Discussion Report 1

Charting INESC's Future in EU Research Funding and Positioning

Winter Meeting 2024

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Executive summary

This report presents a comprehensive overview of the strategic positioning and future trajectory of INESC institutes within the European Research and Innovation (R&I) arena. It encompasses an in-depth analysis of current trends, challenges, and opportunities in the EU R&I landscape, emphasizing the evolving role of public-private partnerships, the significance of EU tenders, and the strategic alignment of INESC institutes with EU policies and initiatives.

Horizon Europe and INESC's strategic direction

The report begins by exploring the strategic shifts under Horizon Europe, highlighting the concept of 'directionality' and its impact on research priorities. It examines the EU strategic planning, challenges, and advancements made by Portugal in EU R&I collaborations, with focus on increasing international visibility and networking.

EU R&I Public-Private Partnerships and INESC's involvement

This section outlines INESC's role in European Partnerships under Horizon Europe, informed by insights from INESC HUB's Intelligence Reports. These partnerships enhance INESC's capacity to address societal challenges and contribute to shaping European policies. The transition of Public-Private Partnerships from Horizon 2020 to Horizon Europe is also discussed, highlighting a shift towards more integrated, priority-aligned collaborative research.

Preparing for Framework Programme 10 (FP10)

The report anticipates the upcoming Framework Programme 10 (FP10), focusing on how INESC can strategically position itself to contribute effectively to its priorities. It examines potential areas of alignment, emerging research themes, and how INESC's strengths can be leveraged in the evolving EU R&I context.

The key role of EU tenders in shaping R&I

The importance of EU tenders in the R&I process is highlighted. INESC's strategic engagement in tenders and framework contracts with EU institutions like FRONTEX and DG Connect is discussed, underscoring the role tender play in influencing the EU's R&I agenda.

INESC institutes: Thematic areas and EU policy alignment

The report delves into the thematic areas of INESC institutes, illustrating how their research strengths align with EU policies and priorities. This section showcases the institutes' contributions to advancing R&I in areas like digital transformation, climate action, and health technologies.

Action Plan for discussion

An Action Plan is presented, outlining strategic initiatives and collaborative efforts for INESC institutes to enhance their positioning in the EU R&I landscape.

Concluding remarks

The report concludes with reflections on the role of the upcoming Winter Meeting. It outlines the next steps post-meeting, focusing on refining and implementing the collective strategy and the continuous engagement of all INESC institutes in collaborative R&I endeavors.

Contextual setting in the EU R&I landscape

Overview of the EU R&I landscape: current state and recent developments

Introduction to the EU R&I landscape: integration with EU strategies, instruments, and global dynamics

The European Union's research and innovation (R&I) landscape is a dynamic, competitive arena where strategic networking, effective communication, and clear demonstration of strengths are essential. Institutions within this sphere, such as the INESC institutes, must excel in scientific and technological endeavors and navigate the intricate dynamics of the EU's political and policy-making environment. This involves engaging continuously in the "Brussels-bubble," where critical R&I decisions are made, and aligning with the EU's R&I strategies, instruments, and funds. At the core of this landscape is the interplay between the European Commission, the European Parliament, and the European Council, along with a network of national and regional representations, educational and research institutions, industry representatives, and startups. These entities collectively shape R&I policies, influenced by the priorities and dynamics of EU R&I programmes and instruments such as Horizon Europe and the Digital Europe Programme.

Recognizing and effectively communicating globally recognized R&I strengths is vital for institutions to establish a prominent position within the EU R&I framework. Opportunities for elevating weaker areas, effective internationalization beyond the EU, and the internationalization of contract research and technology sales are framed within strategic EU-level choices. This includes aligning with the EU's evolving priorities, such as the emphasis on digital transformation, climate neutrality, and sustainable development. Navigating the EU's governance structure requires skills in lobbying and networking, particularly in light of the widening process within the EU, which aims to reduce disparities in R&I capabilities across Member States. The recent expansion to include eastern Member States has introduced new collaborative opportunities and challenges, highlighting the need for equitable participation and resource access.

Transitioning from a reactive to a proactive stance involves integrating institutional strengths with the EU's strategic R&I directions. This demands a deep understanding of the EU's policy mechanisms, strategic networking, and clear thematic contributions. The future success of institutions hinges on their ability to strategically position themselves within the EU R&I landscape, engaging with a diverse network of stakeholders, including EU institutions, the private sector, and international partners.

The EU R&I landscape is a complex political arena, where success is determined by the quality of research and innovation and the ability to strategically position oneself within the intricate web of EU institutions, Member States, and the Brussels network. Aligning with EU R&I strategies, instruments, and funds, and adapting to their evolving priorities both within the EU and globally, is crucial. The post-2027 challenges, such as the expected reduction in cohesion funds for Portugal, underscore the increasing importance of EU programmes like the Framework Programme for Research and Innovation. This period marks a crucial time for strategic adaptation and evolution for Portuguese R&I institutions, shaping their future in the European and global R&I ecosystems.

Key statistics and metrics

Overall investment in R&I[1]

Gross domestic expenditure on R&D (GERD): In 2022, the EU's overall R&D expenditure was €354 billion, showing a 7% increase from the previous year and a 47.5% increase compared to 2012. The GERD-to-GDP ratio increased from 2.08% in 2012 to 2.30% in 2020, then decreased to 2.23% in 2022.

R&D intensity increase: Most EU Member States reported higher R&D intensity in 2022 compared to 2012. Portugal, along with Cyprus, recorded one of the most significant increases in R&D intensity, both increasing by 0.33 percentage points over this period.

R&D expenditure by sector of performance: The majority of R&D expenditure in the EU was in the business enterprise sector, which increased from 1.32% of GDP in 2012 to 1.48% in 2022. The higher education sector's R&D intensity remained stable at around 0.48% of GDP during this period. The government sector saw a slight decrease from 0.27% to 0.24%, and the private non-profit sector had a marginal increase from 0.02% to 0.03% of GDP.

Collaboration and networking metrics

EU frameworks for collaboration: under Horizon Europe, over 10,000 entities from various EU countries have participated in collaborative projects, with funding surpassing €95 billion for 2021-2027.

Collaboration trends can be divided into sub-EU regional groups:

North-Western Europe collaboration: Countries like Germany and France are involved in over 40% of co-funded R&I projects under EU programs. Joint publications between these countries are about 30% higher than the EU average.

East-West collaborative projects: Eastern European countries' participation in EU collaborative projects has risen by about 20% in the last five years, highlighting a growing East-West research partnership trend.

Southern Europe dynamics: Southern European countries, including Italy and Spain, account for approximately 20% of Horizon Europe project participation. There's a 15% increase in their involvement in co-funded R&I projects over the past five years.

Portugal's participation in EU-funded collaborative projects has grown by about 18% in the last five years, outpacing the Southern European average. Collaboration with Spain has increased by 25%, with a focus on marine research and renewable energy. Portugal has also doubled its R&I project collaboration with countries like France and Germany, concentrating on sectors like renewable energy and digital technologies.

There are also some sector-specific dynamics, for example, in digital technologies and green energy. These sectors have experienced significant increases in collaborative projects, with over 25% of Horizon Europe's budget allocated to them.

[1] EUROSTAT Statistics Explained, December 2023

Challenges impacting Portugal in EU R&I collaboration dynamics

Funding limitations

Although Portugal has increased its participation in EU collaborative projects, it still faces challenges in securing competitive funding at the same level as wealthier EU countries. Data indicates that the overall R&I funding for Portugal, including EU contributions, remains lower than the EU average, impacting the scale and scope of collaborative projects.

Research and technology infrastructures

Compared to North-Western European countries, Portugal has historically had limitations in research and technology infrastructures. This includes both physical facilities and access to cutting-edge technologies, which are crucial for high-level R&I collaborations.

Brain drain phenomenon

Portugal faces challenges in retaining its highly skilled researchers and scientists. The trend of brain drain, where talent moves towards countries offering better opportunities and funding, diminishes the domestic capacity for spearheading and participating in significant R&I projects.

Private sector engagement

While Portugal has a growing SME sector engaged in R&I, the overall private sector involvement, especially in high-tech and innovative industries, is less compared to core EU countries. This limits the opportunities for industry-academia collaboration, which is a key driver of R&I success.

International visibility and networking

Portugal's R&I institutions sometimes struggle with international visibility and networking, which are critical for establishing and maintaining robust collaborative relationships. This affects their ability to attract large-scale, multinational R&I projects.

To overcome these challenges, it's essential for Portugal to:

a) Increase R&I funding, possibly through more targeted EU support and national investment.
b) Enhance research and technology infrastructures to align with European standards.
c) Implement sustainable policies to retain and attract talent, countering the brain drain effect.
d) Foster stronger ties between academia and industry, encouraging private sector participation in R&I.
e) Diversify research areas to broaden collaboration opportunities.
f) Boost international visibility and networking efforts, positioning Portuguese institutions as attractive partners in multinational R&I projects.

Figures 1 and 2 (below) provide an overview of Horizon hotspots, a heatmap based on the number of participants in Horizon Europe projects so far.

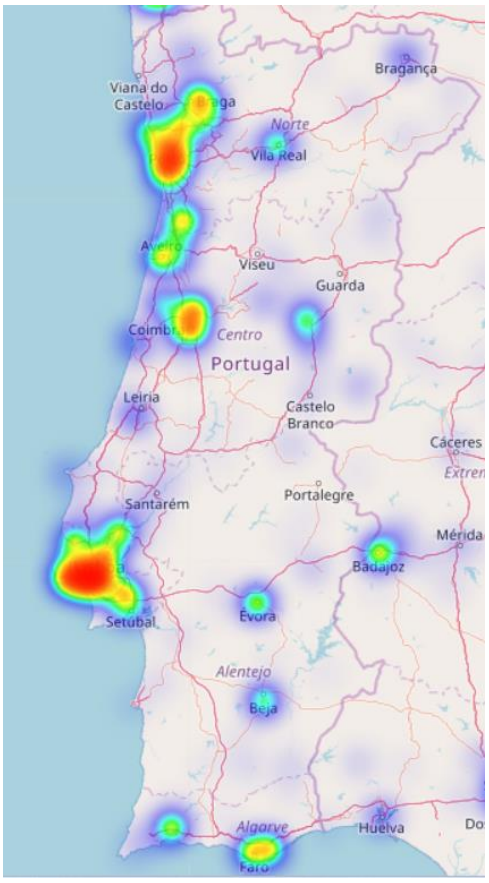

Figure 1: Horizon hotspots (Portugal)

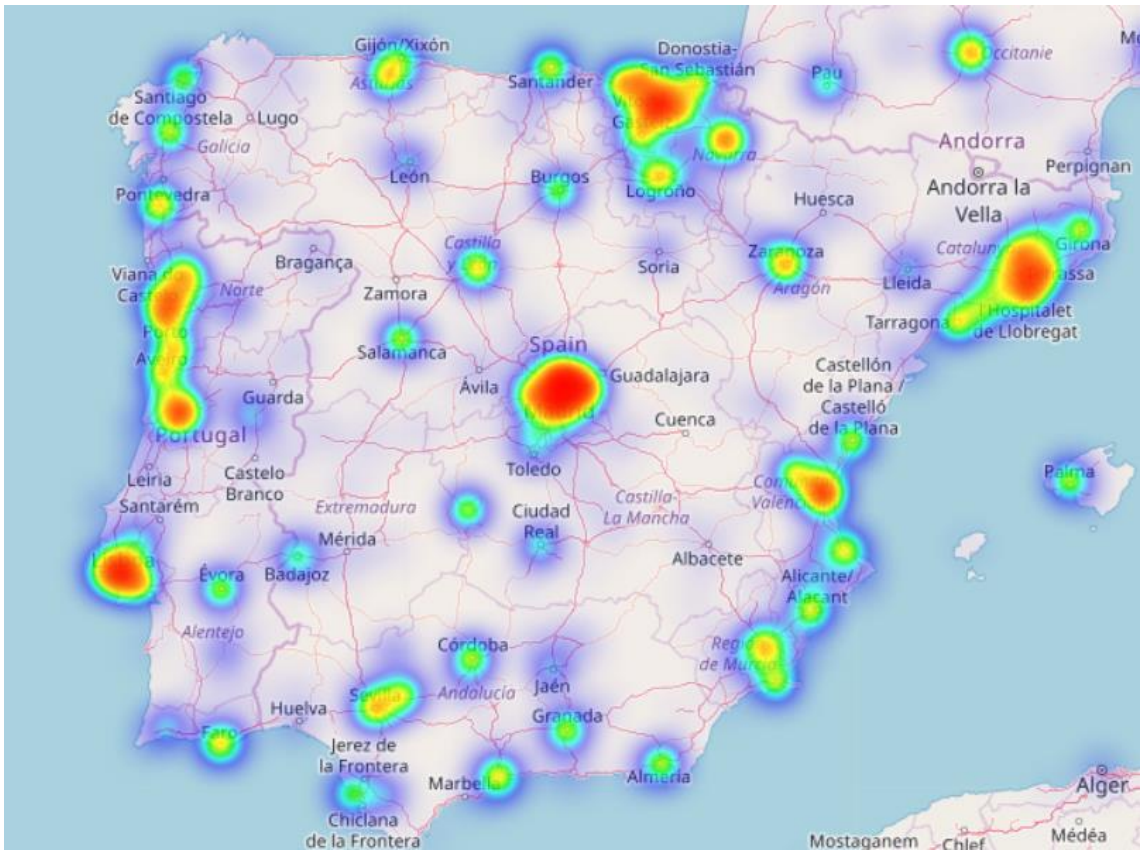

Figure 2: Horizon hotspots (Iberian Peninsula)

Innovation output and academic paper publications

EU countries contribute around 20% of the world's research publications, with Germany, France, and the UK being major contributors. Portugal has seen a 6% annual growth in research publications over the past five years, particularly in renewable energy and digital technologies. Its smaller scale of output compared to major EU players affects its visibility and influence in collaborative R&I networks.

Technology commercialization

The EPO reported over 180,000 patent applications recently, showing a 4% year-on-year increase. Portugal's modest annual growth in patent filings, about 3%, suggests a gap in effectively translating research into commercial applications.

