFN-LNF and ELI-ERIC with their associated project (EuPRAXIA@SPARC_Lab and EuPRAXIA@ELI-ERIC). The two projects are at the moment at different stages. EuPRAXIA@SPARC_LAB is at well advanced stage, the technical design report is in the approval phase (final approval is expected at the end of 2025) and assessed by an independent review panel. As presented in the previous section a substantial amount of resources have been already allocated from Italian Minister of Univeristy and Research. The construction of the building is expected to start by mid 2026 and the machine installation is scheduled by second half of 2029. A rigorous cost estimation analysis based on the Technical Design Report has been done, following ESFRI reccomendation and AACE guidelines and assessed by a independent *Cost & Schedule Review Panel*. The same approach is foreseen for EuPRAXIA@ELI-ERIC. A substantial amount of In-Kind Contribution from the host institution is already in place. The IKC from host institution is implemented through different tools:

- Existing infrastructures put at disposal of the R&D necessary for the TDR phase
- Manpower
- Spaces, buildings and related utilities
- Ancillary facilities for test and development.
- Running cost of the existing facilities.

At EuPRAXIA@SPARC_LAB there are several facilities that are functional to EuPRAXIA implementation and serve as tool for technology validation and subsystem testing. **40 FTE** are approximately allocated as INFN own in-kind contribution.

- TEX - X-Band Test Facility
- Plasma_LAB
- SPARC_LAB
- FLAME
- Other laboratories:Magnetic measurements, Vacuum etc.

EuPRAXIA@SPARC_LAB expected cost distribution per functional area is presented in Tab.4.

Item	**Cost [EUR]**	**%**
LINAC	33.761.020	26,3%
FEL & user beamlines	33.645.400	26,2%
Transverse elements	3.940.740	3,1%
Building & utilities	57.000.000	39,7%
TOTAL EuPRAXIA@SPARC_LAB	**128.347.160**	**100%**

Table 4: Estimated BAC for EuPRAXIA@SPARC_LAB from Technical Design Report

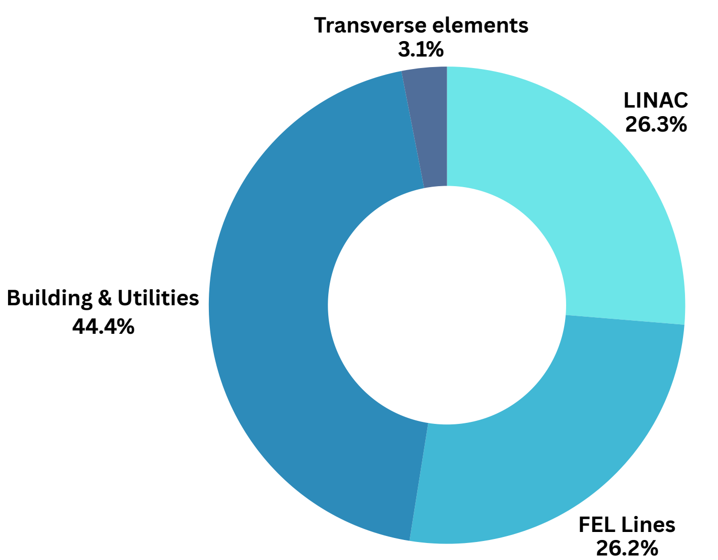

Figure 11: Cost distribution EuPRAXIA@SPARC_LAB

At EuPRAXIA@ELI-ERIC a similar approach is in place. Several facilites are put at disposal to EuPRAXIA for its R&D and implementation namely:

- L2 Laser System
- LE beam transport
- LUIS beam line
- L2 and respective parts of the E5 and E6 halls (with related facilities)
- Respective capacity of the Gammatron beam line with the respective laser driver

Around **20 FTE** are allocated as ELI-ERIC own in-kind contribution. EuPRAXIA@ELI-ERIC is at a less mature stage, being the TDR to be finalized by 2027. At this stage a tentative estimation of the implementation costs have been done in the bid-book and presented in Tab.5.The **Grand Total** considers also the existing infrastructure which has an estimated value of 58M€. A detailed breakdown cost as consequence of the TDR will be performed, similarly as the one done for EuPRAXIA@SPARC_LAB using the same methodology and assessed by an independent cost & schedule review panel.

