INESC TEC

2026

ACTIVITY PLAN

Editorial Notes

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ACTIVITY PLAN 2026

Executive Summary

The year 2026 marks a pivotal transition for the European and national research and innovation landscape. It coincides with the closing of the exceptional recovery-funding cycle that shaped the post-pandemic period. As Portugal's Recovery and Resilience Plan (PRR) reaches completion and the current Centre for Technology and Innovation (CTI) funding cycle concludes, with its successor framework still pending definition, the institutional environment enters a phase marked by funding discontinuities, shifting priorities and intensified competition. At European level, preparations for the next Multiannual Financial Framework (2028-2034) and the future FP10 introduce further uncertainty but also strategic opportunities for institutions able to demonstrate excellence, robustness and societal value. Within this context, INESC TEC approaches 2026 as a bridge year that calls for consolidation, selective investment and deliberate positioning to sustain impact.

INESC TEC will respond through a cohesive set of institutional priorities that reinforce its capacity to deliver scientific impact, societal value and organisational strength. First, it will strengthen and project its scientific core, focusing on the quality and visibility of research, consolidating its scientific domains and centres and reinforcing research teams in strategic areas such as artificial intelligence, quantum technologies, bioengineering, robotics and energy systems. Second, it will deepen international embedment and participation in agenda-setting, using the INESC Brussels Hub, Horizon Europe and FP10 preparation to secure a stronger role in European ecosystems, complemented by strategic partnerships such as UT Austin Portugal, collaboration with SINTEF and cooperation with NIAR. Third, the institute will focus research and innovation more clearly on societal and industrial challenges, aligning the portfolio with the Sustainable Development Goals and working with companies, sectoral associations and public administration through applied projects, pilots and demonstrators, including the development of TEC4ASD in Aerospace, Security and Defence. A fourth priority is to turn knowledge into impact through stronger valorisation and entrepreneurship pathways, simplifying R&D disclosure, improving IP management, refining the spin-off policy and strengthening support for proof-of-concept and spin-offs. Finally, INESC TEC will consolidate the institutional foundations for the next cycle, adjusting team size and composition after an exceptional funding period, implementing a renewed human-resources model, upgrading research infrastructures, reinforcing environmental and ESG practices and advancing digital transformation, knowledge security governance and internal systems.

Scientific activity in 2026 will be characterised by strengthened critical mass, deeper domain coherence and renewed leadership across R&D Centres. The launch of the SYSTEM Centre, merging CEGI and CESE, will consolidate expertise in industrial and systems engineering, data-driven decision support and operations research, enhancing INESC TEC's competitiveness in European research and innovation ecosystems. Across the institute, frontier research will continue to advance in key domains, supported by strong participation in national and European projects. These efforts will reinforce INESC TEC's scientific visibility through high-quality publications and active engagement in leading international research communities. For 2026 the following topics will get a special focus: explainable artificial intelligence models, technologies for personalised health, reconfigurable antenna systems, trustworthy computer systems, resilience and reliability of energy systems, quantum technologies, physical interaction capabilities of robots, and management of systems under uncertain, complex and dynamic environments.

Innovation activity will focus on advancing high-TRL technologies and reinforcing collaboration with industry to accelerate the development and deployment of applied solutions. In areas such as robotics, AI, cyber-physical systems, advanced communications, photonics, energy systems and digital health, the institute will deliver new prototypes, demonstrators and software tools arising from national and European R&D projects. Industrial pilots, co-creation initiatives and direct-contract activities will expand, supported by stronger integration between scientific results, technological infrastructures and industry-driven needs.

Knowledge valorisation is expected to enter a phase of clear acceleration. Technology disclosures are projected to increase, reflecting the growing maturity and market relevance of emerging technologies, while patenting activity remains robust and international filings expand INESC TEC's global IP footprint. Commercial contracts are anticipated to regain momentum after a transitional 2025, supported by enhanced licensing associated with spin-off development. The entrepreneurial ecosystem will also

strengthen, with the launch of new spin-offs in fields such as robotics, bioengineering and advanced computing, demonstrating the conversion of scientific capability into economic and societal impact.

Human resources in 2026 will reflect a period of stabilisation after several years of rapid growth driven by PRR and EU-funded projects. Following consecutive double-digit increases in integrated staff, the institute anticipates a more balanced trajectory, with adjustments to accommodate the conclusion of temporary project-linked contracts and a more deliberate alignment of team size and composition with strategic priorities. Recruitment will continue in key areas, supported by the FCT Tenure Programme and other instruments, while new HR processes, career pathways and development mechanisms will enhance organisational cohesion and talent retention.

Financial activity will naturally adjust following the extraordinary levels of funding recorded in 2024-2025. With the conclusion of PRR and CTI projects, total revenue in 2026 is projected to grow by a moderate 2 per cent, even as competitive project funding declines. An increase in strategic base funding, together with a gradual expansion of research and innovation service activity, is expected to partially offset the impact of the funding transition, while European funding will remain a structurally important pillar. Strengthening services, diversifying income sources and improving proposal success rates in Horizon Europe and FP10-related activities will be essential to sustaining financial resilience.

Scientific production in 2026 is expected to remain stable in volume, with a moderate increase in outputs across indexed journals and conferences, in line with the projected indicators for the year. While the overall number of publications will grow only slightly, a continued shift toward higher-quality and higher-impact venues is anticipated, reflecting the emphasis on scientific visibility. Participation in editorial boards, programme committees and scientific leadership roles will remain significant, even if some indicators show slight reductions after an exceptional 2025. These efforts will be reinforced by Open Science practices, including broader adoption of research data management and FAIR principles, and by deeper cross-centre collaboration, supporting coherent scientific strategies and sustained international recognition.

Dissemination activities will maintain a strong strategic profile in 2026, supported by a diversified programme of international conferences, scientific sessions, outreach events and participation in global technology fairs. Although some quantitative indicators naturally decline after the exceptional peak of 2025, driven by two large flagship conferences hosted in Porto, the institute's visibility and external engagement are expected to keep expanding. INESC TEC will host or co-organise major events such as the ADRA Forum 2026 and IEEE BSN 2026, reinforcing its leadership in AI, robotics and health technologies. Active participation in high-profile international arenas, including ERF 2026, EuCNC 2026, ENLIT 2026 and REPMUS 26, together with national initiatives such as technology open days and thematic Synergy Days, will strengthen engagement with industry, academia, policymakers and society at large.

Amid a changing research and innovation landscape, 2026 will place particular emphasis on strategic focus and organisational coherence, strengthening the foundations required for sustained performance in the next European cycle. INESC TEC approaches this period with confidence, supported by scientific excellence, societal engagement and a resilient institutional model, positioning itself to respond effectively to emerging opportunities and to reinforce its role within national and international research ecosystems.

1 INTRODUCTION

INESC TEC's 2026 Plan sets out how the institute intends to act in a year of transition, bringing together its strategic priorities and the main scientific, technological and institutional activities that will give them concrete expression. The document is designed to support coordinated decision-making and follow-up across leadership, research structures and support services.

The second section offers a concise overview of the institute's profile, vision, mission, organisational model and research and innovation goals, providing the background against which the 2026 plan should be read.

Building on this, Section 3 presents the strategic context for 2026 and the resulting strategic priorities, which set the overall direction for the year and frame the more detailed plans that follow.

A quantitative view of the plan is then provided in Section 4, bringing together the main activity indicators for 2026, namely in human resources, project activity, scientific publications, intellectual property and dissemination.

The high-level research and innovation goals are further developed for the Scientific Domains, Thematic Lines and TEC4 initiatives in Sections 5, 6 and 7, which translate strategic orientations into domain- and theme-specific objectives.

Section 8 details the scientific and technological activities planned by the twelve Research Centres, including their research and innovation highlights.

Special projects are addressed in Section 9, namely the UT Austin Portugal Program and INESC TEC.OCEAN, the Centre of Excellence in Ocean Research and Engineering.

The plans for the Offices, Commissions and ESG, and for the Support Services, which play key roles in enabling many of the initiatives foreseen for 2026, are presented in Sections 10 and 11.

Finally, Section 12 describes the institute's main research infrastructures, which support both research and technology transfer activities, as well as INESC TEC's participation in several national research infrastructures.

2 INESC TEC PRESENTATION

2.1 Purpose, vision, mission and values

INESC TEC is a private, non-profit association with Public Interest status, dedicated to scientific research and technological development, technology transfer, advanced consulting and training, and pre-incubation of new technology-based companies.

The University of Porto, INESC, the Polytechnic Institute of Porto, the University of Minho and the University of Trás-os-Montes e Alto Douro are INESC TEC's associates. INESC TEC's sites are located in Porto, Braga and Vila Real. At the end of the third quarter of 2025, INESC TEC hosted more than 1085 integrated researchers (+410 PhDs), including academic staff, R&D employees, grant holders and affiliated researchers. INESC TEC's team also includes technical and administrative support staff and trainees.

INESC TEC's purpose is to create a fulfilling and sustainable future through impactful science, technology, and innovation.

Its history and purpose are deeply intertwined with those of its academic associates. As set out in the bylaws, its purpose is to carry out excellent research and then to enhance their involvement and intervention in the development of the economic and social fabric, thus contributing to improve the performance and competitiveness of companies and institutions.

INESC TEC aims to be an inspiring and empowering force, driving the science and technology of digitally-enabled systems into overcoming society's challenges.

Pursuing this vision, the institution aspires to continually innovate across all the mission areas of academia, emphasising research and innovation but also contributing distinctively to education and furthering a flourishing collaborative environment, bridging it to the economy and society. The institute endeavours to be an international reference in its fields of activity, underpinned by the excellence of its research and innovation.

As a free-thinking and diverse community, INESC TEC's mission is to take on bold science, technology, and innovation challenges, empowering talent, collaborative ecosystems, and public policies that make a difference in our economy and society.

INESC TEC is a people-centred organisation that cultivates an inspiring discovery and learning environment where a diverse, critical- and free-thinking, venturesome, and creative talent community thrives. It values excellence and openness in science and technology. As such, the institute seeks purpose and meaning in its research as it bridges its scientific domains to societal challenges and problems. It collaborates with academia and other stakeholders to develop talent and build science, technology, and innovation awareness and capability, transforming its ecosystems at all levels and supporting policy- and decision-makers in implementing and formulating public policies.

The **merit of INESC TEC in accomplishing its mission** has been formally acknowledged by the Foundation for Science and Technology, with the institute's recognition as an **Associate Laboratory**, and by the Portuguese Ministry of Economy, with its recognition as a **Technology and Innovation Centre (CTI).**

INESC TEC's **six guiding principles adopted as the shared core values** of its community are: 1) **Rigour and excellence** – Thoroughly embed rigour in all work, from ideation through realisation to evaluation; 2) **Freedom to create and think** - Autonomy in pursuing intellectual agendas, free of unreasonable interference; 3) **Integrity** – Remain true to the institution's principles and act with transparency and compliance with ethical standards; 4) **Collaboration** – Share, with each other and with partners, all successes and challenges, as a cohesive community; 5) **Creativity** - Explore new areas to advance science and innovation, with bold curiosity and accepting the risk of failing as intrinsic to creating new things; and 6) **People-centredness** - Place people at the centre of all activities, as a community in which everyone is welcome and fully supported in their development.

2.2 High-level view of science and innovation

2.2.1 Centres, Scientific Domains and TEC4s

Figure 2.1 - High-level view of science and innovation at INESC TEC

Research and innovation at INESC TEC are undertaken in its 12 Research Centres. These centres are INESC TEC's R&D base organisational units, each focused on specific scientific and technological areas and responsible for its own planning, strategy and resources, reporting directly to the Board of Directors regarding budget and performance indicators.

Research is structured in eight broad Scientific Domains: Artificial Intelligence, Bioengineering, Communications, Computer Science and Engineering, Photonics, Power and Energy Systems, Robotics, and Systems Engineering and Management. The Scientific Domains structure the institute's research competences and challenges, promoting strategic thinking, trajectory monitoring, and science communication.

Innovation is focused on main technology market drivers expressed internally through the TEC4 initiatives, currently TEC4AGRO-FOOD, TEC4ASD, TEC4COMMUNICATIONS, TEC4ENERGY, TEC4HEALTH, TEC4INDUSTRY and TEC4SEA. These initiatives articulate INESC TEC's activity towards the main market sectors and address current societal challenges, defining market strategies and planning the interaction with major application areas. A TEC4 initiative establishes a network of external contacts and a dialogue with industrial and institutional partners and brings back major challenges and opportunities to multiple Centres.

2.3 Organisational structure

The institution's organisational structure (Figure 2.2) comprehends a Board of Directors composed of seven members and an Executive Board comprising four of those seven members, responsible for the high-level management of INESC TEC. The Boards act in close coordination with the Council of R&D Centres, meeting with the Centre Coordinators and the Managers of the different Support Services every other week. This ensures institution-wide coherence in vision, policy and operations, and joint responsibility and commitment in strategic and operational management decisions.

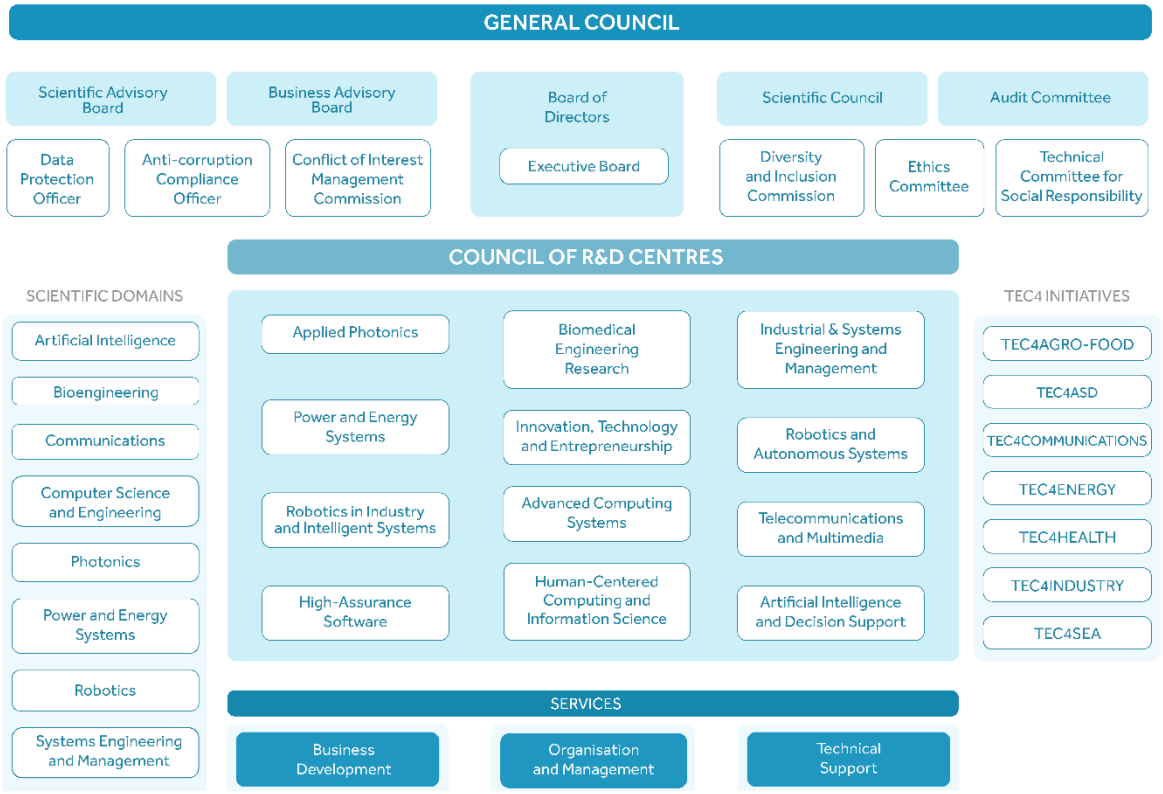

Figure 2.2 - Organisational Structure

The Scientific Advisory Board comprises twelve external internationally recognised scientists who support the institution's search for continuous improvement and excellence, building a vision for future research through a valuable benchmark at the international level. The external monitoring, orientation and evaluation of the technology transfer and innovation activities are entrusted to the Business Advisory Board, whose members have knowledge and experience in several economic sectors relevant to INESC TEC. The Scientific Council is an internal body responsible for monitoring and guiding scientific and technical activities, consisting of PhD researchers who participate permanently in INESC TEC's activities and includes one representative from each Centre and three additional members appointed by the Board of Directors.

The Audit Committee includes a Certified Public Accountant and oversees and validates the legal and financial behaviour of the Institute.

Six non-statutory bodies oversee aspects that INESC TEC particularly values. The Ethics Committee ensures the observance and promotion of integrity, honesty, and responsibility standards in research activities carried out by INESC TEC's members by implementing the institution's Code of Ethics. The Conflicts of Interest Management Commission (CGCI) and the Data Protection Officer are responsible for implementing the institute's Policy on Conflicts of Interest Management and the General Data Protection Regulation, respectively. The Anti-Corruption Compliance Officer is responsible for implementing the Compliance Programme for the prevention of corruption in articulation with other relevant organisational units. The Technical Committee for Social Responsibility has as its mission the incorporation of social responsibility in the institution's organisational culture and practices. The Diversity and Inclusion Commission encourages the organisation to implement practices that promote diversity and inclusion and develops long-term work in this field by proposing and implementing a D&I Programme for INESC TEC, including gender balance as a major priority.

INESC TEC's activities are supported by a streamlined and dynamic team of highly qualified technical and administrative personnel, organised across key areas such as Business Development, Organisation and Management, and Technical Support Services, alongside specialised Offices focused on foresight and public policy, entrepreneurship and spin-offs, project management and research student support.

2.4 Areas of intervention and responsibility of the Board of Directors

To effectively fulfil its responsibilities and address the challenges inherent in the management of the institution, the Board of Directors of INESC TEC defined the distribution of areas of intervention and responsibility among its members for the 2024–2026 term.

This allocation takes into account the need to balance effort, valorise the individual profiles of each Member of the Board, ensure articulation between related areas, and promote proximity to the functions of the Executive Board. The distribution encompasses the operational areas entrusted to each Board Member, the leadership of missions aimed at institutional change in strategic areas, and the responsibilities for closer supervision of Support Services and liaison with R&D Centres, Scientific Domains, and TEC4 initiatives.

João Claro, Chairman and Chief Executive Officer – Coordination of Strategic Management; Planning and Reporting; Coordination of Operational Management; Strategic Partnerships – Public Sector; General Council; Audit Committee; Foresight and Public Policy Office; Entrepreneurship and Spin-offs. Supervision of the Services AG, IBH, HR, TTO, and SCOM.

Gabriel David, Vice-Chairman – Strategic Partnerships – Associates and Higher Education Institutions; Institutional Governance; Institutional Bases and Policies: Rights and Duties, Researcher and Student Statutes, Data Protection; Advanced Training; Knowledge Management; Scientific Council.

Aníbal Matos, Member of the Executive Board – Coordination of Scientific Domains; Institutional Applications and Supervision of Cross-Cutting Projects – Science; Scientific Advisory Board; Students. Liaison with the Centres CRACS, CRAS, CRIIS, HASLab, HumanISE, and LIAAD. Supervision of the Services SAAF and SRI.

Clara Gouveia, Member of the Board – Industry Partnerships; Promotion of the R&D Services and Consulting Area; Liaison with Participations in Other Entities; Institutional Applications and Supervision of Cross-Cutting Projects – Innovation; Business Advisory Board.

Lia Patrício, Member of the Board – Internal Digital Transformation; Knowledge Transfer in the Digital Era; Ecosystem Orchestration for Societal Challenges; Citizen Engagement.

Luís Seca, Member of the Executive Board – Coordination of TEC4; Environmental Sustainability; Quality Management; Non-Legal Compliance and Operational Risk Management; Project Management Office; Management Training and Leadership Development; Institutional Bases and Policies: Social Responsibility. Liaison with the Centres CAP, CBER, SYSTEM, CITE, CPES, and CTM. Supervision of the Services SAS, SIG, SRC, and SGI.

Maria da Graça Barbosa, Member of the Executive Board – Legal Compliance and Risk Management; Institutional Bases and Policies: Ethics, Conflicts of Interest, Diversity and Inclusion. Supervision of the Services AJ, CF, CG, and CSECR.

2.5 Research

Research at INESC TEC is centred around eight broad Scientific Domains. Researchers across INESC TEC come together in each domain to establish a critical mass of scientific competences and enhance scientific cohesion, strategy, impact and communication. These forums enable discussing and planning INESC TEC's longer-term research trajectory, becoming platforms for strategising, with medium to long-term goals leading to measurable results.

The institution’s scientific strategy in each domain is fully articulated with the strategies of the R&D Centres, the organisational units that effectively plan, manage, and carry out the research activities at INESC TEC. INESC TEC’s R&D Centres-based model is at the root of its sustainable growth and distinctive multidisciplinarity.

Today’s Grand Challenges, such as resilient responses to climate change, the decarbonisation and digitalisation of the economy, or the design of sustainable circular solutions, business models and value

chains, present demanding multidisciplinary research challenges. INESC TEC draws on the expertise of its scientists in different fields to assemble multidisciplinary teams to tackle large-scale, time-sensitive projects addressing such critical social and economic challenges quickly and successfully with lasting impacts. To this end, four thematic lines that embrace scientific challenges that crosscut our scientific domains and are decisive to our vision were identified: digital models, sustainable transformation, tackling the extreme, and trustworthy technology.

This INESC TEC hallmark stems from its diversity, critical mass, and intrinsic purpose to cover the entire knowledge value chain. The joining of internal efforts is a crucial enabler for the higher impact of research achievements.

2.6 Innovation

Contemporary societies face multiple major social, economic, political, and cultural issues – societal challenges such as climate change, increasing demographic imbalances, shifting health challenges, shaped by contemporary megatrends such as technological advancements, growing energy needs, hyperconnectivity.

The sciences and technologies underlying digitally-enabled systems have a vital role in addressing these challenges, and INESC TEC has been fully committed to that endeavour, defining five main areas of intervention in the innovation arena:

- Market-pull innovation in which it aligns its strategy with relevant challenges of the main economic sectors;
- Large-scale innovation strategies to increase the level of intervention and impact, from sectors to societal challenges;
- Knowledge management and valorisation paving the way to take full advantage of the cross-sectorial nature of its research results;
- Entrepreneurship support to boost scientific knowledge valorisation and upgrade Portugal's economic fabric;
- Advanced training and capacitation to develop the conditions for adequate knowledge transfer, absorption, and transformation into impactful innovations.

Addressing the first area of intervention, INESC TEC created the TEC4 ("TEChnologies FOR ...") internal initiatives, as an organisational approach aiming at structuring and promoting the market-pull innovation process, targeting specific economic sectors. Each TEC4 addresses the market's regional, national, international, or global/societal challenges by mapping and linking its short, medium, and long-term needs (strategic agenda and roadmap) with INESC TEC's scientific and technological competences and experience.

In line with the above innovation strategy, as a Technology and Innovation Centre recognised by the Portuguese Ministry of Economy, its pluriannual action plan to promote science-based innovation with economic and social impact spans across eight axes: Networking and promoting new projects in companies; Promoting technology transfer and cross-fertilisation; Internationalisation; Strengthening and boosting technological infrastructures; Attracting and developing talent; Digitising processes and continuous improvement; Sustainability and budget predictability; Developing relevant knowledge and technology in the circular economy and decarbonisation, artificial intelligence and cybersecurity.

2.7 Strategic Commitments 2023-2030

INESC TEC is guided by its Strategic Plan 2023–2030, a long-term framework that charts the institution's course towards 2030 by aligning its Purpose, Vision, Mission and Values with a comprehensive assessment of emerging challenges and opportunities. This plan sets out five core strategic commitments, each unfolded into strategic objectives that define key areas for scientific and innovation activities and are

further implemented through dedicated initiatives and programmes. To support robust monitoring and accountability, each strategic objective is accompanied by clearly defined indicators and targets.

Within this framework, the five strategic commitments are expressed as follows:

C1. Excel and innovate across the missions of academia, harnessing the collective strength of our community.

C2. Make an impact on the toughest challenges of our time in science, technology, and society, through bold creativity and transformative action.

C3. Increase our relevance by closely integrating across science and innovation, disciplines, and ecosystems.

C4. Cultivate an attractive, people-centred and talented community.

C5. Strive for a sound, sustainable and effective operational model.

Excel and innovate across the missions of academia, harnessing the collective strength of our community

INESC TEC will address significant challenges, such as the UN's Sustainable Development Goals, the EU's Societal and Grand Challenges, or the US National Academy of Engineering's Grand Challenges, through transformative science and technology. In service of public interest, it will contribute to implementing current policy priorities and help shape future policies addressing critical societal challenges. The institute combines creativity and freedom with action, maintaining a constant focus on excellence.

Strategic objectives to address this commitment span from raising the contribution and visibility of research, namely by increasing the involvement in the leadership of scientific initiatives, to improving the base conditions for technology commercialisation and developing closer and deeper relationships with innovation partners and the broader community. Other objectives, such as providing innovative learning experiences, increasing international embedment, reinforcing strategic alignment, and ever-closer collaborations with Higher Education Institutions (HEI), are also key priorities.

Make an impact on the toughest challenges of our time in science, technology, and society, through bold creativity and transformative action

INESC TEC will take on the toughest challenges through transformative science and technology. It will work hard, acting in the public interest, contributing to implementing current policy priorities and shaping future policies tackling critical societal challenges. It will be boldly creative, blending novelty, freedom, and action through endeavour and a relentless focus on excellence.

To that end, the institution's strategic objectives focus on increasing its contribution to regional and national R&I-based sustainable growth, better aligning the delivery of R&I with the industry's needs and the SDGs. Furthermore, it will contribute to the digitalisation of public administration and raise its involvement in informing debates on issues that matter to society. Finally, it will endeavour to engage in direct dialogue with the public and to communicate scientific and technological achievements and their impact.

Increase our relevance by closely integrating across science and innovation, disciplines, and ecosystems

The institution will act in an integrated manner across the knowledge value chain, researching and developing technology-based systems and fostering sustainable innovation. Its paths to solutions will build on an integrated multidisciplinary approach. Striving for impactful innovation, jointly with its stakeholders, it will strengthen the technology and innovation capabilities of the ecosystems it is a part of.

To fulfil this commitment, INESC TEC's primary goals are to build more vital knowledge-based and multidisciplinary R&I ecosystems and to develop better linkages between knowledge production, development, and market uptake. Moreover, initiatives will be undertaken to increase strategic integration in national and international tech-intensive value chains and promote proactive participation in R&I agenda-setting at regional, national and EU levels. It will aim to expand its international networking, leadership, and competitiveness.

Cultivate an attractive, people-centred and talented community

INESC TEC will strive to attract and retain world-class talent, by motivating, recognising, and fully supporting individuals in their personal and professional growth. It will expand the diversity of its talent and be a welcoming home for international researchers, cultivating an inclusive and freethinking environment. It will promote a good working environment, fostering team spirit, engagement, and social responsibility. It will uphold openness, transparency, independence, and ethical principles in research.

The strategic objectives for this commitment encompass attracting and retaining world-class talent and ensuring opportunities and recognition for career achievements. In addition, they also entail expanding the diversity of INESC TEC's community, providing a more dynamic and fulfilling working environment, and, finally, strengthening the institution's commitment to independence and compliance of research with ethical principles.

Strive for a sound, sustainable and effective operational model

The institute will endeavour for sustainability and resilience in its economic model, providing its community with the best conditions to create new knowledge that will impact society. It will promote and contribute to environmental sustainability, provide excellent facilities, and cultivate a discovery and learning environment, enabling its critical talent community to thrive.

This commitment's strategic objectives include strengthening the sustainability and resilience of INESC TEC's economic model, the improvement, management, and usage of its infrastructures and, to a more significant degree, cementing the distinctive aspects of its institutional model.

3 STRATEGIC PRIORITIES FOR 2026

In 2026, INESC TEC will be operating in a year of transition, with European funding instruments evolving, national STI governance being reshaped, and expectations on impact, competitiveness and strategic autonomy becoming stricter.

The Strategic Plan 2023-2030 continues to set the institute's direction, while the balance of attention and effort is adjusted to these conditions. For this year, a focused set of institutional priorities has been identified to concentrate resources where they can most effectively reinforce the scientific core, deepen international positioning, strengthen contribution to societal and industrial challenges, accelerate valorisation, and consolidate the institute's foundations.

The following pages set out the strategic context for 2026, the priorities that follow from it, and the main institutional initiatives that will give them practical expression.

3.1 Our evolving context

The year 2026 marks a transition in the European and national science, technology and innovation (STI) environment. It coincides with the closing of an exceptional European funding cycle associated with the pandemic response and recovery agendas, and with the gradual exhaustion of Portugal's Recovery and Resilience Plan (PRR) resources. At the same time, the European Union will be accelerating the preparatory phase for the next Multiannual Financial Framework (MFF) 2028-2034 and for the future EU Framework Programme for Research and Innovation (FP10). This combination creates a bridge period likely to be characterised by discontinuity in resources, redefinition of priorities, and institutional readjustments. Nationally, European Regional Development Fund (ERDF)-based structural funding under Portugal 2030 will remain in place through the 2021-2027 cycle; however, its effective contribution to the research and innovation (R&I) environment in 2026-27 will depend on execution and reprogramming dynamics, and medium-term availability beyond 2027 is uncertain in light of the next MFF. This transition also unfolds against a broader European economic backdrop of modest growth prospects and persistent fiscal constraints, which are contributing to a more selective and competitiveness-driven use of public resources.

In parallel, EU R&I policy is being reconfigured, moving from relatively dispersed support towards a clearer focus on strategic competitiveness, technological sovereignty and systemic resilience. Science and innovation are increasingly framed as core instruments for European autonomy, not only for scientific or economic progress, but also for explicit geopolitical and geoeconomic goals. The convergence between industrial, technological, security and innovation policies is becoming more pronounced and is expected to influence the future definition of European priorities.

A key driver of this shift is the intensified geopolitical environment, which has reinforced the strategic relevance of defence, security, energy, digital, materials and health domains. Dual-use technologies, with civilian and military applications, are gaining prominence, supported by both European and national investment patterns, catalysed by the war in Ukraine and by the wider strategic reprioritisation underway in Europe. Innovation is therefore being more directly linked to European strategic autonomy and to the reduction of external dependencies in critical value chains. At the same time, the dual digital and green transition, combined with accelerated technological change, is producing deep transformations across sectors and firms. Digital technologies emerge as central enablers of this transformation, with implications for new markets, for skill demand, and for international competitive positioning. Within this digital acceleration, artificial intelligence (AI) is spreading rapidly across industry, public services and research, while the European regulatory environment for AI, data and cybersecurity is becoming more operational. The implementation of frameworks such as the AI Act, European data-space initiatives and strengthened cybersecurity rules is shaping a context in which compliance, trustworthiness and secure deployment are increasingly integral to the innovation landscape.

These policy, technological and geopolitical dynamics are reflected in ongoing discussions on the future architecture of European funding. In preparation for the next MFF, a substantial reorganisation of EU instruments is under consideration, including changes in eligibility logics and priority setting. The proposal of a European Competitiveness Fund (ECF) signals an intended integration and rationalisation of innovation

funding lines, a closer articulation with industrial and strategic policies, and a possible partial replacement or absorption of Horizon Europe (HE) Pillar II. The overall direction points to stronger thematic concentration on strategic technologies and value chains, reduced space for bottom-up approaches, particularly in instruments closely aligned with industrial and sovereignty agendas, higher interdependence between European and national/regional funding mechanisms, and increased requirements in management, reporting and impact scrutiny. This interdependence is expected to be reinforced through tighter coupling between EU and Member State agendas and instruments, including frameworks such as the European Semester and Research and Innovation Strategies for Smart Specialisation (RIS3), alongside co-fund mechanisms and ERDF synergies.