Human resources in R&I

The EU boasts approximately 1.8 million researchers, with women representing about 33% and about 40% under the age of 35. A notable proportion of the EU's researcher population is involved in cross-border mobility. The gap between academia and industry in Portugal may limit effective collaboration.

Private sector participation

Large corporations in the EU account for about 60% of total R&D expenditure, while SMEs contribute around 20%. Portuguese SMEs have increased their R&D investment by 5% annually but face challenges like limited resources and access to broader EU networks.

Geographical and thematic concentration

Core EU countries account for over 50% of total R&I expenditure. Peripheral regions like Portugal have seen growth rates of about 4-6% annually. Portugal emphasizes digital technologies and green energy, areas that receive the highest funding in the EU. Its peripheral status and thematic focus may limit participation in diverse EU collaborative projects.

Recent developments in EU R&I

Embracing directionality in Horizon Europe and beyond

In the scope of the European Union's Research and Innovation (R&I) framework, a key concept that has emerged is "directionality." This concept, central to the strategic evolution of R&I initiatives, reflects a deliberate alignment of research efforts with broader societal, economic, and policy objectives. The Horizon Europe Strategic Plan 2025–2027 embodies this shift, acknowledging the dynamic changes in the global and European contexts and redefining the role of R&I in addressing these challenges.

The concept of directionality in European Research and Innovation (R&I) is a culmination of a historical evolution and strategic foresight. It's not just a recent response to global and regional phenomena but a reflection of a longstanding tradition in European R&I to align research with broader policy goals and societal needs. Below, we detail key aspects of an important longitudinal perspective on directionality in European R&I:

1) **Early instances of directional R&I**: The genesis of R&I programmes in Europe, notably the ESPRIT programme, was inherently directional and technology-driven. Launched in the 1980s, ESPRIT (European Strategic Programme for Research and Development in Information Technology) represented a concerted effort to foster European competitiveness in information technology. This programme was a clear indication of the EU's commitment to not only support R&I but to do so in a way that directly addresses specific technological challenges and industry needs.

2) **Shift towards fundamental research**: In the last two decades, there has been a notable shift in EU R&I towards more fundamental research. This transition was marked by the establishment of the European Research Council (ERC) within the framework programme, recognizing the importance of foundational research as a lighthouse of excellence. The ERC's creation signified a broader acknowledgment of the need to balance directional, applied research with fundamental, exploratory studies that lay the groundwork for future innovations.

3) **Smart specialisation and cohesion funds**: An essential step towards directionality in EU R&I was the European Commission's requirement for regions and countries receiving Cohesion Funds to submit Smart Specialisation Strategies. This policy move was a strategic effort to ensure that investment priorities and agendas were not just articulated but also aligned across different regions. By encouraging regions to identify and focus on their unique strengths, the EU aimed to foster diverse yet coherent R&I ecosystems across Europe.

The current context of directionality is characterized by:

a) **Globalization and collaboration diversification**: The historical context of directionality enriches our understanding of the strategic approach necessary to accommodate the inclusion of associate members like Canada, New Zealand, and the UK in Horizon Europe. This approach echoes past efforts to harmonize diverse policy priorities, ensuring that R&I remains globally relevant and locally impactful.

b) **Addressing societal and economic challenges**: The current focus on addressing challenges like the climate crisis and technological advancements is a continuation of the EU's historical commitment to use R&I as a tool for tangible societal benefits. This commitment

has evolved from addressing specific technological gaps, as in the ESPRIT programme, to tackling broader societal challenges.

c) **Navigating political and economic fluctuations**: The EU's historical experiences with R&I in fostering economic and political resilience provide a valuable foundation for understanding the current role of R&I in addressing contemporary geopolitical events like the Russian invasion of Ukraine.

d) **Technological evolution**: The continuous adaptation of R&I to the rapid pace of technological change is rooted in the EU's long-standing tradition of anticipating and shaping technological developments, a tradition that began with programmes like ESPRIT.

Directionality in the context of Horizon Europe

The Horizon Europe Strategic Plan 2025–2027, with its focus on current societal challenges and the role of R&I in addressing them, serves as a testament to the EU's commitment to directionality. The plan outlines a vision where R&I is not just a tool for incremental progress but a catalyst for systemic change, addressing everything from climate action to digital transformation.

Key aspects of the Horizon Europe Strategic Plan:

The Horizon Europe Strategic Plan 2025–2027 is a comprehensive blueprint that outlines the strategic direction for the final phase of Horizon Europe. This Plan is reflective of the evolving global and European contexts, incorporating dynamic shifts in various domains since its initial iteration. Here, we present its key aspects:

1) **Societal challenges and R&I's role**: The Plan begins with a thorough examination of current societal challenges, emphasizing R&I's critical role in addressing these issues. It recognizes that in a world marked by rapid changes and unforeseen events like the Russian invasion of Ukraine, R&I serves as a cornerstone for understanding, responding to, and preemptively shaping policies and strategies. This section of the Plan not only highlights the immediate need to address these challenges but also underscores the role of R&I in building a future-ready, resilient Europe.

2) **Global perspective and strategic positioning**: The Plan situates the EU's R&I activities within a global context, identifying strengths and pinpointing gaps where Horizon Europe can provide significant value. This global perspective is crucial for ensuring that European R&I efforts are not only locally relevant but also globally resonant, fostering international collaboration and positioning Europe as a key player in global R&I initiatives.

3) **New research needs and potentials**: A focal point of the Plan is exploring new research needs, particularly in light of the European Green Deal, digital transition, and the 2050 climate objectives. This exploration is pivotal in steering R&I activities towards areas that not only address current needs but are also strategically aligned with long-term goals. It reflects a commitment to transformative R&I policies that can catalyze systemic change and enhance the EU's resilience and sustainability.

4) **Assessment of Horizon Europe's potential**: The Plan includes a critical assessment of Horizon Europe's capacity to address crucial issues, utilizing gap analyses across various clusters. This section reviews the program's implementation and progress, offering insights

into areas where Horizon Europe has excelled and where improvements are needed. This reflective approach is key to ensuring that the program remains adaptive and effective in meeting its objectives.

5) **Uptake and valorization of R&I results**: Finally, the Plan addresses the potentials and limitations in the uptake of R&I results, focusing on valorization, marketable solutions, and Horizon Europe's role in bridging the gap between research and tangible outcomes. This aspect is crucial in ensuring that R&I investments translate into real-world benefits, driving innovation and socio-economic growth.

The Plan also highlights R&I's instrumental role in climate action, particularly in developing renewable energy technologies. This not only aids in the transition towards a low-carbon economy but also disrupts traditional energy sectors, aligning with the broader goal of climate change mitigation. It also acknowledges the significant role of R&I in facilitating digital transformation. Breakthroughs in AI and big data analytics, transforming industries like healthcare and finance, are given as prime examples of how R&I is reshaping societal paradigms.

Current progress of Horizon Europe (2021-2022)

This analysis delves into the core metrics that define the program's success, challenges, and future outlook.

Key implementation figures (2021-2022)

Calls and topics: 236 calls have been launched and evaluated, averaging 4.3 topics per call. This marks an improvement over Horizon 2020's average of 3.4 topics per call.

Proposals and quality: A total of 44,832 eligible proposals were submitted, with 54% assessed as high quality, surpassing Horizon 2020's 46%.

Applicant engagement: Each proposal attracted an average of 4.6 applicants, requesting an average EU contribution of EUR 2.25 million.

Success rates and funding gaps

Higher success rate: The success rate stands at 15.9%, compared to 11.9% for Horizon 2020.

Funding challenges: Despite higher quality submissions, 71% of these proposals remain unfunded, necessitating an additional EUR 34 billion.

Focus on climate and digital transformation

Climate action: Committed to allocating at least 35% of resources to climate objectives, Horizon Europe directed 34% of its 2021-2022 funds towards this goal.

Digital objectives: Investments in digital transformation reached EUR 9069.2 million, constituting 33% of the budget.

SME involvement

SME participation: SMEs account for about one-fifth of participation, with a stable share between Horizon 2020 and Horizon Europe.

Funding to SMEs: In Horizon Europe, SMEs have received EUR 2.9 billion so far.

Synergies and collaborative efforts

Enhanced synergies: Horizon Europe focuses on synergies between R&I framework programmes and other EU funds, aiming to amplify the impact and efficiency of EU policies.

Integrated approach: Efforts include promoting capacity-building, deploying results in various initiatives, and fostering collaboration through European partnerships.

Challenges and forward-looking strategies

Funding gaps: The persistent funding gap for high-quality proposals is a significant hurdle. Many excellent research ideas fail to secure funding, potentially hampering innovation and scientific advancement. Addressing this requires a nuanced approach, including increasing overall funding, improving the efficiency of funding allocation, and perhaps introducing more targeted funding schemes for high-potential projects. However, this raises questions about budget allocations and the balance between funding high-risk, high-reward projects versus safe bets.

Optimizing synergies: The EU has a plethora of funding instruments, but they often operate in silos. This lack of integration can lead to inefficiencies and missed opportunities for cross-disciplinary or cross-sectoral initiatives. Maximizing synergies between different funding instruments (such as Horizon Europe, European Structural and Investment Funds) can enhance the impact of R&I support. The challenge lies in effectively coordinating these instruments while respecting their individual objectives and requirements. Successful integration demands a holistic policy approach and potentially a rethinking of administrative frameworks to facilitate better cooperation. Moreover, some advances have been made in this domain, with an incremental focus on synergies as an integral part of the directionality principle, naturally. However, it worth noting that a significant part of the obstacles are related with institutional inertia and culture at national and regional levels.

Future allocation: Strategically emphasizing sectors such as climate action, digital transformation, and SME (Small and Medium-sized Enterprises) support is crucial. However, prioritizing these areas also means other important fields might receive less attention or funding. The Strategic Plan 2025-27 Analysis suggests a focus on climate action, which aligns with the EU's Green Deal and global sustainability goals. It considers, digital transformation is pivotal in keeping the EU competitive in the global technology race. Supporting SMEs fosters innovation at a grassroots level and drives economic growth. The strategic allocation to these sectors reflects a forward-looking and socially responsible approach. The concern, however, is ensuring a balanced investment across a diverse range of equally important scientific fields to prevent some research areas from becoming underfunded. There is an increasingly clear need to better articulate and define what is funded at EU level and what is funded at national level. Once again, this falls under the directionality principle outlined above.

Preparing for Framework Programme 10 (FP10): Extending the directional approach of Horizon Europe

The European Commission's preparations for Framework Programme 10 (FP10) involve multifaceted efforts to gather insights and create a foundation for the programme. Following the February publication of the public consultation results on FP10, which underscored the research community's desire for an expanded programme with a balanced focus on basic and applied science, the Commission has initiated several critical processes:

1) **Post-Ex evaluation of Horizon 2020:** Scheduled for completion by January 2024, this evaluation will assess the effectiveness of the previous programme and inform the development of FP10.

2) **Expert Group led by Manuel Heitor:** A 15-member group is examining the strategic plan for the final years of Horizon Europe to make recommendations for FP10. They are expected to submit their advice by October 2024 and will engage with stakeholders for comprehensive feedback.

3) **Commission taskforce:** The Commission has formed a taskforce composed of various directorates with research links, including health, transport, and digital, to contribute to the planning process.

4) **Horizon Europe interim evaluation:** This evaluation, to be finalized and published by early 2025, will incorporate diverse inputs including the expert group report, stakeholder feedback, and a report from a special task force of member state representatives through ERAC.

5) **ERAC Task Force and Member States' input:** The ERAC task force is a pivotal channel for member states to articulate their demands and visions for FP10. Despite the risk of diluted consensus, the member states are expected to provide substantial input, with a near-final report discussed in April and adoption in June. Post-report, member states will begin individual lobbying, likely leading to the formation of various coalitions and factions.

6) **Budget concerns:** There is significant debate over the FP10 budget, with calls from the research community for a significant increase, ideally to around €200 billion. However, current financial challenges within the EU and member states make such an increase unlikely. There's speculation that the FP10 budget may struggle to exceed the current Horizon Europe budget of €95.5 billion significantly.

Addressing key issues from Horizon Europe in FP10

FP10 preparation involves addressing contentious issues from Horizon Europe:

a) **Basic vs applied research**: There's a recognized imbalance in Horizon Europe's Pillar 2, with conflicting views on addressing it. Universities advocate for more focus on basic research, whereas industry emphasizes applied research and market-oriented innovation. The European Research Council seeks increased funding for basic research, while the European Innovation Council urges rapid development of strategic technologies. A higher FP10 budget could facilitate a more balanced approach.

b) **Future of the Missions**: Initially designed to drive change through objective-driven seed projects and networking, the success of these missions in Horizon Europe is debatable. The format and continuation of these missions in FP10 will likely be a subject of discussion.

c) **Future of Widening measures**: There's a debate over the allocation of funds to countries less successful in obtaining grants. While some argue this is essential to address east-west disparities, others oppose it. The effectiveness of current Widening measures is questioned, indicating potential for significant changes or overhaul.

d) **Research careers**: Despite progress in 2023, there's demand for more substantial steps, including a monitoring system for research careers and new funding schemes to improve working conditions. These aspects will continue to be a focal point in FP10 discussions.

e) **Strategic Technologies for Europe Platform (STEP):** Initially proposed as a significant fund for green tech, biotech, and deep tech, STEP's funding was significantly reduced, raising concerns about the EU's investment in key technologies. The future scope and funding of STEP will be an important aspect in FP10.

These areas highlight a tension between different research priorities and funding allocation. FP10's challenge will be to balance these diverse needs, ensuring equitable distribution of resources and effective support for various research dimensions. This will require careful negotiation and strategic planning, considering the broad spectrum of stakeholder interests and the overarching goals of the EU's research and innovation agenda.

FP10 Timeline and Key Dates for INESC

The following provisional dates are crucial for INESC to keep in mind:

January 2024: Publication of the ex-post evaluation of the 2014-2020 Horizon 2020 research programme, including expenditure details of its €80 billion budget.

June 2024: Member states will present their vision in the European Research Area and Innovation Committee (ERAC) FP10 task force report.

October 2024: A Commission expert group led by former science minister of Portugal, Manuel Heitor, will publish an independent report on the future of European research and innovation.

Early 2025: The interim evaluation of Horizon Europe is scheduled for publication.

By 1 July 2025: The European Commission will unveil the official proposal for FP10.