Cost Category	Cost [MEUR]	Timeline
Estimated IKC Value	**58**	58
New manpower for infrastructure setup	7*	5 years
E5+E6 construction works	2	2.5 years
Technical equipment: safety, control, shielding	4	2 years
L2 DUHA Laser (to achieve 4 J / 100 Hz)	8	4 years
L2 Aux laser beam transport	0.5	
LPA + Electron beam line + Diagnostics	2.5	3 years
Undulator line (dependent on technology)	25	4 years
Photon beam line (+ diagnostics)	5	3 years
Pump-probe setup	2	2 years
Seeding setup	3	2 years
User stations (2) + Sample delivery systems	3	
Positron beamline, including diagnostics	2	2 years
Required cost to complete PHASE 1	**57 + 7***	**5 years**
Grand Total (Existing Infrastructure + Completion)	**115+7***	

Table 5: Estimated BAC for EuPRAXIA@ELI-ERIC from ELI-ERIC Bid book

5.2.2 Operational phase

The operational phase will be under the host institution responsibilities who will maintain ownership of the assets produced during the implementation phase. An estimation of the running cost have been elaborated. Further refinement will be required especially for EuPRAXIA@ELI-ERIC. There are 4 categories of running costs to be considered, final assessment will be performed during the Early Implementation Phase program.

- Running cost EuPRAXIA@SPARC_LAB
- Running cost EuPRAXIA@ELI-ERIC
- Running cost National Nodes

- Running cost Legal Entity

A tentative breakdown is shown in Tab.6, for the moment no indirect costs are considered (no overhead included), this can be quantified as 20% approximately. It is worth to mention that the host institution would commit to cover the running cost of the facilities.

Cost Category	**Cost/year [MEUR]**
Management Cost Legal entity	0,5 (T.b.d.)
Running Cost EuPRAXIA@SPARC_LAB -direct cost-	
Utilities & power consumption	2,5
Maintenance	2
FTE allocated	40
TOTAL COST EuPRAXIA@SPARC_LAB	4,5 + 40 FTE
Running Cost EuPRAXIA@ELI-ERIC -direct cost-	
Utilities & power consumption	0,7
Maintenance	2,8
FTE allocated	35
TOTAL COST EuPRAXIA@ELI-ERIC	3,5 + 35 FTE
Running cost national nodes	To be fully analyzed

Table 6: Estimated annual running cost breakdown

A central objective of the Early Implementation Phase project is to carry out a comprehensive and detailed assessment of the overall running costs associated with each specific category of expenditure. In particular a clear metric to quantify the in-kind contribution has to be developed and in general the costs incurred by each institute towards EuPRAXIA. This effort is aimed not only at quantifying the financial requirements in a transparent and structured manner, but also at laying the groundwork for the definition of a coherent and forward-looking funding strategy. Such a strategy will be essential to ensure the long-term sustainability of the operations as well as to enable the progressive upgrading and continuous development of the distributed research infrastructure.