Within this evolving system, thematic specialisation is intensifying. European funding is moving toward more specialised, strategically oriented programmes, replacing wider open-topic models. This implies that eligibility will be increasingly conditioned by EU priority areas, competition for positioning within those domains will grow among institutions, regions and Member States, and expectations regarding socio-economic and industrial impact, alongside scientific merit, will become more demanding. At the same time, despite widening policies, structural asymmetries in access to frontier knowledge and funding are persisting, contributing to further institutional and territorial polarisation within Europe. The tightening of funding conditions and potential reduction of decentralised instruments beyond the current cycle may further amplify competitive and operational pressures, in a multilevel governance environment that is more complex, more hybrid and less predictable.

Across Europe and within Member States, this policy and funding transition also intersects with rising pressure on talent and skills. Competition for advanced digital and scientific profiles is intensifying, while demographic ageing in many countries is increasing reliance on effective mobility and recruitment mechanisms. The result is a tightening labour market for high-end R&I competences, particularly in areas critical to the dual transition and to emerging strategic agendas.

Finally, at national level, institutional reforms in STI – most notably the merger of the Foundation for Science and Technology (FCT) and the National Innovation Agency (ANI), among other reorganisations – add a layer of uncertainty. During the transition, risks of instability or fragmentation may arise, including delays, discontinuities and overlaps of functions in the national funding and coordination ecosystem, with potential effects on its articulation with European programmes. In parallel, the Government has announced its intention to revise the Law on Science and Innovation, in particular to clarify the mission and positioning of key STI actors (including State Laboratories, Associate Laboratories, Collaborative Laboratories, and Centres for Technology and Innovation) and to redesign their funding model; the scope, timing and operational consequences of this revision remain to be defined. These state reorganisations may also affect sectoral governance and funding in domains such as energy, industry and health, adding further uncertainty during the transition.

3.2 Our focus in 2026

The external context for 2026 is demanding: European funding is entering a transition phase, national STI governance is being reconfigured, and expectations on impact, competitiveness and strategic autonomy are rising. In this setting, the Strategic Plan 2023-2030 remains the reference for INESC TEC's direction. The 2026 Plan is built on a scenario of slight overall growth in total funding, combined with a moderate reduction in competitive project funding, an increase in strategic base funding, a higher contribution from research and innovation services, and a controlled adjustment in team size and composition after an exceptional funding cycle. The 2026 Plan does not introduce a new strategy; it applies that direction to a specific year of transition. The Plan does not claim foresight beyond what is reasonable; it consolidates and sharpens work that the institute needs to do, and is equipped to do well, in a year marked by funding transition, policy reorientation and intensifying competition.

The first priority is to **strengthen and project the institute's scientific core**. In practical terms, this means focusing on the quality and visibility of scientific output, consolidating the domain and centre structure, and reinforcing research teams in strategic areas such as artificial intelligence, quantum technologies, bioengineering, robotics and energy systems. It also includes implementing a new internal funding model aligned with CoARA principles, deepening Open Science practices, and expanding support for high-

potential research through ERC preparation and internal seed projects. These actions are intended to keep INESC TEC competitive in a more selective European environment and better positioned for the next framework programme, while strengthening scientific capacity mainly through selective reinforcement and rebalancing within a constrained and more base-funded resource envelope.

The second priority is to **deepen international embedment and participation in agenda-setting**. The institute will use the INESC Brussels Hub, structured participation in Horizon Europe and the preparation of FP10 and the European Competitiveness Fund to secure a stronger role in European research and innovation ecosystems. Strategic partnerships such as the UT Austin Portugal Program, collaboration with SINTEF in ocean technologies and cooperation with NIAR in Taiwan, together with mobility and visiting-researcher schemes, are key instruments for this priority. The objective is straightforward: to ensure that INESC TEC is present, visible and influential in the networks and processes where future priorities and instruments are shaped.

The third priority is to **focus research and innovation more clearly on societal and industrial challenges**. The institute will continue to align its research portfolio with the Sustainable Development Goals in areas such as oceans, energy, circularity, responsible AI, health and governance, while contributing to regional, national and European planning and reform processes. At the same time, it will reinforce work with companies and sector associations through applied projects, pilots and demonstrators, including the development of TEC4ASD in Aerospace, Security and Defence, and will support the digitalisation of public administration and the use of data in public policy. This priority reflects a deliberate choice to connect scientific capacity more directly to competitiveness, resilience and public value, in a context where impact and alignment with strategic agendas are increasingly central to funding decisions.

The fourth priority is to **turn knowledge into impact through stronger valorisation and entrepreneurship pathways**. Operationally, this involves simplifying the disclosure of R&D results, improving intellectual property management, and refining the spin-off policy and guidelines. It also includes expanding support for entrepreneurial initiatives and emerging spin-offs, through mentoring, ideation programmes, follow-up mechanisms and proof-of-concept and prototyping instruments, and consolidating participation in European knowledge-transfer and valorisation networks. The aim is to make the path from research to market and societal use more predictable, quicker and better supported, in line with tighter competitive funding conditions, the gradual phase-out of exceptional instruments and the need to increase the contribution of research and innovation services to a resilient economic model.

The fifth priority is to **consolidate the institutional foundations needed for the next cycle**, including the way INESC TEC manages its people, funding mix and internal systems in a more constrained and scrutinised environment, with a particular focus on adjusting team size and composition in a deliberate and sustainable way. In 2026, the institute will continue to implement its renewed human resources management model, covering recruitment, career pathways, performance and development, and will support diversity, inclusion and well-being. It will upgrade key research infrastructures through Equipar+2 and targeted laboratory modernisation, strengthen environmental and ESG practices, and advance digital transformation, including the use of artificial intelligence to support internal processes and Open Science. It will also implement its Knowledge Security Policy and dual-use governance framework and deploy a new HR management system to improve process quality and data integration. These measures are intended to ensure that INESC TEC can operate reliably and responsibly in a more regulated, scrutinised and interconnected environment.

Together, these strategic priorities for 2026 link a changing external context to the long-term commitments of the Strategic Plan and to the concrete initiatives that follow. They provide a managerial frame for decision-making and resource allocation in 2026, recognising that the institute's broader activity continues to depend on the daily work of its centres, services, TEC4 platforms and commissions.

3.3 Main initiatives for 2026

This section presents INESC TEC's main institutional initiatives for 2026, organised by strategic commitment. Each commitment begins with a short introduction that links the external context to the institute's high-level directions and priorities and is followed by the initiatives associated with that commitment, summarised by strategic objective. Together, these elements provide a coherent view of the

institute's orientation for the year, while recognising that they do not exhaust the full scope of activity required to achieve INESC TEC's goals and commitments. Additional cross-cutting efforts, driven by the R&D Centres, Services, TEC4 platforms and commissions, are also important and are presented in other sections of the Activity Plan.

C1. Excel and innovate across the missions of academia, harnessing the collective strength of our community.

In a bridge year between funding cycles, and as European R&I priorities and instruments become more selective and thematically concentrated, the solidity and visibility of research capacity gain additional weight. The initiatives under Commitment 1 continue a line of work that has been progressively reinforced: consolidating excellence, increasing critical mass in key domains, and strengthening the institutional conditions for frontier research and open-science practice.

A first set of initiatives reinforces excellence and visibility through sustained leadership in top scientific channels. This includes more deliberate support for publication in and stewardship of high-impact venues, stronger representation in major conferences, and clearer projection of results in communities where scientific agendas are shaped. The objective is to ensure that INESC TEC's strongest research is consistently visible and competitive in international arenas.

A second set strengthens critical mass and domain coherence. The merger of the SYSTEM Centre, the structured follow-up to the 2024 evaluation, reinforcement of research teams, and consolidation of domain-level scientific strategies respond to the need to increase scale, reduce fragmentation, and sharpen ambition in areas where Europe is concentrating investment and expectations.

A third set improves internal incentives and research practices. The new peer-assessed internal funding model aligned with the Coalition for Advancing Research Assessment (CoARA) principles, together with deeper Open Science commitments (open data, open access, open source and open research infrastructures), supports rigorous, transparent and responsible research environments, in line with evolving European standards for assessment and funding.

A fourth set safeguards high-risk, high-potential research pathways through reinforced European Research Council (ERC) support and an internal Seed Projects Call, providing space for exploratory lines that renew the scientific base and feed future application-oriented work.

Finally, the commitment consolidates INESC TEC's positioning in enabling domains that are central to the dual digital–green transition. Continued leadership in AI, high-performance computing (HPC), quantum technologies and semiconductors-related agendas (including Chips Act-linked opportunities), together with structured industry programmes, improved learning experiences for students and young researchers, and reinforced mobility and visiting-researcher schemes, strengthens the scientific core while keeping it connected to advanced users, talent pipelines and strategic partnerships.

- **C1.1. Raise the contribution and visibility of our research**

  INESC TEC will pursue a comprehensive programme to consolidate and enhance its scientific capacity, reinforcing organisational structures, talent development, and mechanisms for scientific excellence:

  - Growth in scientific relevance and visibility - INESC TEC will prioritise improving the quality and impact of its scientific output by encouraging publication in high-impact journals and top-tier conferences, supported by the progressive use of curated lists of recommended venues. The organisation will also foster active engagement in leading international conferences and reinforce its leadership in international working groups. Furthermore, researchers will be encouraged and supported to take on prominent academic roles, including serving on editorial boards, participating in programme and technical committees, and organising or co-organising international scientific events.
  - Creation of the SYSTEM Centre through the merger of CEGI and CESE - Launch the new SYSTEM Centre in 2026, unifying the research strengths of the former CEGI and CESE in industrial engineering, systems engineering, operations research, and data-driven decision support. This merger consolidates a stronger scientific and strategic presence in

these fields, combining complementary expertise to enhance impact, competitiveness, and international visibility. The increased critical mass and integrated innovation capabilities will reinforce INESC TEC's positioning in science-based innovation and enable a more robust participation in European research and innovation activities. SYSTEM will bring together established research lines and teams, expanding joint opportunities and deepening collaboration across scientific and innovation dimensions under the guidance of its new coordination team.

- Strategic reinforcement of the research team - INESC TEC will continue to strengthen its research capacity by consolidating and further developing the talent recruited in recent cycles across key scientific and strategic domains. Building on the momentum of the FCT Tenure Programme, the institute will support the integration and progression of promising researchers appointed both within INESC TEC and at its Associate HEIs. This ongoing effort will reinforce expertise in priority areas such as Artificial Intelligence, Quantum Computing, Bioengineering, Robotics, and Energy Systems.
- International recognition and researcher development – Strengthen the international profile of INESC TEC's researchers by implementing a new policy to support individual memberships in international scientific societies and communities. A funding model has been defined to cover membership fees, and full implementation is planned for 2026, reinforcing the institute's strategic commitment to international visibility and professional development.
- Deepening the domain-level scientific strategy - After achieving an Excellent rating in the 2024 FCT Units evaluation, INESC TEC will dedicate 2026 to strengthening and consolidating its domain-level scientific strategy. Building on its Scientific Advisory Board's endorsement of the current domain structure, the institute will further articulate scientific priorities within each domain, reinforcing their coherence, visibility, and strategic relevance. Particular attention will be given to enhancing articulation between domains, through joint scientific events and structured opportunities for cross-fertilisation, while preserving the manageable scope of each domain. This effort aims to deepen INESC TEC's scientific focus, support the maturation of each domain's strategic trajectory, and strengthen the institute's position as a leading research organisation with growing international recognition.
- Introduction of a strategically focused, peer-assessed funding distribution model - INESC TEC will implement a new multiyear internal funding model to support the growth and excellence of its scientific activity. This model introduces a major strategic shift by linking resource allocation not only to past performance but also to forward-looking scientific ambition, negotiated between the Board and the Research Centres and assessed through structured, transparent criteria. A core innovation is the integration of external peer evaluation and international benchmarking, ensuring that scientific quality and relevance, in accordance with CoARA principles and commitments, drive funding decisions. This new approach is designed to strengthen scientific domains, promote strategic differentiation, and foster a culture of excellence aligned with global standards.
- Advancing Open Science across the institution – Strengthen the institution's commitment to Open Science by deepening adoption across the four dimensions of Open Data, Open Access, Open Source, and Open Infrastructure. The institution will assess and update its policies to align with international standards, while promoting institutional awareness and adherence to these practices. This work will ensure INESC TEC's alignment with international expectations and standards in Open Science.
- Enhancing support for high-potential research initiatives - Expand institutional support for researchers preparing applications to European Research Council (ERC) grants, strengthening conditions for pursuing ambitious, high-impact research. In parallel, a new edition of the Internal Seed Projects Call will be launched to stimulate inter-centre

exploratory R&D, early-career researcher development, and early-stage proof-of-concept activities, fostering the emergence of new research and innovation avenues.

- **C1.2. Increase our involvement in the leadership of scientific initiatives**

  Consolidate and expand its leadership in strategic technology domains, actively shaping national and European research and innovation initiatives and strengthening its presence in global scientific networks:

  - Ongoing leadership in emerging digital technologies – Maintain a central role in national and European initiatives in High-Performance Computing (HPC), Artificial Intelligence (AI), Quantum Computing, and Semiconductors, including Chips Act opportunities.

- **C1.3. Improve the base conditions for technology commercialisation**

  Enhance INESC TEC's capabilities in knowledge valorisation by streamlining IP disclosure, strengthening spin-off policies, and deepening its engagement in European technology-transfer networks:

  - Streamlined disclosure of R&D results - Simplify and accelerate the internal process for reporting new R&D results to INESC TEC's Technology Transfer Office (TTO), with particular attention to software. This will improve timely protection, facilitate early valorisation pathways, and strengthen cooperation between researchers and the TTO team.
  - Reinforcement of IP frameworks and spin-off pathways - Define robust IP models to support strategic industry partnerships and reinforce knowledge valorisation through spin-offs. INESC TEC will review and improve its Spin-off Policy and establish clear guidelines to support the creation, governance, and sustainable development of new ventures emerging from research activities.
  - Strengthened presence in European knowledge-transfer networks – Consolidate INESC TEC's relevance in key knowledge-valorisation and technology-transfer forums, including TTO Circle and EARTO, while exploring synergies with other research and technology organisations (RTOs). This engagement will enhance the institute's positioning, extend collaborative opportunities, and support the professionalisation of valorisation practices.

- **C1.4. Develop closer and deeper relationships with our innovation partners and the broader community**

  In 2026, INESC TEC will strengthen collaboration with industry by promoting sector-focused engagement and advancing strategic research partnerships that support innovation ecosystems:

  - Strengthened engagement with innovation partners – Promote a diversified programme of targeted workshops and networking events across INESC TEC's research centres to foster dialogue with technology-based companies and stakeholders in key sectors. Initiatives such as the Centres' Open Days or Meet Ups will create opportunities to showcase research capabilities, discuss sectoral challenges, and stimulate collaboration, reinforcing INESC TEC's positioning as a trusted partner in innovation-driven ecosystems.
  - Expansion of strategic industry research & innovation programmes – Advance the development of a robust portfolio of flagship industry-funded research & innovation programmes by fostering structured, long-term collaboration with technology-based companies. This includes organising targeted workshops and maintaining regular contact with industrial partners to identify shared priorities and catalyse multiannual collaboration programs and new strategic research initiatives.

- **C1.5. Provide innovative learning experiences**

  The institute will reinforce its commitment to talent development through sustained academic engagement, improved support for research students, and maintain a strong portfolio of advanced training initiatives:

- Academic engagement and talent development – Maintain INESC TEC's involvement in PhD and Master's Programmes, essential to its ability to attract and involve young talent in conducting and disseminating excellent research while leveraging the intervention of Higher Education Institutions (in recent years, typically assisting more than 20 PhD programmes, and involving over 300 PhD students and 500 Master's students).
- Student experience and development – Ensure the full operation of the Research Student Office, dedicated to enriching the experience of hosted students and supporting their research journey. Key initiatives include strengthening communication, fostering a sense of belonging, and promoting professional growth through a dedicated information channel, support to the PhD Representatives Committee, and a programme of events and workshops focused on community building, career planning, and engagement. A priority for 2026 will be the implementation of mechanisms and tools that provide effective oversight of doctoral activities.
- Advanced training programmes – New initiatives will namely include the development of advanced training opportunities, notably flagship programmes such as the INVICTA Spring School. INESC TEC will also promote at least 21 advanced training programmes in collaboration with industry, ensuring continuous knowledge exchange and contributing to a sustainable, mutually beneficial innovation ecosystem. A new edition of the Executive Master in Cybersecurity, in collaboration with Porto Business School, is also planned.

- **C1.6. Increase the international embedment of our community**

  The institute will advance its international agenda by broadening mobility pathways, supporting incoming research visits, and promoting strategic collaborations across multiple world regions:

  - Strengthening participation in international mobility programmes – Continue expanding involvement in inbound and outbound mobility schemes, including OpenInnoTrain, the ERCIM Alan Bensoussan Fellowship Programme, and the NII International Internships Programme. INESC TEC will also support the implementation of new mobility initiatives with partners in South America and India, and continue efforts initiated in 2025 to build a coherent and sustainable outbound mobility ecosystem, one that namely supports ERC preparedness, strengthens international alliances, and enhances staff development.
  - Continuation of the International Visiting Researcher Programme – Launch a new edition of the INESC TEC International Visiting Researcher Programme, offering international researchers the opportunity to undertake short-term research visits while remaining affiliated with their home institutions. The programme will continue to serve as a key instrument for scientific exchange, international collaboration, and the enhancement of INESC TEC's global visibility.
  - Advancing strategic collaboration with NIAR (Taiwan) – Further reinforce the strategic partnership with the National Institute of Advanced Research (NIAR, former NARLabs) through joint initiatives such as exploratory research calls and high-level scientific workshops. In 2026, a flagship NIAR–INESC TEC workshop on strategic topics of mutual interest, such as Ocean Technologies or Semiconductors, will be organised to deepen cooperation, demonstrate the value of cross-border collaboration, and create new bridges with academic and industry partners on both sides.

- **C1.7. Reinforce strategic alignment and close collaboration with HEIs**

  The institute will reinforce alignment with its Associate HEIs by supporting joint academic programmes, shared institutional frameworks, strategic professorships, and collaborative initiatives:

  - Collaboration in advanced training programmes – INESC TEC maintains its active role in the design and delivery of Advanced Studies Programmes at several Associate HEIs, offering postgraduate training within the scope of R&D projects. These programmes combine hands-on experience with the development of transferable skills (e.g.,

innovation, entrepreneurship, leadership, and time management) and specialisation in technological domains.

- Advancement of collaborative protocols with Associate HEIs – Continued work on the protocols with INESC TEC's Associate HEIs, framing the assignment and sharing of human and material resources.
- Support for strategic professorships at Associate HEIs – Support 20 professorships at Associate Higher Education Institutions, covering one third of their costs under the FCT-Tenure initiative. These positions are closely aligned with 14 permanent researcher roles at INESC TEC, reinforcing advanced expertise in strategic scientific domains such as Artificial Intelligence, Quantum Computing, Bioengineering, Robotics, and Energy Systems. This effort strengthens the alignment between academic teaching, institutional research priorities, and Europe's broader strategic agenda.
- Collaboration with ISPUP on data protection and digital systems – Continue strengthening the partnership with the Institute of Public Health of the University of Porto (ISPUP) by jointly refining data protection procedures, enhancing information systems, and supporting the development of institutional policies. This collaboration will promote the exchange of best practices, reinforce compliance, and advance ongoing digital transformation efforts.

C2. Make an impact on the toughest challenges of our time in science, technology, and society, through bold creativity and transformative action.

In a context where European and national R&I agendas are increasingly framed around competitiveness, resilience and strategic autonomy, and where impact expectations are becoming more explicit, the initiatives under Commitment 2 consolidate INESC TEC's mission-oriented contribution to major societal and economic challenges. They build on areas where the institute is already active and relevant, while strengthening the channels through which research is translated into solutions for society, industry and public policy.

A first set of initiatives reinforces the alignment of the research agenda and portfolio with the Sustainable Development Goals (SDGs), including domains such as the ocean, energy, circularity, responsible AI, health and governance. This alignment is complemented by the strengthening of environmental, social and governance (ESG) integration at institutional level, through the definition of sustainability baselines and a roadmap that connects R&I activity to measurable sustainability objectives.

A second set deepens the institute's contribution to strategic transformation in economic sectors and value chains. Initiatives to strengthen high-TRL applied innovation and to reinforce structured collaboration with industry reflect the need to deliver solutions that can scale in real environments. Within this logic, the launch of TEC4ASD – focused on Aerospace, Security and Defence – consolidates capacity in domains where scientific and technological advances are increasingly tied to geopolitical and security-related priorities, and where dual-use relevance requires both scientific excellence and robust delivery capability.

A third set strengthens INESC TEC's interface with public policy and societal systems. This includes contributions to the digitalisation of public administration and to evidence-based monitoring of policies and reforms. These actions reinforce the institute's role in supporting governance and public-sector innovation at a time when data, AI and cybersecurity frameworks are becoming operational and demand credible, implementation-ready expertise.

Finally, Commitment 2 includes initiatives to expand public engagement and science communication, including the consolidation of the Autumn Forum, new podcast and videocast formats, and outreach events. Alongside continued participation in national science-policy fora and engagement with ongoing institutional reforms in the STI system, these actions sustain visibility, legitimacy and dialogue with society as the environment becomes more competitive and more impact-driven.

- **C2.1. Develop impactful research and innovation aligned with the SDGs**

  Align INESC TEC's scientific agenda with the UN Sustainable Development Goals (SDGs), mobilising research capacity to address global and societal challenges across multiple domains:

- Alignment with the SDGs through R&D project portfolio – Continue strengthening INESC TEC's contribution to the UN Sustainable Development Goals by advancing research in areas with high environmental and societal impact. Priorities for 2026 include the development of robotic technologies for sustainable ocean use, offshore renewables, and critical infrastructure inspection; AI and Decision Support solutions applied to health, industry, and responsible governance; and research on resource efficiency, circularity, and proactive asset management to support decarbonisation. Additional efforts will focus on digital technologies to reduce food waste across agro-food value chains, human-centred technologies that enhance well-being, and data governance frameworks that promote trustworthy and ethical AI.
- Strengthening sustainability alignment and ESG integration – Prepare plans, reports, and analyses that assess INESC TEC's research contributions to the Sustainable Development Goals, supported by new internal mechanisms for collecting and disseminating this information. In parallel, establish the baseline for Environmental, Social, and Governance (ESG) performance and develop a roadmap for implementing the ESG strategy, ensuring its effective integration into the organisation's operations.

- **C2.2. Increase our contribution to regional and national R&I-based sustainable growth**

  The institute will maintain its role in shaping regional and national innovation policies while strengthening the operation of key innovation ecosystems and collaborative structures:

  - Strategic contributions to regional and national innovation planning – Continue to contribute actively to the definition of regional, national, and European R&I policies and strategies, including Smart Specialisation, ECF, FP10, and related programmes and instruments. INESC TEC will provide strategic input to planning processes and public consultations, helping shape investment priorities and mechanisms that reinforce synergies between regional, national, and European initiatives. A particular focus will be given to the process of merging FCT and ANI, as well as the drafting of the new Law of Science and Innovation.
  - Support for innovation ecosystems and collaborative structures – Promote the creation and sustained development of innovation ecosystems by supporting the operation, at the European level, of Public-Private Partnerships, and at the national level, of Clusters and CoLABs, as well as other collaborative structures with academic and industry partners. These initiatives will strengthen the translation of research into societal and economic value, foster cross-sector collaboration, and help address complex technological and societal challenges.

- **C2.3. Better align and deliver R&I with industry's needs**

  In 2026, the institute will reinforce its responsiveness to industrial needs by expanding sector-driven initiatives, promoting industry-aligned research, and leveraging guidance from its Business Advisory Board:

  - Launch of the TEC4ASD initiative – Establish TEC4ASD as INESC TEC's new strategic interface for Aerospace, Security, and Defence, capitalising on the rapid growth of these sectors and emerging national and European opportunities. Building on strong participation in key networks such as AED, EASTRO, and EARTO, the initiative will position the institute as a relevant player across ASD markets by strengthening partnerships with industry and RTOs, leveraging funding programmes and strategic agendas, and pursuing major contracts. TEC4ASD will also promote collaborative R&D projects, contribute to the digital transformation of public administration in ASD domains, and enhance international visibility through high-profile events.
  - Industry-aligned research and applied innovation - Across its R&D Centres and TEC4 platforms, INESC TEC will continue to develop industry-oriented R&D through applied projects, high-TRL demonstrators, digital twins, robotics pilots, sector-specific AI solutions, and collaborative development activities. These efforts reflect a broad

institutional commitment to respond to industrial needs through practical experimentation, technology validation, and close engagement with companies across multiple sectors.

- Implementation of industry collaboration framework, foreseeing R&I activities, advanced consultancy and capacity building aligned with companies' innovation roadmaps. This will materialise in a multiannual collaboration program aiming to support our partners in achieving their short to medium-term innovation challenges, developing new services and products and preparing in long-term for future innovation challenges and cutting-edge technologies, through joint PhD research programs.
- Strategic input from the Business Advisory Board – Deepen discussions with the Business Advisory Board towards the internationalisation of INESC TEC innovation and advanced consultancy. Support in the revision of the business development organisation and strategy for improving customer relation, proposal preparation and promoting adequate incentives to the internal teams.

- **C2.4. Contribute to the digitalisation of public administration**

  The institute will reinforce its support to public administration through digital transformation initiatives and contributions to improved public-policy monitoring and evaluation frameworks:

  - Support for public administration digital transformation and policy alignment - Develop projects that address the digital transformation needs of public administration, particularly in security, defence, and critical-infrastructure domains, while contributing to national and European R&I policies and strategic initiatives. INESC TEC will also deepen collaborations with public research and health institutions on data protection, digital governance, and information-system improvements.
  - Contribution to public policy monitoring and evaluation - Participate in the activities of the Multisectoral Monitoring Team (EMM) of the Public Administration Planning and Foresight Services Network (REPLAN), helping to strengthen mechanisms for monitoring sectoral and cross-cutting public policies. In 2026, INESC TEC will build on the work initiated in 2025 by supporting access to microdata, sharing good practices, and contributing to strategic frameworks and sustainability indicators, promoting the use of data and evidence in public policy planning and evaluation in collaboration with governmental and institutional partners.

- **C2.5. Raise our contribution to inform debates on issues that matter to society**

  The institute will reinforce its role in informing societal debates through targeted research, public engagement initiatives, and participation in key science-policy platforms:

  - Research that addresses societal challenges - Advance research across sustainability, responsible AI, energy transition, public health, and digital transformation, ensuring that INESC TEC's scientific outputs provide evidence and insight that contribute to public and policy debates on major societal issues.
  - Science communication and public engagement - Strengthen initiatives that bring research closer to society through INESC TEC's Autumn Forum, but also open days, demonstrations, workshops, exhibitions, and outreach activities, helping to contextualise technological developments and foster informed dialogue with citizens and communities.
  - Engagement in national science policy forums – INESC TEC will remain an active member of the Council of Associate Laboratories and the CTI Alliance, contributing to national discussions on the evolving research and innovation governance landscape. In 2026, this will include engagement with the newly established Agency for Innovation and Research (AI2), participation in consultations on revisions to the Science Law and related legislation, and contributions to the design of funding instruments and regulatory frameworks that shape the national R&I ecosystem.

- Launch of videocasts and podcasts – Launch new issues of the magazine INESC TEC Science & Society, as well as videocasts and podcasts aimed at citizens interested in general knowledge about research, its possible applications and impact on society, as well as informed opinions on the public policies most influenced by technology.

- **C2.6. Engage in direct dialogue with the public**

  The institute will reinforce its outreach mission by promoting audience-engaging events and initiatives that enhance societal understanding of science and technology:

  - Public-facing events and demonstrations - Expand open days, laboratory visits, and technology demonstrations across Centres and TEC4 Platforms, while maintaining participation in national science outreach events. These activities will create accessible opportunities for citizens, schools, and communities to engage directly with INESC TEC's research and technologies.
  - Science communication and outreach - Strengthen public-oriented communication through initiatives such as the Autumn Forum, the INESC TEC Science & Society magazine, and new videocasts and podcasts, helping to explain research, its applications, and its societal relevance to a broader audience.
  - Citizen engagement in societal and policy discussions - Promote participation in public dialogue by organising workshops, exhibitions, and debate sessions on themes such as responsible AI, sustainability, digital transformation, and other emerging technologies, supporting informed discussions that connect citizens, researchers, and policymakers.

- **C2.7. Communicate scientific and technological achievements and their impact**

  In 2026, the institute will broaden its science communication and outreach efforts through new digital formats, a renewed online presence, major international conferences, and public engagement initiatives showcasing its scientific and technological achievements:

  - Strengthening digital science communication - In 2026, INESC TEC will expand its digital outreach through new seasons of its science podcasts and videocasts, including "INESC TEC Science and Society" and "Science Bits", disseminated across platforms such as YouTube and Engenharia Rádio. The institute will also further develop "INESC TECWatch", its commentary format providing timely insights on scientific and technological developments, ensuring a stronger and more diverse presence across digital media channels.
  - Development of a new institutional website - Launch a new institutional website to revitalise the institution's online presence and serve as a critical platform for communication, outreach, and engagement with diverse stakeholders, including the scientific community, industry partners, policymakers, and the general public.
  - Hosting and organising international conferences – INESC TEC will host and co-organise several major international conferences, namely ADRA Forum 2026 – AI, Data and Robotics Forum, one of Europe's leading events in artificial intelligence, data, and robotics. The event is expected to gather more than 500 experts, researchers, industry representatives, and policymakers. In parallel, INESC TEC researchers will also serve as main organisers of the IEEE EMBS flagship conference on Body Sensor Networks (IEEE BSN 2026), also to be held in Porto. This responsibility reflects eight years of leadership of the IEEE EMBS Portugal Chapter and provides strengthened access to the global IEEE network.
  - International presence and visibility – INESC TEC will strengthen its global profile by showcasing research and technological developments at major international events, including ERF 2026 in Stavanger, EuCNC 2026, ENLIT 2026, REPMUS 26, and other flagship expositions and conferences. Participation in these events will enhance international visibility, reinforce strategic positioning in key technological domains, and support engagement with global research and industry communities.

- Institutional outreach and engagement events – The institute will promote dialogue with society, academia, industry, and the media through a diverse programme of events hosted by its R&D Centres, such as the Energy Technology Open Day, the iiLab Open Day, the TRIBE Lab Synergy Day, and the 3rd Synergy Day on Robotics and IoT for Agriculture. These initiatives will present high-TRL prototypes and solutions across areas including AI, cybersecurity, energy systems, robotics, and digital technologies, reinforcing INESC TEC's commitment to openness, accountability, and the dissemination of scientific and technological achievements.

C3. Increase our relevance by closely integrating across science and innovation, disciplines, and ecosystems.

As European R&I evolves toward more tightly coupled scientific, industrial and societal agendas, and as competition concentrates around strategic technologies, value chains and large-scale partnerships, the initiatives under Commitment 3 reinforce INESC TEC's role as an integrated actor across disciplines and ecosystems. They build on established platforms and networks, while strengthening the institute's capacity to operate at the intersections where knowledge, innovation and policy priorities increasingly meet.

A first set of initiatives consolidates multidisciplinary and cross-centre integration through flagship ecosystems. The continued development of INESCTEC.OCEAN as a strategic, institute-wide platform provides a coherent structure for converging competencies around complex challenges that require combined scientific, technological and policy responses. This flagship logic is complemented by sustained engagement in national and European collaborative structures, including Clusters, Collaborative Laboratories (CoLABs) and major R&I associations and partnerships (such as EARTO, EFFRA and ADRA), which remain central arenas for shaping and executing strategic agendas.