Autumn 2025: Member states begin negotiations on the proposed framework programme.

Beginning of 2026: Member states are expected to reach a deal, initiating negotiations with the European Parliament.

End of 2026: A hopeful conclusion of a deal on FP10, allowing the Commission a year to prepare the programme.

2027: Heads of state and Parliament will set the seven-year budget, including funding for FP10.

2028: The start of FP10.

Focus Areas in EU R&I

The European Union's commitment to addressing global challenges through innovation is evident in its dedication to promoting research and innovation (R&I). This commitment is crucial for tackling pressing issues such as climate change, digital transformation, and societal inequalities. The Horizon Europe framework, along with the Strategic Technologies for Europe Platform (STEP) and the Horizon Europe Strategic Plan, is instrumental in this endeavor, supporting groundbreaking research and technological advancements.

1. Digital and technological leadership

With STEP's emphasis on critical technologies, the EU aims to boost investment in digital transformation. This includes advancements in artificial intelligence (AI), cybersecurity, quantum computing, and digital infrastructure. The focus here is on maintaining and enhancing the EU's technological sovereignty, ensuring that Europe remains competitive in the global digital economy.

2. Climate change and environmental sustainability

Aligned with the European Green Deal, a significant portion of R&I efforts is geared towards sustainable development. This includes research in renewable energy technologies, sustainable agriculture, green transport systems, and circular economy principles. The aim is to foster systemic change across all sectors to meet climate neutrality objectives and reduce dependence on fossil-based resources.

3. Healthcare and biomedical research

The pandemic has highlighted the importance of healthcare innovation. The EU is focusing on infectious diseases research, personalized medicine, and healthcare system resilience. This includes the development of new treatments, vaccines, and health technology assessments.

4. Resilience and crisis preparedness

Recent global events have underscored the need for research aimed at strengthening resilience against cross-border health threats, climate risks, and critical supply chain disruptions. This involves investing in R&I to enhance preparedness for future challenges.

5. Industry 5.0 and manufacturing

Moving towards Industry 5.0, the EU is focusing on the integration of digital technologies in manufacturing, promoting smart and sustainable industrial processes. This aligns with the aim of transforming European industry to be more competitive while ensuring social inclusiveness and environmental sustainability.

6. Societal challenges and inclusive innovation

The EU is emphasizing R&I that addresses societal challenges like social inequality, aging populations, and urbanization. This includes fostering social innovation and multi-actor approaches to create more inclusive, resilient societies.

7. Energy transition

With a focus on achieving climate neutrality, the EU is prioritizing R&I in clean energy transition, including research in renewable energy sources, energy efficiency, and green technologies. This also involves exploring new forms of energy like renewable hydrogen.

8. Sustainable mobility and smart transport

Investment in R&I for sustainable mobility solutions, including electric and autonomous vehicles, smart traffic management, and green public transport systems, is a priority. This aligns with the EU's goal of reducing emissions from the transport sector.

9. Bioeconomy and food systems

The EU is focusing on sustainable agriculture, food security, and the bioeconomy. This includes research on sustainable food production, reducing food waste, and developing new bio-based materials and products.

10. Digitalization of public services and infrastructure

Enhancing the digital capabilities of public services and infrastructure is a key focus, ensuring that digital transformation benefits society as a whole.

Existing initiatives to support the twin transitions and the resilience of the Union

In this section we present a brief overview of each initiative and respective links to their official pages.

Net-Zero Industry Act: This initiative likely focuses on accelerating the transition of industries towards net-zero emissions, potentially involving investments in green technologies, decarbonization strategies, and innovation in sustainable industrial processes.

REPowerEU: A plan aimed at rapidly reducing dependence on fossil fuels and fostering energy independence. It could involve R&I in renewable energy, energy efficiency technologies, and the integration of the European energy grid.

InvestEU: This program aims to stimulate public and private investments across the EU. It supports various sectors, including sustainable infrastructure, research, innovation, and digitalization, serving as a financial pillar for several other initiatives.

European Chips Act: Focused on bolstering Europe's semiconductor industry, this act includes R&I investments in chip manufacturing, design, and the overall semiconductor supply chain.

Connection between policies and funding programmes or instruments

Net-Zero Industry Act related funding instruments: *The European Regional Development Fund (ERDF) and the Just Transition Fund (JTF).*

Importance for INESC institutes: *Access to these funds can enable INESC institutes to participate in projects focusing on green technologies and sustainability, crucial for transitioning to a net-zero emissions economy.*

REPowerEU related funding instruments: *Horizon Europe's Clean Energy Transition partnerships and the Innovation Fund.*

Importance for INESC Institutes: *Enables participation in cutting-edge research in energy transition, critical for energy independence and alignment with EU energy goals.*

InvestEU related funding instruments*: The European Fund for Strategic Investments (EFSI) and the Connecting Europe Facility (CEF).*

Importance for INESC institutes*: Provides opportunities for securing funding for large-scale research projects and infrastructural development.*

European Innovation Council (EIC): Aimed at supporting high-risk, high-impact innovations, the EIC plays a pivotal role in fostering breakthroughs in technologies related to the twin transition.

Green Deal Industrial Plan: Part of the European Green Deal, this plan supports the development of green industries and technologies, aligning with the Net-Zero Industry Act and REPowerEU in terms of sustainability goals.

Critical Raw Materials Act: This act focuses on securing the supply of essential materials necessary for high-tech and green industries, which could be critical for initiatives like the European Chips Act and green technology developments.

EU Secure Connectivity Programme: This program aims to develop secure communication technologies, which are essential for modern infrastructure and defense systems, potentially tying in with the European Defence Industry Reinforcement through common Procurement Act (EDIRPA).

Act in Support of Ammunition Production: This initiative aims to bolster EU's capacity for ammunition production, relevant to defense research and innovation, and could be linked with the EDIRPA.

European Defence Industry Reinforcement through common Procurement Act (EDIRPA): This act is focused on strengthening the EU's defense industry through collaborative procurement strategies, potentially involving R&I in defense technologies and systems.

European Chips Act related funding instruments: The Digital Europe Programme and Horizon Europe's Cluster 4 (Digital, Industry, and Space).

Importance for INESC institutes: Access to these funds can bolster research in semiconductor technology, enhancing INESC's position in this strategic industry.

Green Deal Industrial Plan related funding instruments: LIFE Programme and Horizon Europe's Climate, Energy and Mobility cluster.

Importance for INESC institutes: Enhances participation in projects focused on environmental sustainability, a key area of INESC's research focus.

Critical Raw Materials Act related funding instruments: Horizon Europe's Cluster 6 (Food, Bioeconomy, Natural Resources, Agriculture, and Environment).

Importance for INESC institutes: Offers a pathway to engage in research critical for securing raw materials vital for the tech and green sectors.

EU Secure Connectivity Programme related funding instruments: The Connecting Europe Facility (CEF) - Digital.

Importance for INESC institutes: Supports research in secure communication technologies, essential for modern infrastructure.

Act in Support of Ammunition Production & EDIRPA related funding instruments: European Defence Fund (EDF).

Importance for INESC institutes: Facilitates participation in defense-related R&I, expanding the scope of INESC's research activities.

Figure 3 presents a map illustrating the interconnections among various EU initiatives supporting the twin transition in Research & Innovation (R&I). The map of these initiatives shows connections based on shared objectives like sustainability, technological advancement, and strategic autonomy. The overlaps in areas like financial tools (InvestEU), technological domains (European Chips Act, EU Secure Connectivity Programme), sustainability (Green Deal Industrial Plan, Net-Zero Industry Act), and strategic industries (Critical Raw Materials Act, EDIRPA).

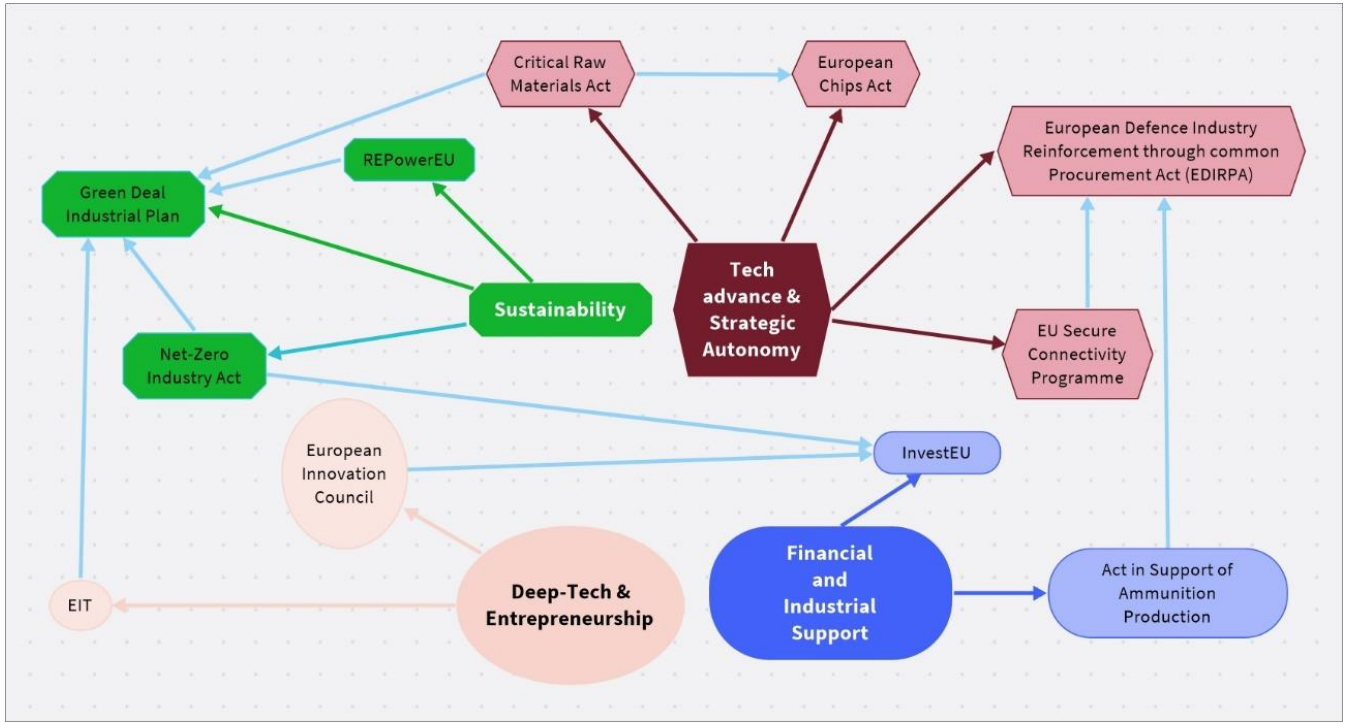

Figure 3: Map of initiatives supporting the twin transition and their interconnections

The key role of EU R&I Public Private Partnerships

Partnerships are a fusion of efforts between the European Commission and public or private partners. European Partnerships, as outlined in the INESC Brussels HUB's Intelligence Reports 7 and 9 (available in the private area of the HUB's website, for registered users), play a transformative role in the European Research and Innovation (R&I) landscape. They not only embody the spirit of Horizon Europe but also significantly contribute to advancing the European Union's political and research priorities.

For INESC, involvement in European Partnerships is not a mere participation; it is a conscious, dedicated, and prolonged engagement that yields multifaceted benefits. This commitment to active participation in these partnerships is a strategic choice, reflecting a deep understanding of the value they bring. The benefits reaped from this engagement are manifold, ranging from success in project acquisition to invaluable access to a network of prominent stakeholders from both academia and industry.

Participation in European Partnerships offers more than just the opportunity to contribute to significant research endeavors; it opens doors to contract research opportunities, enhances visibility and recognition, and positions INESC at the forefront of critical discussions and developments. It provides INESC and its researchers with unparalleled insights into the process of agenda-setting at the European level, empowering them with the ability to influence it effectively.

Moreover, being part of these partnerships amplifies INESC's reputation, underscoring its role as a key player in advancing research technology development and innovation. This enhanced stature is not only recognition of INESC's contributions but also a testament to its ability to navigate and shape the R&I landscape in Europe.

For more and updated information on EU Partnerships, the ERA-Learn website serves as a valuable resource, providing insights into the evolving dynamics of these collaborations.

Transition from H2020 to Horizon Europe

The transition of Public-Private Partnerships (PPPs) from Horizon 2020 to Horizon Europe marks a significant evolution in the European Research and Innovation (R&I) framework. This shift, as depicted in the visuals from the ERA-LEARN 2022 Annual Report, embodies a strategic reorientation aimed at enhancing the effectiveness, impact, and alignment of these partnerships with the broader objectives of the European Union.

Under Horizon Europe, the focus of PPPs has been recalibrated to ensure closer synergy with the EU's key priorities, such as the Green Deal, digital transformation, and the resilience of European societies. This transition reflects a more integrated approach, where PPPs are not only avenues for collaborative research but also pivotal instruments in driving policy development and innovation agendas. The rationale behind this transition is to streamline the partnerships, making them more targeted and impactful, and to better leverage public and private investments in addressing the grand challenges facing Europe. The new structure under Horizon Europe and its transition from H2020 is illustrated in the figures below.