6 Governance and future legal framework

The selection of an appropriate legal framework constitutes a pivotal and multifaceted decision that confronts every nascent research infrastructure during the early stages of its project development. Furthermore, the landscape of available options for legal frameworks is vast and diverse, offering a spectrum of possibilities ranging from traditional models to more innovative and specialized approaches. Notably, the European Commission has introduced a relatively novel concept known as the European Research Infrastructure Consortium (ERIC) model, which has emerged as a prominent legal framework for research infrastructures within the European Union. Since its inception EuPRAXIA collaboration is similar to High Energy Physics collaboration modeled as MoU best-effort based and complemented by more specifically a fund-based collaboration in the Eu Framework of the typical legal tools used in EU Grants (DESCA Model - collaboration agreement). Within the preparatory phase, the activities carried out under WP4 focused on benchmarking the existing legal frameworks adopted by comparable research infrastructures in Europe and, by applying an analytical methodology, identified the most appropriate legal framework for EuPRAXIA. The analysis concluded that, in light of the specific requirements and boundary conditions, the AISBL model represents the most suitable option. Nevertheless, a number of critical steps remain before the formal establishment of a new AISBL can be achieved. The first and most crucial step is to secure the broadest possible consensus within the collaboration. Following this, the necessary legal documentation—including the statutes, by-laws, internal rules, service-level agreements, and provisions on membership fees—must be carefully drafted and formally approved. These issues will be systematically addressed and further developed within the framework of the Early Implementation Phase program.

6.1 Current status

Since its inception, the legal framework of the EuPRAXIA collaboration has been primarily grounded in grant-based collaboration agreements, following the DESCA model. Over time, several such agreements were signed in connection with successfully submitted grant applications. A particularly significant milestone was the signature of an extended Memorandum of Understanding (MoU) ahead of the ESFRI Roadmap application. The signatories of this MoU were subsequently integrated into the EuPRAXIA Preparatory Phase collaboration agreement, either as beneficiaries or as observers. The overall collaboration agreements that have been succeeded so far are sketched in Fig.12.

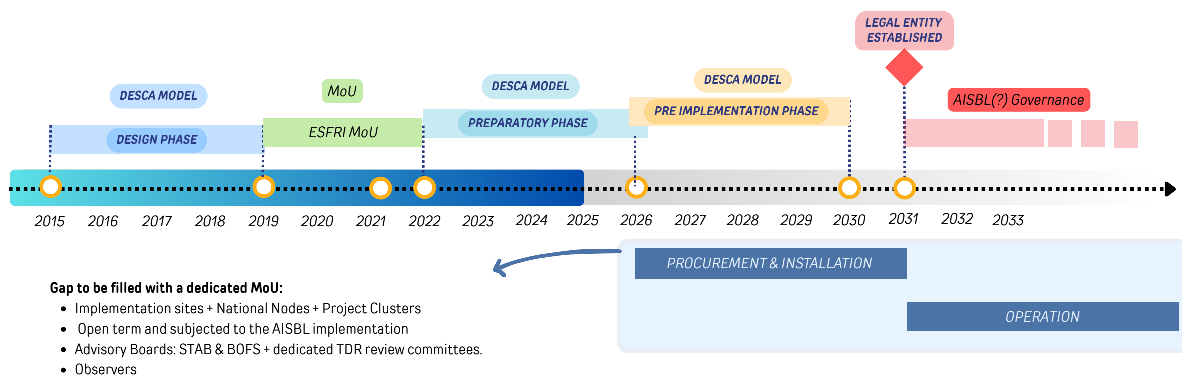

Figure 12: Different collaboration agreements as function of the lifecycle

A broad group of institutes has consistently participated in all collaboration agreements, although it should be noted that, for the Early Implementation Phase program, a smaller subset of institutes joined the call as full beneficiaries. Due to the asynchronous nature of the project lifecycle, the preparatory and pre-implementation phases now overlap with the initial stages of procurement and implementation. In this context, it becomes essential to establish a Memorandum of Understanding (MoU) that can provide a coherent legal framework encompassing the entire collaboration.