A second set strengthens integration with innovation and entrepreneurship ecosystems. The reinforcement of the spin-off development pipeline and associated entrepreneurship mechanisms aims to ensure that research results are translated into market and societal value through structured pathways, in alignment with growing European emphasis on high-TRL deployment and measurable impact. These initiatives connect scientific work more systematically with innovation actors, investors and application environments.

A third set deepens INESC TEC's positioning in strategic value chains and technology-intensive domains where Europe is concentrating investment and expectations. This includes stronger integration in areas such as energy, robotics, semiconductors, aerospace, cybersecurity and telecommunications, and active participation in European initiatives linked to semiconductors and Chips for Europe, including POEMS. The objective is to reinforce the institute's relevance in ecosystems that combine frontier knowledge with industrial competitiveness and strategic autonomy priorities.

Finally, Commitment 3 reinforces proactive agenda-setting and international embedment. The Foresight and Public Policy Office, now with a Lisbon workspace, and the INESC Brussels HUB strengthen INESC TEC's capacity to engage early in national and European programme design and partnership formation. This is complemented by the consolidation of strategic international partnerships (including UT Austin Portugal and SINTEF) and by broader membership and networking actions that sustain visibility and influence in the arenas where future R&I priorities will be defined.

- **C3.1. Build stronger knowledge-based and multidisciplinary R&I ecosystems**

  The institute will reinforce its role in multidisciplinary R&I ecosystems through major institutional initiatives and sustained engagement in national and European collaborative structures:

  - Consolidation of INESCTEC.OCEAN as a multidisciplinary R&I ecosystem – INESCTEC.OCEAN will advance its consolidation in 2026 as Portugal's Centre of Excellence in Ocean Research and Engineering. The initiative will strengthen multidisciplinary work across its four scientific domains - across marine structures, marine robotics, ocean energy, and ocean data -, launch cross-cutting programmes linking marine robotics, structures, energy, and ocean data, and expand partnerships with national and international networks. These efforts will be supported by joint laboratories

with Higher Education Institutions, new corporate research chairs, pilot projects in real operational environments, and enhanced use of shared research infrastructures, contributing to a robust and knowledge-driven ocean R&I ecosystem, as outlined in Section 9.2.

- Support for Collaborative Laboratories (CoLABs) and new regional technology infrastructures – Contribute to the public policy objectives of Clusters and CoLABs through active engagement in eleven CoLABs in which INESC TEC participates. Contribute to the launch of new technology infrastructures for advanced computation (CNCA), offshore technologies (SUSTEMARE) and industry.
- Promote the revision and implementation of regional smart specialisation strategies through the participation and coordination of the platforms' activities, particularly in the public policy, sea, and industry sectors.
- Reinforce participation in national and European research associations – Strengthen INESC TEC's active involvement in major R&I networks and associations, such as EARTO, EFFRA, ADRA and other European partnerships, contributing to shared strategic agendas, fostering multidisciplinary collaboration, and enhancing the institute's role within broader knowledge-based and innovation ecosystems.

- **C3.2. Develop better linkages between knowledge production, development, and market uptake**

  The institute will reinforce mechanisms that link research, innovation, and market uptake, strengthening support for entrepreneurship and emerging spin-offs:

  - Support for spin-off development - Advance the creation and maturation of spin-offs currently under development, providing structured guidance on business modelling, IP strategy, market validation, and early-stage fundraising to ensure successful transition from research outcomes to viable companies.
  - Strengthening entrepreneurship pathways and market-linked spin-off development - In 2026, INESC TEC will reinforce the transition from research to market by expanding mentoring, intensifying ideation and strengthening spin-off project development. These initiatives will support stronger connections between scientific results, technology development, and commercial opportunities, while regular entrepreneurship events, internal roadshows to INESC TEC's Centres, and dedicated follow-up mechanisms help accelerate the maturation and market readiness of emerging spin-offs.
  - Strengthening sectorial market analysis and valorisation pathway definition with the improvement of internal coordination instruments, facilitating collaboration TTO, TEC4 and the research teams.

- **C3.3. Increase strategic integration in national and international tech-intensive value-chains**

  The institute will reinforce its engagement in strategic technological sectors through strengthened industrial partnerships and participation in national and European initiatives:

  - Expand collaboration with industry in high-technology sectors – Deepen cooperation with strategic industrial partners in areas such as energy systems, autonomous robotics, semiconductors, aerospace, cybersecurity, and advanced telecommunications, leveraging collaborative R&D, high-TRL demonstrators, and long-term programme contracts. These initiatives will strengthen INESC TEC's contribution to the technological capabilities and competitiveness of national and international industrial value chains.
  - Active participation in POEMS - Portuguese Competence Centre in Semiconductors, a cutting-edge initiative under the Chips for Europe Initiative, focusing on the strategic areas of chip design, advanced packaging, and emerging semiconductor technologies. This strategic alignment aims to bring Portugal to the forefront of semiconductor innovation and production, specifically focusing on microelectronics and semiconductors, pivotal

for elevating the existing industrial and technological capacities to meet the key global challenges.

- **C3.4. Promote our pro-active participation in R&I agenda-setting at regional, national and EU level**

  The institute will intensify its contribution to national and European R&I policymaking through targeted engagement with strategic actors, participation in key consultations, and sustained dialogue across governance levels:

  - Strengthening engagement with national policy frameworks - INESC TEC will reinforce its contribution to national R&I agenda-setting by mapping key policy stakeholders, monitoring relevant public policies and consultations, and promoting structured dialogue with national authorities. This includes the production of policy briefs and papers, participation in policy fora, and the organisation of high-level events and visits, supported by the Lisbon workspace to ensure continued proximity to decision-makers and strategic actors.
  - Deepening strategic participation in European R&I agenda-setting – INESC TEC will reinforce its contribution to EU-level research and innovation policy through the INESC Brussels Hub, expanding its involvement in the co-design of FP10 and the European Competitiveness Fund and strengthening its participation in strategically aligned Coordination and Support Actions (CSAs). These efforts will support the institute's role in shaping emerging policy priorities, funding instruments, and strategic orientations within the European R&I landscape.

- **C3.5. Increase our international networking, leadership and competitiveness**

  The institute will further strengthen its international positioning through strategic partnerships, expanded engagement in European R&I ecosystems, and deeper collaboration with leading global research organisations:

  - Strengthening strategic positioning through the INESC Brussels Hub - In 2026, the INESC Brussels Hub will reinforce INESC TEC's presence in European research and innovation ecosystems by expanding structured participation in FP10 and European Competitiveness Fund co-design processes and strengthening involvement in strategically aligned Coordination and Support Actions. The Hub will also enhance INESC TEC's policy intelligence and outreach through initiatives such as the INESC Future Labs Forum, expanded European R&I dialogue platforms, and regular foresight and intelligence outputs, supporting deeper engagement with EU institutions, policymakers, and key strategic actors. (see Section 10.3.2).
  - Engagement in the UT Austin Portugal Program - In 2026, INESC TEC will continue to manage the UT Austin Portugal Program to the highest standards, ensuring full compliance with Phase IV commitments and reinforcing the institute's visibility as a strategic partner in international science and technology cooperation. Efforts will focus on advancing joint research activities, supporting mobility schemes, strengthening training initiatives, and deepening collaboration with UT Austin across emerging scientific domains, while contributing to a sustainable and globally aligned international engagement strategy, as detailed in Section 9.1.
  - Broadened institutional engagement in international organisations - Actively engage as a member in international organisations (20+), in broadened geographies, and in collaboration with international partners (Memoranda of Understanding, R&D contracts, researchers exchange programmes, etc).
  - Collaboration with SINTEF in ocean technologies - Within the scope of the INESCTEC.OCEAN project, INESC TEC will deepen its close partnership with SINTEF (Norway), reinforcing its role in the international ocean research community.

C4. Cultivate an attractive, people-centred and talented community.

In a context of intensifying competition for advanced scientific and technological talent, and of growing expectations regarding responsible and secure R&I practice, the initiatives under Commitment 4 strengthen the human and cultural foundations of INESC TEC. They aim to secure the conditions that allow excellence and relevance to be sustained over time: attractive career pathways, strong research environments, and a community prepared to operate in increasingly demanding ethical, regulatory and knowledge-security settings.

A first set of initiatives focuses on implementing the renewed human resources (HR) management model. This includes improvements across recruitment, onboarding, career progression, performance and development tools, together with clearer merit-based recognition mechanisms. The objective is to make career pathways more transparent and coherent, supporting both retention and attraction of high-end R&I profiles, and aligning internal practices with evolving European standards for assessment and professional development.

A second set strengthens the working and research environment in which people develop and collaborate. Hands-on scientific development opportunities are reinforced through upgraded laboratories, equipment and participation in high-impact projects, while community-building actions and physical workspace improvements support a people-centred institutional culture. International mobility and diversity/inclusion initiatives complement this effort by widening recruitment horizons and reinforcing an open, internationally embedded community.

A third set consolidates institutional integrity and responsibility frameworks. Initiatives to strengthen ethics and research integrity, data protection, anti-corruption practices, and dual-use oversight ensure that researchers and teams operate with clear guidance and shared standards. This reinforces trustworthiness and robustness in areas where AI, data usage and knowledge-security requirements are becoming more operational and visible across European and national R&I systems.

- **C4.1. Improve attraction and retention of world-class talent**

  In 2026, the institute will implement a renewed HR Management model and enhance the scientific conditions that enable researchers to thrive in cutting-edge research environments:

  - Implementation of the new HR Management model - In 2026, INESC TEC will begin implementing the HR improvements previously analysed and designed, including updates to recruitment and onboarding processes, career progression frameworks, and performance and development tools. These changes aim to strengthen organisational effectiveness, promote a supportive and inclusive work environment, and align talent management practices with the institute's long-term strategic objectives.
  - Expand opportunities for hands-on scientific development - Provide researchers and students with enriched research environments, including upgraded laboratory infrastructures, access to state-of-the-art equipment, immersive R&D settings, and participation in high-impact projects and international collaborations that strengthen both attraction and retention.

- **C4.2. Ensure opportunities and recognition for career achievements**

  The institute will introduce new career development mechanisms to support merit-based progression and provide clear pathways for researcher advancement:

  - Strengthen structured career development pathways - Framed in the new HR Management model, implement new career pathways, competency frameworks, and progression mechanisms, while expanding performance-based evaluation models that support merit recognition, transparency, and long-term career growth across all research and support roles.
  - Expand opportunities for professional development and visibility - Promote advanced training, international mobility, participation in high-prestige grant programmes (e.g., ERC), and leadership roles in scientific initiatives, ensuring that researchers at all stages gain recognition, broaden their expertise, and enhance their scientific profile.

- **C4.3. Expand the diversity of our community**

  The institute will foster an inclusive and globally engaged community by strengthening international mobility pathways and advancing diversity and inclusion initiatives:

  - Expansion and consolidation of international mobility initiatives - INESC TEC will broaden its global mobility opportunities by supporting the implementation of new programmes with partners in South America and India, while continuing to develop a coherent and sustainable outbound mobility ecosystem that strengthens international alliances and prepares researchers for competitive European funding. These efforts will be complemented by training on research security and immigration procedures, as well as high-level initiatives such as the NIAR–INESC TEC workshop, which will deepen cross-border collaboration and create new opportunities for researcher exchange and joint work.
  - Support for diversity and inclusion initiatives – Reaffirm our commitment to diversity and inclusion policies and support the initiatives of the Diversity and Inclusion Commission focused on gender equality, interculturality, accessibility and age diversity as described in greater detail in Section 10.

- **C4.4. Provide a more dynamic and fulfilling working environment**

  The institute will advance initiatives that strengthen organisational cohesion and improve working conditions, fostering an engaging and supportive environment for its community:

  - Community-building and internal events – INESC TEC will promote a diverse programme of internal initiatives led by its institutional committees, including those dedicated to Diversity and Inclusion and Social Responsibility, complemented by actions coordinated by the Communication Service. These activities will foster engagement, sense of belonging, and community spirit across the organisation, as detailed in Section 10.2.
  - Improvement of physical workspaces - Several labs and facilities across INESC TEC premises will be renovated and upgraded to improve working conditions and overall comfort.

- **C4.5. Strengthen our commitment to independence and compliance of research with ethical principles**

  In 2026, INESC TEC will consolidate its ethics and compliance structures and expand institutional dialogue on emerging ethical issues across the research landscape:

  - Support for internal ethics and compliance structures - The institute will continue to strengthen its internal Commissions and Committees dedicated to ethics, conflict of interest management, social responsibility, data protection, and anti-corruption compliance. In 2026, this will include enhanced coordination on emerging areas such as defence and dual-use research, ensuring rigorous ethical oversight in line with European developments. Details are provided in Sections 10.
  - Expand ethics-related dialogue and collaboration - INESC TEC will launch a new cycle of quarterly online seminars dedicated to ethical issues in research and will reinforce cooperation with ethics committees across the University of Porto and other R&D institutions, promoting shared learning and strengthening a culture of ethical responsibility.

C5. Strive for a sound, sustainable and effective operational model.

In a year marked by the run-down of exceptional recovery funding and by preparation for a more selective and strategically oriented European cycle, the initiatives under Commitment 5 reinforce the operational resilience and sustainability of INESC TEC. They focus on safeguarding the robustness of the institutional model, strengthening execution capacity, and ensuring that infrastructures and internal systems remain fit for high-TRL, strategically aligned and increasingly regulated R&I environments.

A first set of initiatives addresses the financial and strategic transition beyond the PRR cycle. This includes active management of the post-PRR funding landscape, reinforcement and adjustment of Horizon Europe participation strategy, and the intensification of R&I services and other mechanisms to diversify revenue sources. The objective is to preserve stability while increasing the institute's capacity to compete in a more concentrated and impact-scrutinised European environment.

A second set strengthens environmental and operational sustainability. Initiatives to advance ESG monitoring and practices in R&D and internal operations aim to consolidate sustainability as a structural dimension of the institute's model, aligned with evolving European expectations and with the long-term requirements of strategic value chains.

A third set focuses on upgrading and modernising research and technology infrastructures. Through Equipar+2 and complementary renewal actions – such as Tec4Sea, the x-Energy Lab, and broader laboratory upgrades – INESC TEC reinforces testbed capacity, shared platforms and service provision that are increasingly decisive for participation in European partnerships, high-TRL demonstrators and strategically aligned programmes.

A fourth set accelerates institutional digital transformation. The systematic upgrade of internal digital systems, including the use of AI as an organisational enabler, strengthens operational efficiency, data-driven management and service capability, in line with the wider digital transition affecting both research and institutional operations.

Finally, Commitment 5 consolidates governance and process robustness in sensitive and regulated contexts. The implementation of a Knowledge Security Policy and dual-use governance, together with continuous process improvement and the deployment of a new HR Management System, strengthens institutional readiness for work in domains where security, compliance and accountability are rising expectations.

- **C5.1. Strengthen the sustainability and resilience of our economic model**

  In 2026, INESC TEC will address the uncertainties of the post-PRR period by consolidating its participation in European programmes and diversifying income sources through research and innovation services:

  - Transition beyond PRR funding - With the conclusion of major projects under Portugal's Recovery and Resilience Plan (PRR), INESC TEC will focus on ensuring a smooth transition by closely monitoring financial impacts, adapting internal planning, and strengthening mechanisms that mitigate the uncertainties associated with the end of this exceptional funding cycle.
  - Active participation in European programmes - Monitor and adjust INESC TEC's strategy for effective participation in European funding calls, particularly within the Horizon Europe program, which constitute a significant portion of INESC TEC's projected 2026 budget.
  - Research and innovation services – To reinforce economic resilience in the post-PRR context, the institute will also seek to intensify the development provision of research and innovation services for industry and public-sector partners, leveraging from a renewed innovation portfolio composed by more than 40 new technologies formalised, 8 patents submitted and 9 license agreements under negotiation, resulting from PRR mobilising agendas.

- **C5.2. Promote and contribute to environmental sustainability**

  The institute will reinforce environmental sustainability both through its scientific work and through the development of internal systems that promote responsible resource use and ESG alignment:

  - Environmental sustainability through R&D - INESC TEC will continue to develop scientific and technological solutions that contribute to climate action, sustainable ocean use, clean energy transitions, and resource efficiency. This includes robotics for environmental monitoring, offshore renewable energy technologies, proactive asset management for decarbonisation, circularity approaches in industrial systems, and digital innovations that

reduce waste and enhance sustainability across sectors such as agro-food, infrastructure, and mobility. Promote environmental sustainability as a cross-organisational theme, namely by developing and publishing sustainability plans and reports.

- Internal sustainability practices and monitoring - The institute will strengthen its internal commitment to environmental sustainability by improving data collection mechanisms, establishing baselines for ESG performance, and implementing measures that support responsible resource use. These actions will underpin the development of an institutional sustainability roadmap and ensure alignment with national and European expectations on environmental responsibility.

- **C5.3. Improve quality, management and usage of our infrastructures**

  The institute will advance the renewal and strategic upgrading of its research infrastructures, supported by Equipar+2 programme and targeted laboratory modernisation, while maintaining high-quality services for external partners:

  - Reinforcement of flagship research infrastructures through Equipar+2 - INESC TEC will leverage the investment awarded under FCT's Equipar+2 programme to re-equip and modernise two of its major research infrastructures, Tec4Sea and x-Energy Lab. This upgrade will strengthen national and international competitiveness, expand open-access capabilities, and support advanced PhD and postdoctoral training. Enhanced testing, validation, and computational capacities will accelerate research in sustainable ocean technologies, smart grids, e-mobility, and data-driven energy systems, and strengthen the institute's capacity to support advanced research, large-scale experimentation, and innovation services in critical technological domains.

  - Modernisation and support of research laboratory infrastructures - INESC TEC will implement planned upgrades to multiple laboratories to meet the growing demands of R&D activity and emerging application areas, ensuring the renewal of equipment, enhanced rapid prototyping capabilities, and high-performance systems for field experimentation. These infrastructures will also continue to provide essential laboratory and technical support to several EU-funded and international research projects, maintaining alignment with international scientific requirements.

  - Maintaining external service provision - Leveraging from the investments under CTI and other PRR funding, the institute will consolidate existing infrastructure services offered to external communities, and conclude new demonstrators and testing capabilities under CTI and PRR mobilising agendas, that will foster new testing and capacity building capabilities to industry, public organisations, and research partners that rely on INESC TEC's specialised facilities.

- **C5.4. Strengthen the distinctive aspects of our institutional model**

  The institute will reinforce the core elements of its organisational model by advancing digital transformation, strengthening knowledge-security governance, and improving internal processes and systems:

  - Advancement of the institutional digital transformation strategy - The institute will continue developing its digital transformation agenda, aligned with international R&I trends, with a particular emphasis on artificial intelligence as a key enabler of organisational processes. Initial efforts focus on strengthening digital capabilities in Open Science and progressively extending AI-supported tools across internal workflows.

  - Strengthening knowledge security and dual-use governance - INESC TEC will implement its Knowledge Security Policy to ensure responsible and ethical research practices in a sensitive geopolitical landscape. Measures include compliance with national and international norms, systematic assessment of dual-use risks, monitoring and support for sensitive projects, and training for researchers, reinforcing a culture of integrity,

transparency, and responsibility in activities linked to defence, security, and dual-use technologies.

- Continuous improvement of organisational processes - The institute will reinforce mechanisms for process optimisation and quality enhancement across administrative and scientific support functions, promoting greater efficiency, transparency, and alignment with evolving institutional needs through systematic review, monitoring, and iterative refinement of procedures.
- Deployment of a new Human Resources Management System - INESC TEC will implement a new HR software platform covering all organisational areas, streamlining administrative processes, aiming to improve data integration and reporting, and to enhance operational efficiency and user experience across the institution.

4 MAIN INDICATORS FOR 2026

This section presents the main global indicators for INESC TEC, regarding human resources, activity in projects, scientific publications, IP protection, exploitation and technology transfer, and dissemination activities planned for 2026. The presentation of each R&D Centre and the detailed discussion of their objectives, activities and results are carried out in Section 8.

4.1 Human Resources

4.1.1 Global indicators – Headcount as of 31 December

Table 4.1 and Figure 4.1 show the breakdown of Human Resources by type of contractual relation with INESC TEC and its evolution since 2024.

Table 4.1 - Evolution of Human Resources (Headcount)

	Type of Human Resources		2024	2025 (Forecast)	2026 (Plan)	Δ 2025-26	
Integrated HR	Core Research Team	Employees	276	283	260	-23	-8%
		Academic Staff	188	199	198	-1	-1%
		Grant Holders and Trainees	454	492	400	-92	-19%
		Total Core Researchers	**918**	**974**	**858**	**-116**	**-12%**
		Total Core PhD	**308**	**329**	**314**	**-15**	**-5%**
	Affiliated Researchers		71	73	72	-1	-1%
	Management, Administrative and Technical	Employees	137	148	154	6	4%
		Academic Staff	9	8	8		0%
		Grant Holders and Trainees		1	1		0%
		Total Manag, Admin and Tech	**146**	**157**	**163**	**6**	**4%**
		Total Integrated HR	**1135**	**1204**	**1093**	**-111**	**-9%**
		Total Integrated PhD	**403**	**428**	**415**	**-13**	**-3%**

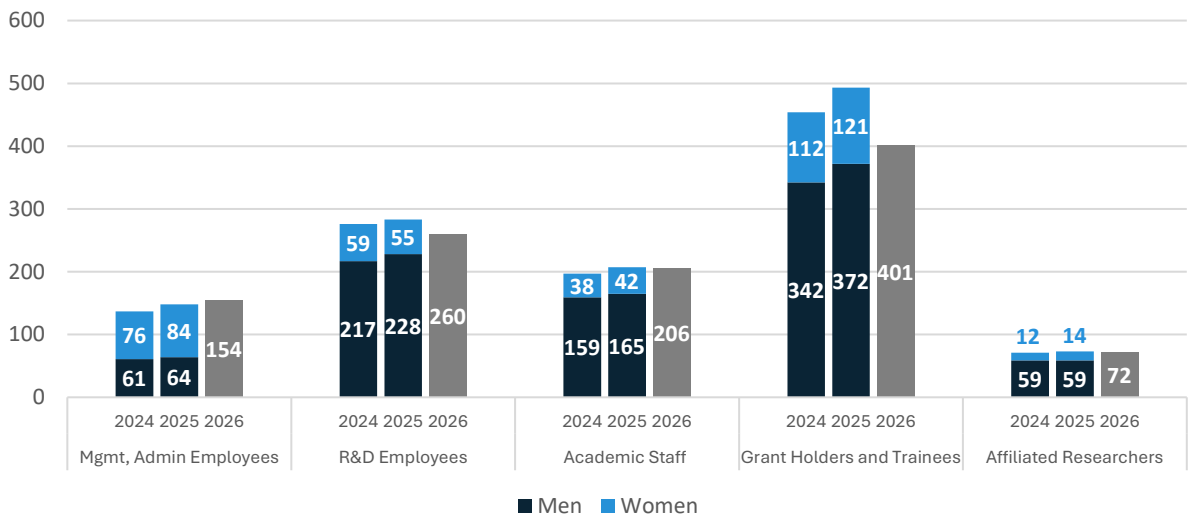

Figure 4.1 - Evolution of Human Resources (Headcount)

4.1.2 Global indicators – Person-Years in 2026

Previous plans have characterised the organisation's staffing profile mainly through headcount figures, offering a static snapshot of individuals involved in research. However, this metric does not capture the dynamics and variations in engagement that occur throughout the year. To provide a more accurate picture of effective research capacity, this section presents person-year data, which reflects the cumulative level of effort over time and therefore offers a more meaningful representation of annual capacity.

Table 4.2 - Evolution of Human Resources (Person-years)

	Type of Human Resources		2024	2025 (Forecast)	2026 (Plan)	Δ 2025-26	
Integrated HR	Core Research Team	Employees	253,9	283,7	233,2	-51	-18%
		Academic Staff	194,2	191,6	199,7	8	4%
		Grant Holders and Trainees	438,6	493,6	399,8	-94	-19%
		Total Core Researchers	**886,6**	**968,9**	**832,7**	**-136**	**-14%**
		Total Core PhD	**305,3**	**319,4**	**297,4**	**-22**	**-7%**
	Affiliated Researchers		64,8	70,8	72,0	1	2%
	Management, Administrative and Technical	Employees	131,1	140,6	140,0	-1	0%
		Academic Staff	9,0	8,6	8,0	-1	-7%
		Grant Holders and Trainees		0,1	1,0	1	900%
		Total Manag, Admin and Tech	**140,1**	**149,3**	**149,0**		**0%**
		Total Integrated HR	**1091,5**	**1189,0**	**1053,7**	**-135**	**-11%**
		Total Integrated PhD	**393,8**	**413,7**	**395,1**	**-19**	**-4%**

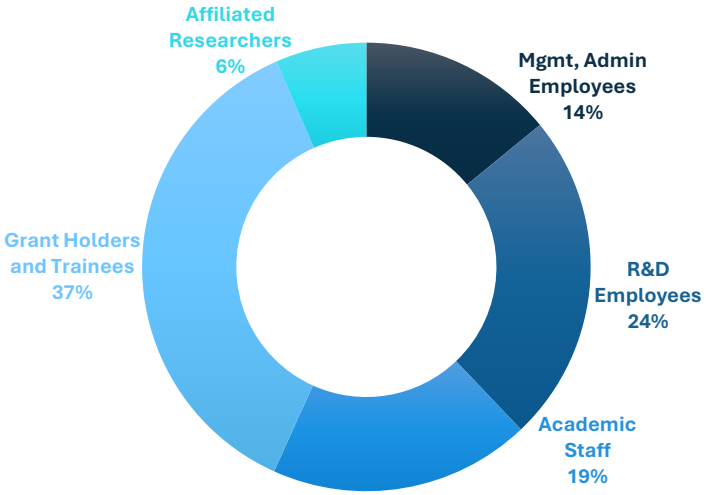

Figure 4.2 - Distribution of Human Resources (Plan 2026 Headcount)

In line with the adjustment in financial activity associated with the phasing out of PRR and CTI projects, a contraction of the team is anticipated. As these initiatives were inherently temporary, recruitment followed a transitional employment policy aligned with their implementation period. Accordingly, a reduction of approximately 8% in R&D employees and 19% in grant-holder positions is planned.

By contrast, staffing levels in Support Services are expected to remain on a moderate upward trajectory, around 4% in 2026, to uphold strategic commitments still in development and to maintain capacity in new roles essential to the organisation's ongoing growth.

4.1.3 R&D Centres indicators

The detailed Human Resources figures expected for the end of 2026 are given in Table 4.3 for each R&D Centre.

Table 4.3 - Human Resources by type and R&D Centre (Plan 2026 Headcount)

	Type of Human Resources		Total R&D Centres	R&D Centres													Special Projects
				CTM	CAP	CRAS	CBER	CPES	SYSTEM	CRIIS	CITE	HUMANISE	LIAAD	CRACS	HASLAB	
Integrated HR	Core Research Team	Employees	**260**	13	15	47	7	59	31	32	7	21	14	1	10	3
		Academic Staff	**198**	17	7	12	4	11	30	17	3	32	22	17	26	
		Grant Holders and Trainees	**400**	32	21	47	14	56	39	33		61	23	13	61	1
		Total Core Researchers	**858**	**62**	**43**	**106**	**25**	**126**	**100**	**82**	**10**	**114**	**59**	**31**	**97**	**4**
		Total Core PhD	**314**	**25**	**19**	**27**	**9**	**32**	**44**	**32**	**5**	**39**	**31**	**17**	**31**	**3**
	Affiliated Researchers		**72**	8	1		3	2	16	1	2	26	9		4	
	Administrative and Technical	Employees	**32**	1	1	6	1	3	3	4		1	1		4	7
		Total Admin and Tech	**32**	1	1	6	1	3	3	4		1	1		4	7
		Total Integrated HR	**962**	**71**	**45**	**112**	**29**	**131**	**119**	**87**	**12**	**141**	**69**	**31**	**105**	**11**
		Total Integrated PhD	**383**	**33**	**20**	**27**	**10**	**34**	**58**	**33**	**7**	**65**	**40**	**17**	**35**	**4**

4.1.4 Support Services indicators

The Human Resources figures expected for the end of 2026 for the Board of Directors, the TEC4 teams, and the Support Services and Offices are provided in Table 4.4.

Table 4.4 - Human Resources by type and Service (Plan 2026 Headcount)

	Type of Human Resources	Total	Board of Directors	Offices & Board Advisors	Support Services															
					TEC4	DPO	Organisation and Management Services					Business Development Services				Technical Support Services			
							AG	AJ	CF	CG	RH	SAAF	TTO	SRI	SCOM	SRC	SIG	SAS	SGI
Integrated HR	Employees	122	7	14	8	2	4	6	11	14	9	3	5	5	10	3	9	5	7
	Academic Staff	8	4		4														
	Grant Holders and Trainees	1		1															
	Affiliated Researchers																		
	Total Integrated HR	**131**	**11**		**12**	**2**	**4**	**6**	**11**	**14**	**9**	**3**	**5**	**5**	**10**	**3**	**9**	**5**	**7**
	Total Integrated PhD	**32**	**5**	**8**	**8**		**2**	**2**	**1**		**1**		**5**						

4.2 Activity in projects

4.2.1 Global indicators

Table 4.5 shows the breakdown of INESC TEC's funding sources and the expected evolution from the 2025 plan to the 2026 plan with an overall growth in activity of 2%.

Table 4.5 - Funding sources and evolution (Plan 2025 and Plan 2026)

Sources			Value (k€)		Δ (k€ | %)	
			2025	2026	2025-26	
Firm Projects	PN-FCT	National R&D Programmes - FCT	1 238	2 006	768	62%
	PN-COOP	National Cooperation Programmes with Industry	17 720	13 444	-4 277	-24%
	PUE-FP	EU Framework Programmes	12 347	10 812	-1 535	-12%
	PUE-DIV	EU Cooperation Programmes - Other	819	1 152	333	41%
	SERV-NAC	R&D Services and Consulting - National	1 322	2 225	904	68%
	SERV-INT	R&D Services and Consulting - International	454	403	-51	-11%
	OP	Other Funding Programmes	877	1 600	723	82%
		Total Active Projects	**34 777**	**31 641**	**-3 136**	**-9%**
Uncertain Projects			1 226	3 115	1 889	154%
National Strategic Programme - Pluriannual			3 250	4 692	1 441	44%
National Strategic Programme - EEC, Tenure, Bolsas_FCT			696	1 457	761	109%
National Strategic Programme - CTI			3 399	810	-2 588	-76%
National Strategic Programmes - Infrastructures			566	3 336	2 770	490%
Other Revenues			549	501	-48	-9%
		Total Revenues	**44 463**	**45 552**	**1 089**	**2%**

The planned activity for 2026 reflects a moderate yet steady 2% increase in total revenues relative to 2025, driven primarily by national programmes, most notably PRR projects, while other funding sources remain comparatively stable. Figure 4.3 provides a high-level synthesis of the previous table, consolidating its values into four overarching revenue categories.