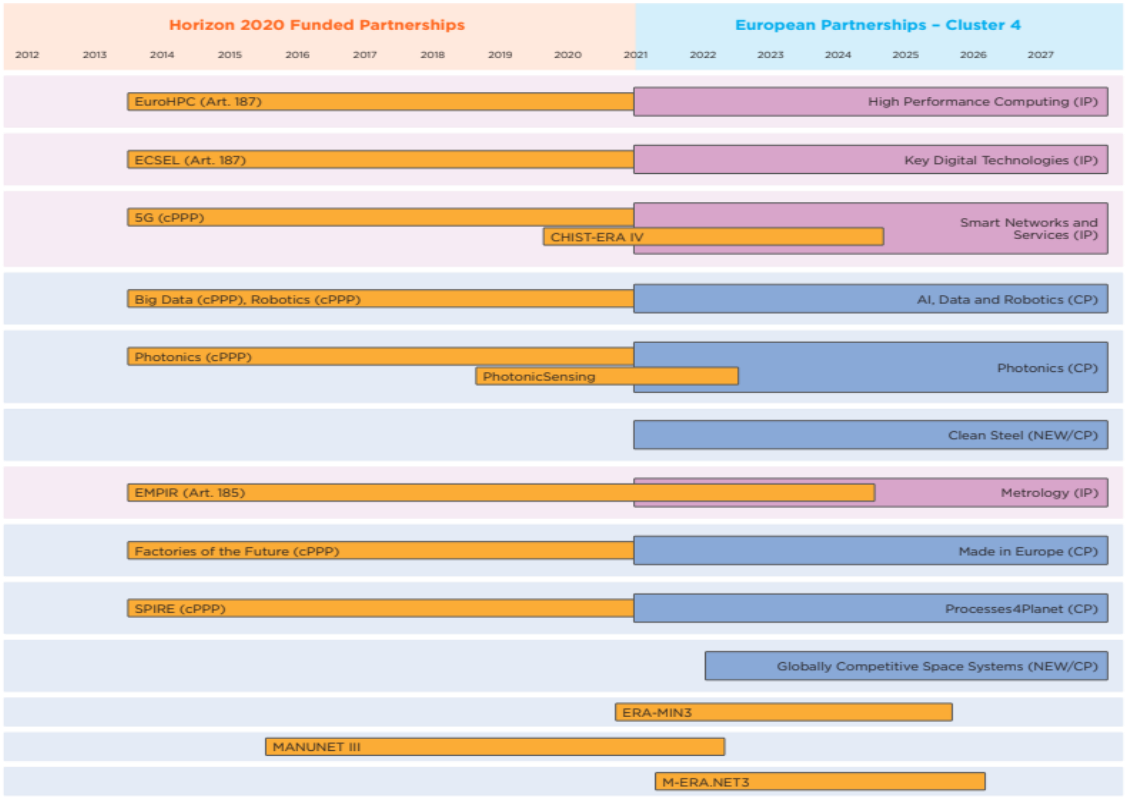

Figure 4: Cluster 4 European Partnerships and Horizon 2020 predecessors

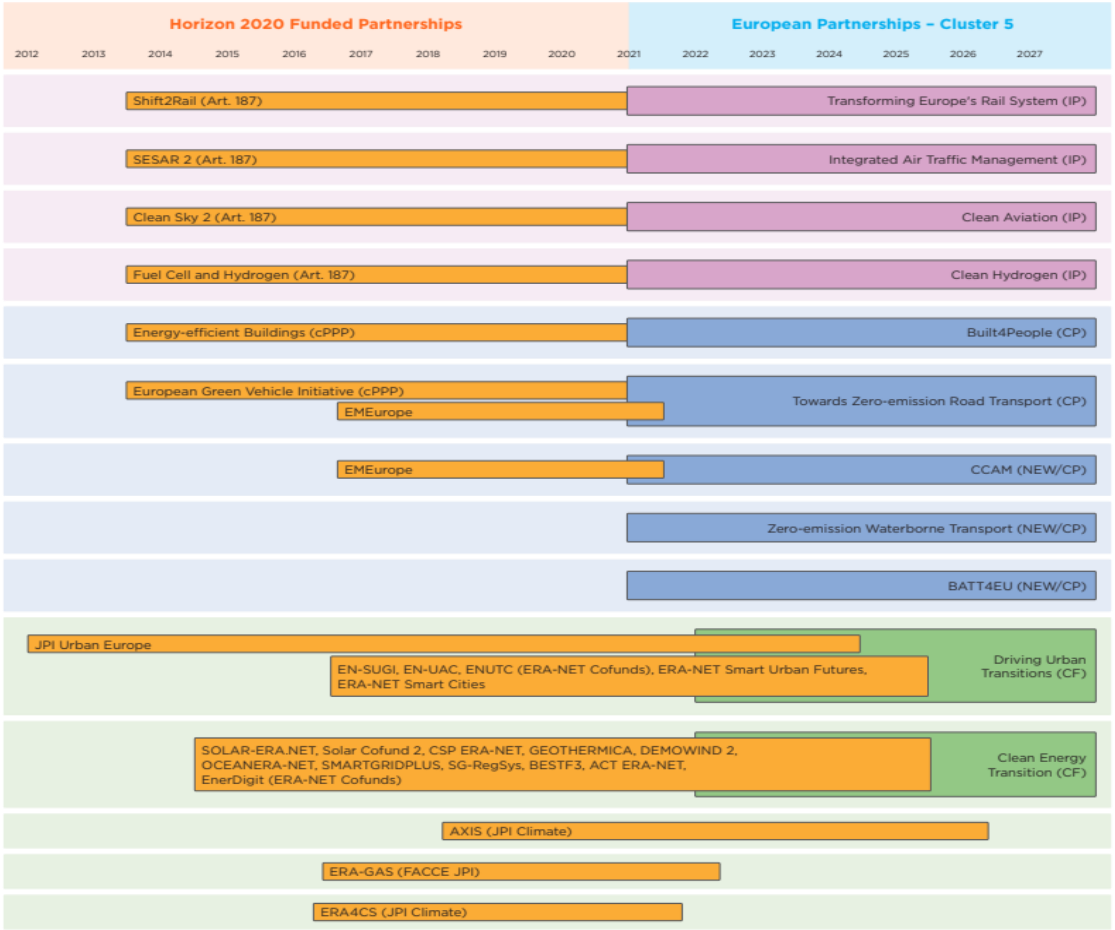

Figure 5: Cluster 5 European Partnerships and Horizon 2020 predecessors

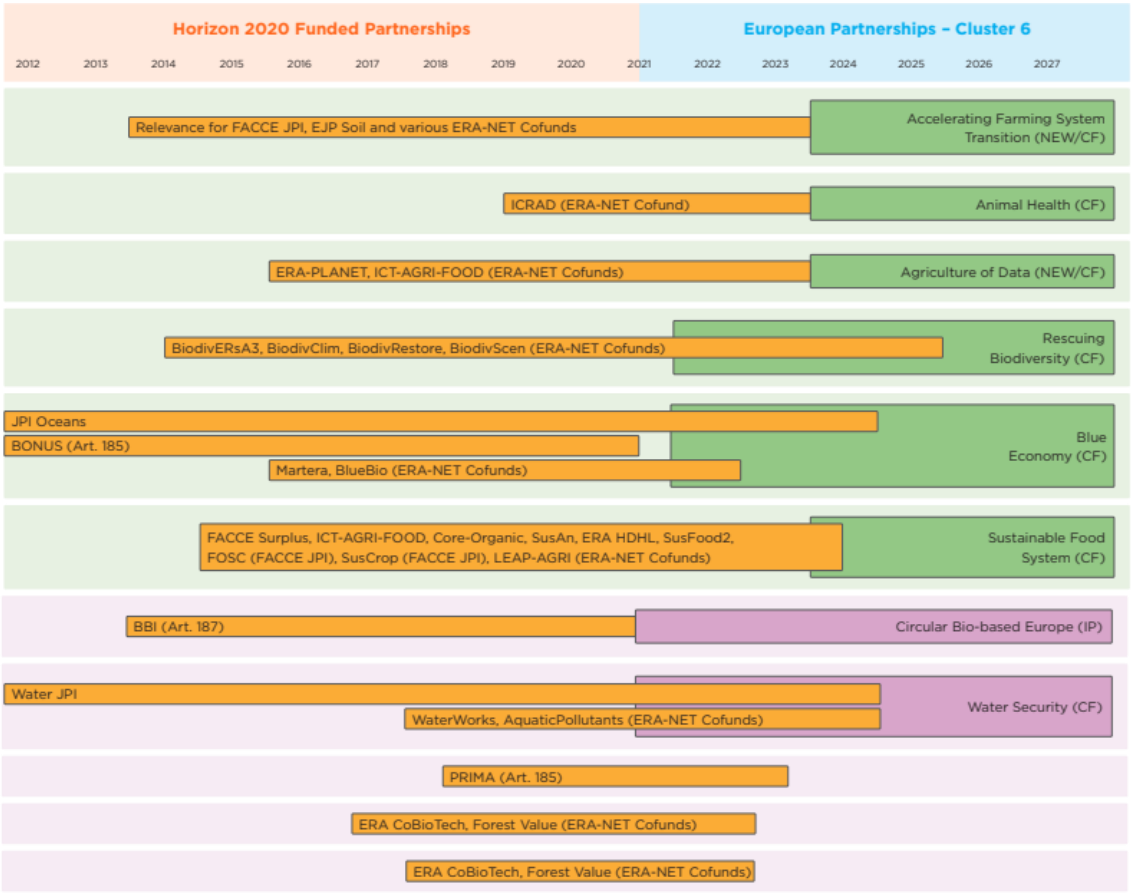

Figure 6: Cluster 6 European Partnerships and Horizon Europe predecessors

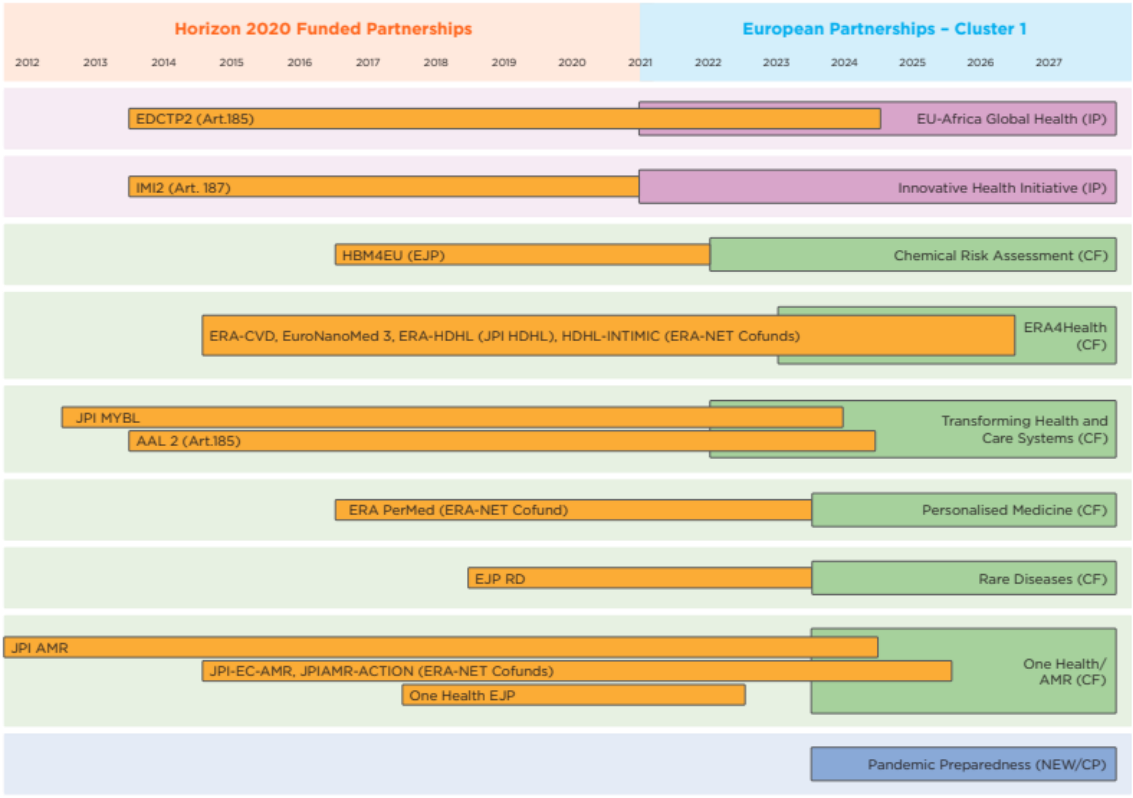

Figure 7: Other European Partnerships and Horizon 2020 predecessors

Tenders: shaping the trajectory of EU Research and Innovation

Tenders play a pivotal role that extends far beyond the procurement of goods and services. They are instruments through which the European Commission (EC) acquires critical insights necessary to sculpt policies, catalyze new initiatives, and, at times, expedite the R&I process. Tenders, while not exclusively research-focused, invariably encompass research-related issues and possess the potential to exert considerable influence on future R&I agendas.

The involvement of INESC in EU tenders is a testament to its strategic positioning and intellectual capital. As a member of the Advisory Board for the emerging policy on Technology Infrastructures, INESC is at the vanguard, advising on frameworks that will shape the continent's technological landscape. In collaboration with Science Business, INESC contributes to the development of next-generation ecosystem-based policies for entities like CERN, signifying its role in pioneering policy evolution in high-impact sectors.

These tenders, although varied in nature, often dovetail with the broader objectives of the European Commission's Directorates-General (DGs), executive agencies, as well as other EU institutions such as the European Parliament and Council. By securing framework contracts (FWCs) with these entities, INESC is not merely providing services on a recurring basis; it is actively engaging with thematic areas and methodologies that are at the forefront of Europe’s R&I pulse.

INESC's participation in winning consortia for FWCs with FRONTEX and DG Connect exemplifies its proficiency in aligning with EU priorities. These contracts, which are substantial and extend over multiple years, offer a steady platform for INESC to deploy its expertise, particularly in domains where the Commission is seeking regular and sustained input to inform its strategic R&I trajectory.

The EU's R&I process is crafted upon a foundation of strategic thought, planning, and extensive studies. Tenders issued by the European Commission are a crucial mechanism by which such groundwork is laid. Commissioning these studies through tenders enables the EC to draw upon external expertise, such as that of INESC, ensuring that work programmes are not only reflective of current research and innovation paradigms but are also prescient of future directions and challenges.

INESC's acumen in areas pertinent to these tenders—whether it be technology infrastructures, digital transformation, or security—positions it as a critical ally of the European Commission. The Institute's contributions to these tenders serve to augment its influence and visibility in shaping the EU's R&I agenda. By continuing to engage in these tenders and FWCs, INESC not only reinforces its stature within the European R&I ecosystem but also ensures that its expertise is harnessed in the crafting of a more innovative and resilient Europe.

Transition to INESC institutes' context

As we transition from the general landscape of EU Research and Innovation (R&I) to the specific context of INESC institutes, it becomes evident that the trends and developments discussed in the preceding sections are not only relevant but crucial for the thematic areas of INESC. The dynamic and competitive nature of the EU R&I landscape, with its focus on strategic networking, effective communication, and demonstration of strengths, resonates deeply with the strategic areas of INESC institutes. The evolving priorities of the EU, such as digital transformation, climate neutrality, and sustainable development, are directly aligned with the thematic areas INESC has been focusing on.