6.2 MoU towards new legal entity

The Early Implementation Phase program is intended, among other objectives, to bring to completion all legal matters required for the establishment of the new legal entity. The project will be governed through a structured framework that includes a dedicated Collaboration Board (based on the DESCA model), a Steering Committee, and several Advisory Boards. This governance structure is designed to ensure a focused collaboration, fully aligned with the objectives defined in the grant agreement. At the same time, the imminent transition towards the implementation phase highlights the necessity of drafting a dedicated Memorandum of Understanding (MoU). Such a document will be essential not only to maintain the active engagement of the entire collaboration, but also to clearly identify and formally recognize the main contributions and areas of interest of each partner. The MoU should therefore be conceived as a comprehensive and flexible instrument, provided with the following key features:

- Open term or at least long term (10 years?)
- Extended to the whole collaboration
- Focused on the identification of the scientific and technical support by the whole collaboration.
- IKC proposals

The governance scheme should resemble and anticipate the one that will be fully implemented in the legal entity. A collaboration board as governing and decision making body will be composed by one representative for each institute. Voting rules will be fully defined provided an agreement by all the parties. A steering committee will be in charged to fulfill the mandate of the MoU and several advisory boards will assess the progress and the main outcomes. It is advisable that the same advisory board with the same composition of the EU grants will be maintained (BOFS and STAB). A tentative draft of the MoU Governance scheme is presented in Fig.13. In order to have an efficient tool to maximize the effort during the implementation phase, it would be appropriate that the agreement on such document is reached by the end of Preparatory Phase (October 2026).

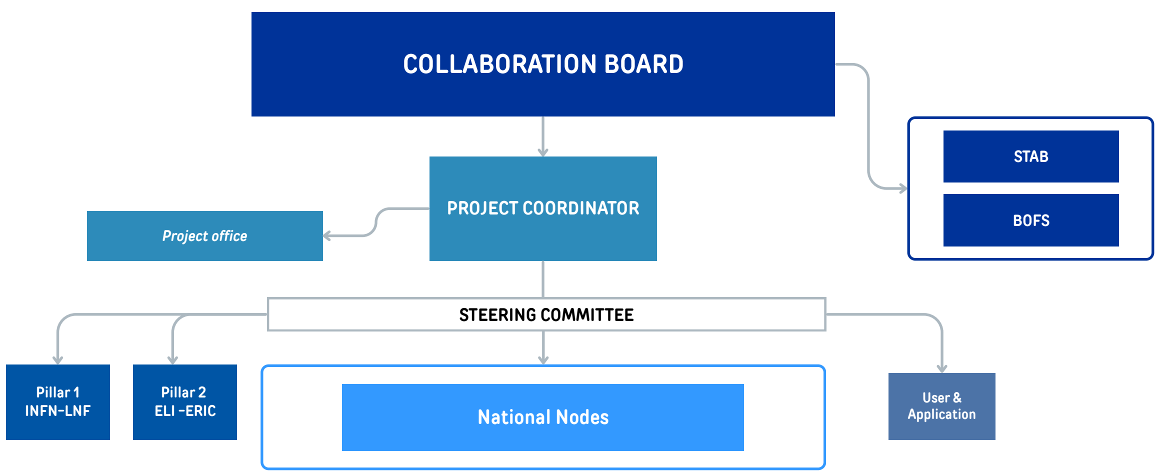

Figure 13: Tentative governance MoU - EuPRAXIA Collaboration

6.3 AISBL Governance Draft

The identification of an appropriate legal framework is a crucial task of the Preparatory Phase of each nascent research infrastructure. In the EuPRAXIA-PP context this issue has been addressed through a clear methodology:

- Benchmarking
- Legal requirements collection
- Quantitative and qualitative analysis
- Ranking of the most appropriate legal framework

Without delving into the detailed steps already undertaken, the main outcome of the analysis carried out so far is the identification of the AISBL as the most suitable legal framework for EuPRAXIA. This conclusion stems from the specific characteristics of the project and from the need to strike a fair balance among the diverse interests of stakeholders, while ensuring the long-term sustainability of the infrastructure and maximizing its impact in terms of scientific mission. The adoption of an AISBL framework is therefore considered the most appropriate pathway to secure both operational effectiveness and strategic alignment with European research policy. This preliminary outcome will be further examined, validated, and refined within the scope of the Early Implementation Phase project, where a more detailed legal, financial, and governance analysis will be carried out. The establishment of the EuPRAXIA legal entity aims to provide the collaboration with a self-sustaining and autonomous organizational framework, capable of independently managing its operations, applying for competitive European and international funding, and coordinating key activities such as user access, scientific strategy, outreach and dissemination, as well as education and training initiatives.