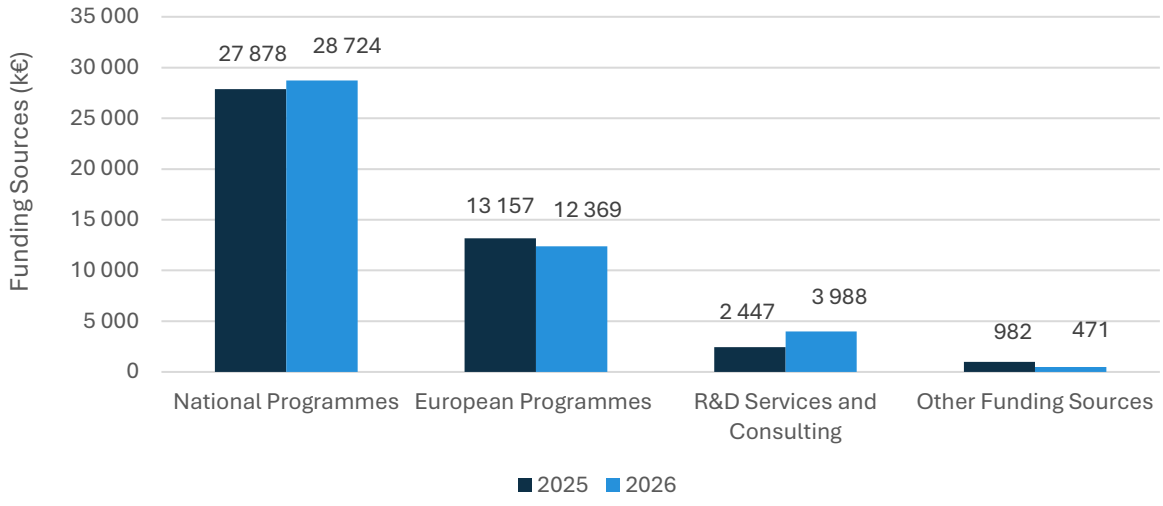

Figure 4.3 - Evolution of funding by source (k€) (Plan 2025 and Plan 2026)

Figure 4.4 shows the funding distribution by source in comparison with that of the previous plan.

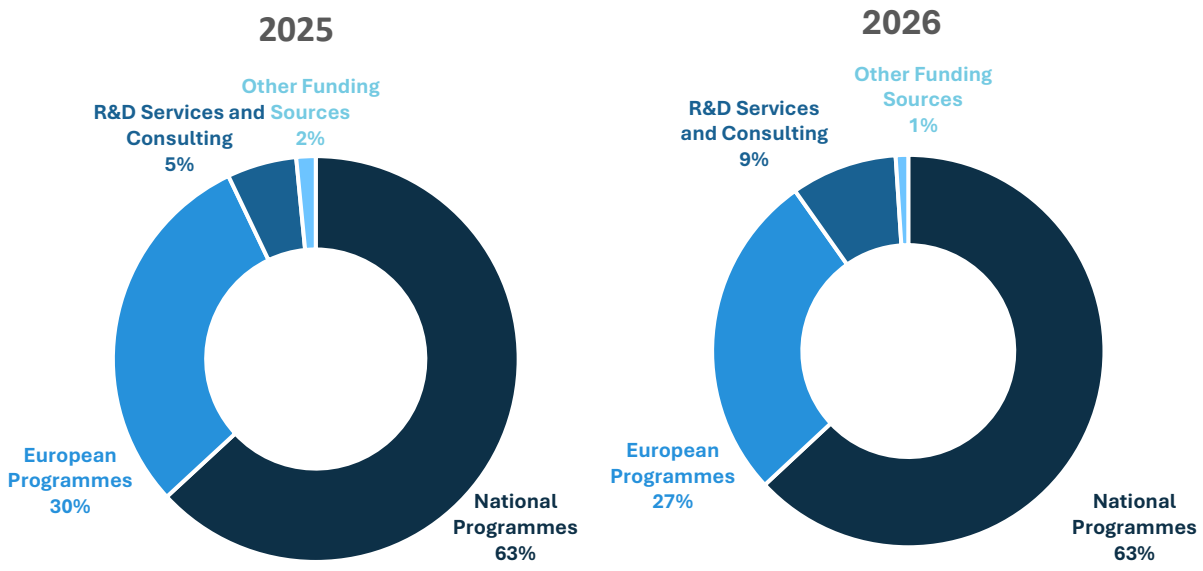

Figure 4.4 - Distribution of project funding by source - Plan 2025 (left) and Plan 2026 (right)

The number of active projects and the average funding per project by source is also of interest, as shown in Table 4.6.

Table 4.6 - Number of active projects and average funding by source (Plan 2025 and Plan 2026)

Type of Project		Number of Active Projects		Δ (%)	Average Funding (k€)	
		2025	2026	2025-26	2025	2026
PN-FCT	National R&D Programmes - FCT	24	49	25	52	41
PN-COOP	National Cooperation Programmes with Industry	32	55	23	554	244
PUE-FP	EU Framework Programmes	80	66	-14	154	164
PUE-DIV	EU Cooperation Programmes - Other	12	15	3	68	77
SERV-NAC	R&D Services and Consulting - National	39	42	3	34	53
SERV-INT	R&D Services and Consulting - International	7	12	5	65	34
OP	Other Funding Programmes	8	13	5	110	123
	Total	202	252	50	172	126

The main observations arising from the global indicators summarised in the previous tables and figures are the following:

- In 2026, INESC TEC anticipates a slight overall growth in activity, reaching 45.6M€ in total income, a 2% increase over the previous plan, and managing more than 250 active R&D projects. Despite an important structural shift in the funding landscape and the transition away from an exceptional,

stimulus-driven period, the institution will strive to maintain a diversified portfolio, reinforcing the robustness of its funding model and its capacity to adapt to evolving national and European programme dynamics.

- Significant increases in national strategic funding offset reductions elsewhere: National R&D Programmes - FCT (PN-FCT) grow by 62% (+768k€), while the Pluriannual programme expands by 44% (+1.44M€). These stable, mission-oriented programmes gain importance as we verify that, conversely, National Cooperation Programmes with Industry (PN-COOP) contract markedly, decreasing by 24% (-4.28M€), reflecting the structural impact of the termination of PRR mobilising agendas (10.8M€ in 2026), which had previously anchored much of this activity.
- European programme funding is expected to remain at a high level in 2026, supported by 46 M€ already secured under Horizon Europe across 76 approved projects extending in the coming years. In addition, more than 120 applications were submitted to Horizon Europe in the second half of 2025 and are currently under evaluation, reinforcing the outlook for continued strong activity. This performance consolidates the institution's position as one of the leading Portuguese beneficiaries of Horizon Europe and demonstrates its sustained capacity to lead and collaborate within highly competitive international research and innovation ecosystems.
- Income from direct R&D and consulting services is expected to grow by 63% in 2026, hopefully reflecting a recovery of domestic R&D demand following the peak period of PRR-funded collaborative projects.
- Uncertain projects increase sharply from 1.23M€ to 3.12M€ (+154%), accounting for a growing proportion of service-based activities. This reflects ongoing proposal pipelines and delays in decisions from several national and European calls. Careful monitoring will be necessary given their share.
- The multi-annual base funding for technology transfer activities (CTI) declines markedly in 2026 (–76%), reflecting the formal conclusion of the current multi-annual funding cycle. This reduction materially affects the structure of institutional revenues, given CTI's historical role in supporting long-term technology transfer and innovation activities. At present, no information has been released regarding the launch of the new CTI funding cycle, introducing an additional layer of uncertainty for medium-term planning and reinforcing the need for prudent financial and operational adjustments.
- The higher average funding per project in the National Cooperation Programmes reflects the larger scale of PRR-funded mobilising agendas. EU Framework Programme projects, although prestigious and numerous, tend to involve smaller funding amounts per participating institution. R&D and consulting service contracts, typically shorter in duration and more targeted, also naturally result in lower average funding levels.

4.2.2 R&D Centres indicators

A detailed view of the total funding by source per R&D Centre is given in Table 4.7 and Figure 4.4. In comparison with the plan for 2025, some changes can be highlighted:

- National Cooperation Programmes with Industry maintain a strong contribution to the activity of the R&D Centres, supported by the continued execution of PRR projects. Despite PRR concluding mid-2026, the scale and duration of these initiatives ensure their significant presence across nearly all Centres.
- In terms of European projects, the slight decrease projected for 2026 does not diminish their strategic importance. CRAS and CPES continue to lead European engagement, while CTM and HumanISE maintain consistently high levels of participation. Additionally, the INESCTEC.OCEAN Special Project continues to play a significant role in this landscape.
- Activity in national contract research and consulting projects within the Centres is expected to grow, with CRIIS, SYSTEM, HUMANISE and CPES standing out as the main contributors to this positive evolution, and additional relevant contributions from CRACS and HASLAB.

Table 4.7 - Project Funding (k€) and Uncertainty Analysis (Plan 2026)

			R&D Centres												
		Total (k€)	CTM	CAP	CRAS	CBER	CPES	SYSTEM	CRIIS	CITE	HUMANISE	LIAAD	CRACS	HASLAB	Special Projects
Projects	PN-FCT	**2 006**	81	314	614	244	49	129	2	0	167	193	35	177	0
	PN-PICT	**0**	0	0	0	0	0	0	0	0	0	0	0	0	0
	PN-COOP	**13 444**	1 694	696	1 644	268	3 720	1 662	1 405	293	829	454	61	718	0
	PUE-FP	**10 812**	1 415	247	2 583	314	2 393	638	732	178	1 244	142	0	172	754
	PUE-DIV	**1 152**	60	107	442	0	95	0	0	72	107	14	1	171	82
	SERV-NAC	**2 225**	5	37	87	38	334	451	595	0	436	149	0	94	0
	SERV-INT	**403**	0	0	6	0	313	9	7	0	0	0	0	60	8
	OP	**1 600**	15	42	64	7	134	0	0	0	31	102	0	174	1 032
	Total Projects	**31 641**	**3 270**	**1 443**	**5 440**	**871**	**7 036**	**2 890**	**2 740**	**544**	**2 813**	**1 054**	**98**	**1 566**	**1 877**
	Uncertain Projects	**3 115**	**132**	**87**	**422**	**53**	**423**	**534**	**594**	**11**	**195**	**210**	**3**	**164**	**287**
	Total Funding	**34 756**	**3 402**	**1 529**	**5 862**	**924**	**7 459**	**3 424**	**3 334**	**555**	**3 008**	**1 264**	**101**	**1 730**	**2 163**
	Uncertain Projects	**9%**	4%	6%	7%	6%	6%	16%	18%	2%	6%	17%	3%	9%	13%

Table 4.7 also shows that uncertain projects represent 9% of the total funding from projects, although the relative weight between uncertain and firm projects is quite variable across R&D Centres, as shown in Figure 4.5.

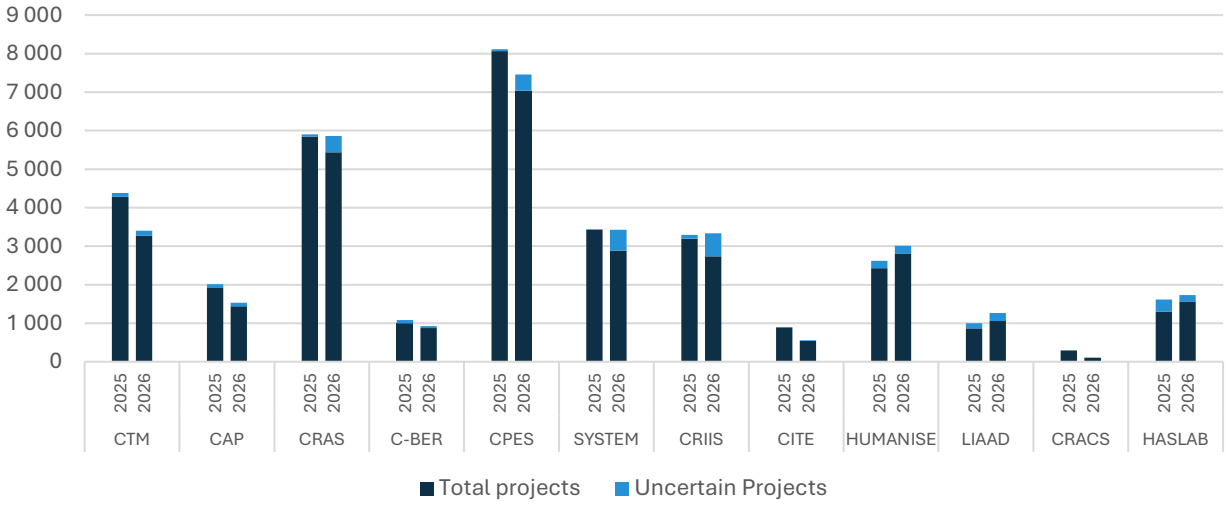

Figure 4.5 - Project funding and uncertainty analysis (k€) per R&D Centre (Plan 2025 vs Plan 2026)

4.3 Publications

4.3.1 Global indicators

Table 4.8 and Table 4.9 along with Figure 4.6 and Figure 4.8 present the evolution of INESC TEC's scientific publications since 2020. Two distinct data sets are shown:

- Planned data, estimated for each annual planning cycle.
- Closed data, calculated eleven months after year-end, at the time of institutional planning.

This two-stage process accommodates the inherent time lag in the indexing and validation of scientific outputs. Publication data is sourced from multiple indexing systems (ISI, Scopus, and CORE via the Authenticus platform). Publications involving multiple Centres are counted once per Centre, with the institutional total adjusted to avoid duplication

Table 4.8 - Number of publications by type (planned data)

Publication Type	2022 (Planned)	2023 (Planned)	2024 (Planned)	2025 (Planned)	2026 (Planned)
Indexed Journals	390	314	404	394	433
Indexed Conferences	443	305	309	373	402
Books	14	7	6	3	5
Book Chapters	24	15	27	22	15
Concluded PhD Theses - Supervised	NA	NA	NA	54	58

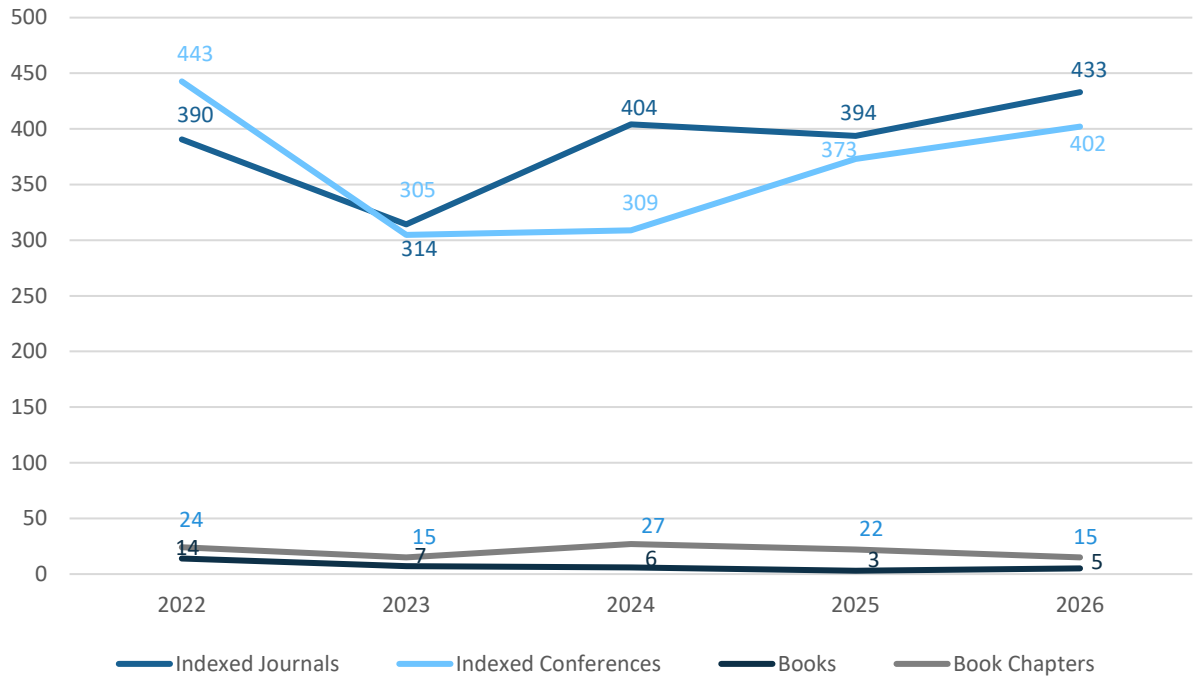

Figure 4.6 - Evolution of publications by type (planned data)

The 2026 planned indicators reflect INESC TEC's expectation of sustaining strong levels of scientific output, with particularly robust projections for indexed journal articles and conference publications. Although earlier years display the cautious variability characteristic of the planning cycle, the projections for 2026 align with a stable and consistent pattern of anticipated publication activity.

These indicators resonate with the broader ambition to reinforce scientific excellence and international visibility, with a particular emphasis on high-quality scientific contribution as outlined by the R&D Centres in their Plans. Despite the challenging context of a year in which Centres will face significant pressure to maintain economic sustainability, stemming from the conclusion of PRR projects and CTI funding, the commitment to preserving a steady flow of scientific production reflects an aspirational and commendable collective effort.

An analysis of publication intensity per researcher (Figure 4.7), based on the Planned data, shows a gradual recovery in both indexed journal and conference outputs after a decline observed in 2023, with planned values for 2026 indicating a continued upward trajectory across both publication types.

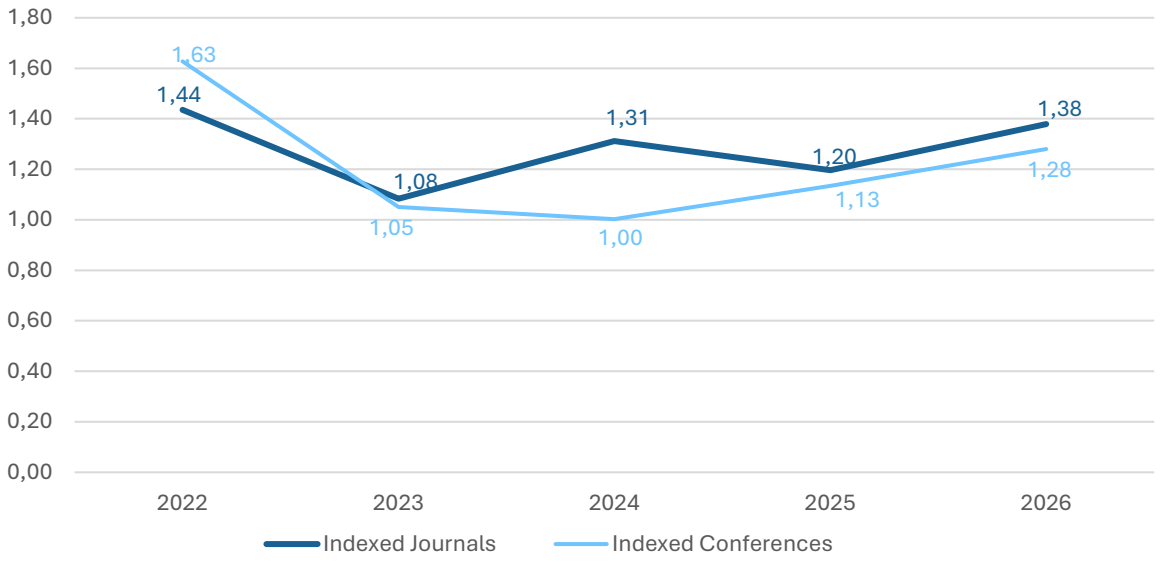

Figure 4.7 - Indexed publications per Core PhD (planned data)

The consolidation of closed data is undertaken approximately eleven months after the end of the year, owing to the time required for scientific outputs to be fully indexed and validated across the bibliographic systems used by INESC TEC (ISI, Scopus and CORE via Authenticus). This interval ensures accuracy and comparability, meaning that the figures presented here constitute the final and definitive account of the year's scientific production, with no further revisions foreseen in future reporting cycles.

Table 4.9 - Number of publications by type (closed data)

Publication Type	2020 (Closed)	2021 (Closed)	2022 (Closed)	2023 (Closed)	2024 (Closed)
Indexed Journals	444	451	539	524	495
Indexed Conferences	413	471	446	538	557
Books	2	4	4	11	6
Book Chapters	25	33	40	31	28
Concluded PhD Theses - Supervised	46	58	43	38	74

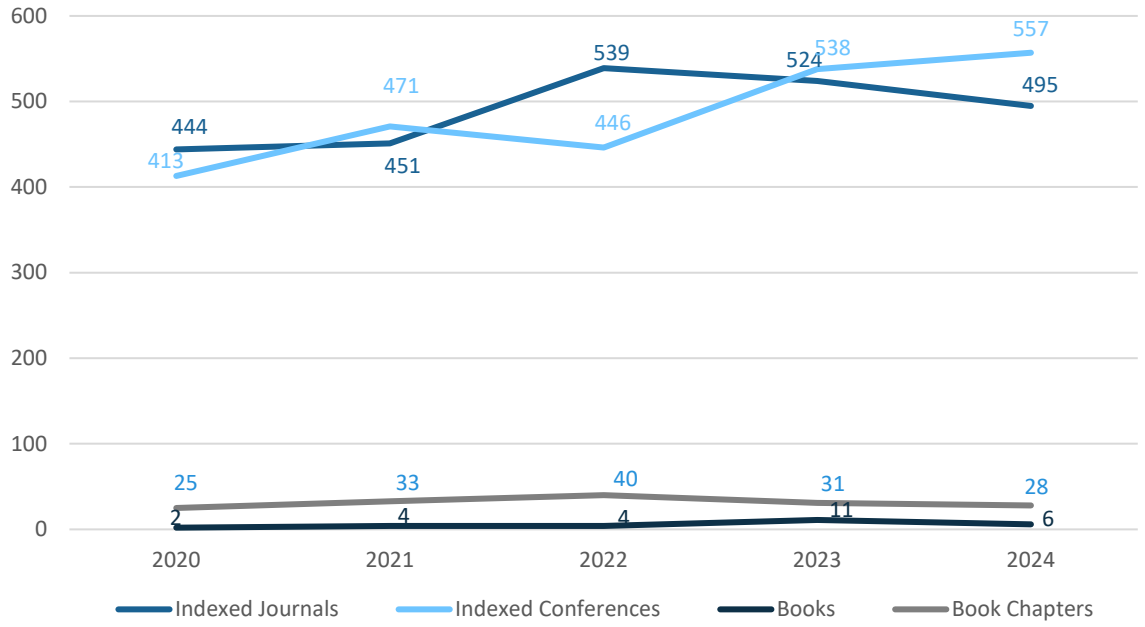

Figure 4.8 - Evolution of publications by type (closed data)

As shown in Figure 4.8, the 2024 closed data indicate a solid overall performance, with continued growth in total indexed publications. Although a slight decline in journal articles is visible when compared with previous years, this largely reflects a strengthened emphasis on publishing in higher-quality venues.

This shift is further evidenced in Figure 4.9, where the distribution of publications across quartiles shows clear improvement, including a marked rise in Q1 outputs in 2024, reinforcing the trend toward higher-impact scientific contributions.

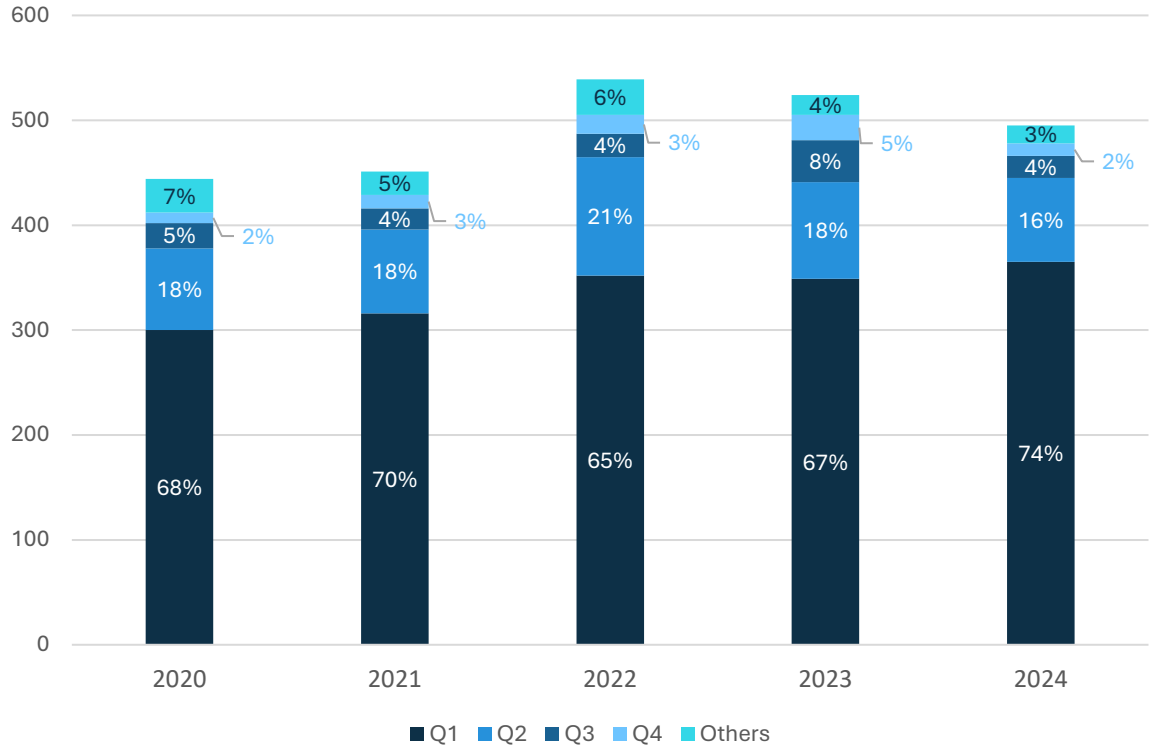

Figure 4.9 - Evolution of indexed journal articles by impact factor quartile (closed data)

4.3.2 R&D Centres indicators

Figure 4.10 presents the number of indexed publications in journals and conferences per R&D Centre.

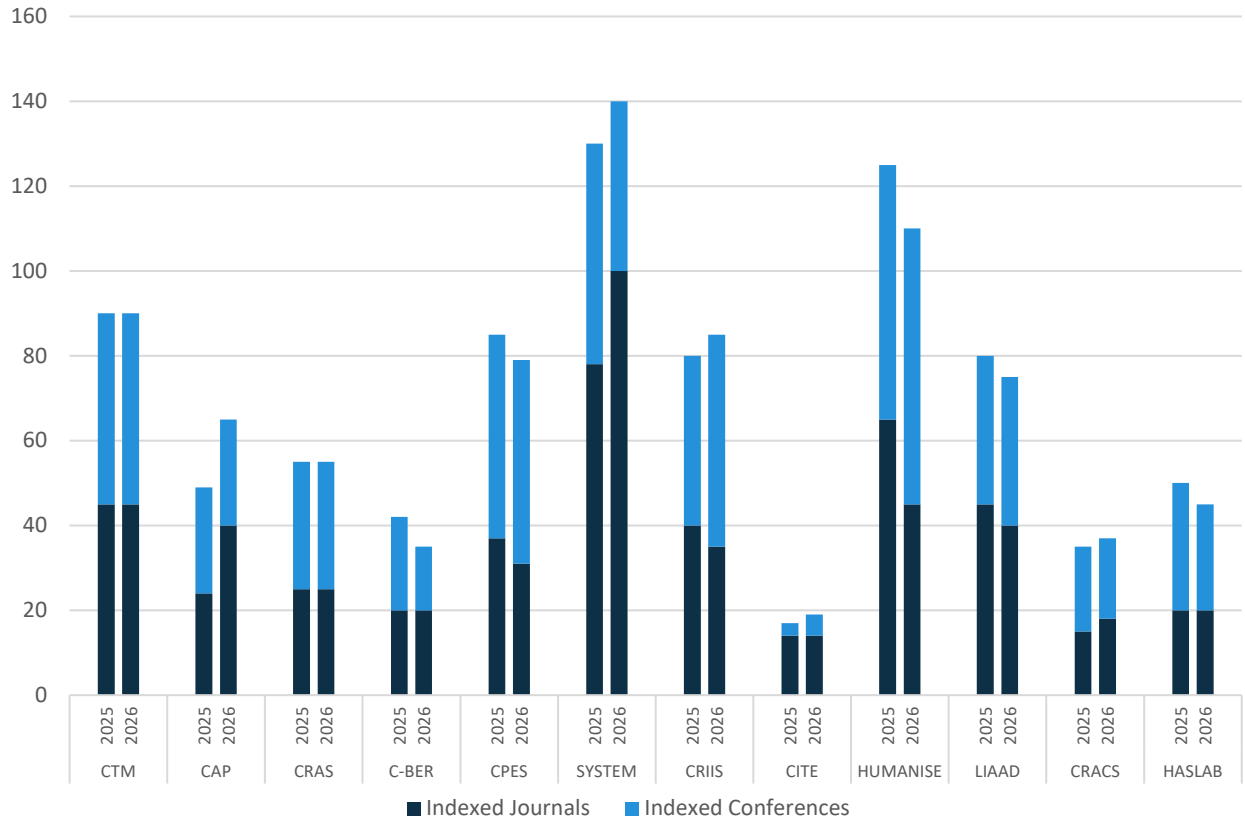

Figure 4.10 - Indexed Publications in Journals and Conferences (Plan 2025 and Plan 2026)

In 2026, the planned distribution of publication outputs across INESC TEC's R&D Centres reflects expectations of steady scientific activity throughout the institution. A salient development is the emergence of the SYSTEM Centre, whose projected figures position it immediately among the most scientifically active units. The enhanced critical mass resulting from the merger of CEGI and CESE is expected to strengthen the Centre's scientific presence and establish it as a key contributor to INESC TEC's publication landscape from its inaugural year. Overall, the 2026 projections point to a balanced yet strategically reinforced profile, with Centres maintaining stable levels of output despite what is anticipated to be a challenging transition year in terms of economic conditions and funding availability.

4.4 Knowledge transfer

Table 4.10 presents the number of INESC TEC's knowledge transfer (KT) results and the expected evolution for 2026.

Table 4.10 - Results related with Knowledge Transfer

Type of Result	2024	2025 (Forecast)	2026 (Plan)
Pre-Disclosures (PDF)	34	18	12
Technology Disclosures (TDF)	15	24	35
First Priority Patent Applications (New Inventions)	7	10	9
First Patents Internationalisation	3	2	11
Commercial Contracts (Licences, Options, Assignments)	3	0	4
Spin-offs	2	1	3

In 2026, INESC TEC's innovation and IP pipeline is set to expand strategically, with growth concentrated in results that signal stronger market alignment. Technology disclosures are expected to rise significantly (from 24 to 35), while first priority patent applications remain stable at a high level (9). This reflects a deliberate focus on quality, maturity, and commercial relevance, ensuring that only the most promising inventions progress toward protection and international positioning.

Commercial valorisation is projected to regain momentum, with four new commercial contracts planned following a transitional year in 2025. This uptick reflects the cumulative effect of improved negotiation tools, targeted market engagement, and stronger alignment between technological assets and industry needs. The 2026 portfolio is therefore expected not only to grow but to convert more efficiently into tangible market agreements.

Entrepreneurial activity will accelerate markedly, with five new spin-offs planned - more than doubling recent outputs. These ventures originate from increasingly mature research in areas such as robotics, bioengineering and advanced computing, highlighting INESC TEC's strengthened capacity to translate scientific excellence into impactful market solutions. Overall, 2026 stands as a year of scaling, where a streamlined pipeline, reinforced IP strategy and expanding market pathways converge to produce a robust innovation outcome.

4.5 Dissemination activities

Table 4.11 illustrates the expected activity of INESC TEC members and R&D Centres in various categories of dissemination activities.