One significant aspect is the concept of "directionality" in EU R&I, particularly under the Horizon Europe Strategic Plan 2025-2027. This directionality, which is about aligning research efforts with broader societal, economic, and policy objectives, finds a natural synergy with the mission and vision of INESC institutes. Whether it is the engagement in power and energy systems, AI and big data, or climate technologies, INESC institutes are well-positioned to contribute significantly to these EU-specific trends. The emphasis on addressing societal challenges, fostering digital transformation, and advancing towards climate neutrality mirrors the strengths and aspirations of INESC.

Furthermore, the challenges and opportunities in the EU R&I landscape, such as funding limitations, infrastructural needs, and the necessity of international networking and visibility, offer a roadmap for INESC institutes. These aspects not only highlight areas for strategic focus but also underscore the potential for INESC to enhance its role and impact in the EU R&I ecosystem. The evolving nature of EU strategies, including the integration with Horizon Europe, the Green Deal, and the Digital Europe Programme, provides a fertile ground for INESC institutes to align their research priorities, strategize their networking efforts, and enhance their participation in collaborative projects.

As we go deeper into the specific thematic areas of INESC institutes in the next section, it becomes increasingly clear that the developments in the EU R&I landscape are not just external factors but integral elements that shape and drive the research and innovation agenda of INESC. The strategic alignment with EU policies, the focus on emerging and relevant technological domains, and the commitment to address pressing societal challenges are not only in line with EU trends but are also at the heart of INESC institutes' mission. This seamless integration of INESC’s thematic areas with the EU's R&I landscape underscores a unique opportunity for these institutes to not only contribute to but also shape the future of R&I in Europe.

INESC institutes: strategic areas and EU policy alignment

The collective strength of the INESC institutes emerges not only from shared strategic objectives but also from the unique diversity each institute brings to the table. This chapter, a keystone of our broader discussion paper, aims to weave together a cohesive narrative that respects this multiplicity of perspectives, competencies, and ambitions.

The primary objective of this chapter is twofold: first, to align the collective thematic areas of the INESC institutes with the priority axes of EU policy, thereby leveraging synergies and capitalizing on shared opportunities; and second, to shine a spotlight on the individuality of each institute. By doing so, we reflect on how their specific areas of competence and research strengths can further the development of the collective and resonate with the overarching goals of the European Union.

We approach this task with the understanding that the whole is greater than the sum of its parts. As such, while we address the collective capabilities and strategies, we also dive into the particular contributions and potential of INESC Coimbra, INESC ID, INOV, INESC MN and INESC TEC. Our discourse is not homogenizing; rather, it seeks to identify how the distinctiveness of each entity can be harmonized into a powerful collective force aligned with EU directives.

Acknowledging the complexity of this endeavor, we proceed with a clear vision: to establish a roadmap for strategic positioning that not only aligns with but actively contributes to shaping the future of EU research and innovation. This chapter is set out to provide actionable insights and a platform for discussion, ultimately serving as a blueprint for the INESC system to navigate the evolving EU policies and funding mechanisms with agility and foresight.

In the spirit of constructive collaboration, we invite each INESC institute to engage with this chapter not just as a reflection of current capabilities but as a catalyst for future growth and a guide for concerted action.

Below are some highlights that underscore our commitment to a strategic alignment that is proactive, coherent, and ambitious. They provide a foundation for the action plan we will discuss, focused on leveraging our collective role, our role in Europe and the role of the INESC Brussels HUB as a facilitator and catalyst for our collective aspirations.

1. **Unified R&I front:** The INESC institutes collectively embody a formidable front for innovation, with capabilities that resonate deeply with the European Green Deal and the digital agenda set by the EU. Our collective expertise in areas such as energy, technology, and sustainability is not just aligned but integral to the success of these initiatives.

2. **Diversity as strength:** The diversity of our institutes – spanning from advanced computing and materials nanotechnology to energy systems and smart cities – positions us uniquely to contribute to a wide array of EU policies. This diversity enables a multi-faceted approach to research and innovation, reflecting the comprehensive scope of EU strategic interests.

3. **Synergy with smart specialisation:** Our alignment with regional smart specialisation strategies enhances our ability to tap into EU funding streams, ensuring that our research efforts are both regionally grounded and European in scope.

4. **Action points for collaboration:** The INESC network is poised to strengthen collaboration through joint initiatives, shared infrastructure projects, and coordinated policy advocacy.

By doing so, we can amplify our impact, increase our visibility, and secure a more significant share of EU funding opportunities.

5. **Strategic roadmaps for infrastructures:** Developing joint roadmaps for research infrastructures will enable us to present a united front in EU forums, showcasing our collective commitment to addressing European and global challenges.
6. **Holistic engagement:** By engaging with the EU's policy-making processes, we ensure that our collective voice is not only heard but that it also actively shapes the research and innovation landscape.
7. **Monitoring for success:** Establishing a network-wide monitoring and evaluation framework will help us to measure our progress against EU policy alignment and funding success, ensuring that our strategies remain agile and responsive to the evolving EU landscape.

Thematic areas

As we talk about the thematic areas of the INESC institutes, we must first recognize the intricate process that underpins this chapter of our discussion paper. Orchestrated by Prof. Pedro Guedes de Oliveira and propelled by the concerted efforts of the INESC Holding's Conselho Superior do Sistema INESC in partnership with the INESC Brussels HUB, this endeavor has been a testament to collaborative synthesis.

This initiative, often referred to as "the impossible exercise," sought to coalesce the extensive range of research and innovation fields from the five distinct INESC institutes into a set of thematic areas, each with its own knowledge domains. This was not a task of reduction but of representation—distilling the essence of our institutes into thematic areas as comprehensive as they are succinct. These areas are a testament to our collective expertise and a beacon for our unity in diversity.

The implications of this exercise extend far beyond internal organizational alignment. They are integral to amplifying our presence and shaping our identity within the European research and innovation environment. By defining these thematic areas, we lay the groundwork for enhanced branding, increased visibility, and a pronounced institutional presence, crucial for our engagement with the European community.

In the next few pages, we will outline each thematic area along with the current, albeit non-exhaustive, knowledge domains. This classification will serve as a scaffold for mapping our collective competencies to the specific priorities of EU policy, including initiatives such as the European Green Deal, the digital transformation agenda, and smart specialization strategies. Here, we will reveal points of synergy and potential avenues for contribution and growth.

To bring these thematic areas to life, we will present examples from the individual INESC institutes that underscore their strengths, anchored in activity reports and strategic documents. Additionally, we will explore deeper into the institutes' unique fields of expertise with case studies that illustrate the alignment and developmental prospects within the EU policy framework.

We will also identify relevant EU funding programs that resonate with our thematic areas, emphasizing Horizon Europe and the Innovation Fund. Alongside this, we will discuss the

trends that are poised to shape future funding directions—trends that hinge on sustainability, technological integration, and the interplay between science and society.

This section is not merely descriptive but is designed as a platform for strategic dialogue, setting the stage for an informed discussion focused on leveraging the INESC Brussels HUB's role in fostering a unified and proactive approach to European collaboration and funding acquisition.

Through this exploration, the INESC institutes affirm their commitment to a future where our thematic areas not only align with but also actively contribute to and shape the European Union's vision for research and innovation.

Thematic areas and knowledge domains

Thematic area	Knowledge domains
Power and Energy Systems	Steady-state and dynamic power system operation and control
	Electricity markets modelling and simulation
	Distributed energy resources modelling and aggregation
	Sector coupling modelling
	Power electronics
	Modelling and real-time simulation of cyber-physical systems
	Reliability analysis of energy systems
	Data Science
	Optimisation and decision-aid
	Micro-grids and nano-grids
	Sensors for energy systems
	End-of-life battery evaluation
	Sustainable energy systems for IoT
	Carbon based electrodes and electrolytes for batteries

Thematic area	Knowledge domains
Advanced Computing	Agile Methods
	Computer architecture
	Computer Graphics
	Embedded Systems
	Formal Methods
	Human-Computer Interaction
	Immersive Environments
	Information Security
	Information Systems
	Information Retrieval
	Information Visualization
	Theory of Computation
	Parallel and Distributed Systems
	Programming Languages
	Quantum Computing
	Real-Time Systems
	Software Verification and Validation
	Software Architecture and Design
	Model-driven Development
	Storage Systems
	Cybersecurity
	Information systems
	Hardware for computing
	Scientific computing

Thematic area	Knowledge domains
Artificial Intelligence & Data Science	AI Ethics
	Audio and Signal Understanding and Forecasting
	Bayesian Approaches
	Bioinformatics, Cheminformatics, Medical Informatics
	Computer Vision and Pattern Recognition
	Decision Support
	Deep Learning and Reinforcement Learning
	Distributed and Federated Machine Learning
	Information Retrieval
	Natural Language Processing
	Network Science
	Personalization and Recommender Systems
	Cyber-physical systems
	Robotics and autonomous systems
	Statistical Data Analysis
	Symbolic Machine Learning
	Transparent and Trustworthy AI
	Hybrid Human-Artificial Intelligence

Thematic area	Knowledge domains
Advanced Communications Systems and technology	Communications architectures and protocols
	Electronics
	Multimedia
	Network and resource management
	Network security
	Optoelectronics and photonics
	Reconfigurable hardware systems
	Signal processing
	System modelling, simulation, and prototyping
	Wireless communications
	5G/6G
	LPWAN

Thematic area	Knowledge domains
Systems engineering and management	Optimisation and decision support
	Digital technologies
	Information management and analytics
	Operations research
	Operations management
	Service system design
	Technology management and policy
	Innovation management
	Socio-technical systems design

Thematic area	Knowledge domains
Electronic systems, microelectronics and Optoelectronics	Fiber Optic Sensors
	Fiber lasers
	Remote Sensing
	Optical microfabrication
	Metallic and dielectric nanostructures
	Optofluidics
	Integrated optics
	Optical resonance structures
	Optical signal processing
	Optical computing
	Nonlinear optics
	Quantum simulations
	Optical tweezers
	Spectroscopy
	Micro and nano technologies
	Micro and Nanofabrication, Infrastructures and Pilot Lines
	Heterogeneous integration of sensors and MEMS with CMOS
	Flexible and Wearable Electronics
	Photonics
	Semiconductors
	Sensoring and monitoring
	Biosensors and microfluidics
	Circuit design

Thematic area	Knowledge domains
Bioengineering and Health Technologies	Biosensors and microfluidics
	Point-of-care and Lab on Chip systems
	Biomedical Devices
	Affective Computing & Human-Machine Symbiosis
	Bioinformatics & Computational Biology
	Biomechanics & Biorobotics
	Biomedical Engineering in Education, Industry & Society
	Biomedical Signal & Image Processing
	Biometrics
	Bionics, Wearable & Implantable Technologies
	Biosensors
	Cardiopulmonary Systems Engineering
	Diagnostic & Therapeutic Systems
	Health Informatics – Personalized Health
	Micro- & Nano biotechnologies
	Neuroengineering
	Rehabilitation Engineering
	Telemedicine

Thematic area	Knowledge domains
Transversal areas	Research and Technology Infrastructure managers and tech support
	HR/Research Careers
	Knowledge valorisation and tech commercialisation
	R&I Management
	R&I Communication
	Science-based policy advice

Power and energy systems – Selected EU policies and funding opportunities

Policy Name	Description	Relevance to INESC
European Green Deal	Aims to make Europe climate-neutral by 2050, directly relating to sustainable and efficient energy system operations.	Aligns with INESC's focus on sustainable and efficient energy operations.
Clean Energy for All Europeans Package	Seeks to empower consumers, improve energy efficiency, increase renewable energy usage, and ensure a well-functioning energy market.	Relevant to INESC's efforts in consumer empowerment and renewable energy research.
EU Strategy for Energy System Integration	Focuses on linking different energy sectors to improve efficiency and reduce carbon emissions, aligning with sector coupling modelling.	Matches INESC's work on energy sector efficiency and carbon emission reduction.
Circular Economy Action Plan	Addresses sustainable resource use and life-cycle thinking, applicable to end-of-life battery evaluation and sustainable energy systems.	Complements INESC's research on sustainable resource management and energy systems.
Strategy on Hydrogen	Focuses on enabling large-scale deployment of hydrogen technologies by 2030, essential for decarbonizing industrial processes.	Crucial for INESC's research in hydrogen technology and industrial decarbonization.
Decarbonising our Energy System	Emphasizes reducing carbon emissions across all sectors of the energy system, encouraging research in energy efficiency and renewable energy.	Aligns with INESC's focus on energy efficiency, renewable energy, and smart energy systems.
EU Energy System Integration Strategy	Complements the strategy for energy system integration, focusing on the coordinated planning and operation of the energy system as a whole.	Relevant to INESC's integrated approach to energy system planning and operation.
EU 2050 Long Term Strategy	Aims to achieve a climate-neutral economy by 2050, necessitating significant contributions from the energy sector.	Supports INESC's contributions to achieving a climate-neutral economy.
RePowerEU	Addresses immediate energy supply challenges and the longer-term objective of transforming the EU's energy system.	Aligns with INESC's work towards transforming the EU's energy system.
National Energy and Climate Plans	Integrated plans encompassing climate and energy objectives, targets, policies, and measures for 2021-2030, key to the EU's energy governance.	Important for aligning INESC's agenda with EU climate and energy objectives.
EU Action against Energy Crisis	Involves measures to ensure energy security and manage the impact of energy price increases while supporting the green transition.	Supports INESC's role in addressing energy security and the green transition.

Funding Programme	Scope	Opportunities for INESC
Horizon Europe	The key funding programme for R&D, including clusters focused on climate, energy, and mobility.	Offers funding for energy system reliability and optimization research.
Innovation Fund	One of the world's largest programmes for innovative low-carbon technology demonstrations.	Relevant for INESC's energy system innovation projects.
LIFE Programme	Provides funding for energy efficiency, renewable energies, and energy-related technology development.	Supports INESC's projects related to energy efficiency and renewable energy technologies.
Connecting Europe Facility (CEF)	Supports trans-European networks and infrastructures in transport, telecommunications, and energy.	Provides opportunities for INESC in developing energy infrastructure and networks.
Digital Europe Programme	Supports the digital transformation of Europe's society and economy, relevant to cyber-physical systems and data science.	Provides funding opportunities for INESC in areas of digitalization related to energy systems.