While the host institutions will continue to retain ownership of their respective assets and infrastructures, the legal entity will serve as the central coordinating body, ensuring coherence across all participating sites and alignment with the overall mission of EuPRAXIA. As example, a tentative governance scheme might be similar to the one adopted by KN3NET (an ESFRI Project used as benchmark). Through this structure, the legal entity will facilitate the efficient use of resources, promote synergies among partners, and guarantee the maximization of scientific output and long-term financial sustainability of the distributed Research Infrastructure. The AISBL has to be provided with a set of legal documents approved by all the potential shareholders such as:

- Statute
- By-laws
- Service Level Agreement
- Rules and organization
- AISBL Financial plan
- AISBL In-kind contribution framework
- ASIBL Intellectual Property Rights policy

The governing body is the *General Assembly* (also known as *Council*) composed by representatives of the AISBL members and potentially observers. The general assembly nominates a director which is the legal representative of the AISBL itself. This scheme has been successfully implemented in the KM3net case, an ESFRI project very similar to EuPRAXIA that has been used as benchmark. At least two advisory boards are considered:

- Resource Review Board (RRB) from representative of AISBL founders
- Scientific and technical advisory board (STAB)

All the legal documents necessary to set up the AISBL and the final governance scheme will be studied and drafted during the early implementation phase project and supported by a legal firm experts in setting up Research Infrastructure in the ESFRI domain.

7 Conclusions

This report provides a comprehensive summary of the main outcomes achieved by WP.4 in collaboration with WP.1 and WP.3 within the EuPRAXIA Preparatory Phase Project, focusing on both financial and legal perspectives.

From a financial standpoint, a preliminary draft of the business and financial model has been developed and presented, accompanied by a consolidated overview of the funding that has been secured to date. In addition, the report discusses forward-looking projections, including tentative estimations of both the implementation costs and the long-term running costs of the infrastructure. These elements provide an initial framework for assessing the overall financial sustainability of EuPRAXIA as it moves from planning to execution.

From a legal and governance perspective, the report highlights the project-based governance structure that has so far characterized the collaboration, largely shaped by the framework of grant agreements. However, with the forthcoming transition to the implementation phase and the establishment of a dedicated legal entity, it is evident that broader consensus and stronger, more sustained engagement across all partners will be required—beyond what a traditional grant-based collaboration scheme can ensure on its own. In this context, the need has clearly emerged for drafting and adopting a dedicated Memorandum of Understanding (MoU). Such an MoU is expected to serve both as an interim legal framework to guide and coordinate the collaboration during the implementation phase, and as a foundational document for the creation of the future EuPRAXIA legal entity. This work constitutes a critical step in preparing the collaboration for the transition from a grant-based, project-oriented structure to a legally recognized and self-sustained Research Infrastructure, capable of delivering on its scientific mission and ensuring long-term operational excellence.

List of Acronyms

AACE - Association for the Advancement of Cost Engineering

AISBL - Association International Sans But Lucratif

BAC - Budget At Completion

BMC - Business Model Canva

BOFS - Board of Financial Sponsor

CDR - Conceptual Design Report

ERIC - European Research Infrastructure Consortium

ESFRI - European Strategic Forum for Research Infrastructure

FEL - Free Electron Laser

H2020 - Horizon 2020

HE - Horizon Europe

IKC - In Kind Contribution

MoU - Memorandum of Understanding

RI - Research Infrastructure

RRB - Resource Review Board

STAB - Scientific and Technical Advisory Board

TDR - Technical Design Report

TRL - Technological Readiness Level

WP - Work Package