Table 4.11 - Participation in dissemination activities (Plan 2025 and Plan 2026)

Type of Activity	2025	2026
Participation as principal editor, editor or associated editor in journals	79	72
Conferences organised by INESC TEC members (in the organising committee or chairing technical committees)	60	48
International events in which INESC TEC members participate in the program committees	188	152
Participation in events such as fairs, exhibitions or similar	81	77
Conferences, workshops and scientific sessions organised by the R&D Centres	54	71
Participants in the conferences, workshops and scientific sessions organised by the R&D Centres	4 460	3 960
Advanced training courses organised by the R&D Centres	23	21

In 2026, INESC TEC's dissemination activity maintains a strong and strategically focused profile, despite a natural reduction in several quantitative indicators when compared with 2025. The decrease in participants in conferences, workshops and scientific sessions must be interpreted in context: 2025 was an atypical year, marked by two large-scale scientific conferences hosted in Porto (ECML-PKDD 2025 and OFS29), each attracting extensive international audiences. In contrast, 2026 reflects a return to more typical participation levels, while still sustaining a robust programme of scientific and technical events across the R&D Centres, which will organise an increased number of sessions (from 54 to 71).

The institute's international scientific presence continues to be reinforced through high-profile leadership roles. Although the number of editorial positions and conference committee participations decreases slightly, INESC TEC will play a central organising role in two major international conferences: the ADRA Forum 2026 – AI, Data and Robotics Forum, expected to attract more than 500 experts, and IEEE BSN 2026, the flagship IEEE EMBS conference on Body Sensor Networks. Hosting and co-organising these events underscores the institute's scientific leadership, enhances its visibility within influential global networks, and consolidates long-standing roles such as the eight-year leadership of the IEEE EMBS Portugal Chapter.

International outreach and visibility efforts will also intensify through participation in major global events, including ERF 2026, EuCNC 2026, ENLIT 2026, and REPMUS 26, among others. These engagements reflect a deliberate strategic orientation: rather than maximising volume, INESC TEC prioritises high-impact platforms in key technological domains such as robotics, energy systems, cybersecurity, and communication technologies. This targeted approach strengthens partnerships, supports technology showcasing, and ensures alignment with European and global innovation ecosystems.

Finally, institutional outreach and societal engagement remain essential pillars of the 2026 dissemination strategy. Through a diversified set of open days and thematic events, such as the Energy Technology Open Day, iiLab Open Day, TRIBE Lab Synergy Day, and the Synergy Day on Robotics and IoT for Agriculture, the institute will promote dialogue across academia, industry, and society. These initiatives highlight high-TRL prototypes and emerging solutions in AI, robotics, digital technologies and energy, reinforcing INESC TEC's commitment to transparency, impact, and the effective dissemination of scientific and technological achievements.

5 INESC TEC SCIENTIFIC DOMAINS

Research at INESC TEC is centred around eight Scientific Domains – Artificial Intelligence (AI), Bioengineering (BIO), Communications (COM), Computer Science and Engineering (CSE), Power and Energy Systems (PES), Photonics (PHT), Robotics (ROB), Systems Engineering and Management (SEM) - presented in the following sections.

5.1 Artificial Intelligence

Steering Committee: Andry Pinto, Alípio Jorge, Jaime Cardoso, João Gama, and Rita Ribeiro

5.1.1 Scope and vision

Artificial Intelligence is a decades-old scientific domain which has recently boosted its importance and impact in science, the economy and society in general.

Stemming mostly from Computer Science, AI has strong influences from other scientific fields, namely mathematics, neuroscience, linguistics, psychology, philosophy, and physics. In the 21st century, AI has made major advances, particularly in areas dominated by machine learning and more specifically deep learning. These include natural language processing, computer vision, content generation and recommender systems. Artificial Intelligence is already having a significant impact on many industries, including healthcare, energy, finance, transportation, and manufacturing, and is also playing an increasingly important role in our everyday lives, from virtual assistants to online recommendation systems. The symbolic legacy of AI is also very significant with roots in mathematical logic, linguistics, and psychology. Currently, symbolic approaches open avenues for explainability and transparency in AI systems.

Besides the fundamental need for large amounts of high-quality data (for the correct application), the growing influence of Artificial Intelligence calls for a human-centric approach with advances in the trustworthiness of the delivered tools, chiefly the interpretability of predictions and decisions, generalisation to unseen and even unpredictable situations, and robustness to biased data or unethical results.

Nowadays, Artificial Intelligence has powerful algorithms that can approach very difficult tasks, only doable by humans until little more than five or ten years ago, with astounding quality. Although the success of current neural and statistical approaches is almost blinding, there is a very important legacy of symbolic methods. They matter not only to the human dimension of AI, but also to the possibility of powering non-symbolic solutions with new cognitive layers that can be engineered and designed.

The growing dissemination of AI solutions and AI agents as enhancers of human capabilities, artificial co-workers or artificial experts, boosts the importance of human-AI interaction and of the trustworthiness of AI counterparts. The myriad of different interaction scenarios motivates research along many lines, such as human modelling (including the theory of mind), human-AI collaboration (including human oversight), interaction, usability and user experience, information visualisation and visual analytics, explanations and verification of AI processes and results.

The power of current and future AI also requires the mitigation of AI risks and implications. AI solutions and deployment must be ethical by design, following European and International guidelines that defuse as much as possible any potential harm. The ongoing and foreseen transformation of human tasks and jobs requires anticipation and reflection by all the players.

From an algorithmic point of view, the current moment of AI is strongly influenced by the emergence of large models built using deep and reinforcement learning. These approaches are fundamentally statistical and extremely data-thirsty. At the same time, they can capture refined patterns due to highly powerful estimations and are highly reusable. While their stochastic nature dispenses human intervention and obliterates the knowledge engineering bottleneck, the need for labelled data is still demanding and costly. On the other hand, their statistical nature and complexity make them highly opaque and hard to scrutinise.

5.1.2 Research challenges

A) Build highly valuable and reusable AI resources

- Algorithms are the central piece in AI development. The combination and modification of classical and modern AI approaches in their symbolic and subsymbolic flavours is the essence of the answer to every current AI challenge. Dealing with different types of inputs and combining them in different regimes, from static to streaming, is very important.
- More than simply processing information, AI algorithms and systems use and produce models that represent knowledge. Models are increasingly an important output of AI. Producing reusable, expandable and refinable models poses a number of important challenges. Developing live and responsive models such as digital twins is a challenge not only for AI but for other domains as well.
- Models become complex and mutable, raising hard questions of how to continuously evaluate and manage them, using human centred and automated approaches. AutoML approaches enable the automatic selection and assessment of models and algorithms.
- Data is a highly valuable asset. Producing, collecting, curating, managing, disseminating, accessing and learning from datasets or data sources are transversal challenges essential to AI development. Data augmentation and the production of artificial data mitigate the lack of data in many scenarios.
- Intelligent systems require development and deployment pipelines that integrate AI and non AI components taking into account interaction with humans in challenging contexts. Such pipelines can be made reusable and are an important asset.

Aligned with this research challenge, the following actions are planned for 2026:

- Develop methodologies for sustainable, efficient and effective Generative approaches for AI challenges.
- Exploit ontology-based semantic enrichment using Generative AI.
- Contribute with models, datasets and applications for European Portuguese.

B) Exploit models and algorithms for advanced tasks

- Develop and leverage advanced learning algorithms capable of operating under complex real-world constraints such as imbalance, sparsity, temporal variability, and the need for trustworthy anomaly detection and prediction of rare but crucial events, enabling robust forecasting, reliable alarm generation, and improved decision-support in critical monitoring systems.
- Pre-trained large models have the ability to solve problems they haven't been trained for. They can be exploited as is, in a zero-shot manner, or with some further training, as in few-shot, placed in AI pipelines, combined and stacked, used for obtaining representations with different levels of abstraction (probing), reused in completely new domains and queried using natural language, prompting, instead of artificially coded programs.
- Exploiting models as complex entities, and almost natural phenomena, represents a number of challenges which themselves lead to the understanding of the models, their algorithms, and to further developments.
- Symbolic algorithms and models, including network science approaches, do not compete with neural approaches for predictive ability, but can be used in specific cases, when there is little data, when there is external knowledge to convey, when communication with humans is important. The exploitation of neuro-symbolic approaches or the use of symbolic methods per se for more than optimising prediction error are important research paths.
- The development and validation of AI systems or of information systems with AI components.

Aligned with this research challenge, the following actions are planned for 2026:

- Design ML techniques for imbalanced data streams to forecast potential failures in advance across different time horizons, provide post-hoc explanations for anomalies, and study metrics and assessment strategies for alarms in predictive maintenance scenarios.
- Advance the state of the art in the prediction of extreme values and online outlier and event detection.
- Advancement of hybrid optimisation methods to address increasingly complex problems in health, manufacturing, logistics and supply chains. These efforts will target dynamic production planning, asset management and inventory routing in environments characterised by uncertainty and rapid change. By integrating optimisation with machine learning, these methodologies will provide robust, real-time decision-support systems, enabling faster and more effective responses to disruptions. Applications will span diverse sectors, including manufacturing, transportation, and energy, contributing to greater operational efficiency and resource utilisation.
- Application of AI models for accounting organisation, software configuration and validation of clinical records.
- Develop methods for outlier detection in multivariate distributional data.
- Develop nowcasting approaches for macro-economic data using un-conventional and administrative data sources.

C) Produce AI models that humans can inspect, understand, learn with and contribute

- Human-AI interaction will become increasingly complex, requiring the combination of different specialities from computer science and human sciences. The development of effective collaboration between AI systems and humans requires sophisticated modelling, trustworthiness and explainability.
- Enabling humans to inspect AI algorithms, pipelines and models is important for avoiding and correcting errors, increasing safety and trust. Verification of systems and programs becomes more complex than with ordinary algorithms. Visualisation becomes a very important tool.
- It is important to anticipate and mitigate the risks and the impact of AI systems in society and in individuals. Privacy, safety, freedom, employment and general wellbeing must be considered in every step of AI development, starting from conception and continuously in deployment.

Aligned with this research challenge, the following actions are planned for 2026:

- Propose novel methods aiming at understanding, synthesising, and explaining complex real-world phenomena by integrating and generating data across text, vision, audio, and other modalities.
- Improve causal inference from data using machine learning and Bayesian reasoning and use causal models for explainability and enable the transparency of black box fault models.
- Development of techniques for entity extraction and disinformation detection.

D) Learn models and deploy AI Efficiently

- The data thirst of current AI solutions and the fact that data is more often than not an expensive asset motivates research in more data-economic approaches. To face these challenges it is important to study new ways of exploiting and generating data as well as new algorithms that are able to propagate feedback from the environment as in reinforcement learning.
- New frameworks for machine learning can be based on alternative approaches, such as photonics, that combine the paradigms of extreme learning machines, reservoir computing and diffractive neural networks towards the deployment of all-optical processors and A.I. platforms, with advantages in processing speed, scalability, and energy efficiency.

Aligned with this research challenge, the following actions are planned for 2026:

- Improvement of algorithms for Edge AI, namely Federated Learning (FL) approaches and defense mechanisms for FL.
- Development of classifiers for real-time application to run on the edge, on-board of autonomous systems with limited or no communications with control systems.
- Development of innovative toolchains and architectures for RISC-V based SoCs extended with custom accelerators and instructions, in the context of AI-edge devices.
- Work on Federated Learning, model quantisation and distillation, generation of synthetic data and data stream mining (online learning).

E) Enhance perception in dynamic, noisy, and multi modal scenarios

- The work on the development of intelligent decision support systems combines audio-visual data understanding with any additional information available, coming from sensors or other external sources, to enhance the analysis and the decision process as well as the efficient handling of the large amounts of data produced.
- Enhancement of the analysis and the decision process, as well as the efficient handling of the large amounts of data produced, through the development of intelligent decision support systems that combine audio-visual data understanding with any additional information available, coming from sensors or other external sources.
- How to adapt the (deep) machine model's learning ability to the challenging conditions presented by audio-visual data focusing on: Compression and acceleration of Deep CV; Explainable and uncertainty aware deep learning architectures; Multimodal learning; Efficient annotation Learning; Open World Learning; Domain Adaptation; Domain knowledge and data integration.
- Bringing together the semantics of text, knowledge bases, ontologies, sound and images for multi-model Machine Learning and AI systems.

Aligned with this research challenge, the following actions are planned for 2026:

- Creation of a large-scale image dataset for video captioning and future event prediction in industrial environments.
- Continue the development of new sensor fusion methods and algorithms for multi-modal perception systems, addressing dynamic in multiple scenarios from underwater, airborne or other GNSS-denied environments.
- Development of new approaches for automatic audiovisual content creation that explores the coherence of the content created in terms of multimodality, the emotion transmitted and the artistic quality of the overall content.
- Development of methods that are robust and able to generalise to unseen and even unpredictable situations. Enhance the multi-task learning frameworks to efficiently and accurately perform multiple interconnected tasks.
- Development of novel methodologies for grounding language with images and for information fusion.

5.2 Bioengineering

Steering Committee: Ana Maria Mendonça, Hélder Oliveira and João Paulo Cunha

5.2.1 Scope and vision

The field of Bioengineering addresses fundamental engineering principles, practices and technologies for medicine, biology, environmental and health sciences to provide effective solutions to problems in these fields. This field includes (but is not limited to) the development of mathematical theories & models, physical, biological and chemical principles, computational models and algorithms, devices and systems for clinical, industrial and educational applications in these domains.

We envision the next generation of advances and high impact of research on bioengineering for prevention, early detection and diagnosis of different types of diseases, ageing-related impairments, rehabilitation, occupational health and wellness, environmental-biology interactions, among others, namely the development of advanced methods & technologies at the frontier of engineering, medicine, biology and other health & environmental sciences, aiming to climb the ladder of their reediness level towards its future transfer to world market.

5.2.2 Research challenges

A) From Macro-to-Nano Scale Biosensing

Biosensing has been in a rapid evolution towards smaller and smaller scales, turning biosensing into a widespread commodity, many times connected to the internet by design and opening novel domains & opportunities to innovate in bioengineering.

The aim of this challenge is the design & development of novel biosensors (e.g. bio-electrochemical, optical and photonic micro & nano biosensors & actuators, etc.) to approach macro-to-nano life sciences environments such as wearables and snap-to-skin biosensing solutions for sports performance or the chronic disease management, implantable sensors and actuators/stimulators for adaptative modulation in neurological diseases (e.g. Parkinson's or epilepsy), cell & sub-cell activity micro & nano sensing in different disease models or environmental hazardous volatile components monitoring for protecting "connected" workers in their hostile work environments (e.g. firefighters, miners, etc.).

In 2026 we plan to establish a brand-new Lab in "Neuroprobes" and neuromodulation devices development by attracting back to Portugal a distinguished PI currently abroad in the area, broadening further this Research Challenge.

B) Novel Technologies for Personalised Health & Wellness

Nowadays we are collecting ever larger amounts of health information and having more and more computer power, but we are not using this availability to its full potential for promoting personalised and precision solutions to today's'health challenges such as cardiovascular diseases, diabetes, Alzheimer's or Parkinson's disease.

Genomics is generating data at an unprecedented scale by assaying molecular data from a large set of individuals in a time and cost-effective way. While this opens new avenues for research and treatments, it also poses many challenges in order to handle the volume of data and speed of analysis that is required. To tackle some of these problems, we expect to apply cutting-edge genomic data science, including AI and machine learning techniques, but also develop novel data analysis strategies. Different omics data will be combined with other multi-modal data, including wearable and health sensors and clinical data, to obtain an integrative view of the physiological state of the individuals. Data will be analysed at different levels of granularity to understand the mechanisms that lead to complex phenotypes and diseases. We expect to understand unmet clinical needs and apply the acquired knowledge for patient benefit.

Methods and tools to integrate and harmonise knowledge will be brought together with computational models to produce digital platforms leveraging personalised health research. The goal is to empower medical research with the necessary computational framework to determine treatment pathways adapted to each individual.

In this RC we aim to combine large-scale data collection (from electronic patient records to genetics and proteomics) with human-centred technology design to contribute to new approaches to these health challenges and help patients better manage their health and humans live healthier & happier lives. Several competencies of INESC TEC are and will be involved in this RC, from Health informatics & Computational Biology to Bionics, Wearable and Implantable technologies.

Aligned with this research challenge, the following actions are planned for 2026:

- Support our new startup inSignals Neurotech in launching the next phase of the Movement Disorders Digital Health Platform around our wearable iHandU system based on a 0.5M€ pre-seed funding recently attracted.
- Initiation of clinical-domain research using dual-mode optoelectrochemical systems for liquid biopsies.
- Development early-stage optoelectrochemical sensors capable of detecting circulating biomarkers at low concentrations, either at point-of-care or in centralised settings, aiming for cancer diagnostics.
- Integration of multi-omics datasets to obtain disease insights.

C) New Challenges in Medical Signal & Image Analysis

Medical image and signal analysis play an important role throughout the clinical process, from diagnosis and treatment planning to surgery and follow-up research. Learning methodologies can be a way to help physicians in their daily tasks, for example, when dealing with multiple data sources, data sparsity or providing information about visual findings using explainable methods. This research challenge is present in different use cases: cancer management, biological image and signal analysis, biomedical imaging and computational anatomy; contributing with novel approaches to the following sub-challenges:

Cancer Image Analysis

- Developing advanced AI-driven methods to support detection, characterisation, treatment planning and response assessment across cancer typologies.

Cardiac Image and Signal Analysis

- Creating models for the interpretation of multimodal cardiac imaging and physiological signals, enabling early detection of cardiac dysfunction and improved patient monitoring.

Brain Imaging

- Advancing computational approaches for structural, functional, and diffusion imaging to support neurological disease diagnosis and disease-progression modelling.

Eye Image Analysis

- Designing machine learning solutions for retinal and ocular imaging to support early screening and monitoring of ophthalmological disorders.

Lung Image Analysis

- Developing algorithms to detect, quantify, and characterise pulmonary disease from CT, MRI, and radiographic modalities.

Gastroenterology Imaging

- Supporting clinicians with automated endoscopic and imaging analysis tools for lesion detection, classification, and navigation.

Multimodal Auscultation

- Integrating acoustic, physiological, and imaging signals to improve cardiopulmonary assessment through AI-enhanced digital auscultation.

Sleep monitoring

- Introducing advanced multi-sensor and learning-based tools to characterise sleep architecture, detect sleep disorders, and personalise recommendations.

Aligned with this research challenge, the following actions are planned for 2026:

AI-Based Clinical Frameworks for Cancer Management

- Design and deployment of artificial intelligence frameworks to support clinical practice by improving treatment-planning pipelines and decision-making processes in cancer pathologies.

Advanced Medical & Biological Image Analysis Methodologies

- Development of state-of-the-art machine learning and image analysis techniques - including generic and domain-specific approaches - aimed at producing reliable computer-aided diagnosis systems for both medical and biological imagery.

Deep Learning Architectures with Built-In Explainability and Uncertainty Quantification

- Creation of next-generation architectures where interpretability and uncertainty modelling are core design principles. This includes novel regularisation strategies to mitigate data bias and improve generalisation across applications such as medical diagnosis, forensic scene and behaviour analysis, facial analytics, and sleep monitoring - ensuring ethical, transparent, and trustworthy AI in practice.

Patient-Centric Digital Tools for Treatment Visualisation and Decision Support

- Development of a cloud-based healthcare platform enabling patients to visualise proposed locoregional treatments. The system will display representative cases of "similar" patients who have undergone analogous procedures, helping align expectations and improve satisfaction with clinical outcomes.

Hybrid In Silico / Physics-Informed ML Models for Multimodal Data Fusion

- Integration of computational biomechanics, MRI data, and machine learning to produce high-fidelity digital breast models capable of simulating pose transformations and accurately predicting tumour location with clinical relevance.

Human-Centric Sleep Technologies and Real-Time Guidance

- Ensuring that sleep-monitoring technologies are intuitive, trustworthy, and designed for sustained user engagement. This includes real-time feedback mechanisms, sleep-literacy tools, and the development of personalised, automated sleep recommendations and interventions.

D) BioRobotics & Human-Machine Symbiosis

Within the biorobotics challenge, we aim at novel and innovative approaches:

- To develop surgery, molecular biology automation, and biological-inspired robots and exoskeletons;
- To fuse robots with humans "in-the-loop", brain-computer interfaces (BCIs) and affective computing;
- In keeping biometrics algorithms computationally efficient and guaranteeing privacy, transparency and explainability;
- With generalisation capabilities to unseen or under-represented types of data, analyse attributes embedded in data, assuring the veracity and detecting incorrect output predictions;
- To design and provide representations invariant to the domain of the sample making results more interpretable.

Aligned with this research challenge, the following action is planned for 2026:

- Acquisition and installation into our Neuroengineering lab of a new fNIRS wearable system integrated with our 3D-video EEG infrastructure already in-place around the MRI simulator to further improve our capacity of fusion robots with humans in-the-loop in more home & mobile scenarios.
- Pursue on the design and implementation of a “symbiotic engine” and test it in a virtual environment and possibly initiate trials in real life scenarios.

5.3 Communications

Steering Committee: Luís Pessoa, Manuel Ricardo and Rui Campos

5.3.1 Scope and vision

The Communications Scientific Domain is at the forefront of developing cutting-edge wireless communications technologies that are central to next-generation communication systems. INESC TEC aims to advance communications research across key sectors, including industry, energy, smart cities, mobility, health, the maritime domain, and agriculture. The research group focuses on developing advanced communications solutions tailored to the evolving demands of these fields.

The forthcoming wave of mobile and wireless communications will reshape the landscape through ubiquitous multimodal sensing and localisation, service-oriented software architectures, autonomous systems such as drones and high-altitude platforms, pervasive artificial intelligence, and edge-cloud integration. Building on this, the Communications Scientific Domain has defined the following vision:

"Perceptive and sustainable communication systems integrating ubiquitous sensing"

This vision reflects the domain's ambition to contribute significantly to the wireless communications research, considering the development of technologies that are more adaptable, efficient, and aligned with the needs of an increasingly digital world.

The dual goals of supporting bandwidth-intensive, latency-sensitive applications and bridging the connectivity gap for unconnected machines and humans drive this scientific domain. The core challenge is to develop communication systems that are inherently perceptive and deployable on demand in both terrestrial and non-terrestrial environments. These systems must dynamically adapt to their context by considering the physical environment, energy constraints, communication entities, and the specific needs of users and machines.

5.3.2 Research challenges

A) Autonomous Communications Systems

Next-generation communication systems must be perceptive and self-adaptive, capable of sensing and understanding their environment, and dynamically adjusting their behaviour to meet diverse and evolving operational demands. This includes high-density urban scenarios as well as extreme environments such as deep oceans, outer space, underground facilities, and disaster-stricken areas. The increasing complexity of wireless systems, the proliferation of heterogeneous services, and the need for scalable, secure, and sustainable operation render traditional human-in-the-loop network management unfeasible.

This challenge addresses the development of communication systems that continuously perceive, interpret, and adapt based on advanced sensing, AI-driven decision-making, and dynamic network architectures. The goal is to design robust, resilient, and intelligent networks that operate effectively in both structured and unpredictable environments, ensuring long-term sustainability, performance, and trustworthiness. Our research focuses on:

- **Perceptive network infrastructures**, integrating mobile autonomous platforms (UAVs, UGVs, AUVs, ASVs) to support adaptive coverage, mobility, and situational awareness in inaccessible or volatile environments.
- **Multi-tier, cross-domain architectures** that seamlessly blend terrestrial, aerial, underwater, underground, and space-based networks, enabling reliable connectivity across heterogeneous and dynamic operational domains.
- **Digital twins of communication networks** to enable fast, flexible, and energy-efficient evaluation of "what-if" scenarios, and the training and validation of adaptive protocols and AI-driven control systems without the burden of resource-intensive real-world experimentation.
- **Context-aware baseband and physical layer adaptability**, enabling resilient, energy-efficient communications using techniques such as geometric and probabilistic constellation shaping, and

supporting multi-standard, multi-mode operation (e.g., radio, optical) under varying environmental and hardware conditions.

- **Multimodal and hybrid communication techniques**, combining acoustic, optical, radio, and free-space quantum technologies to ensure service continuity under diverse propagation conditions and physical media, including underwater environments affected by salinity, turbidity, and acoustic noise.
- **Resource-efficient multimodal RF and sensor perception** using open-source foundation model backbones paired with lightweight adapters. This combination aligns WiFi/5G CSI, radar, LiDAR and other modalities into a shared representation space and explores the general purpose nature of foundation models.
- **Integrating communication and energy systems**, by developing mechanisms that exploit advances in distributed renewable energy sources and energy flexibility to enable the joint optimisation of communication infrastructure and power distribution, supporting energy-aware and sustainable networking.
- **Security-by-design principles**, including adaptive threat detection (e.g., AI-based intrusion detection in encrypted zero-trust networks) and resilient communication mechanisms across all protocol layers, enhancing trust in self-managed systems.

By advancing in these directions, we aim to help establishing a new generation of communication systems that perceive and adapt in real time – systems that respond intelligently to their environment, anticipate change, and evolve with minimal intervention. To enable such perceptive and sustainable infrastructures, innovation must also extend to the design of reconfigurable, energy-efficient, and multifunctional radio interfaces. These capabilities are essential for building resilient digital infrastructures that can operate across a wide range of challenges, from everyday smart environments to critical and extreme scenarios. These system-level capabilities stand on advances on antenna systems that can intelligently shape and sense the environment.

Aligned with this research challenge, the following actions are planned for 2026:

- Zero-touch node positioning and link optimisation in robotic-borne wireless networks: development of algorithms and mechanisms for autonomous node positioning and resource management in robotic-borne wireless networks, optimising LoS for improved performance in next-generation networks.
- ML-based solutions to model, optimise, and enhance wireless networks: development of semantic encoders/decoders, cross-layer algorithms, and Network Digital Twins using ML-based approaches to achieve context-aware, self-adaptive and robust communications solutions for demanding scenarios.
- Generative multimodal reasoning: novel methods aiming at understanding, synthesising, and explaining complex real-world phenomena by integrating and generating data across text, vision, audio, and other modalities.

B) Reconfigurable and Sustainable Antenna Systems

Future wireless networks must rely on advanced antenna technologies that are reconfigurable, adaptive, energy-efficient, and environmentally sustainable. As communication and sensing domains converge – enabled by innovations in millimeter-wave, sub-THz, and optical technologies – antennas are evolving from passive components into programmable, intelligent front-ends that actively shape wireless propagation environments and capture context-rich information.

This challenge addresses the development of antenna-centric solutions that support high-frequency communications, environmental sensing, and green networking outlined in the previous challenge. We aim to build foundational capabilities for intelligent, adaptive, and resource-efficient antenna systems focusing on:

- **Scalable Reconfigurable Intelligent Surfaces (RIS)**, including the design and fabrication of high-frequency RIS hardware operating up to 170 GHz, leveraging PIN diodes, varactors, memristors, and emerging materials such as 2D nanomaterials.
- **Real-time control and beamforming algorithms for RIS, including vision-assisted approaches**, by developing dynamic control mechanisms for RIS-enabled environments, including phase profile optimisation, user-centric beam shaping, and vision-assisted beamforming.
- **Co-design of reconfigurable antenna systems and near-antenna intelligence,** exploring the integration of signal processing and AI capabilities directly into antenna or RIS modules to enable real-time, energy-aware adaptation, including lightweight inference for beam control, sensing, and security.
- **Developing photonics-enabled antenna systems**, including **radio-over-fiber** and **optical-wireless interfaces**, to support high-speed, high-resolution RF sensing and ultra-broadband wireless communications.
- **RIS-enabled RF sensing for human activity recognition,** using techniques to enhance RF sensing by dynamically shaping the wireless channel. Through intelligent RIS configuration, spatial diversity is introduced into the channel response, enabling improved classification of human activity using machine learning.
- **RIS-enabled physical-layer security against unauthorised sensing** exploring the use of reconfigurable intelligent surfaces to selectively degrade the ability of external attackers to sense or localise targets in indoor environments, without disrupting legitimate communication.
- **Sustainable antenna design** leveraging eco-conscious materials (e.g., graphene, MoS_2), thin-film electronics, and energy harvesting techniques (solar, RF, piezoelectric) to reduce environmental impact and support autonomous, low-maintenance operation.

By embedding intelligence and reconfigurability into antenna systems, and aligning them with sustainable design goals, we aim to transform the role of antennas in next-generation networks – from static elements to active agents in perception, communications, and environmental awareness. This approach will empower the creation of perceptive, energy-efficient, and resilient wireless systems, supporting applications from smart cities and Industry 5.0 to mission-critical sensing and immersive digital experiences.

Aligned with this research challenge, the following actions are planned for 2026:

- **Sustainable Reconfigurable Intelligent Surface (RIS): Experimental** demonstration of a RIS prototype integrating memristor-based tuneable elements, enabling bistable control states with zero static power consumption. The system highlights the potential of non-volatile electronics for sustainable and energy-efficient control of large-scale electromagnetic surfaces, with direct implications in energy-autonomous reconfigurable networks.
- **Vision-aided closed-loop control of Reconfigurable Intelligent Surfaces (RIS):** Experimental validation of a vision-aided RIS platform implementing closed-loop beam steering based on real-time RGB-D video input. The system tracks user movement and dynamically adjusts the RIS reflection pattern, enabling adaptive link optimisation. A robotic arm executes pre-programmed motion trajectories to emulate mobile users, while a marker-based multi-camera motion capture system provides ground truth for performance evaluation.

5.4 Computer Science and Engineering

Steering Committee: Ana Alonso, Ana Paiva, Hugo Paredes, João Canas Ferreira and Manuel Barbosa

5.4.1 Scope and vision

The field of computer science and engineering is facing significant scientific and technological challenges, especially in the wake of the ongoing digital transformation. The pervasiveness of computer systems brings about new and often unforeseen challenges that defy our knowledge and best practices.

These challenges arise from the sheer complexity and scalability of computer and software systems, and the ever-increasing demand for their performance, interoperability, security, privacy, dependability, and sustainability.

The incredible progress being made towards the widespread use of digital sensing and instrumentation technologies along with the sheer computing power at our disposal reinforces our resolve to effectively and efficiently collect, filter, curate, store, process, visualise and analyse the massive volumes of data generated.

As our reliance on information systems grows, there is a rising need for these systems to be trustworthy, fast, always available, and ethically responsible. Software development, verification, and testing have become crucial aspects in the critical path of any digital system, underlining the paramount importance of ensuring quality throughout the entire process.

The whole computing pipeline is becoming more complex, which poses additional challenges in ensuring reliability and performance. Therefore, research on computing architectures and non-functional aspects of software is essential for achieving the scalability, interoperability, and efficiency required for sustainable digital systems.

5.4.2 Research challenges

A) Advancing the Software Development Ecosystem

Software systems are becoming increasingly complex, with unprecedented scale, integrity requirements and shorter time-to-market. In addition, they are increasingly developed in volatile, uncertain, complex, and ambiguous conditions. In this context, it is essential to create new methods, techniques and tools to advance the software development ecosystem, including processes, development tools, and education. This is to be achieved as follows:

- Designing tools and techniques to evaluate and improve the interaction between developers and software development tools in next-generation development environments.
- Creating new approaches, techniques and tools to improve the developer experience, along the software development life cycle by providing quicker, better and more informative feedback about the several quality aspects of the software being built; easy integration with traditional development and quality assessment tools; and suggestions, recommendations, and guidance on how to improve those quality aspects (e.g. liveness, smart-assistance, AI-based co-piloting tools, immersive environments).
- Develop new techniques and tools to support and ease the maintenance phase of software systems. This can be achieved by automatically generating new test cases to exercise novel system parts and using traceability information to calculate the subset of existing test cases that are impacted by changes.
- Improve the education of future software engineers, with didactic approaches and learning-supporting tools, targeting all phases of the software development process, from formal requirement specification to programming and testing.
- Empowering more people with simpler software development approaches and tools to enable them to design and build their own applications addressing their personal and professional needs.

Aligned with this research challenge, the following actions are planned for 2026:

- Continue to identify, distil, and document what actually constitutes good solutions in modern-day software engineering, working closely with experienced professionals.
- Continue advancing the state of the art in techniques, practices, and tools that can, in different ways, improve the effectiveness, efficiency, and experience of software developers.
- Definition of a unifying theory that can deal with several effects relevant to programming languages (work in collaboration with IRIF at Université de Paris).