Advanced computing – Selected EU policies and funding opportunities

Policy Name	Description	Relevance for INESC
EU's Cybersecurity Strategy for the Digital Decade	Outlines the vision for a secure digital transformation, aiming to protect services, infrastructure, and citizens from cyber threats.	Aligns with INESC's commitment to advancing secure digital transformation and enhancing cybersecurity readiness.
Network and Information Security Directive (NIS2)	Introduces rules for a high level of cybersecurity across the EU, covering essential sectors and enhancing obligations for entities.	Relevant to INESC's involvement in critical sectors and strengthening cybersecurity practices across its operations.
Cyber Resilience Act	Aims to establish cybersecurity requirements for products with digital components to bolster security across the EU.	Supports INESC's development of secure-by-design digital products and contributes to cybersecurity standardization.
EU Cyber Defence Policy	Developed to boost cooperation and investments in cyber defence capabilities, constructed around four pillars.	Strategically important for INESC's role in cooperating on cyber defence initiatives and capability development.
European Data Strategy	Aims to create a single market for data to ensure Europe's competitiveness and data sovereignty, with a role for HPC in data processing.	Crucial for INESC's engagement in high-performance computing and data processing for competitive and sovereign data strategies.
European Industrial Strategy	Acknowledges the importance of advanced computing in boosting industrial innovation and productivity across sectors.	Enhances INESC's opportunities to leverage advanced computing for innovation and productivity in various industries.
European Cybersecurity Competence Centre (ECCC)	Strategic move to consolidate cybersecurity efforts, focusing on investment in key areas and guiding future work programmes.	Offers INESC a platform for engagement in coordinated EU cybersecurity efforts and access to related investments.
Open Science Policy	Supports efforts to make science more efficient through sharing of data and resources, including the European Open Science Cloud.	Facilitates INESC's participation in open science initiatives, enhancing collaboration and data sharing.

Funding Programme	Scope	Opportunities for INESC
Horizon Europe	The EU's key funding program for research and innovation, supporting initiatives including advanced computing and cybersecurity.	Opportunity to engage in a broad range of research and innovation projects, enhancing INESC's capabilities in advanced computing.
Digital Europe Programme (DEP)	Accelerates the economic recovery and digital transformation of Europe with provisions for advanced computing, HPC, AI, and cybersecurity.	Supports INESC's contributions to Europe's digital transformation and recovery with a focus on computing technologies.
Connecting Europe Facility (CEF)	Funds key infrastructure investments at the EU level, enhancing digital connectivity and infrastructures encompassing advanced computing and cybersecurity.	Facilitates INESC's involvement in enhancing digital connectivity and infrastructure, including cybersecurity.
EuroHPC Joint Undertaking (JU)	Pools European resources to deploy supercomputers and develop an exascale supercomputing ecosystem for Europe.	Enables INESC to participate in leading supercomputing initiatives and access cutting-edge computing resources.
European Defence Fund (EDF)	Supports the development of cybersecurity measures and technologies, including those relevant to advanced computing.	Offers INESC potential to contribute to defense-related cybersecurity and computing technologies.
European Cybersecurity Competence Centre (ECCC)	Improves cybersecurity competences and coordinates research and innovation funding in the cybersecurity domain.	Aligns with INESC's efforts to strengthen cybersecurity research and coordination of funding.
European Regional Development Fund (ERDF)	Supports regional development, including innovation and research in advanced computing.	Provides INESC with opportunities for regional development through innovation in advanced computing.
European Structural and Investment Funds (ESIF)	Supports economic development across the EU, including investments in advanced computing infrastructures.	Presents potential for INESC to leverage investments for developing advanced computing infrastructures and research.

Artificial intelligence and data science – Selected EU policies and funding opportunities

Policy Name	Description	Relevance for INESC
Europe for the Digital Decade	Outlines EU's vision to empower people with new technologies by 2030, for a fully inclusive digital transformation contributing to EU's green transition goals.	Aligns with INESC's initiatives on digital transformation and sustainability.
European AI Strategy	Focuses on ensuring AI development/deployment are trustworthy, respecting EU values and rights, resources for businesses and public sector to adopt AI.	Supports INESC's efforts in AI adoption and compliance with European values.
Digital Services Act (DSA) and Digital Markets Act (DMA)	Aims to create a safer digital space where users' rights are protected and to establish a level playing field for businesses.	Relevant to INESC's commitment to creating a safer digital environment and fair business practices.
Data Governance Act	Designed to increase trust in data sharing, improve data availability, and support the creation of common European data spaces.	Matches INESC's work on data sharing, availability, and creating data spaces.
European Legal Framework for AI	Addresses risks associated with AI and lays down rules for AI development and use to protect fundamental rights and safety.	Complements INESC's adherence to legal frameworks in AI development and application.
Civil Liability Framework	Adapts liability rules to the digital age and AI, ensuring they are fit for the digital economy and society.	Important for INESC's focus on AI-related legal adaptability and digital economy integration.
EU AI Act	Classifies AI systems by risk level and sets regulatory requirements to ensure AI systems are safe and respect laws on rights and safety.	Crucial for INESC's alignment with safety and regulatory standards in AI.
AI in Science Policy	Emphasizes accelerating the adoption of AI in science, addressing challenges like data access, computational power, and scientific integrity.	Enhances INESC's involvement in AI-driven scientific research and innovation.
Open Science	Includes initiatives like EOSC to provide researchers access to scientific data across borders, impacting areas like bioinformatics.	Facilitates INESC's access to scientific data, promoting cross-border research collaborations.
EU Copyright and Data Legislative Framework for Research	Intended to facilitate the sharing and utilization of data, relevant to domains such as statistical data analysis and information retrieval.	Aids INESC's data-related research activities and data sharing practices.
Civil Law Rules on Robotics	Recommends developing civil law rules on robotics, addressing ethical and legal issues like safety, privacy, integrity, and data ownership.	Pertinent to INESC's research on robotics and the development of ethical guidelines.
Coordinated Plan on Artificial Intelligence	Includes robotics as a priority, promoting technological sovereignty while maintaining a competitive edge.	Aligns with INESC's research on AI and robotics, ensuring compliance with EU standards.
Regulation on Machinery Products	Aims to update safety requirements for emerging autonomous robots, ensuring compliance with EU safety standards.	Significant for INESC's research in autonomous robotics and safety compliance.
Product Liability Directive	Being revised to clarify compensation rules when damages are caused by AI and robots, addressing liabilities associated with robotics technologies.	Essential for INESC's understanding of liabilities in robotics and AI applications.
Robotics and AI in Healthcare	Recognizes the potential of robotics and AI in healthcare, seen as pivotal in transforming health technology.	Strategic for INESC's research and development in healthcare technology.
Ethics and Liability	New rules are being discussed for ethical considerations and liabilities in case of accidents caused by robots.	Vital for INESC's approach to ethical issues and liability in robotics and AI.

Funding Programme	Scope	Opportunities for INESC
Horizon Europe	Supports a wide range of activities from frontier research to market-creating innovation, including specific funding for AI, data, and robotics technologies.	Opportunity to participate in a broad range of research and innovation projects, enhancing INESC's position in AI and related technologies.
Digital Europe Programme	Aims to accelerate the recovery and digital transformation of Europe, with a targeted approach to funding AI technologies.	Supports INESC's digital transformation efforts and projects that contribute to Europe's digital progress in AI.
Artificial Intelligence, Data and Robotics Partnership	Defines and implements a joint research and innovation agenda for Europe in AI, data, and robotics, funding networks of excellence and testing facilities.	Facilitates INESC's involvement in driving technological advancements and applications in AI and robotics across various sectors.
European Research Council (ERC)	Provides grants to support investigator-driven frontier research in various fields, including top-level AI research.	Opportunity for INESC's researchers to pursue groundbreaking AI research with a focus on scientific excellence.
European Innovation Council	Offers funding for breakthrough innovations, including advancements in AI, data, and robotics, targeting promising innovators and SMEs.	Encourages INESC's innovative projects and SMEs to engage in AI-related breakthroughs with potential for market impact.

Advanced Communications Systems and technology – Selected EU policies and funding opportunities

Policy Name	Description	Relevance for INESC
Europe's Digital Decade	Targets for 2030 to guide digital transformation, focusing on skills, secure digital infrastructures, business digitalization, and public services digitalization.	Enhances INESC's research in digital transformation and infrastructure.
Gigabit Infrastructure Act	Legislation to enhance gigabit internet infrastructure, prioritizing high-speed connections.	Critical for advancing INESC's focus on high-speed internet connectivity.
Gigabit Connectivity	Initiatives ensuring that all EU citizens and businesses have access to gigabit connectivity, supporting advanced technologies like 5G/6G and LPWAN.	Aligns with INESC's initiatives in next-generation internet technologies.
Transformation of the Connectivity Sector in the EU	Overarching strategies for updating connectivity infrastructure and regulatory frameworks to support new technologies.	Influences INESC's strategies in modernizing connectivity frameworks.
European Electronic Communications Code	A regulatory framework for electronic communications, enhancing consumer rights and encouraging investment in high-capacity networks.	Relevant for INESC's focus on consumer rights and network investment.
Connectivity Toolbox	Best practices to foster investment in high-capacity network infrastructures, supporting communication architectures and network management.	Helpful for INESC in developing high-capacity network solutions.
WiFi4EU Initiative	Program to offer free Wi-Fi in public spaces, improving public access to internet services.	Aids INESC's work in public internet access and service improvement.
Smart Networks and Services Joint Undertaking	Research and innovation support in 5G and beyond, aiming for European leadership in the field.	Key to INESC's leadership in 5G and future network technologies.
5G Networks	Policies for the deployment of 5G networks, essential for wireless communications and reconfigurable hardware systems.	Essential for INESC's involvement in 5G deployment and innovation.
Open Internet	Regulations ensuring net neutrality, with equal treatment of internet traffic.	Resonates with INESC's commitment to fair internet access and usage.
ICT and Standardisation	Standard-setting efforts across ICTs for compatibility and security.	Aligns with INESC's work in ICT standardization for security and compatibility.
Satellite Broadband	Policies for satellite broadband services, expanding connectivity in remote areas.	Expands INESC's research in remote connectivity solutions.
Cybersecurity	Laws to bolster cybersecurity, including establishing a European cybersecurity center.	Relevant for INESC's efforts in enhancing cybersecurity measures.
Intelligent Road Transport Systems (ITS)	New rules for ITS in road transport to advance wireless communication technologies.	Influential in INESC's research in intelligent transportation systems.
European Digital Identity (eID)	Developing a secure eID for reliable digital identification across the EU.	Significant for INESC's work in digital identity and security.
Taxation of the Digital Economy	Creating fair tax rules where digital presence is significant, affecting the economic ecosystem of advanced communications.	Impacts INESC's understanding of digital economy and taxation.

Funding Programme	Scope	Opportunities for INESC
Horizon Europe	EU's flagship research and innovation programme supporting a wide range of projects including advanced communications, with a budget of €95.5 billion.	Participating in projects, leading research collaborations, and influencing EU policy implementation in relevant fields.
Digital Europe Programme (DIGITAL)	Accelerates recovery and digital transformation in Europe, with a focus on supercomputing, AI, cybersecurity, digital skills, and digital technology use.	Engaging with specific calls for proposals, especially in advanced digital skills and semiconductor disciplines.
Connecting Europe Facility	Supports development of high-performing, sustainable, and interconnected trans-European networks in digital, energy, and transport fields.	Involvement in projects enhancing digital connectivity infrastructure, which can include advanced communications systems.
EU4Health Programme	Focused on health but intersects with communications technologies, particularly in health data and telemedicine.	Leveraging intersections with telemedicine and health data management for communications technology projects.
European Social Fund+ (ESF+)	Invests in people, including education and training in digital skills for the advanced communications sector.	Accessing funds for training programs in digital skills relevant to the communications sector.
Smart Networks and Services Joint Undertaking (SNS JU)	Supports research and innovation in 5G and beyond, focusing on the next generation of mobile communication systems.	Crucial for INESC researchers focusing on wireless communications and network infrastructures.
Clean Aviation Joint Undertaking	Focuses on making aviation more environmentally friendly but also drives innovation in communication technologies for aeronautics.	Relevant for INESC researchers working on communication technologies for aeronautics.
European Green Vehicles Initiative (EGVI)	Offers opportunities for innovation in the development of new transport and mobility technologies, including vehicular communications.	For INESC researchers focused on intelligent transportation systems and vehicular communications.
5G Infrastructure Public Private Partnership (5G PPP)	A joint initiative to create the next generation of communication networks and services, providing ubiquitous super-fast connectivity.	Enables INESC researchers to be at the forefront of developing super-fast connectivity solutions for European citizens and businesses.
Partnership for Research and Innovation in the Mediterranean Area (PRIMA)	Aims to enhance cross-sectoral collaboration opportunities in research involving advanced communication technologies related to environmental monitoring or agriculture.	Provides INESC with collaboration opportunities in environmental monitoring and agriculture related communication technologies.

Electronic Systems, Microelectronics, and Optoelectronics – Selected EU policies and funding opportunities

Policy Name	Description	Relevance for INESC
European Chips Act	A regulation aimed at bolstering Europe's competitiveness and resilience in semiconductor technologies and applications, which includes provisions to strengthen research, technological capabilities, and production within the EU.	Semiconductors R&I and integration in production value chains
Alliance on Processors and Semiconductor Technologies	An initiative designed to bring together stakeholders across the semiconductor value chain, from microelectronics companies to chip users, with the goal of creating a robust European microelectronics ecosystem.	Industrial Alliance on Microelectronics
DIGITALEUROPE Recommendations	DIGITALEUROPE has provided recommendations for the EU's semiconductor strategy, emphasizing the need to create a European microelectronics ecosystem. The alliance formed should include microelectronics companies and their supply chain, as well as chip users. Public investments are suggested to be based on market demand, and there is a call for action to make Europe more business-friendly to attract private microelectronics investments. This includes improving administrative systems, speeding up IPCEI procedures, and introducing innovation measures like tax credits.	Monitor, participate and influence agenda-setting in Digital Europe programme
Microelectronics and Communication Technologies (IPCEI)	Important Projects of Common European Interest (IPCEI) allow Member States to jointly support transnational projects in order to overcome important market or systemic failures and societal challenges. It is a framework that supports research and innovation, first industrial deployment, and construction of infrastructure in the field of microelectronics and communication technologies.	Chips Act related initiatives at EU-MS level
Semiconductor Alert System	A monitoring and coordination mechanism for assessing and evaluating the semiconductor supply chain. This system is designed to recommend and organize action in the event of supply chain disruptions, ensuring a swift and decisive response from the EU.	Research and Technology Infrastructures related to microelectronics, micro and nano fabrication

Funding Programme	Scope	Opportunities for INESC
Horizon Europe	The EU's key funding program for research and innovation, with a strong emphasis on digital and green technologies, including microelectronics and optoelectronics.	Continued funding for projects under Horizon Europe, especially in digital and green technologies related to microelectronics and optoelectronics.
Digital Europe Programme	Set to bolster the digital transformation of Europe, with specific funding for supercomputing, artificial intelligence, cybersecurity, advanced digital skills, and digital technologies utilization.	Contributes to funding of the Chips JU and supports initiatives in supercomputing, AI, cybersecurity, and digital skills relevant to INESC.
European Regional Development Fund (ERDF)	Aims to correct imbalances between EU regions, with a portion of its budget likely to be allocated to innovation and research in microelectronics and optoelectronics.	Potential allocation of budget for research and innovation in microelectronics and optoelectronics, areas of interest for INESC.
Connecting Europe Facility	Provides key infrastructural support, which may include digital infrastructure relevant to microelectronics and optoelectronics.	Infrastructural support opportunities that can benefit INESC's work in microelectronics and optoelectronics.
Chips Joint Undertaking (Chips JU)	Oversees programs for innovation in electronic components and systems, including activities from research to production and security of supply in the semiconductor sector.	Calls for projects that encompass research to production in semiconductors, offering significant opportunities for INESC.
Chips Fund	Aims to facilitate access to finance, especially for startups, scale-ups, SMEs, and small mid-caps in the semiconductor sector.	Access to finance for INESC initiatives, particularly in the startup and SME sectors within the semiconductor industry.

Bioengineering and Health Technologies – Selected EU policies and funding opportunities

Policy Name	Description	Relevance for INESC
EU4Health	EU's ambitious health program aimed at creating a European Health Union to improve health care and strengthen health systems.	Participating in the creation of a European Health Union and influencing health care improvements.
Fit for Health 2.0	A network to stimulate European researchers' participation in health-related projects within Horizon Europe.	Involvement in health-related Horizon Europe projects and benefiting from the support network.
Health Technology Assessment (HTA)	A strategic approach to evaluate health technology implications and value, informing healthcare decision-making at policy and clinical levels.	Contributing to the HTA process, informing healthcare decision-making with technology assessments.
Regulation on HTA	A proposal to boost cooperation among EU Member States for assessing health technologies transparently and based on clinical evidence.	Engaging in EU-wide health technology assessments, promoting the use of clinical evidence in health innovation.
Personalised Medicine	Customization of healthcare, with decisions and treatments tailored to individual patients, improving outcomes and health system effectiveness.	Advancing research in personalized medicine, contributing to more effective treatment protocols tailored to individual needs.
Environment and Health	Actions aimed at understanding and mitigating the impact of environmental degradation and pollution on human health.	Researching the intersection of environmental factors and human health, supporting policies that mitigate health risks.
European Health Union	An initiative to strengthen the EU's response to serious cross-border health threats and improve health system resilience.	Contributing to the strengthening of health systems and responding to cross-border health threats.
European Health Data Space	A proposal to improve access to and exchange of health data, crucial for healthcare advancement, research, and policymaking.	Utilizing health data to advance health care, research, and policy-making within the European Health Data Space.
Europe's Beating Cancer Plan	A comprehensive plan to tackle cancer from every angle, supporting Member States' efforts at every stage of the disease.	Participating in initiatives and research to support the comprehensive approach of Europe's Beating Cancer Plan.
A Comprehensive Approach to Mental Health	EU actions and strategies to address mental health as a key public health component, promoting well-being and providing care.	Addressing mental health through research and innovation, supporting comprehensive health strategies.
EU Global Health Strategy	A strategy to shape global health policy, improve health security, and foster better health for all through international cooperation.	Shaping global health policies and contributing to international health security measures.
Crisis Preparedness	Initiatives and mechanisms for the EU to prepare for and manage serious cross-border health threats and crises.	Enhancing crisis preparedness through research in health technologies and systems.
Pharmaceutical Strategy for Europe	A strategy to ensure that patients have access to high-quality, safe, effective, and affordable medicines.	Influencing the future pharmaceutical landscape and ensuring the availability of innovative medicines.

Funding Programme	Scope	Opportunities for INESC
EU4Health Programme	A large EU funding programme aimed at improving health across the EU, protecting citizens from serious cross-border health threats, and enhancing crisis response capacity.	May align with bioengineering and health technologies, offering financial support for research in these areas. Can fund INESC projects aimed at health improvement, protection, and system innovation within Europe.
Innovative Health Initiative (IHI)	A joint undertaking to speed up the development of better and safer medicines for patients, including research in bioengineering and health technologies.	Provides opportunities for INESC to engage in pharmaceutical and bioengineering research projects.
Digital Europe Programme	Focused on digital transformation in Europe and supports the deployment and use of digital technologies, including health informatics.	Supports the use of digital tools in health technologies, relevant for INESC's work in health informatics.
European and Developing Countries Clinical Trials Partnership (EDCTP)	A public-public partnership that focuses on accelerating the development of new or improved drugs, vaccines, and diagnostics for infectious diseases in sub-Saharan Africa.	Offers potential for INESC to contribute to global health technologies through clinical trials and research in infectious diseases.

Systems engineering and management – Selected EU policies and funding opportunities

Policy Name	Description	Relevance for INESC
Digital Single Market Strategy	Aims to open up digital opportunities for people and businesses and enhance Europe's position as a world leader in the digital economy.	Support initiatives to deployment and best use of digital capacity, relevant for digital technologies and information management.
Europe's Digital Decade	Envisions 2030 digital targets for the EU's digital transformation, focusing on data, technology, and infrastructure in systems engineering.	Systems engineering embracing human-centricity and fostering sustainability and resilience, aligning with industry 5.0.
Industrial Strategy for Europe	Seeks to maintain the EU's global competitiveness and innovation capacity, linked to systems engineering in operations and technology management.	Contribute to maintaining competitiveness through technology management and policy, relevant for operations management.
European Green Deal	Focused on environmental issues, including sustainable infrastructure and clean energy, requiring systems engineering for optimization.	Engineering sustainable and clean energy systems, optimizing socio-technical systems design for resilience.
The SME Strategy for a sustainable and digital Europe	Addresses the needs of SMEs in service system design, digital technologies, and innovation management for digital transformations.	Support SMEs with digital transformation, service system design, and innovation management.
European Strategy for Data	Focuses on making the EU a leader in a data-driven society, crucial for information management, analytics, and operations research.	Lead in information management and analytics, supporting data-driven society initiatives.
AI White Paper	Sets out measures to promote AI development and uptake in Europe, integral to computing, decision support systems, and technology management.	Develop and integrate AI into affective computing and decision support systems, managing technology effectively.
New European Innovation Agenda	Aims to position Europe at the forefront of global technological and industrial leadership, fostering innovation and socio-technical systems integration.	Foster innovation management and integrate socio-technical systems, positioning INESC at the forefront of technological leadership.
Cybersecurity Strategy for the Digital Decade	Ensures that systems engineering incorporates strong cybersecurity principles, vital for digital technologies and information management.	Incorporate cybersecurity in systems engineering, ensuring robust digital technology and information management practices.
Skills Agenda for Europe	Targets the development of a skilled workforce, enhancing digital skills crucial for effective systems engineering and management.	Develop advanced digital skills, crucial for implementing effective systems engineering and management.
European Education Area	Aims to enhance the quality and inclusiveness of education systems, essential for skills development in systems engineering and management.	Influence the education agenda to enhance systems engineering and management skill development.

Funding Programme	Scope	Opportunities for INESC
Horizon Europe	EU's key funding programme for R&I until 2027, budget of €95.5 billion. Aims to foster collaboration and strengthen impact of R&I in developing and implementing EU policies, while tackling global challenges.	Relevant for digital technologies, operations research, and technology management and policy. Promotes inclusive R&I strategies.
Digital Europe Programme	Focuses on digital transformation with a budget of €7.59 billion, covering supercomputing, AI, cybersecurity, and advanced digital skills.	Relevant to digital technologies, information management and analytics, and technology management and policy.
Connecting Europe Facility (CEF)	Supports development of sustainable, interconnected trans-European networks in digital, energy, and transport fields.	Important for service system design and socio-technical systems design, relying on digital, energy, and transport infrastructure.
European Regional Development Fund (ERDF)	Aims at correcting imbalances between regions, including through technology and innovation support.	Supports all listed subdomains, particularly technology and innovation in diverse regions.
InvestEU	Provides long-term funding and attracts private investment for projects that make Europe greener, more digital, and resilient.	Supports innovation management and socio-technical systems design, attracting private investment for sustainable projects.
Erasmus+	Traditionally associated with education, supports professional and personal development in areas relevant to R&I.	Supports innovation management and technology management policy through development in professional and personal aspects.
European Innovation Council (EIC) within Horizon Europe	Targets innovations with breakthrough and disruptive potential, key for innovation management and digital technologies.	Crucial for driving innovation management and digital technologies with potential for disruptive innovation.
Horizon Europe's 'Reforming and enhancing the European R&I system'	Aims at structural changes and improving access to excellence in the R&I system.	Optimizes decision support and fosters interconnected knowledge ecosystems, improving access to R&I excellence.

Transversal areas – Selected EU policies and funding opportunities

Policy Name	Description	Relevance for INESC
European Strategy Forum on Research Infrastructures (ESFRI)	ESFRI identifies investment priorities in research infrastructures (RIs) across Europe for the next 10-20 years, facilitating cooperation and contributing to policy-making in RIs.	Strategic alignment with Europe's RIs investment priorities and participation in collaborative projects.
European Research Infrastructure Consortium (ERIC)	ERIC provides a legal framework to establish and operate RIs, supporting researchers and innovation within Europe.	Facilitation in establishing and operating RIs, enhancing INESC's research capabilities and partnerships.
European Open Science Cloud (EOSC)	The EOSC offers a cloud-based platform for researchers to store, share, and use data across borders, disciplines, and sectors.	Access to a vast pool of shared data, promoting cross-border and interdisciplinary collaborations for INESC.
Recommendations for an EU Strategy on Technology Infrastructures	This recommendation advocates for a strategy development for TIs, including creating repositories and mappings, roadmapping expenditure needs, and enhancing access and networking.	Alignment with TI strategies, ensuring INESC stays ahead in technological advancements and networking.
Regional Smart Specialisation Strategies	Part of the EU's Cohesion Policy, these strategies guide investments in RIs and TIs at the regional level, leveraging the European Structural and Investment Funds (ESIF).	Opportunity for regional collaboration and access to funding, enhancing INESC's research impact and outreach.
European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers	These documents outline general principles for the roles, responsibilities, and entitlements of researchers and employers, aiming to improve research careers and working conditions.	Ensuring compliance with European standards, enhancing INESC's attractiveness as a research employer.
Plan S	Launched by cOAlition S, Plan S mandates that scientific publications from publicly funded research must be published in compliant open access journals or platforms.	Adherence to open access policies in publishing, increasing visibility and impact of INESC's research.
COARA (Coalition for Advancing Research Assessment)	COARA focuses on reforming research assessment methodologies to foster a more inclusive and fair academic environment, aligning with the EU's research quality evaluation criteria.	Participation in shaping fair research assessment practices, aligning with INESC's commitment to research excellence.
Recommendation on a European Framework for Research Careers	Agreed in December 2023, this framework focuses on promoting attractive and sustainable research careers, especially for young and early-career researchers.	Contributing to the development of attractive research career frameworks, benefiting INESC's talent acquisition and retention.
Support Tools and Platforms	Tools and platforms like EURAXESS, ERA Talent Platform, an observatory on research careers, and RESAVER are being developed to support new measures in research careers.	Utilization of support tools for better management of research careers, enhancing INESC's research environment.
Knowledge Valorisation Platform	Established to connect stakeholders across Europe, this platform aims to turn research results into sustainable products and solutions for public good.	Engagement in collaborative efforts for turning research into practical applications, aligning with INESC's innovation goals.
Code of Practice on the Management of Intellectual Assets for Knowledge Valorisation	This code provides recommendations for managing intellectual assets to maximize value creation from research and innovation activities.	Effective management of intellectual assets, maximizing INESC's research value and innovation potential.
Code of Practice on Standardisation in the European Research Area	This code emphasizes the use of standards and standardization as channels for transferring and commercializing research results.	Leveraging standardization for effective research transfer and commercialization, aligning with INESC's strategic objectives.

Funding Programme	Scope	Opportunities for INESC
Horizon Europe - Research Infrastructures	Focuses on enhancing global leadership in research, supporting health research, green and digital transformations, and advancing frontier knowledge. Specific destinations include INFRADEV, INFRAEOSC, and INFRATECH.	Participation in cutting-edge research projects, access to state-of-the-art facilities, and collaboration in developing the European research infrastructure landscape.
European Research Infrastructures Consortium (ERIC)	Provides a legal framework to establish and operate top-tier research infrastructures in Europe, fostering significant scientific advances and innovation.	Access to leading RIs, enhancing INESC's research capabilities and fostering collaborations for innovation.
Other RI Initiatives and Networks	Includes ESFRI, EIROforum, and ERF-AISBL. Aims to reduce fragmentation, coordinate development, and foster international cooperation in research infrastructures.	Engagement in collaborative networks to benefit from coordinated development and international partnerships in RIs.
Open Innovation Test Beds (OITBs)	Allocates over €319 million to support development, testing, and upscaling of nanotechnology and advanced materials. Benefits SMEs and industries, reducing costs and investment risks.	Opportunities to participate in nanotechnology and advanced materials projects, benefiting from the test beds and collaboration with SMEs and industries.
Digital Europe Programme	Focuses on digital technology for businesses, citizens, and administrations. Establishes Testing and Experimentation Facilities for AI development.	Leveraging funding to integrate digital technologies, with potential to participate in AI Testing and Experimentation Facilities.
Research Assessment and Reforming Research and Innovation System	Grants worth EUR 54.2 million focusing on open science, research integrity, and enhancing the European Research and Innovation ecosystem.	Potential to receive funding for projects focused on research integrity, open science, and enhancing the research ecosystem.
New EOSC Projects in 2024	Funds projects under 'Consolidating and Developing the Landscape of European Research Infrastructures'. Focuses on diverse topics like science clusters, scientific knowledge production, and software quality.	Opportunity to be involved in new EOSC projects, contributing to and benefiting from advancements in research infrastructures.