B) Ensuring Software Correctness

Functional correctness is one of the key aspects of software quality: ensuring that software is free of defects and does precisely what is supposed to do, and no more (avoiding potential liability gaps). Our goal is to devise new methods and tools to ensure correctness in the increasingly complex software systems that are being developed nowadays, namely large-scale concurrent and distributed systems and cyber-physical systems that operate in uncertain and hostile environments. We will also target emerging computing paradigms where future software systems will be developed, particularly quantum computing platforms. This is to be achieved as follows:

Designing scalable rigorous methods, calculi, and logic to ensure and verify program correctness at all levels of the software development process.

Improving structured and formal requirements specification languages to diminish ambiguity and enable research on the automation of the software development process, namely on the deployment of synthesis procedures to repair incorrect programs or automatically generate invariants to support program verification.

- Designing techniques and tools to increase the effectiveness and efficiency of software testing where traditional testing techniques are difficult to apply (for example, distributed or AI/ML driven systems) and taking advantage of HPC environments.
- Contributing to innovative concurrent high-level and domain-specific programming languages, APIs and compilers targeting the whole spectrum of parallel and distributed computing, by raising the abstraction level of current approaches.
- Improving the scalability and usability of formal design techniques and tools, to enable the verification of complex distributed and cryptographic protocols directly by the domain experts, without the need to resort to (scarce) formal methods experts.
- Integrating rigorous formal analysis and user-centred design practices in software design techniques and tools to enable both formally proving user-centred requirements during early design stages and prototype evaluation.
- Creating foundations and rigorous mathematical methods for emerging computing paradigms, including Quantum Computer Science, Quantum Software Engineering, Post-Quantum Secure Systems and Cyber-Physical Systems.

Aligned with this research challenge, the following actions are planned for 2026:

- Enhancements to the formal verification framework comprising Jasmin and EasyCrypt will be pursued, including new automatic proof generation techniques that will reduce proof effort and widen the set of formally proved end-to-end security guarantees.
- Continue the development of formally verified implementations of post-quantum cryptographic standards ML-KEM, ML-DSA, SLH-DSA
- Design of novel tools for testing the reliability of data-centric applications to ensure data durability under faults.
- Development of a lightweight formal methods tool for the design and analysis of transactional consistency criteria in database management systems.

- Development of a tool-supported approach to generating natural language explanations of model checking counterexamples.

C) Managing the Increasing Complexity of Critical Information Systems

The way information is produced and consumed has a profound impact on society, both in personal and professional contexts. Two central problems arise from this information abundance: managing complexity and managing information quality and relevance.

Managing complexity is a challenge that arises from both the infrastructure and access points of view. With so much information available, it can be difficult to manage the underlying infrastructure that supports it, including storage, processing, and distribution. Ensuring that these systems can handle large volumes of data while still operating efficiently and effectively is crucial.

At the infrastructure level, where complexity results from factors such as its size, diversity of software and services, multiple data sources, differences in administrative domains, compliance with laws and regulations, and other challenges related to functionality and application domains, non-functional system characteristics play a critical role in ensuring the trustworthiness and sustainability of these systems. Non-functional system characteristics refer to aspects of computing systems that are not directly related to their core functionality, but rather to how well they perform in terms of scalability, performance, interoperability, dependability, security, energy efficiency, as well as quality, quantity, and confidentiality of information they process.

The second central problem arising from information abundance is accessing and managing the quality and relevance of the information organisations and individuals use and are exposed to. With so much information available, it can be challenging to find the specific data or content that one needs, and this is crucial for maximising productivity and efficiency. Even more difficult, is to ensure that the information being used is of high quality and relevance. This is particularly true in the era of fake news and misinformation, where it can be challenging to distinguish between accurate and inaccurate information.

The overarching challenge when dealing with multi-objective solutions and often conflicting requirements lies in being able to provide the best balance for each specific application or service at hand, which requires a deep understanding of the many variables at play, and composable multidisciplinary approaches and solutions. To this end, we envision the continued need to focus on improving:

The non-functional aspect of data management systems and infrastructures on:

- Heterogeneous data management and cross-sector applications on public and private infrastructures, such as cloud computing and HPC centres, while realising their interoperability and enabling control of the information life cycle.
- Data management systems underpinning data-centric and privacy-preserving applications such as machine learning, analytical, and database frameworks.
- Systems of the Edge-to-Cloud continuum and cyber-physical systems as these systems evolve towards distributed and virtualised architectures.
- Standard cluster management and task scheduling tools to prioritise energy efficiency in Cloud and HPC centres.

Information management through:

- Representation models, information governance frameworks and policies, until the level of global communities.
- Information life-cycle control in organisations by enhancing the authenticity and traceability of data provenance.
- Tools to support the different stages in the data management process, along with interoperability protocols.

Access to information through:

- Studies of users' information needs and their interactions with information systems, by contributing to relevance estimation algorithms, ranking algorithms, and the development of novel mechanisms for human information interaction.
- Increasing the efficiency and effectiveness of visual analysis and exploratory visualisation of complex and multidimensional information.
- Ameliorate the communication of complex narratives, through information extraction and representation techniques, and interactive visual storytelling models.

Aligned with this research challenge, the following actions are planned for 2026:

- Development of predictive mechanisms that balance resource usage under dynamic workloads.
- Establishment of concurrency management mechanisms in data structures, emphasising lock-free synchronisation techniques, such as lock-free locks, to enhance scalability in multicore environments.
- Development of GPU-accelerated high-performance simulation for predicting aeroelastic loads in flexible aircraft structures.
- Design and implementation of early attack detection mechanisms capable of identifying malicious behaviour and of activating automated blockage procedures.
- Development of data management solutions to improve the efficiency and sustainability of AI workloads running on HPC centres by designing novel energy-efficient and carbon-aware systems, namely, at the storage layer.
- Improvement of the security and privacy of data-centric applications/services and corresponding infrastructures by designing privacy-preserving data management solutions and ransomware-proof systems.
- Development of techniques to foster adaptable computing in the edge-cloud computing continuum with privacy-centric processing to be done at edge, namely, by exploiting application-specific accelerators, the memory hierarchy, and weak consistency replication.

D) Designing and Deploying Heterogeneous Computing Architectures

Processor architectures moved from single-core to multi and many-core including heterogeneous accelerator devices such as ASICs or FPGAs, with many of the dimensions of flexibility offered in the past by software to be shifted to hardware components. However, the future is looking towards new applications on the edge and IoT applications, including the use of AI and ML algorithms, stricter time constraints, and more power-efficient computation to address economical and sustainability concerns.

Therefore, as the performance requirements of these modern applications continue to increase, heterogeneous systems offer a way to achieve the required performance while minimising power consumption and cost. Heterogeneous systems will provide a way to tailor hardware to specific applications, where the hardware meets the application demands, and where the software effectively utilises the hardware.

The design of these novel computing systems needs to consider the holistic vertical continuum of hardware and software, to cope with these emergent applications. The increase in the complexity of systems, the requirements on high performance of autonomous systems, and the dependability and cybersecurity requirements. This comprises a challenge that spans from the digital component, through the instruction sets and compilers, and up to the languages and APIs. Within this hardware-software continuum, we focus on:

- Developing bio-inspired mixed-signal microelectronic circuits to improve power and area efficiency through event-driven computational architectures.

- Designing heterogeneous hardware platforms: methods and tools for design space exploration of accelerators, to optimise performance, power consumption, and area.
- Integrating CPUs with application-specific accelerators: this involves addressing challenges in interface design, memory hierarchy, coherence and consistency, programming model, and performance optimisation.
- Devising novel compilation techniques to decrease the effort of scheduling and mapping computations to heterogeneous targets.
- Improving performance and predictability of computing systems, by appropriate management of HW and SW resources and components, including models for prediction of performance and energy efficiency of a heterogeneous application at design time.

Aligned with this research challenge, the following actions are planned for 2026:

- Hardware integration and compilation support for spatial accelerators in RISC-V SoCs: a SoC design and supporting compilation flow where fast mapping methods offload computations onto spatial array–type accelerators coupled to a host RISC-V core, leveraging an ISA extension for direct accelerator control and embedding accelerator usage into binary code, thus unifying compilation for heterogeneous SoCs.
- Establishment of new hardware architectures in CMOS technology that exploit the inherent parallel computing properties of analogue signal processing and its power efficiency for AI applications. Take advantage of ever-smaller digital circuits to build digitally assisted analog computation for improved accuracy. Improve efficiency by encoding information in sparse, pulse-based signalling with very low duty cycle for real-time, event-based operations where the system consumes energy only during the event.
- Design novel mechanisms and scheduling schemes to improve the energy efficiency of HPC clusters by leveraging the heterogeneity of modern infrastructures and the programmability of emerging hardware solutions.

E) Improving Computational Systems for a better Human-Technology Symbiosis

Human-technology symbiosis is a close and mutually beneficial relationship between humans and machines, mutually enhancing their capabilities. Humans and machines are increasingly collaborating, by sharing information, goals, and tasks, fostering a symbiotic relationship to empower and complement each other.

Digital environments, combining immersion/presence, collaboration, interaction, and narrative, provide rich and engaging experiences for users, in the context of learning, entertainment, workplaces, and industry, raising challenges for their integration with everyday information systems and processes.

This research challenge aims to improve computational systems to enable a better relationship between humans and machines, combining data, operations, processes, and awareness. It is focused on:

- Empowering humans with contextual awareness in increasingly complex extended reality systems, for areas such as education & training, information analysis, exploratory visual analysis, and decision-making processes.
- Integrating effective user-centred and co-creation design practices in computational systems and tools, to increase their effectiveness, adoption, and impact.
- Empowering domain and human-factors experts in the use of state-of-the-art model-based tools for automated verification, in particular in the context of safety-critical system, enabling them to model systems, define safety requirements, perform analysis and interpret the results.
- Empowering non-technical people in authoring activities, incorporating new interaction paradigms, supported by extended reality, natural user interfaces, new AI tools, and multimodal systems, enabling them to design and build personalised solutions.

- Leveraging multisensory stimulation and haptics to attain perceptually equivalent scenarios for extended reality systems.
- Reinventing symbiotic processes for learning, work, and well-being in digital environments, including serious games, gamification, and extended reality, optimising user experience.

Aligned with this research challenge, the following actions are planned for 2026:

- Apply computing and information technologies to empower individuals with disabilities and older adults by eliminating the gap between the average user and those with special needs, promoting equal rights and opportunities for all.
- Development of immersive learning environments.
- Development of 3D environments and tangible interfaces and in multisensory systems.
- Development of information retrieval and information access methods to support better integration between users and computational systems.

5.5 Power and Energy Systems

Steering Committee: Clara Gouveia, João Peças Lopes and Ricardo Bessa

5.5.1 Scope and vision

Support for the Sustainable Energy Transition

This scientific domain supports the energy transition, leading to a reduction in greenhouse gas emissions through the decarbonisation of the energy system, the integration of large-scale renewable energy sources (RES), the electrification of society, and increased energy efficiency. This involves combining model-driven representations and data-driven methods to model and optimise energy systems across different spatial and temporal scales, leveraging emerging technologies such as AI and interoperability, and combining it with operations research and domain knowledge in power systems. Results encompass concepts, models, methodologies, and tools that are useful for addressing the decision-making challenges faced by citizens, communities, multi-utilities, system operators, regulators, policymakers, and government bodies.

5.5.2 Research challenges

A) Cost-effective decarbonisation and digitalisation of energy systems

An efficient and sustainable energy system is crucial for global climate targets and a sustainable future, as it provides critical services like electricity, heating/cooling, and transportation. Renewable energy systems can generate carbon-free hydrogen and ammonia, which are critical to decarbonising other sectors of the economy, such as hydrogen use in fuel cells (e.g., mobility) or hydrogen/nitrogen use as renewable energy storage (to generate carbon-free electricity again). Moreover, digital technologies should be integrated into the operation and planning of energy systems to further increase the integration of clean energy sources.

Main challenges:

- New mathematical models for emerging technologies like electrolyzers and thermal storage.
- Novel methods must be developed to optimise the integrated management of multiple energy networks and vectors.
- Managing advanced digital infrastructure for power systems.
- Designing 100% RES-based systems.

The main goal regards the development of new models, methods, and tools to:

- Optimise the operation of electrolyzers to maximise the use of renewables and provide system services.
- Develop advanced control solutions to manage natural gas networks when incorporating renewable gases (biogas and H2).
- Enable the implementation of peer-to-peer solutions associated with seasonal energy storage to guarantee security of supply.
- Improve the integrated management and control of multiple energy networks, considering high shares of renewable electricity and gas production (in electricity and gas networks, respectively).
- Aggregate multi-vector resources' flexibility for optimal participation in electricity, gas and carbon markets.
- Design and operate 100% renewable systems for green hydrogen and ammonia production.
- Implement reference architectures to facilitate secure data sharing in the energy sector – energy data spaces.
- Design and develop interoperability frameworks that rely on open standards to ensure the compatibility of equipment and systems, while safeguarding the privacy and cybersecurity of users.

Aligned with this research challenge, the following actions are planned for 2026:

- Advancing understanding and control of power system dynamics. Efforts will include integrating epistemic uncertainty into dynamic simulations to capture the effects of inaccurate models or parameters in new grid assets, thereby improving the reliability of system-wide stability assessments and exploring hybridisations between physical models and classical statistical theory.
- Address the definition of functional requirements and interoperability guidelines to enhance dynamic stability in future hybrid networks, as well as the dynamic behavior of systems with large electrolyzers, employing a Kuramoto-based dynamic model of the Iberian system calibrated to the April 2025 blackout.
- For offshore hybrid power plants, optimisation strategies will minimise losses and enhance reliability through improved internal grid layouts, while integrated energy management frameworks will coordinate hydrogen and battery storage assets. New control strategies will enable offshore farms to actively support grid restoration procedures.
- AI-driven integration of renewables, batteries, and green hydrogen through forecasting and model predictive control, enabling the creation of rigorous digital twins for multiple facilities.
- Reinforcement learning and advanced optimisation will support the predictive scheduling of electrolyzers, batteries, and electric vehicle (EV) charging, improving flexibility, reducing costs and emissions, and providing decision-aid to the industry.
- Study governance, policy, and social factors alongside technical systems for sustainable energy transition.
- Develop methods for collaborative time series forecasting in electrical energy time series data with privacy guarantees, and synthetic multivariate time series generation via complex networks. In particular, (1) designing a link prediction method that encompasses both quantile graphs and visibility graphs derived from univariate time series, and developing an inverse mapping method that transforms the graphs into synthetic interval time series data, and (2) employ time series–to–network transformation mappings as a mechanism for generating synthetic multivariate time series concealing sensitive information while preserving the essential properties of the original data.

B) Evolving and decentralising energy-driven business models and markets

Electricity markets have proven to be effective tools to: (a) improve the efficiency in the production and pricing of electricity commodities such as energy, flexibility, and capacity, and (b) provide appropriate economic signals to consumers and producers to induce them to adapt their short- and long-term behaviours to existing and expected demand and supply.

In the past, these markets were based on large, centralised conventional generation plants that produced and adjusted their schedules to follow inelastic and unaware energy demand, along with the provision of necessary reserves to the system. Presently, we are now facing a shift towards a distributed and decentralised energy system, characterised by (a) mass electrification, (b) the increase of distributed generation from clean and hard-to-dispatch renewable primary sources, and (c) the development of new distributed energy resources.This rapidly evolving environment is posing new technical and market challenges for their efficient integration.

The main challenges are:

- Redesign and regulate wholesale electricity markets to integrate new resources and market players and assess their impact.
- Develop and regulate new business models and local markets for collective self-consumption and energy communities, seamlessly integrated into existing wholesale markets and capable of fostering decentralised electricity trading and local renewable generation to empower end-customers in the energy system.

- Unlock existing distributed flexibility to contribute to a better operation of the electricity system through more flexible and near-real-time resource management systems and markets.

Aligned with this research challenge, the following actions are planned for 2026:

- Design mathematical formulations to include emerging markets (inertia, voltage control, hydrogen), capacity mechanisms, and assess the influence of decentralised generation and mobility sectors on market outcomes and system stability, including V2X-enabled EVs.
- Water value assessment methods will also be explored through hybrid and data-driven approaches.
- Circular business models will integrate uncertainty-aware data envelopment analysis, while a causal and stochastic optimisation framework for EV charging stations will dynamically optimise flexibility envelopes and market bids to maximise profitability.

C) Resilience and reliability of energy systems

Transitioning from fossil fuels to sustainable energy sources in the context of climate change can introduce new vulnerabilities to severe weather events, creating risks of energy shortages and damage to existing infrastructure. Extreme heat, cold waves, storms, and dust clouds can significantly reduce thermal and hydro generation, render photovoltaic power unavailable for extended periods, and cause a lack of wind power. At the same time, the progressive electrification of consumption may lead to sudden and substantial surges in electricity demand. Conversely, the digitalisation of power systems brings important opportunities to enhance reliability and resilience. Through the development of planning and operation strategies supported by forecasts, real-time monitoring and control, and predictive maintenance, system operators can better anticipate and respond to disruptions.

Investing in infrastructure capable of withstanding severe weather events is essential to ensure the long-term resilience of power systems. Equally important is the development of flexible and responsive solutions - such as demand response programmes and local energy islands - that can help safeguard the security of electricity supply. Energy storage technologies also play a critical role, serving as a cornerstone of a flexible and resilient system by providing backup capacity, smoothing variability, and supporting stability. By leveraging these opportunities, power systems can evolve to become more efficient, reliable, and resilient, thereby ensuring a stable and sustainable electricity supply for consumers.

The envisioned research challenges are:

1. To develop models and tools for the assessment of the long-term adequacy of interconnected systems under climate change and extreme weather affecting bulk energy consumption.
2. To develop methodologies for establishing reliable and resilient expansion plans for coupled energy networks (electricity and gas) in converter-dominated systems.
3. To analyse the ability of the existing flexibilities in local energy grids for improving the continuity of supply during contingency events.
4. To leverage data-driven models to monitor the asset condition and to define optimal maintenance plans.

Aligned with this research challenge, the following actions are planned for 2026:

- Multi-domain computational models capturing steady-state, dynamic, and transient behaviour across LV and MV hybrid AC/DC networks.
- Optimisation-based control algorithms will be proposed for power flow, voltage, and reactive power management in multi-terminal DC grids. Further work will develop coordination, islanding, and restoration methods for secure MVDC system integration based on hybrid AC/DC modelling and analysis.
- Dynamic protection adaptation using SCADA/PMU data and wide-area control, alongside ML-based adaptive protection for IBR-dominated grids, considering virtualised online adaptation, fuzzy clustering, and real-time fault detection under non-standard inverter transients.

- Reliability and resilience will be further enhanced through sequential Monte Carlo simulation and AI-accelerated load-flow computation, supported by the GridFM initiative for foundation models, to improve hybrid AC/DC grid planning.
- Monitor high-voltage power-distribution cables for bird-collision detection, including installing cameras for direct impact observation, contributing to the assessment of deterrence measures and biodiversity conservation.

D) Smart control architectures and centres of the future

Electrical networks are undergoing a profound transformation as decarbonisation and digitalisation introduce new assets and system devices, such as PMUs and IEDs. These developments directly affect power system control centres and architectures, requiring greater interaction with neighbouring transmission networks, the integration of weather-dependent energy resources, the emergence of new market products, the growth of active distribution networks and microgrids, and the wider availability of operational data. As a result, supervision systems in control rooms have expanded to a point where they are no longer cognitively manageable, making a redesign of human–machine interactions essential. At the same time, ageing grid infrastructure, the rapid proliferation of distributed energy resources in medium- and low-voltage networks, and increasing cybersecurity risks further reinforce the need for new control architectures.

The main challenges to address are:

- More numerous, complex, and coordinated decisions to make.
- More uncertainty to consider and more anticipation needed.
- Human operator cognitive load would continue to increase and might saturate.

The envisioned research challenges are:

1. Promote coordinated operation between electricity markets, TSO, and DSO, within an increasingly complex network and market operation context:
    a. Dealing with both long-term and short-term operation restrictions imposed by future flexibility services;
    b. Considering automatic and decentralised control and human-assisted operation.
2. Assist human operators via a proactive collaboration in robustly operating the flows over a power grid, avoiding blackouts because of overloads, while minimising energy losses, as well as the operator's cognitive load.
3. Structure the decision-making process, and design it explicitly for making decisions over tasks and not for monitoring (i.e., to avoid operating systems with information overload).
4. Let human operators become "navigators", defining forecasted trajectories over time and choosing options ahead of time rather than reacting in real-time.
5. Distributed and decentralised protection, automation, and control, benefiting from virtualisation and distributed computation at the edge. Namely:
    a. Protections adaptive to network operating conditions and to the distributed energy resources connected;
    b. Dynamic control area definition could help improve the efficiency of network control strategies.

Aligned with this research challenge, the following actions are planned for 2026:

- Leveraging digitalisation, research will advance neuro-symbolic models to explain power system dynamics, define remedial actions for congestion management, and evolve operational heuristics.
- Network-aware optimisation frameworks will be developed in both centralised and decentralised forms, employing secure multiparty computation and ADMM for tractable multi-energy dispatch.

5.6 Photonics

Steering Committee: Diana Viegas, Nuno Silva and Pedro Jorge

5.6.1 Scope and vision

The vision for Photonics research at INESC TEC is to be an international flagship in science-driven photonic innovation that enables ground-breaking solutions to complex scientific and industrial challenges, while attracting and developing exceptional talent.

At INESC TEC, Photonics is not just a well-established field but was one of the original seeds from which the institute itself grew, with its roots in an early major European project on optical telecommunications that brought together the founding team. Over the years, this strong foundation consolidated the area with a notable history of sustained internal reinvention, and successful spinoffs. Building on this legacy, the Photonics domain consistently seeks to expand its expertise and embrace cutting-edge challenging fields such as chemical sensing, optofluidics, and quantum simulation, uniting diverse competencies under a shared commitment to science-driven innovation.

The Photonics Scientific Domain at INESC TEC looks at optical phenomena as a unique toolbox for cutting-edge science and technology, with the ambition of exploiting symbiotic relations that span the whole S&T ecosystem towards a sustainable research model. On the one hand, our fundamental research - from theory to laboratory experiments - aims to develop novel sensing and computing platforms capable of advancing scientific knowledge and seeding impactful technology. On the other hand, at the applied research level, we leverage emerging photonics-based platforms to foster innovation and performance in real-world applications, materialising the impact of our science and diversifying funding opportunities.

5.6.2 Research challenges

A) Enabling Resilient and Reliable Photonics-Based solutions for biological and chemical sensing

To meet the required performance in demanding and continuous real-world operation scenarios, the next generation of photonic sensors must be not only highly sensitive but also resilient, being capable of long-term operation without degradation, presenting high reliability, and providing accurate and trustworthy insights under diverse and challenging conditions. This need is particularly pressing for biological and chemical sensing applications, where issues such as sensor drift, biofouling, and cross-sensitivity to environmental factors (e.g. temperature, pH, or salinity) can significantly reduce signal fidelity, lead to false alarms, and ultimately compromise critical decisions.

To address this challenge, our team leverages cutting-edge expertise in optical sensing and microfabrication to establish a comprehensive approach that spans the full sensing pipeline: transduction, integration, and interrogation. This multi-pronged strategy ensures each stage contributes to the development of robust, high-performance sensing systems suited for continuous and reliable operation in real-world settings.

Aligned with this research challenge, the focus for 2026 will be on the development of sensing devices and systems with the following features: better than present day standard accuracy, scalability, ease of use, miniaturisation, operational speed, and long-term reliability.

B) Monitoring Extreme Environments with Remote and Distributed Optical Sensing

Understanding and monitoring dynamic and complex systems is of crucial importance for informed decision and policymaking. Yet, extreme environments such as the ocean present specific monitoring challenges. They involve wide spatial and temporal scales that complicate system architecture and deployment, including the need for reliable long-distance delivery of both power and data. At the same time, harsh conditions like corrosion, high pressure, and mechanical stress threaten sensor integrity, while seawater's chemical complexity complicates analytical accuracy and stability.

In this context, we seek to enable light-based monitoring solutions capable of operating in extreme and demanding environments. A strong emphasis is placed on the ocean (aligning with ongoing activities and medium-term research lines at INESC TEC), but energy infrastructures, space applications, and other

harsh settings will also be considered as contexts where optical technologies offer clear operational advantages.

In this challenge, we propose an integrated approach based on advanced optical technologies, leveraging our expertise in optical fibres and complementary sensing and imaging modalities. Building on advances developed in other challenges, this approach will demonstrate practical impact through three complementary directions, together enabling robust, real-world solutions for extreme environments.

Aligned with this research challenge, the following actions are planned for 2026:

- Development and optimisation of distributed sensing systems for permanent deployment in infrastructures or extreme environments, based upon optical fiber distributed acoustic sensing to monitor and sense geophysical phenomena (seismic activity and tsunamis), oceanography studies and vessel detection and classification.
- Demonstration of the use this technology for bird collision detection in high power electric distribution lines in biodiversity studies to assess deterrent/avoidance/alarm processes.

C) Harnessing Optical Devices and Quantum Technologies for Sensing, Imaging, and Computing

Light is the fastest, most versatile information carrier we know, being able to travel immense distances with minimal loss, and encode data simultaneously in amplitude, phase, polarisation, and even orbital angular momentum. Yet, to achieve all-optical data processing and control its properties to increase signal-to-noise ratio specifically when entering the quantum regime - where extreme sensitivity and unique versatility compete with higher noise levels on the detection side - requires significant work on the fundamental research side.

In this challenge, we aim to explore the use of light as a multipurpose channel to encode, probe, and process information, leveraging wavefront control, interference, and nonlinear effects as information processing elements. We commit to a path that spans two directions, intertwined in the needed competencies and technologies (e.g. wavefront shaping, nonlinear optics, free space):

- Ultra-fast physical computing and data processing, and
- Shaping new quantum technologies for sensing and imaging.

Aligned with this research challenge, the following actions are planned for 2026:

- Development of quantum technologies for hyperspectral imaging and sensing, exploring Hong-Ou-Mandel Microscopy and Undetected Photons framework.
- Building of digital twins for quantum photonic devices to model and forecast optical quantum coherence research challenge to optimise chip topology and operating set-points to preserve quantum states of light under realistic imperfections and disturbances.

D) Enhancing decision tools through Multimodal Spectroscopy Instrumentation

Growing sustainability demands, resource scarcity, and the need for more circular production models create persistent challenges for the industry in accessing high-performance solutions capable of reliably identifying and characterising materials across sectors such as raw materials processing, manufacturing and recycling. While spectroscopy is already an established and valuable tool in industrial settings, important gaps remain in delivering fully integrated, robust, and real-time systems suited to demanding production environments.

In this research challenge, our focus is to address these needs by developing science-driven, fit-for-purpose tools that deliver actionable insights and enable advanced decision-making to improve sorting processes, quality control, and environmental impact assessments. Building on recent advances in instrumentation and interpretable AI-based signal processing and analysis, our team has already demonstrated solutions capable of tackling real industrial sorting challenges, including mineral identification in mining, detection of refractories in glass recycling, and characterisation of recycled wood. This challenge seeks to further develop these capabilities into a robust, flexible, and integrated multimodal approach, along the following directions:

- Develop versatile multimodal spectral imaging hardware,
- Integrate advanced data processing and interpretable AI, and
- Enable seamless deployment and integration in industrial workflows.

5.7 Robotics

Steering Committee: António Paulo Moreira and Bruno Ferreira

5.7.1 Scope and vision

Robotics became more intelligent, autonomous, and useful in a wide area of applications. This new paradigm poses new challenges and problems to be solved that require new scientific approaches.

In 2026, developments in Robotics at INESC TEC will focus on:

- Autonomous systems capable of operating in hostile, dynamic and GNSS-denied environments.
- Integration of advanced AI, including Agentic AI, Deep Reinforcement Learning, Federated Learning, Generative AI, LLMs and VLMs.
- Natural and intuitive interaction between humans and robots through multimodal interfaces, XR/VR and Digital Twins.
- Heterogeneous robotic platforms (marine, aerial and terrestrial) with superior coordination and operational autonomy.
- Modern digital infrastructures that support massive simulation, sustainable development and continuous validation.
- Research, design and development of customised robots with new concepts and innovative auxiliary systems.

Seminars, courses and workshops will also be organised in areas such as artificial intelligence applied to robotics.

This plan aims to strengthen INESC TEC's position as a national and European reference in autonomous systems, human-robot collaboration, and multidisciplinary integration between robotics, AI and communications.

5.7.2 Research challenges

A) Increase Autonomy and Coordination in Challenging Environments

The operation of robotic systems in more complex and dynamic environments and for long term or permanently requires higher levels of autonomy of such systems, that will only be obtained by addressing the different stages of the sense-perceive-plan-act cycle. The following specific challenges directly contribute to achieve such gains in autonomy:

1. Positioning precision/accuracy of robotic (especially systems operating in GNSS denied environments).
2. Distributed simultaneous localisation and mapping strategies that are robust to communication failures and delays.
3. Trajectory planning for active perception and adaptive sampling, for single or cooperating robots.
4. Definition of novel mapping strategies that scale well with the extension of operation environments and duration of missions, for both single robots or heterogeneous robotics teams.
5. Robust navigation and control for heterogeneous systems (UAV, ASV, AUV).
6. Multi-vehicle coordination under communication constraints.
7. Information-driven planning and environment-aware control.
8. Advanced AI-based autonomy: Deep RL, Federated Learning, Generative AI, Agentic AI.
9. Integration of Digital Twins for planning and validation.

Aligned with this research challenge, the following actions are planned for 2026:

- Implementation of cooperative multi-vehicle systems with distributed planning.
- Demonstration of highly robust autonomous underwater docking.
- Incorporation of advanced AI into continuous decision pipelines.

B) Perception, Localisation, Mapping and Communications

Autonomous and cooperative operation depends on advanced multimodal perception capabilities and robust connectivity.

Main Lines of Research:

1. Multimodal sensory fusion: vision, LiDAR, radar, acoustics, and DAS.
2. Semantic and ontological 3D mapping.
3. Robot-supported wireless networks: autonomous node positioning and LoS optimisation.
4. Network Digital Twins, semantic encoders, and AI-based cross-layer algorithms.

Aligned with this research challenge, the following actions are planned for 2026:

- Multimodal perception system for surveillance, mapping, and tracking.
- Robotic wireless networks with autonomous positioning and performance optimisation.
- Short-range underwater localisation in structured environments

C) Improve manipulation and other physical interaction capabilities

We aim to address the state-of-the-art of robotic manipulation and other scenarios where a robot interacts physically with the environment. This will advance along these major lines:

1. Autonomous and robust underwater manipulation focused on complex constrained tasks and complex non-rigid deformable objects.
2. Intervention from mobile platforms: inspection, maintenance, sample collection.
3. Embodied robotics for unstructured environments (textile, naval, agricultural, construction, recycling).

Aligned with this research challenge, the following actions are planned for 2026:

- Validation of underwater manipulators for complex grasping tasks.
- Inspection and maintenance operations supported by intelligent mobile platforms.
- Development of industrial prototypes with embedded autonomy.

D) Human-Robot Interaction (HRI) and Intelligent Interfaces

Most recent technological and scientific advancements allow stand-alone robots to perform tasks with a high degree of autonomy and the difficulties associated with robotics are well-known and have reached a certain level of maturity. However, the inclusion of the human element disrupts this determinism and factors such as the user's mental model, emotional state, and perception influence robot behaviour. Therefore, this challenge aims the development of new algorithms, methodologies and tools that allow robotic systems to synergistically and dynamically collaborate with humans.