Institute-specific illustrations

INESC Coimbra

Case study – Regional development and disaster mitigation strategies

INESC Coimbra has established a reputation for excellence through its notable collaborations with industry leaders such as Gallo Worldwide Lda and Matereospace Lda. These partnerships have been pivotal in driving forward INESC Coimbra's impact on critical areas such as regional and urban planning, and notably in enhancing the resilience of communication network services against disasters. These projects exemplify the institute's commitment to applying its research expertise to real-world challenges, contributing significantly to regional development and disaster mitigation strategies.

EU policy and strategic development alignment

INESC Coimbra's activities align closely with the EU's strategic goals in sustainable development, technological innovation, and advanced training. The institute's work in regional and urban planning and its efforts to bolster communication networks against disasters resonate with the EU's focus on sustainable urban development and crisis resilience. These projects not only contribute to the regional growth but also embody the broader EU objectives of technological advancement and sustainable development.

Representative examples

***Interdisciplinary Research**: Exploration of mathematical, engineering, and management disciplines to develop innovative models and algorithms for optimization and decision support.*

***Energy Systems and Policies**: Engagement in dynamic demand response management, integration of consumer participation in energy markets, and sustainable mobility in smart cities.*

***Geospatial Information**: Innovative use of multispectral image analysis for structural assessment of infrastructures and heritage, and advanced approaches in hydro-systems planning and management.*

Bridging theory and practice

The practical application of INESC Coimbra's research is evident in its work on energy systems and urban planning. This demonstrates a successful translation of theoretical research into practical solutions, addressing real-world challenges such as energy efficiency, sustainable urban development, and resilience against natural disasters. By bridging the gap between theory and practice, INESC Coimbra not only contributes to the academic field but also provides tangible benefits to society and aligns with EU directives on sustainable development and technological innovation.

INESC ID

Case study – From science to society

INESC ID distinguishes itself in advanced research within the realms of computer science, electrical engineering, and interdisciplinary projects. With a growing community of doctoral researchers and students, the institute is at the forefront of addressing societal challenges in digital transformation, energy transition, health, environment, security, and privacy. Their research spans from artificial intelligence and human-machine interaction to sophisticated digital security tools and complex algorithms for genome analysis and disease prevention, positioning INESC ID as a global leader in cutting-edge scientific domains.

Representative examples

***Digital Citizenship and Transformation**: Specialization in data science, human-computer interaction, security information, and process mining. Notable for its work in multilingual language processing technologies.*

***Life and Health Technologies**: Expertise in theoretical and computational methods relevant to health. Collaboration with hospitals and international research centers on decision support systems for medical planning and treatment optimization.*

Alignment with EU policy and strategic development

INESC ID's involvement in health technology is a prime example of its alignment with EU policies in research, innovation, and technological development. The institute has secured participation in four projects funded by the EU's Recovery and Resilience Plan, attracting more than 8 million euros for research and development over four years. This significant financial support underscores INESC ID's crucial role in advancing EU strategic interests in health technology and beyond.

Bridging theory and practice

INESC ID not only engages in groundbreaking research but also actively participates in real-world applications and policy-making. The institute's theoretical and computational expertise in health-related fields, including AI, machine learning, operational research, and dynamic systems, has broad applications. These range from decision support systems in medical treatment planning and optimization to advanced diagnostic imaging, biomedical data analysis, and genetics. INESC ID collaborates with various hospitals and research laboratories, both nationally and internationally, thereby exemplifying the bridge between theoretical knowledge and practical implementation.

In 2022, INESC ID demonstrated significant scientific productivity, with 386 publications, an increase from the previous year. The focus on international journal publications (176 in 2022) highlights the institute's commitment to contributing to the global scientific community.

INOV

Case study- Growth and impact

In 2022, INOV experienced significant growth, evidenced by a 29% increase in collaborators and an 18% increase in researchers. This expansion in human resources, coupled with a 55% increase in the number of scholarship holders and a 12% rise in researchers, underlines the institute's robust development in expertise and capacity.

With over 50 projects in 2022, INOV has established itself as a key player in ICT and electronics innovation. Their collaboration with more than 250 partners and engagement with over 30 clients highlights their significant impact and reach in the field.

Alignment with EU Policies and Strategic Development

INOV's activities align closely with EU policies, particularly in digital transformation and security. Their work in cybersecurity and intelligent systems reflects a strong commitment to EU strategies, focusing on enhancing security measures and pioneering in digital innovations. The institute's growth in these key areas is a testament to its alignment with and contribution to EU's digital and security objectives.

Representative examples

***Cybersecurity and Communication Networks**: INOV has made significant advancements in the fields of cybersecurity and communication networks. Their focus on innovative technologies in these areas is evident from their numerous projects and partnerships.*

***Enterprise Systems**: Developments in enterprise systems, showcasing their capacity for integrating advanced ICT solutions in business environments.*

***Remote Monitoring and Intelligent Systems**: Demonstrating expertise in remote monitoring technologies and the development of intelligent systems.*

Innovation and economic impact

The growth and successful execution of numerous projects underscore INOV's contribution to technological innovation and economic development. INOV's emphasis on ICT projects resonates with the EU's focus on research and innovation in this field. Their advancements in cybersecurity, intelligent systems, and collaboration in various national and European projects demonstrate their pivotal role in driving technological progress and economic growth.

INESC MN

Case Study – Collaboration and innovation

INESC MN's 2022 activities highlight its role in international research and technology transfer. Notably, the institute collaborated with Purdue University on magnetic devices for cryptographic and quantum computing applications, funded by DARPA. This collaboration signifies INESC MN's commitment to cutting-edge research in quantum computing. Additionally, a partnership with the Institute of Physics of the Chinese Academy of Sciences on Tunnel Magnetoresistance (TMR) sensors underlines the institute's prowess in advanced material research. INESC MN also played a vital role in defining Portugal's candidacy for the Important Project of Common European Interest (IPCEI) in Microelectronics, further showcasing its international impact.

Representative examples

***Materials, Devices, Systems, and Magnetic Simulation**: Focus on spintronics, biosensors, microfluidics, and microsystems for biological, biomedical, and agro-food applications.*

***Advanced Training and Technology Transfer**: Emphasis on training young engineers and scientists in cutting-edge micro and nanofabrication technologies, and intellectual property creation for technology transfer to both national and international industries.*

EU policy and strategic development alignment

INESC MN's contributions align with the EU's strategic goals in sustainable development, technological innovation, and advanced training. The institute's participation in numerous projects, including the coordination of the MAGID project and the involvement in the i-GRAPE project, demonstrates this alignment. INESC MN also took part in 22 national projects and initiated activities in 6 Recovery and Resilience Plan (PRR) projects, reflecting its commitment to European strategic initiatives.

Bridging theory and practice

INESC MN's practical applications of research in real-world scenarios are evident in its significant role in advanced material research and technology transfer. In 2022, the institute made substantial scientific contributions, including 37 publications referenced in the ISI Web of Knowledge and one book chapter. Their multidisciplinary approach, evidenced by collaborations with over 20 institutions, bridges theoretical research with practical applications. The institute's involvement in conferences such as INTERMAG and Transducers, and the continuation of the doctoral program AIM, financed by FCT, further emphasize this bridge between theory and practice.

INESC TEC

Case Study – Sea and Energy

INESC TEC's TEC4SEA initiative stands out as a pivotal program focusing on agro-food, energy, health, industry, and maritime technologies. A notable achievement in 2022 was in the energy systems domain, particularly in the integration of renewable energy sources and the development of data-driven methodologies for energy system optimization. These efforts include extensive work on large-scale modelling and optimization of energy systems, highlighting INESC TEC's commitment to innovative energy solutions.

Alignment with EU policy and strategic development

INESC TEC demonstrates strong alignment with EU policies in research, innovation, and technological development. The institute's contribution to renewable energy, as exemplified by the TEC4SEA initiative, aligns with EU strategic goals. INESC TEC's broad scope of activities, from energy to health technology, reflects its capacity to respond to societal needs and contribute significantly to the EU's priorities in sustainable development and technological innovation.

Representative examples

***Networked Intelligent Systems**: Innovations in perception tools, robotic autonomy, and context-aware communication systems.*

***Industrial and Systems Engineering**: Focus on operations management for resilient systems, operations research for digitized decision support, and sustainable technology-driven innovation.*

***Power and Energy**: Advances in massive renewable energy integration, large-scale energy systems modeling, and smart grid operation.*

Bridging theory and practice

INESC TEC excels in bridging theory and practice, engaging in groundbreaking research while actively participating in real-world applications and policy-making. This is evident in their work on projects like STAYAWAY, a Covid contact tracing algorithm, and PS-MORA, a tool for renewable energy integration planning. These projects showcase INESC TEC's ability to translate scientific knowledge into innovative technologies and engineering solutions addressing social problems. Additionally, the institute's involvement in initiatives like the Agency for Integrated Rural Fire Management and the ForestWISE CoLAB further exemplifies their commitment to practical and societal impact.

Action Plan for discussion

The path forward is one that demands a cohesive framework, where the collective expertise and diverse strengths of the Institutes are mobilized towards a shared goal: to carve out a distinctive and influential position in the EU R&I Arena.

We present this action plan as a canvas for robust discussion. We acknowledge the bold and ambitious nature of the proposals laid forth. It is with a reinforced conviction in our joint positioning, effort, and intent that we aim to bridge the gap between our current state and a cohesive understanding of our goals. This endeavor is crucial, particularly as we navigate the uncertainty post-2027, a period that will demand both structural success and a clear articulation of our collective ambitions.

Strategic framework for discussion

At this juncture, the Institutes must recognize the power of unity in diversity. The strategic framework is rooted in an understanding that while each INESC entity brings unique strengths to the table, it is the alignment of these strengths with the overarching EU priorities that will amplify their impact. This alignment is not just in the thematic congruence with initiatives like the European Green Deal or the other many dedicated to Digital Transition but also **in the methodological synergy with Europe's approach to collaborative, interdisciplinary, and mission-oriented research and innovation**.

This framework hinges on the intelligent fusion of resources, expertise, and strategic intent. It calls for a roadmapping process that goes beyond individual planning and creating a shared trajectory for technological advancement and innovation.

Derived from this framework, a series of 7 action points unfold naturally:

1) **Concerted project collaboration:** To crystallize this alignment, the Institutes will foster joint projects, leveraging their collective strength to present a united front in competitive EU funding programs. This collaboration will be a testament to their concerted effort to address Europe's grand challenges.
2) **Strategic KPI development:** In measuring progress, the Institutes will develop KPIs that reflect their strategic alignment with EU policies. These KPIs will serve as beacons, guiding their research trajectory and ensuring that it is in lockstep with European directives.
3) **Winter Meeting as a Strategic Conclave:** The annual Winter Meeting will transform into more than a gathering—it will become a strategic conclave. Here, the collective wisdom of the Institutes will convene to deliberate, refine, and energize their joint mission.
4) **Joint roadmapping:** The Institutes will embark on joint roadmapping exercises, not just as a planning tool but as a declaration of strategic intent. To begin with a research and technology infrastructures roadmap promoting and outlining a collaborative, efficient process of resource sharing in conscious alignment with EU priorities.
5) **Unified EU positioning:** The Institutes will amplify their voice through a unified stance in key media, policy briefs, and strategic event participation. This concerted media exposure will bolster their position as thought leaders in the European R&I landscape.
6) **Portfolio of Strategic Projects:** Building a robust portfolio of strategic projects, particularly through Coordination and Support Actions (CSAs) and tenders, will enable the Institutes to influence agenda-setting within the EU. This portfolio will serve as both a showcase of capability and an instrument of strategic influence.

7) **Drafting a Joint Mission Statement:** Looking to the horizon, the next year will witness the drafting of a joint mission statement. This document will articulate the shared vision of INESC's role in the EU R&I arena, serving as a charter for their collective journey forward.

Through this structured approach, the INESC Institutes will not only fortify their position in the EU R&I arena but also set a precedent for how collaborative networking in Portugal can drive forward the European research agenda. It is a vision of collective action, strategic foresight, and a shared commitment to shaping our future in research and innovation.

Concluding Remarks

The action plan outlined herein is designed not just to navigate the present but to illuminate the path that lies beyond the horizon of current European Research and Innovation frameworks.

The Winter Meeting stands as a pivotal event in this journey, a forum for collective intelligence and aspirations. The goal is to work from the abstract to the concrete, where ideas are tempered into actionable strategies. The discussions held and the decisions made during this assembly will be instrumental in shaping the trajectory of our collective efforts.

As we adjourn from the Winter Meeting, the work that begins will be both reflective and forward-looking. The immediate next steps involve a meticulous refinement of the action points discussed, transforming them into a granular strategy with clear timelines and assigned responsibilities. This strategy will serve as a blueprint for our concerted efforts to enhance the positioning and impact of the INESC institutes within the European R&I landscape.

Implementation teams, comprising representatives from across the INESC spectrum, will be tasked with translating our collective vision into reality. These teams will be empowered to drive the initiatives forward, ensuring that the momentum generated during the Winter Meeting is not lost. They will also be charged with maintaining the agility of our strategy, allowing it to evolve in response to the dynamic European R&I environment.

Regular follow-ups and assessments will be scheduled to monitor the progress of the action points. This iterative process will ensure that our strategy remains aligned with the EU’s R&I priorities and responsive to the needs of society and industry. It will also provide a framework for the continuous engagement of all INESC institutes, fostering a culture of collaboration and mutual accountability.