To achieve such a goal, the following topics will be addressed:

1. Multimodal interfaces (voice, vision, gestures) supported by XR/MR.
2. Integration of LLMs and VLMs for natural communication and task specification.
3. Digital Twins for detecting operator states (fatigue, intention, attention).
4. Advanced teleoperation and learning by demonstration.

Aligned with this research challenge, the following action is planned for 2026:

- XR interfaces with LLM/VLM integration for natural interaction.
- Intelligent teleoperation platforms with multimodal feedback.
- Development of an Industrial Metaverse concept for HRC.

E) Simulation and Computing

This challenge provides the technological foundation needed to accelerate development, testing and validation.

Main Lines of Research

1. Realistic cloud-based simulation environments with synthetic data generation.
2. Sim-to-real mitigation through CI/CD, automation and modularity.
3. Multimodal models for generative reasoning (text, vision, audio).
4. Large-scale industrial datasets for human operations analysis.

Aligned with this research challenge, the following actions are planned for 2026:

- Cloud simulation platform with the capacity to generate large-scale synthetic datasets.
- CI/CD pipelines for continuous validation of robotic software.
- Development of multimodal datasets for generative reasoning in an industrial context.

5.8 Systems Engineering and Management

Steering Committee: António Lucas Soares, José Pedro Rodrigues, Lia Patrício and Maria Beatriz Oliveira

5.8.1 Scope and vision

Research in Systems Engineering and Management seeks to advance the design, implementation, and continuous improvement of decision-support systems and human-centred intelligent operations, while simultaneously advancing research on technology management and innovation.

Major challenges arise from optimisation in complex organisations and networks at multiple levels, including customer-centric service design and technology-based innovation management and policy, which target improvements in business performance, productivity, innovation, resilience, and economic, social, and environmental sustainability.

5.8.2 Research challenges

A) Transitioning Socio-technical systems towards sustainability

Research challenge

Grand societal challenges require radical shifts in socio-technical systems, requiring research on (i) **understanding the role of businesses and industries in sustainability transitions**, and (ii) **designing system innovations for transitions towards sustainability**.

This research combines service science, technology and innovation management, and public policy research to facilitate technology-leveraged transitions of key socio-technical systems.

Research Questions

- How can firms innovate business models based on flexibility, self-sufficiency, or servitisation and develop new value propositions and service offerings to facilitate ecosystem transformation and sustainability transitions?
- How can innovation management practices evolve through the lenses of Responsible Research & Innovation for sustainability and impact, with a focus on circular value chains, open innovation and co-creation practices?
- How can firms and policymakers facilitate the effective adoption and diffusion of technologies for sustainability transitions and develop strategies for citizen co-creation and engagement with sustainability transitions?

Aligned with this research challenge, the following actions are planned for 2026:

- Examine how people, organisations, and technologies interact to create value and drive transformation within manufacturing and private and public service ecosystems, focusing on value co-creation processes, analysing how individuals, organisations, and technologies jointly shape systems' performance, user experience, customer engagement, citizen participation, and sustainability-related behaviours.
- Study how organisations adopt, integrate, and govern emerging technologies, developing human-centred and sustainability-oriented models of technology adoption, by developing theoretically grounded and empirically informed frameworks that explain how socio-technical, organisational, and behavioural factors shape technology-driven change.
- Prototypical implementations will be demonstrated in the iiLab, integrating Digital Twins and mixed-reality tools for training and validation. Research will also utilise Living Labs as experimental infrastructures to observe real-world adoption processes and prototype digital transitions with stakeholders, thereby accelerating systemic learning and socio-technical transformation.

B) Developing Responsive and resilient end-to-end Value Chains

Research challenge

The prevailing global supply chain models pose several challenges, including over-dependency and logistics issues. Recent crises have highlighted the fragilities of those models, both in terms of **resilience and sustainability** (environmental, social, and economic).

Research Questions

- How can digital technologies contribute to reducing the critical dependencies and weaknesses inherent in current global supply chain models, and to managing the trade-offs and synergies between sustainability and resilience practices in complex value chain environments?
- How can digital technologies facilitate joint innovation activities to increase the circularity of products, processes, and overall supply chains?
- How to adequately manage and operate critical infrastructure sectors, in particular utilities, with a focus on resilience, sustainability and efficiency?

Aligned with this research challenge, the following actions are planned for 2026:

- Consolidate INESC TEC's scientific leadership in AI-based systems for manufacturing, developing the foundations for designing and managing sustainable, resilient, and human-centred manufacturing systems, by developing simulation models - discrete-event, agent-based, and hybrid - combined with optimisation techniques, digital twins, and reinforcement learning
- Continue to study sustainability and resilience in supply chains through the integration of digital technologies for traceability, collaboration, and circular strategies, developing predictive models for demand, disruptions, emissions, and material flows behaviour, supported by digital technologies.
- Research innovative models for assessing circular supply chains, integrating environmental, social, and economic criteria, with particular emphasis on remanufacturing processes and circular design strategies.
- Continue researching resilience and responsible innovation for mission-oriented innovation ecosystems, with a focus on designing ethical, adaptive, and SDG-aligned innovation systems.

C) Managing Systems under uncertain, complex and dynamic environments

Research challenge

Managing and supporting decisions in **continuously complex environments** with multiple stakeholders and overarching goals (e.g., sustainability) brings additional challenges to the research on these methods.

Research Questions

- How can we rigorously model complex socio-technical systems with multiple stakeholders, goals, and incentives - explicitly capturing uncertainty, dynamics, assumptions, and scope - so that models remain valid, transparent, and decision-relevant?
- How can hybrid approaches - combining AI methods (for optimisation and trade-offs), hybrid simulation, and Digital Twin-based techniques with qualitative, strategy-oriented modelling and enhanced risk assessment - significantly improve and accelerate decision making in uncertain, dynamic environments such as adaptable production and complex manufacturing?
- How can we design and manage innovative, resilient, inclusive, and sustainable urban mobility and global freight services - leveraging smart-city paradigms, sharing economy models, synchro modal operations, and inter modal hubs - to achieve environmental, social, and economic goals?
- How can AI methodologies be used to optimise critical parameters' trade-offs in designing adaptable production systems?

Aligned with this research challenge, the following actions are planned for 2026:

- Develop models and tools that support day-to-day, mid-term, and lifecycle decisions, enabling the analysis of how systems can be adapted when demand patterns, constraints, or operational requirements change. Approaches such as optimisation algorithms, metaheuristics, machine learning, reinforcement learning, and generative-AI-supported model adaptation will be explored to enhance responsiveness to dynamic conditions.
- Develop research on dynamic decision support systems, integrating real-time data, adaptive algorithms, and sequential decision-making processes to support complex and high-stakes decisions in uncertain environments. These systems will follow sequential decision-making processes, enabling them to operate effectively in unstructured and volatile environments influenced by multiple interacting variables.
- Methods that help design transport solutions for people in urban and metropolitan areas, developing predictive models for travel demand, mode choice, and network performance, supported by modelling techniques such as simulation, digital twin-based approaches, and real-time data analytics.

D) Engineering Human-Centred Systems for Sustainability and Resilience

Research challenge

Demands for sustainability and circularity raise specific challenges to **digital platforms and AI-based systems**, such **as trust and confidentiality** on one side, **and systems adoption and user engagement** on the other side.

The exponential growth of digital technologies applied to manufacturing poses a challenge in creating awareness about socio-technical strategies for technology adoption.

Research Questions

- How to design inter-organisational systems, particularly industrial digital platforms that support collaboration, information management and collective action to foster and implement circular and sustainable business strategies?
- How to manage and govern industrial data and information in organisations and ecosystems to support knowledge creation and unlock value creation from data, and create transformative services for value co-creation and system transformation??
- How to assess the impact and derive design propositions for information systems based on emerging technologies, leading to the creation of organisational capabilities that foster competitiveness and sustainability?

Aligned with this research challenge, the following actions are planned for 2026:

- Develop and design industrial information systems by integrating socio-technical principles, artificial intelligence, and data ecosystems supporting sustainability, circularity, and human-centred innovation.
- Explore new pathways in transportation, logistics and mobility, going far beyond purely technical domains, in particular by delving deeper into aspects such as the environmental impacts of transport, the development of participatory instruments and the co-creation of human-centric decision support tools, based on the integration of multiple, advanced technologies and incorporating the different stakeholders' perspectives.
- Human-machine collaboration will be explored in human-in-the-loop systems that integrate advanced analytics with cognitive ergonomics and trustworthy AI to support operators' decision-making.
- Research on measuring sustainable research and innovation to scale and develop tools to track social, environmental, and ethical impacts of innovation.

6 THEMATIC LINES

The four thematic lines at INESC TEC - Digital Models, Sustainable Transformation, Tackling the Extreme, and Trustworthy Technology - serve as strategic frameworks for organising and advancing multidisciplinary research activities. These thematic lines facilitate collaboration among researchers from diverse scientific domains, enabling them to tackle impactful and complex research challenges through integrated and innovative initiatives.

6.1 Digital Models

Coordinator: Susana Barbosa

6.1.1 Scope and vision

This line aims to bring comprehensive, high-precision digital models of physical entities into the lab, leveraging the groundbreaking strides in pervasive intelligence, a core ethos at INESC TEC. The drive to create more complex digital twins has greatly increased, making it a priority in the EU's research agenda. Flagship initiatives include the development of digital twins of the Earth (DestinE), the Ocean (DTO), human health via the Virtual Human Twin (VHT), and urban and rural areas through the European Local Digital Twin (LDT).

Future digital twinning platforms will encompass a complete computing pipeline from sensing, edge computing, big data management, and processing for monitoring, analysis, training, inference, and forecasting, culminating in visualisation and actuation. A high level of maturity in digital twins leads to a seamless and interactive exchange of information between humans and digital counterparts. This will require cutting-edge technologies like cloud and high-performance computing, pushing the limits of what is possible in terms of scalability, performance, efficiency, reliability, security, and privacy.

Computer Science & Engineering and Artificial Intelligence will focus on the computational challenges of building large-scale, high-fidelity digital twins, including big data management, machine learning, human-computer interaction, information security, and advanced visualisation. The AI researcher's data-driven and symbolic AI knowledge will make the twins robust and explainable. Communications will enable bandwidth-intensive, latency-sensitive, and secure data transmission.

Robotics will focus on dynamic and autonomous sensing, cyber-physical models and integrating autonomous robots in areas shared with humans. Bioengineering will develop macro to nano biosensors as inputs to biological or "bio-inspired" models, enabling early disease detection, diagnosis, and prediction. Photonics will innovate in real-time nano-scale diagnosis and long-term sensing of extreme environments.

Power & Energy Systems researchers will model and optimise integrated energy systems. In contrast, in Systems Engineering and Management will optimise complex organisations, design customer-centric services, and manage technology-based innovation.

This line presents extensive opportunities to impact INESC TEC's core innovation areas:

- Industry: Optimising operations, maintenance, and safety;
- Healthcare: Revolutionising patient care through organ/individual simulation and adverse event prediction;
- Environment and Climate: Addressing weather, climate, ecosystems, and biodiversity to support decision-making.

This multidisciplinary thematic line will strategically leverage and integrate INESC TEC's diverse research capabilities to realise the groundbreaking potential of complex digital models and twins. It calls for further collaborative research to enable more accurate, dynamic digital models that can optimise operations, improve maintenance, enhance safety, revolutionise patient care, and predict and respond to emergencies.

6.1.2 Achievement highlights

For 2026, the following major achievements are anticipated:

- Continue to actively contribute to the European Digital Twin of the Ocean by advancing the integration of extensive Earth observation data, citizen science data, and advanced computing infrastructures.
- Improve decision-making and facilitate access to ocean data by developing, within the scope of the Blue-X project, integrated digital solutions that increase the availability and usability of ocean information.
- Development of tools based on secure system design in a federated digital twin environment, using advanced sensing, machine learning, artificial intelligence and simulation.
- Development of a Modelling and Simulation as a Service ecosystem for military mission planning and execution.
- Deployment services for energy flexibility services that make use of cloud and edge computing resources along the compute continuum, applying new orchestration techniques at the edge, ensuring the reliability of the services.
- Deployment of the Common European Energy Data Space, as outlined in the European Strategy for Data and the EU Action Plan on Digitalising the Energy System. It enables the secure, interoperable, and ethical sharing of energy data across Europe.
- Development of a digital twin of the European power system, based on pan-European data exchange and connected to the Energy Data Space. Using AI and high-performance computing, it enables real-time simulation and optimisation of Europe's energy infrastructure.
- Creation of the concept of the Pan-European digital twin based on the federation of local twins of the electricity system.
- Development of a RIS beam tracking system using RGB-D vision and ground-truth motion capture to model dynamic interactions between wireless links and moving objects in indoor environments.
- Development of digital models in ns-3 to replicate past 5G/6G experiments, reproducing realistic physical-layer (PHY) conditions and video streams to ensure their repeatability and reproducibility.
- Development of a clinical framework based on Artificial Intelligence to support clinical practice and improve the pipeline associated with the planning and treatment of procedures associated with lung pathologies.
- Design of new models able to integrate contextual information on the detection of anomalous situation. Different fusion approaches will be experimented as well as the impact of data granularity. Generalisation aspects, towards unseen data within different scenarios, will also be benchmarked.
- Development of interactive, data-driven digital twins that synchronise human, robot, and environmental data in real-time. These digital models will serve as the foundation for simulating, predicting, and optimizing collaborative processes, effectively bridging physical and virtual spaces through high-fidelity representations of human-robot ecosystems.
- Improve time series forecasting and synthetic data generation with privacy guarantees.
- Development of interoperable, governance-driven data spaces and AAS-based digital twin frameworks enriched with semantic models and namespace structures, fully aligned with European standards.
- Creation of predictive and prescriptive digital models to support maintenance, renewal, and resilience of long-lived assets through simulation and data-driven analytics.
- Development AI-driven digital twins that improve pallet and container utilisation, support automation and robotised loading processes, and reduce emissions by enabling more efficient and data-driven logistics planning.

6.2 Sustainable Transformation

Coordinator: Clara Gouveia

6.2.1 Scope and vision

This thematic research line aims to harness interdisciplinary expertise to address the critical challenge of achieving long-term sustainability in social, economic, and environmental systems. It leverages the collective strengths of INESC TEC's Scientific Domains to create innovative solutions to accelerate sustainability transformation through science-based technology supported by circular economy principles and sustainable supply chain management.

As we navigate the complexities of integrating technology with natural and social systems, this thematic line explores sustainable business model and life cycle analysis, consumer-centric service design with advanced management, monitoring and control systems for supporting electrification of the energy sector and development of sustainable supply chains.

Systems Engineering and Management will tackle the challenge of designing sustainable business models and optimising complex organisational networks for environmental sustainability. This includes the development of decision-support systems for sustainable supply chain management and the integration of circular economy principles into business practices.

Power and Energy Systems will lead efforts in modelling and optimising integrated, sustainable energy systems. Their work will focus on the massive integration of renewable energy sources, energy storage solutions, and the electrification of transport and industry.

Artificial Intelligence and Computer Science & Engineering will develop algorithms and computational models that optimise resource efficiency and reduce environmental impact and can support AI-driven energy and transport management systems.

Bioengineering will contribute by advancing technologies for sustainable healthcare, including the development of biodegradable materials and energy-efficient medical devices. This domain will also explore bioengineering solutions to environmental challenges, such as bioremediation techniques for pollution cleanup.

Communications will work on enhancing the energy efficiency of digital networks, which is crucial for reducing the carbon footprint of our increasingly connected world. This includes the development of low-power communication protocols and the optimisation of data transmission for energy savings.

Photonics will innovate in the development of precision sensing, energy-efficient lighting and photovoltaic technologies, contributing to the reduction of energy consumption and the advancement of renewable energy sources.

Robotics will develop autonomous systems for environmental monitoring and conservation, including robots capable of planting trees, cleaning oceans, and monitoring wildlife. These robots will operate with minimal human intervention, reducing the ecological footprint of conservation efforts.

This thematic line strives to foster a collaborative approach among all INESC TEC researchers to enhance and bolster the sustainability of the developed technology by lowering its adoption, maintenance, social, economic and environmental costs.

6.2.2 Achievement highlights

For 2026, the following major achievements are anticipated:

- Development and implementation and innovative optical sensors within a Multisensing Module to measure multiple parameters, enabling dynamic control of fish–algae symbiosis and generating data to optimise future control systems and algorithms for complex production processes.
- Development of sensing solutions to monitor key parameters, characterise the concrete curing process, and ensure platform stability during operation for intelligent floating wind-turbine platforms and wind-farm deployments.

- Development of innovative solutions for operating energy systems with high shares of renewable generation, advancing the decarbonisation of domestic and industrial consumers through multi-energy approaches, and promoting the optimal planning and operation of local energy communities.
- Contributions to the scalability in high-performance computing and distributed systems for latency-aware autoscaling in distributed event systems and predicting aeroelastic loads in flexible aircraft structures.
- Optimisation of task allocation and energy management for Human-Robot Collaboration systems through intelligent scheduling algorithms, robots and human operators will jointly minimise idle time and resource consumption while maintaining flexibility and productivity.
- Design of a modular Reconfigurable Intelligent Surface prototype using glass and non-volatile memristor-based control to demonstrate large-scale, energy-efficient reconfigurable surfaces.
- Development of solutions that integrate computer vision and artificial intelligence to enhance monitoring and decision making in farming environments.
- Development and evaluation of spiking neural network techniques as energy-efficient alternatives to convolutional neural networks for training and inference in ordinal regression and ranking tasks.
- Creation of an interoperable and flexible Digital Product Passport service for electric infrastructure equipment.
- Development of an integrated solution for managing and optimising health-related refund claims using advanced hyper-automation and generative AI techniques.
- Characterisation of the use of AI and data science methods to monitor and to automatically assess the impacts of the food economy in the environment and in society using existing data and documented knowledge.
- Use of NLP and generative AI to promote transparency in local administration through data driven approaches sustained on the collaboration with linguists and communication scientists.
- Development of method for the analysis of high-resolution satellite image to detect new illegal constructions on the land scape and enable authorities to act.
- Development of advanced recovery, valorisation, and fibre-to-fibre recycling processes supported by sensing, traceability, and data-driven optimisation to enable circularity in textile value chains.
- Digitalisation of agro-food value chain enabling end-to-end traceability, predictive modelling, and consumer behaviour analytics, reducing food waste, enhancing process transparency, and supporting more sustainable and efficient retail and agro-food systems.
- Development of digital and real-time information tools that make public transport more accessible and user-friendly, especially for people with reduced mobility or special needs.
- Creation of co-designed digital services that help citizens make informed energy choices and engage actively in sustainable local energy ecosystems.

6.3 Tackling the Extreme

Coordinator: Eduardo Silva

6.3.1 Scope and vision

This thematic line addresses the growing need to develop technologies capable of operating safely, reliably and efficiently in environments and situations where natural, technological or sociotechnical conditions push systems beyond their traditional limits. In a global landscape shaped by environmental pressures, urban densification, increased digital dependency and evolving geopolitical dynamics, extremes increasingly emerge from both natural phenomena and human-driven factors, often interacting in unpredictable ways. This thematic line seeks to create robust technological foundations that enhance resilience and ensure operational continuity across critical infrastructures and societal systems.

INESC TEC's interdisciplinary expertise will develop novel design methods and tools aimed at delivering solutions that are trustworthy, robust, and capable of self-adaptation in the face of extreme conditions. This will involve the use of synthetic modelling techniques and the creation of comprehensive virtual environments to simulate and analyse extreme scenarios safely and effectively.

Computer Science & Engineering and Artificial Intelligence will focus on creating advanced algorithms and computational models capable of operating under extreme conditions. This includes the development of AI systems for rapid decision-making and the analysis of vast datasets.

Communications will concentrate on ensuring reliable and secure data transmission in extreme environments, developing technologies that can withstand interference, disruptions, and high-risk conditions, thereby maintaining the integrity and availability of critical communications.

Photonics will develop sensors and imaging technologies capable of operating in extreme conditions, such as high temperatures, pressures, or radiation levels, enabling the observation and analysis of otherwise inaccessible or hazardous environments.

Robotics will focus on designing and deploying autonomous systems capable of navigating and performing tasks in dangerous or uncooperative environments, from deep-sea exploration to disaster response, minimising human exposure to risk. Similarly, Bioengineering will explore the development of resilient biotechnologies for human monitoring extreme conditions, as well as bio-sensing techniques that can operate in hostile or contaminated environments, contributing to environmental monitoring and cleanup efforts.

Power & Energy Systems will address the challenges of energy management and distribution in extreme scenarios, focusing on developing resilient and adaptive energy systems that can ensure continuous operation under adverse conditions.

Systems Engineering and Management will tackle developing decision-support tools and methodologies for planning and executing high-risk and high-stakes activities.

Through this initiative, INESC TEC reaffirms its commitment to pushing the boundaries of innovation, contributing to a future where extreme environments are no longer barriers to exploration, discovery, and progress.

6.3.2 Achievement highlights

For 2026, the following major achievements are anticipated:

- Development of a continuous 1 µm lasers for wireless power transfer in space vehicles.
- Final evaluation of microchip lasers for a space-based LiDAR.
- Advancement of AI-based support for critical infrastructures, including electricity, railway, and airspace. It focuses on extreme and disruptive scenarios, where rapid, reliable decisions supported by AI ensure system security and resilience.
- Developing robust and adaptive robotic systems capable of operating in challenging and unpredictable environments.

- Development of a multi-technology communications gateway, leveraging LEO Satellite links and the local available Wi-Fi and Cellular connections to provide reliable Internet connectivity between on-site and cloud-based systems during disaster events.
- Design and implementation of a multi-technology maritime gateway and network architecture, allowing for seamless Command and Control and Data transfer over underwater (acoustic), and overwater (local RF or Satellite) communication links.
- Enhancement of the resilience and reliability of industrial systems operating in extreme and variable environments can be done by developing advanced, explainable predictive maintenance methods.
- Development of an integrated fire management strategy to efficiently and effectively address extreme wildfire events in Europe.
- Explore the application of quantum computing to complex, large-scale, and high-pressure decision-making challenges of the future.

6.4 Trustworthy Technologies

Coordinator: Rui Oliveira

6.4.1 Scope and vision

This line aims to develop reliable, secure, and ethical digital technologies integral to modern society. This multidisciplinary strand leverages expertise from the eight INESC TEC Scientific Domains to address the challenges of creating technology that is not only advanced but also dependable and aligned with societal and environmental values.

As the world faces pressing challenges such as climate change, inequality, and geopolitical instability, trustworthy technology will become increasingly important in supporting sustainable and resilient societies. Transparency, equity, reliability, security, privacy, and meaningful human control need to be at the forefront of research and development in the upcoming years as our dependence on cutting-edge technologies increases.

Artificial Intelligence and Bioengineering will develop explainable AI models, ensuring fairness in algorithmic decision-making, enhancing robustness against biased or unethical outcomes, and, chiefly, for healthcare, developing transparent and replicable machine learning models for patient benefit.

Computer Science and Engineering will lead the research on the dependability-, security-, and privacy-enabled technologies orchestrating the various Scientific Domains concerns and expertise, notably on large-scale data-centric systems, towards robust digital and cyber-physical real-world solutions. Communications and Photonics will work on secure data transmission, protecting sensitive information, and defending against adversarial attacks.

Robotics and Computer Science & Engineering will explore human-computer interaction, designing intuitive and trustworthy communication channels for seamless collaboration between humans and autonomous systems.

Power & Energy Systems will leverage its expertise and long-standing experience in developing secure and efficient power grids to ensure data integrity and trustworthiness in decentralised autonomous system operations, as well as to promote cross-disciplinary translational research into related critical infrastructures.

Systems Engineering and Management will optimise complex organisations and networks, ensuring customer-centric service design, and managing technology-based innovation.

By encouraging collaboration among these diverse research groups, the thematic research line will create synergies that drive innovation in trustworthy technology. This multidisciplinary approach will enable the development of comprehensive solutions that address the technical, ethical, and societal challenges associated with the increasing reliance on digital systems.

The research line will also prioritise disseminating knowledge and best practices, engaging with stakeholders across academia, industry, and government to promote adopting trustworthy technology. Through this collaborative effort, the thematic research line aims to contribute to a future where digital systems are reliable, secure, and aligned with the values and needs of the communities they serve.

6.4.2 Achievement highlights

For 2026, the following major achievements are anticipated:

- Advancement of interpretable neuro-symbolic learning that integrates human expertise and domain constraints, ensuring transparent, safe, and trustworthy AI systems.
- Advancement work in the following initiatives: (i) resilience and cascade failures in decentralised and censorship-resistant systems; (ii) early attack detection & blockage based on ML and visibility graphs; (iii) joint communication and sensing privacy aspects; (iv) gamified approaches applied to cyberawareness; (v) digital forensics and detection of anomalies in IoV and IIoT environments.

- Creation of trustworthy, transparent, and ethical collaborative systems, integrating Large Language Models and Vision-Language Models into Human-Robot Interface frameworks.
- Exploration of reconfigurable intelligent surfaces to selectively degrade the sensing and localisation capabilities of unauthorised third parties, while preserving communication performance for legitimate users.
- Development of deep learning architectures that integrate explainability and uncertainty quantification as core design principles, fostering transparency and robustness in AI-driven decision-making.
- Development of software that enables a new way of dealing with locoregional treatment proposal.
- Integration of humans in the loop in the context of federated learning and other supervised ML techniques that require algorithm training, and for which there is a need for human intervention to ensure the ethical development of automated processes.
- Development of solutions based on secure multi-party computation techniques and federated learning as means to apply EHDS guidelines and overcome the limitations in the availability of health data to train AI models.
- Development of a Socio-Technical AI Maturity and Governance Platform providing diagnostic tools to assess ethical readiness, governance, and socio-technical risks in AI adoption across industrial sectors.
- Design of efficient and sustainable logistics strategies, improving routing performance and reducing last-mile delivery impacts. Centres involved: SYSTEM.
- Development of Human-Centred and Generative AI solutions for Extreme Decision Systems combine human-in-the-loop optimisation and generative AI to support production management under rapidly changing, data-intensive, and high-uncertainty conditions.
- Development of hybrid decision models that combine Operations Research and AI - including reinforcement learning and real-time optimisation - to support robust decision-making in volatile, dynamic, and high-stakes operational contexts.

7 TEC4 INITIATIVES

7.1 Overview

TEC4 (**TEChnologies FOR...**) is an organisational approach designed to structure the **market-driven** innovation process, complementing the naturally occurring **science-driven** research conducted within Research Centres. This approach fosters a **balanced** and **integrated** knowledge-to-value chain.

Short-term objectives of TEC4 initiatives include:

- Developing innovative, knowledge-based solutions and services with high export potential;
- Leveraging internationally competitive research and innovation capabilities;
- Contributing to the resilience and growth of the Portuguese economy.

Long-term objectives encompass:

- Identifying scientific and technical challenges across diverse fields;
- Harnessing the full potential of INESC TEC in application domains relevant to businesses;
- Establishing and sustaining **virtuous innovation cycles** within each TEC4.

Each TEC4 focuses on a specific market segment and fosters **cross-cluster, multidisciplinary projects**. They actively collaborate with businesses to develop solutions for technology transfer. Each TEC4 also maintains a **strategic agenda** aligned with its market domain, addressing:

- Stakeholder perspectives;
- Strategic roadmap and associated technological roadmap;
- R&D infrastructure evolution to maintain state-of-the-art capabilities and support the roadmap;

TEC4 application areas are aligned with European, national, and regional priorities, fostering internal R&D competencies around socio-economic pillars. Additionally, attracting **international partners** supports INESC TEC's internationalisation strategy, facilitates access to international partners for national companies, and fosters foreign direct investment.

Performance measurement for each TEC4 primarily considers:

- **Level of recognition and activity** within its market (including direct contracts with companies and stakeholders);
- Number of inter-Centre collaborations generated.

TEC4s are not directly involved in project development. Once an opportunity is identified, negotiations occur with relevant Centres, which then manage and execute the project.

Typically, a TEC4 comprises:

- **A defined market domain** represented by businesses and associations;
- **A group of INESC TEC Centres** with multidisciplinary expertise relevant to the market domain;
- **R&D infrastructure** supporting scientific and innovation activities and providing added-value services to businesses.

Each TEC4 follows a structured implementation plan encompassing the following stages:

- **Identification of market segments** where INESC TEC competencies can create value;

- **Assessment of market needs** to identify internal research lines with the highest potential impact on businesses;
- **Evaluation of R&D infrastructure** (laboratories, equipment, demonstration facilities, etc.) to support value-added services for businesses;
- **Identification of potential partners and stakeholders** who can contribute to the TEC4 and its innovation cycle;
- **Definition and alignment of the strategic agenda** for each TEC4 and creation of its advisory board.

The current TEC4 organisation comprises:

- **Seven established TEC4s:**
    - TEC4AGRO-FOOD: Focuses on the agro-food and forestry sectors;
    - TEC4ASD: Addresses Aerospace, Security and Defence sectors;
    - TEC4COMMUNICATIONS: Communications and digital innovation;
    - TEC4ENERGY: Addresses energy-related activities and the energy economy;
    - TEC4HEALTH: Targets activities and the economy related to health and well-being;
    - TEC4INDUSTRY: Concentrates on production technologies, manufacturing, distribution, logistics, and retail;
    - TEC4SEA: Focuses on sea-related activities and the maritime economy.

TEC4s are dynamic organisational models that require periodic evaluation and adaptation to the evolving economic landscape.

7.2 TEC4AGRO-FOOD

Coordinator: Filipe Neves dos Santos

Business Developer: André Sá

7.2.1 Scope and strategy overview

TEC4AGRO-FOOD is INESC TEC's Initiative for Agro-Food and Forestry. TEC4AGRO-FOOD's mission is co-creating the digital (r)evolution in agro-food and forestry through research and technological development in digital technologies and robotics for the creation of long-term value for INESC TEC from customers, markets, and relationships.

TEC4AGRO-FOOD has as main application areas Smart (digitalisation) Precision ("right time, right treatment, right amount, right place") Agriculture and Forestry, Food Security and Bioeconomy. TEC4AGRO-FOOD may act in all phases of the smart precision agriculture/forestry cycle, from variability measurement to action with variable rate technologies (VRT), encompassing data analysis and decision and prescription map:

TEC4AGRO-FOOD's strategy is to consolidate the importance it has achieved at both national and European levels and to sustain the considerable growth verified in the last years, especially since 2017. The presence in the relevant Collaborative Laboratories and National Competence Centres, the established partnerships, with INIAV, Herculano, Sogrape Vinhos and complementary partners, and specially in what concerns Europe, the start or the strengthen of the participation in relevant European programmes/initiatives, are essential to implement the strategy. The existing TEC4AGRO-FOOD's Strategic Plan includes a characterisation of the megatrends and trends in agro-food and forestry, internal and external diagnosis and a medium-long term action plan.

The current focus is on direct contracts and European projects, although not neglecting other sources of funding. Promoting the transfer of intellectual property rights for technologies that are at this stage is also part of TEC4AGRO-FOOD's current focus.

7.2.2 Main objectives for 2026

Continuing the overall strategy of full implementation of portfolio projects, namely at the level of the Aligned with INESC TEC Strategic Plan 2023-2030, in 2026, TEC4AGRO-FOOD is prioritising significant advances in the following Strategic Objectives:

Commitment 2 - Make an impact on the toughest challenges of our time in science, technology, and society, through bold creativity and transformative action.

C2.3. Better align and deliver R&I with industry's needs: research and develop innovative robotics and automation solutions to cope with the labour shortage in agriculture and forestry. KPI: n.º of projects involving robotics and automation.

Commitment 3 - Increase our relevance by closely integrating across science and innovation, disciplines, and ecosystems.

C3.5. Increase our international networking, leadership and competitiveness: strengthen the relationship and, eventually, establish a formal partnership with Wageningen University & Research (WUR), the lighthouse of R&I for agro-food. KPI: no. of projects with WUR.

Commitment 5 - Strive for a sound, sustainable and effective operational model

C5.1. Strengthen the sustainability and resilience of our economic model: redouble efforts with companies to increase direct contracts. KPI: no. of direct contracts with companies.

Jointly with these key advances, in 2026, the other main objectives for TEC4AGRO-FOOD towards its vision are:

- A. redoubling efforts at European level. KPI: no. of European projects.
- B. Make TEC4AGRO-FOOD's most impactful results better known to INESC TEC's relevant internal stakeholders.

7.2.3 Action plan

In 2026, TEC4AGRO-FOOD plans to design and/or implement the following initiatives and actions:

Table 7.1 - Action Plan TEC4AGRO-FOOD

Initiatives	Key Results	Strategic Objectives
Continue to implement TEC4AGRO-FOOD's Strategic Plan	Implementation of TEC4AGRO-FOOD's strategy.	C2.3; C3.5; C5.1
Strengthen the relationship and, eventually, establish a formal partnership with WUR	Stronger relationship and, eventually, formal partnership with WUR.	C3.5
Strengthen or establish contact with the main European project consultants	More European projects.	C3.3
Strengthen or establish contact with the "champions" of coordinating European projects	More European projects.	C3.5
Participate in World FIRA 2026	International networking and notoriety. Robotics and IoT technologies exhibition. Robotics and IoT R&I projects.	C2.3
Participate as "RTD Partner" in AgroIN 2026	National networking and notoriety. R&I projects.	C2.3
Participate in Agromek 2026	Keep abreast of the latest innovations.	C2.3

7.3 TEC4ASD

Coordinator: António Gaspar

7.3.1 Scope and strategy overview

The Aerospace, Security and Defence sectors experience a significant growth, due to increase in air travel, New Space activities and international security context. This opens important opportunities for national and international funding, either under direct industrial contracts or collaborative research activities.

In recent years Portugal has seen the development of local aeronautics industry (OGMA privatisation, new EMBRAER/AERNNOVA factories, new AIRBUS ATLANTIC factory) driving a whole ecosystem of local suppliers. Portugal is also reinforcing its contribution to ESA, enlarging local space market due to geo-return mechanisms. Additionally, Azores will host a space port capable of launching small satellites and able to support the return missions of SpaceRider. And, finally, in Security and Defence, there is a need for disruptive, innovative and cost-effective solutions, under EU programmes (Horizon Europe Civil Security and European Defence Fund), in direct contracts with major European OEMs or in industrial offset programmes associated with new national defence acquisitions, like new fighters or new frigates.

TEC4ASD, covering Aerospace, Security and Defence, is deeply involved in the national and international ASD sector, participating in the Board of the Portuguese national aeronautics, space and defence cluster (AED), in the Executive Board of EASTRO and in the Security and Defence Working Group of EARTO.

Taking advantage of present international context, funding opportunities and national and international networks, TEC4ASD aims to make INESC TEC a relevant player, increasing funding originating from these sectors. Priority will be given to national and European markets, with a special focus on France, benefiting from INESC TEC's Crédit d´Împot Recherche (CIR) accreditation.

7.3.2 Main objectives for 2026

Aligned with INESC TEC Strategic Plan 2023-2030, in 2026, TEC4ASD is prioritising significant advances in the following Strategic Objectives:

Commitment 1 - Excel and innovate across the missions of academia, harnessing the collective strength of our community.

C1.4. Develop closer and deeper relationships with our innovation partners and the broader community

Actions for key indicator "Major contracts with industry":

- Identify and meet new potential partners;
- Regularly meet with partner network, discussing potential opportunities;
- Engage industrial partners, partner RTOs and consulting companies;
- Focus on national and European markets, with a particular attention to France (CIR accreditation).

Commitment 2 - Make an impact on the toughest challenges of our time in science, technology, and society, through bold creativity and transformative action.

C2.3. Better align and deliver R&I with industry's needs

Actions for key indicators "Number of national and international projects in partnerships with industrial players" and "Number of national and international research contracts with industrial players":

- Use collaborative funding mechanisms to establish long-term partnerships with industrial partners, taking advantage of existing sectorial Strategic Research and Innovation Agendas (SRIAs), funding programmes, partner priorities and INESC TEC's competences;
- Promote industrial direct contracts;
- Orchestrate INESC TEC's participation in national and international calls in these sectors, to maximise overall funding, minimise internal competition and promote INESC TEC's image;
- Create sector specific presentation profiles, to support promotional activities.

C2.4. Contribute to the digitalisation of public administration

Actions for key indicator "Number of projects that respond to digitalisation needs of public administration":

- Develop projects addressing digital transformation needs, in the ASD sectors.

C2.7. Communicate scientific and technological achievements and their impact

Actions for key indicators “Participate in high-profile international trade fairs and events and “Laboratory visits and technology open days”:

- Participate in high-profile trade fairs and events, industry days and industrial missions.
- Organise laboratory visits for industrial partners.

Commitment 3 – Increase our relevance by closely integrating across science and innovation, disciplines, and ecosystems.

C3.2. Develop better linkages between knowledge production, development, and market uptake

Actions for key indicator “Number of development and demonstration projects resulting from previous internal research projects”

- Evaluate research results from ongoing and past projects, to launch new initiatives.

C3.5. Increase our international networking, leadership and competitiveness

Actions for key indicator “Number of leading roles in EU PPPs and international networks”

- Maintain participation in EASTRO’s Executive Board, as a gateway to increase space-related projects.
- Actions for key indicator “Number of high visibility international events”.
- Promote participation in international events, such as trade fairs, industry days and industrial missions.

Actions for key indicators “Number of EU projects approved in coordination role” and “Revenue in EU projects.”

- Maximise number of new EU proposals in ASD sectors, actively looking for coordination opportunities.

Commitment 5 – Strive for a sound, sustainable and effective operational model

C5.1. Strengthen the sustainability and resilience of our economic model

Actions for key indicator “International competitive research funding” and “Major contracts with industry and philanthropic funding”:

- Identify diversified international funding opportunities, through new programmes, direct contracts and new instruments, like pre-commercial procurement.

Jointly with these key advances, in 2026, the other main objectives for TEC4ASD towards its vision are:

- Support the evolution and promote the use of the CRM platform, to disseminate, coordinate and orchestrate funding opportunities, among our geographically dispersed organisation.

7.3.3 Action plan

This year, TEC4ASD will design and/or implement the following initiatives and actions:

Table 7.2 - Action Plan TEC4ASD

Initiatives	Key Results	Strategic Objectives
Meeting with national and international entities	New projects	C1.4, C2.3, C2.7, C2.4, C3.2, C3.5, C5.1
Participation in national and international events	Identify new partners and new projects	C1.4, C2.4, C2.7, C3.2
Industrial networking (Clusters, Associations, CoLabs)	Networking and promotion	C1.4, C2.3, C3.5
Support Software Systems	Efficient support of activities	C1.4, C3.2, C3.5

7.4 TEC4COMMUNICATIONS

Coordinator: Manuel Ricardo

7.4.1 Scope and strategy overview

The digitalisation of vertical sectors of economy demands adequate communications networks, services and applications. The next generation of communications systems will be highly configurable and adapted to client needs, increasingly virtualised, and capable of providing also sensing services. The development of such complex systems demands the multi-disciplinary competences INESC TEC owns through its research centres including microelectronics, photonics, energy, robotics, artificial intelligence, computing, and business models.

TEC4COMMUNICATIONS brings together institutions, businesses and associations with the purpose of defining solutions with value for economy and society. Three types of partners are envisaged: producers of communications systems, large enterprise consumers of communications and sensing, and policy makers. The innovation activities addressed by TEC4COMMUNICATIONS will be supported by the new Communications and Machine Perception Laboratory, to be created in Matosinhos, which will consist of a set world-level experimental zones, collocated with space for startup companies and new spaces for reference companies.

7.4.2 Main objectives for 2026

Aligned with INESC TEC Strategic Plan 2023-2030, in 2026, TEC4COMMUNICATIONS is prioritising significant advances in the following Strategic Objectives:

C1.4. Develop closer and deeper relationships with our innovation partners and the broader community. The TEC4COMMUNICATIONS business strategy will enable the identification of relevant innovation partners and the characterisation of the relationships to be established.

C3.5. Increase our international networking, leadership and competitiveness. The laboratory facility to be created will increase our international visibility and improve INESC TEC international networking and the Porto region competitiveness.

Jointly with these key advances, in 2026, the other main objectives for the TEC4 towards its vision are:

- Help create the new Communications and Machine Perception Laboratory. This infrastructure shall consist of a set of experimental zones, including a reconfigurable anechoic chamber, a sensing laboratory, an autonomous systems arena, an electronics laboratory, and a computational cluster.
- Define the business strategy of TEC4COMMUNICATIONS. After identifying a Business Developer, a business strategy will be defined based on the key competences of INESC TEC in the field and in cooperation with INESC TEC Centres.
- Create the INESC TEC innovation identity in Communications. This identity shall be defined and announced in the INESC TEC web site under its Innovation section to help the business strategy.

7.4.3 Action plan

This year, TEC4COMMUNICATIONS will design and/or implement the following initiatives and actions:

Table 7.3 - Action Plan TEC4COMMUNICATIONS

Initiatives	Key Results	Strategic Objectives
INESC TEC business strategy for Communications	Business Plan, Dec/2026	C1.4, C3.5
INESC TEC Innovation identity in Communications	INESC TEC website updated with relevant information on communications, Dec/2026	C1.4, C3.5

7.5 TEC4ENERGY

Coordinator: João Peças Lopes

Business Developer: Alberto Jorge Bernardo

7.5.1 Scope and strategy overview

The energy sector faces the challenge of decarbonising society and the economy. TEC4ENERGY aligns with EU policies on societal challenges and smart specialisation, with emphasis on the digitalisation of the electric power system, decentralisation of generation when using renewable power sources, user-centric, market-driven approaches, large-scale integration of RES, development of an electric mobility infrastructure, smart grids, renewable energy communities and green hydrogen in a diverse energy mix.

TEC4ENERGY utilises INESC TEC's expertise to deliver innovative energy solutions, addressing societal challenges and industry needs. Through industry collaboration, it aligns with European strategic goals and PNEC2030 decarbonisation targets.

7.5.2 Main objectives for 2026

Aligned with INESC TEC Strategic Plan 2023-2030, in 2026, TEC4ENERGY is prioritising significant advances in the following Strategic Objectives:

C1.4. Develop closer and deeper relationships with our innovation partners and the broader community

Major contracts with Industry

TEC4Energy is focused on creating last long relationships with industry, valorising and transferring INESC TEC's R&D through strategic partnerships and contract programmes with the energy sector in Portugal and abroad when dealing with topics like offshore wind energy projects, provision of conventional and new ancillary services, development of voltage control tools to support decisions in dispatch centres, large scale deployment of electric mobility and namely development of ultra-fast charging stations, controlling the operation of electrolysers to provide grid services, developing solutions for the hybridisation of wind farms with solar PV and batteries, fostering renewable energy communities, security of supply assessment, evaluation of grid renewable hosting capacities and deployment of energy storage solutions, with emphasis on batteries and reversible hydro power plants.

Follow collaborative global electrical industry community initiatives and other strategic events

TEC4Energy should follow the innovative work of CIGRE, by participating actively in strategic working groups (WG C2.45), workshops and conferences promoted by this organisation, and become involved in collaborative initiatives like the working groups of ETIP SNET, SET Plan and CRESYM that will open doors for participation in new EU projects.

C1.5. Provide Innovative learning experiences

New training programmes

In addition to technology transfer, TEC4ENERGY is committed in promoting the knowledge created at INESC TEC through the development of advanced training initiatives for technical staff of important energy market players, involving the most relevant topics in the energy sector like the use of knowledge-based tools and AI for energy system management, utilisation of energy storage-based solutions, planning of wind off-shore solutions, H2 technology for system services and security of supply, as well as new ancillary services and products with the corresponding markets.

C2.3. Better align and deliver R&I with industry's needs

Promote new national and international projects with relevant partners in the energy sector, endeavouring long-lasting and synergistic relationships, allowing for the cross-fertilisation of R&D in domains relevant for the success of the energy transition, involving the electrification and digitalisation of the economy and the exploitation of complementary vectors like the hydrogen.

C2.7. Communicate scientific and technological achievements and their impact

Develop the following top priority initiatives, to divulge INESC TEC innovation capabilities:

- Participation in high-profile international Energy trade fairs and events as exhibitors with booths with demonstration of products and ideas born at INESC TEC and hosting pitch sessions.
- Promote regular industrial laboratory visits to the x-energy Lab (formerly known as Smart Grids and Electric Vehicles Laboratory), the Optical and Electronic Technologies Research Laboratory, the Robotics and Autonomous Systems Laboratory and the Laboratory of Computer Graphics and Virtual Environments.
- Organisation of the Energy Technology Open Day event with the presentation of prototypes and solutions with high TRL related to innovative products that can bring added value to the energy industry needs in Power and Energy, Robotics, Autonomous Systems, Fiber Optics, Virtual Environments, Cybersecurity and Telecommunications. The next session of this event may address specific subtopics, such as AI and cybersecurity and their impact on the energy field. Moreover, this event is intended to be aligned with the new orientations for further entrepreneurship strategies, namely, to foster spinoffs from INESC TEC, driven by energy targeted technology. In this regard, the organisation of the next event will comprise the participation of INESC TEC's Entrepreneurship and Spin-offs Office.

TEC4Energy intends to increase its participation in international fairs (e.g. ENLIT 2026) and consolidate the Energy Technology Open Day, disseminating the results of INESC TEC's research projects and seeking to create new business and entrepreneurial opportunities. In addition, the INESC TEC laboratory infrastructures will be strategically repositioned to deal with emergent energy topics, also increasing the exploitation of the x-energy Lab and other laboratories when providing services to industrial companies related to the energy segment.

C3.5. Increase our international networking, leadership and competitiveness

As previously mentioned, TEC4Energy intends to organise the participation in major international events and will also continue its mission to seek partnerships with international partners, both on the European continent and on emerging markets such as Africa with the support of the World Bank, African Development

C5.1. Strengthen the sustainability and resilience of our economic model

As stated previously, one of TEC4ENERGY main efforts is in the promotion of R&D projects targeting the energy sector, capitalising INESC TEC's technology and innovation competencies and resources. TEC4Energy incentivises variability in the typology of projects endorsed, covering a spectrum ranging from contract programmes to the provision of advanced consulting services, tenders for competitive research funding, both nationally and internationally. This effort aims to increase the contractualisation of R&D and innovation services, contributing for the sustainability and resilience of INESC TEC economic model.

7.5.3 Action plan

Table 7.4 - Action Plan TEC4ENERGY

Initiatives	Key Results	Strategic Objectives
Participation in international fairs like the ENLIT 2026 in Vienna, Austria	Increase visibility among potential partners and customers, increase networking opportunities, show new solutions and technology, attract talent	Increase the international recognition; Exploit new markets and opportunities; Show technological and innovation capabilities; Foster collaboration opportunities. C1.4, C2.3, C2.4, C3.2, C5.1
Organisation of the “Energy Technology Open Day” event	Increase visibility among potential partners and customers, increase networking opportunities, show new solutions and technology, attract talent	Increase recognition in Portugal; Exploit new opportunities; Show the organisation technological / innovation capabilities; Foster collaboration opportunities. C1.4, C2.3, C2.4, C3.2, C5.1
Promotion of regular industrial laboratory visits	Exposure of the latest research and development activities and products serving Energy needs; Increase of network opportunities; Foster new service contracts; Present innovations, and experiments that are at the forefront of technology.	Gain exposure to the latest research and development activities in the field of high technology leading to new contracts that involve the exploitation of the laboratorial infrastructures for testing and other services; Foster networking and new R&D projects. C1.4, C2.3, C2.4, C5.1
Follow collaborative global electrical industry community initiatives and other strategic events	Access to the latest industry trends, innovations, and best practices; Build a global network that can lead to collaborative projects; Stay informed about international standards.	Promote and foster major contracts with industry. C1.4

7.6 TEC4HEALTH

Coordinator: To be appointed

7.6.1 Scope and strategy overview

TEC4HEALTH strategically implements a market-driven approach in R&D with the aim of engaging all value chain actors and processes within the healthcare and well-being sectors. To accomplish this, TEC4HEALTH explores opportunities in the health sector where technology needs and roadmaps align with INESC TEC's competencies. Recognising the pivotal role of positioning itself not only between academia and the market but also by directly engaging with healthcare institutions, TEC4HEALTH considers the importance of establishing robust connections with these institutions. Such connections are crucial, serving as both the foundation for research challenges and a valuable source of data for analysis. Additionally, forging strong ties with the innovation ecosystem is imperative, providing the opportunity for contributions to have a tangible impact through technology adopters.

Through collaborative endeavours with partners, TEC4Health is dedicated to fostering the advancement of prosperous projects, contracts, and technology transfers. This strategic approach aims to secure funding for INESC TEC's research initiatives, actively seeking opportunities with entities interested in investing in technology development, as well as engaging in dedicated programs that support and drive forward R&D.

7.6.2 Main objectives for 2026

Aligned with INESC TEC Strategic Plan 2023-2030, in 2026, TEC4HEALTH is prioritising significant advances in the following Strategic Objectives:

Commitment 1 - Excel and innovate across the missions of academia, harnessing the collective strength of our community.

C1.4. Develop closer and deeper relationships with our innovation partners and the broader community

- Ensure all existing collaboration protocols are up-to-date and aligned with current priorities.
- Strategic visits to existing and new partners to reinforce collaborations and identify unmet needs.

Commitment 2 - Make an impact on the toughest challenges of our time in science, technology, and society, through bold creativity and transformative action.

C2.3. Better align and deliver R&I with industry's needs

- Conduct a comprehensive reassessment of market R&D needs to align priorities with emerging trends.

C2.4. Contribute to the digitalisation of public administration

- Pilot innovative solutions addressing specific challenges in hospital systems and public health administration.

C2.7. Communicate scientific and technological achievements and their impact

- Develop engaging content formats (e.g., success stories, interactive reports, and multimedia presentations) to highlight the transformative potential of INESC TEC innovations in advancing healthcare and addressing critical challenges in the health sector.

Commitment 3 – Increase our relevance by closely integrating across science and innovation, disciplines, and ecosystems.

C3.2. Develop better linkages between knowledge production, development, and market uptake

- Strengthen ties with local clusters to expedite the commercialisation of research outcomes.

C3.5. Increase our international networking, leadership and competitiveness

- Expand participation in Horizon Europe by targeting underexplored opportunities and initiating high-profile consortia.

Jointly with these key advances, in 2026, the other main objective for the TEC4 towards its vision is:

- [T4H1] Reassess internal R&D alignment by implementing a "Center-to-Impact" approach, encouraging each centre to define pathways from their existing capabilities to tangible societal and healthcare outcomes.

7.6.3 Action plan

This year, TEC4HEALTH will design and/or implement the following initiatives and actions:

Table 7.5 - Action Plan TEC4HEALTH

Initiatives	Key Results	Strategic Objectives
Organisation of internal meetings with INESC TEC Centres	More project proposals Proposals with higher quality	T4H1
Study and plan of European calls	More project proposals Proposals with higher quality	C3.5
International businesses visits	Increased visibility of INESC TEC within the health technology area Improve relationships	C2.3, C3.5, T4H1
National businesses visits	Increased visibility of INESC TEC within the health technology area Improve relationships	C1.4, C2.3, C2.4, T4H1
INESC TEC participating in relevant networks and clusters	Increased visibility of INESC TEC within the health technology area Networking and promotion	C2.3, C3.5
Enhancing technologies	Secure more technology transfers New products and spin-offs	C1.4, C2.3, C2.4, C2.7, C3.2, C3.5, T4H1
Participation in national and international fairs	Projects with new entities Market scouting (access to sectorial roadmaps)	C1.4, C2.3, C3.5
Healthcare technology demonstration days	Increased visibility of INESC TEC within the health technology area Projects with new entities	C1.4, C2.3, C2.4, C2.7, C3.5
(Re)take collaboration protocols	Improved alignment with partner needs Strengthened long-term relationships	C1.4, C2.3, C2.4, C3.5
(Re)engage with strategic partners	Improved relationships New project opportunities	C1.4, C2.3, C2.4, C3.5

7.7 TEC4INDUSTRY

Coordinator: Américo Azevedo

Business Developers: Pedro Senna and Vasco Teles

7.7.1 Scope and strategy overview

TEC4INDUSTRY is one of INESC TEC's strategic interfaces, acting as the bridge between research and industry. Its mission is to reinforce the competitiveness and sustainability of industrial ecosystems by aligning scientific knowledge, technological capability, and market needs.

In 2026, TEC4INDUSTRY continues to pursue a dual strategy that ensures balanced interaction between INESC TEC and the industrial environment:

- a **push strategy**, leveraging INESC TEC's scientific and technological excellence to transfer innovation, technologies, and knowledge to the market;
- and a **pull strategy**, capturing the evolving needs and challenges of companies to feed back into INESC TEC's research and development agenda.

Through this dynamic model, TEC4INDUSTRY acts as a translator and enabler, ensuring that the research developed within INESC TEC effectively contributes to industrial competitiveness, while simultaneously bringing real industrial challenges into the research and innovation process.

The initiative remains aligned with the INESC TEC Strategic Plan 2023–2030 and with the European twin transition, digital and sustainable, by promoting collaboration across disciplines and sectors. Its priorities for 2026 include:

- Consolidating the mechanisms that connect research and industry (e.g., iiLab, technology transfer, and consultancy services);
- Scaling collaborative projects and demonstrators that integrate digitalisation, automation, and sustainability principles;
- Strengthening the link between knowledge generation and market application, ensuring impact, relevance, and long-term value creation for companies and society.
- Positioning INESC TEC's market-ready solutions for industrial ecosystems through branding, licencing and patenting initiatives in partnership with TTO.

Ultimately, TEC4INDUSTRY's goal is not to position itself as an independent reference, but to act as a strategic arm of INESC TEC, capable of amplifying the institute's scientific impact through market engagement, and of bringing industrial intelligence back into research, fostering a continuous and virtuous innovation cycle.

Through these strategic directions, TEC4INDUSTRY aims to contribute to a resilient, adaptive, and human-centric industrial ecosystem, capable of responding to global challenges with innovation, agility, and responsibility. Our ambition is to continue transforming knowledge into impact - fostering a digital, sustainable, and competitive industry for the future.

7.7.2 Main objectives for 2026

Aligned with the INESC TEC Strategic Plan 2023–2030, in 2026 TEC4INDUSTRY will strengthen its mission as the operational and strategic arm of INESC TEC that connects research excellence with industrial and societal impact.

Through a dual push–pull strategy, TEC4INDUSTRY will both transfer technological and scientific outputs to the market (push), and bring back the challenges and needs of the industrial ecosystem to guide applied research and innovation (pull).

C1.4 - Develop closer and deeper relationships with our innovation partners and the broader community, and C1.5 - Provide innovative learning experiences.

TEC4INDUSTRY will deepen engagement with industrial partners, business associations, and innovation clusters, creating stronger collaborative ecosystems that connect academia, research, and industry.

The focus will be on building long-term partnerships, fostering joint research and innovation initiatives, and expanding advanced training activities through iiLab and sector-based capacity-building programs.

C2.3 - Better align and deliver R&I with industry's needs.

TEC4INDUSTRY will reinforce the alignment between INESC TEC's scientific capabilities and the concrete demands of the industrial sector. This includes the development of a systematic process for technology and market intelligence, identification of emerging industrial challenges, and creation of "push–pull innovation loops" that ensure the effective translation of knowledge into market-relevant solutions.

C2.4 - Contribute to the digitalisation of public administration.

Building on INESC TEC's digital transformation expertise, TEC4INDUSTRY will collaborate with public sector entities and agencies supporting industrial policy (such as IAPMEI and ANI) to disseminate best practices in digitalisation, automation, and data-driven management applied to public–industrial interfaces.

The goal is to support policy alignment and digital maturity across the industrial ecosystem.

C2.5 - Raise our contribution to inform debates on issues that matter to society.

Through the "push-pull innovation loops", develop short industry briefs on the current state of industrial maturity, Nationally and European, combined with INESC TEC's R&D Centres scientific developments, to be shared with INESC TEC's Foresight and Public Policy Office for development of policy-oriented briefings.

C2.7 - Communicate scientific and technological achievements and their impact.

TEC4INDUSTRY will strengthen communication channels to disseminate case studies, demonstrators, and technology transfer success stories, highlighting the tangible outcomes of R&I collaboration with companies.

This will include the publication of an annual "Industry Impact Report" and active participation in national and European innovation forums.

C3.1 - Build stronger knowledge-based and multidisciplinary R&D ecosystems.

TEC4INDUSTRY will drive national and international initiatives to establish and make use of technology infrastructures in co-creation and collaboration with external entities, to upscale the demonstrations developed internally and establish our Tis as pilot-driven and market-readiness platforms for partners. Position iiLab as a key Technological Infrastructure for the testing and development of solutions in co-creation initiatives with industrial players, leveraging the Testbed infrastructure and adapted business model.

C3.2 - Develop better linkages between knowledge production, development, and market uptake.

TEC4INDUSTRY will expand its consulting and technology transfer services, promoting integrated initiatives that connect R&D outputs with industrial adoption.

Special focus will be placed on demonstration pilots, cross-centre collaboration, and scaling of the iiLab platform as a testbed for the digital and sustainable transformation of industry.

C3.5 - Increase our international networking, leadership, and competitiveness.

TEC4INDUSTRY will consolidate its presence in European innovation ecosystems by actively participating in strategic consortia, contributing to EU working groups (e.g., manufacturing, digitalisation, circular economy), and coordinating or co-leading international projects.

The objective is to strengthen INESC TEC's visibility and influence at the European level, reinforcing its role as a reliable industrial innovation partner.

C5.1 - Strengthen the sustainability and resilience of our positioning and operational model.

TEC4INDUSTRY will contribute to INESC TEC's sustainability by expanding industry-driven revenue streams, through contract research, consulting services, and European project participation.

The initiative will also implement an internal monitoring and KPI framework to measure the impact of its actions on industrial competitiveness, sustainability, and knowledge transfer efficiency.

7.7.3 Action plan

Table 7.6 - Action Plan TEC4INDUSTRY

Initiatives	Key Results	Strategic Objectives
Provide new and more services	Increase INESC TEC revenues.	C1, C2, C3, C5
Redevelop TEC4Industry portfolio	A comprehensive and updated portfolio that can be used in contacts with companies	C3
Produce state of the art white papers / reports	2 reports that showcase INESC TEC positioning in the field of technology and policy for industry	C2, C3
Visits to companies	Get to know new companies/challenges as initial contacts to be further developed.	C2, C3
Welcome visits from companies to INESC TEC and its Labs.	Showcase INESC TEC competences, capabilities, infrastructure, and solutions.	C2, C3
Develop workshops with companies	(Co-develop) Companies' requirements.	C2, C3
Participate in external events	Raise awareness and promote INESC TEC and TEC4Industry's competences and capabilities.	C3
Close collaboration with iiLab	A better alignment between TEC4Industry and iiLab's activities; develop possible new activities at iiLab aligned with feedback from companies.	C1, C2, C5
Increase in advanced training activities	2 new courses (themes to be defined) Provide more training.	C2, C3, C5

7.8 TEC4SEA

Coordinator: Eduardo Silva

7.8.1 Scope and strategy overview

TEC4SEA addresses the innovation challenges posed to industries working in the Blue Economy, facing a considerable number of challenges, driven by the increasing world population, urbanising and ageing, the pressure on global food supplies, increasing demand for metals and minerals, energy demand and energy transition, ocean health, climate-ocean interactions and climate changes, geopolitical tensions, increasing technological revolutions among others. It covers a wide range of established and emerging industries such as marine living resources (fisheries and aquaculture), extraction of non-living resources (minerals, oil & gas), marine renewable energies, desalination of water, maritime and fluvial transport, as well as coastal and maritime tourism. Examples of activities directly related to the marine environment include processing food of marine origin, marine biotechnology, shipbuilding and repair, port activities, technologies and equipment, healthy ocean (pollution and biodiversity), defence, and security for the Sea environment.

The 2026 strategy will be focused on scouting emerging and consolidated markets, namely related with port logistics, operation and maintenance in offshore structures, fisheries and fishing transformation. The TEC4SEA will also support the consolidation of the business partnerships pillar at the centre of excellence in Ocean research and Engineering – INESCTEC.OCEAN – leveraging the already existing infrastructures such as TEC4SEA, Aguçadoura test-site (CEO – Companhia de Energia Oceânica) and the HUB AZUL de LEIXOES 1, supporting the establishment of regional innovation ecosystems connected with other leading regions of Europe, expand the R&D+I activities around the Atlantic ocean.

7.8.2 Main objectives for 2026

Aligned with INESC TEC Strategic Plan 2023-2030, in 2026, TEC4SEA is prioritising significant advances in the following Strategic Objectives:

Commitment 1 - Excel and innovate across the missions of academia, harnessing the collective strength of our community.

Leading the development of strategic infrastructures (like Hub Azul de Leixões 1 and the Aguçadoura Test-site – Companhia de Energia Oceânica (CEO)) that will strengthen the relations with the academic and economic ecosystem, TEC4SEA contributes to the strategic commitments: “C1.1. Develop closer and deeper relationships with our innovation partners and the broader community”

C1.4. Develop closer and deeper relationships with our innovation partners and the broader community

TEC4SEA together with INESCTEC.OCEAN aims to strengthen long-term collaboration with industry, public bodies, and ocean-economy stakeholders, ensuring that marine technologies respond directly to real societal and environmental needs. The initiative will promote structured engagement through co-creation sessions, joint pilots, and shared testbeds.

Commitment 2 - Make an impact on the toughest challenges of our time in science, technology, and society, through bold creativity and transformative action.

TEC4SEA via the INESCTEC.OCEAN initiative is contributing to the development and establishment of value- and supply-chains, leveraging the INESCTEC´s, regional and national stakeholders’ competencies, into some of the most relevant challenges, such as decarbonisation, digitalisation and circular economy. These will contribute to: “C2.1. Better align and deliver R&I with industry's needs”, and “.C2.3. Communicate scientific and technological achievements and their impact”.

C2.3. Better align and deliver R&I with industry's needs

TEC4SEA together with INESCTEC.OCEAN will be focus on establish cooperation among industry and promote stakeholder forum to better understand the industry challenges in the different markets related to sea activities.

C2.4. Contribute to the digitalisation of public administration

TEC4SEA intends to support public entities with digital tools for maritime spatial planning, environmental monitoring, and coastal management, leveraging advanced sensing, data analytics, and robotics.

C2.7. Communicate scientific and technological achievements and their impact

TEC4SEA together with INESCTEC.OCEAN will actively disseminate breakthroughs in key technological achievements under the R&D developments of INESCTEC to the quadruple-helix ecosystem (civil society, policymakers, academia and industry), highlighting their societal, environmental, and economic relevance.

Commitment 3 – Increase our relevance by closely integrating across science and innovation, disciplines, and ecosystems.

Leading complementary strategic infrastructures, devoting them to new scientific developments and opening them to national and international cooperation (e.g., INESCTEC.OCEAN- Human Resources capacitation; TEC4SEA infrastructures – means to test and operate in the ocean; Aguçadoura test site – offshore test and validation of renewable energy solutions, robotics, digital solutions, sensors and telecommunications; Hub Azul de Leixões Pólo 1 – ocean basin for scaled test of offshore renewable solutions, robotics, sensors, scientific diving, etc.) impacts in the strategic commitments: “C3.1. Develop better linkages between knowledge production, development, and market uptake” and “C3.2. Increase our international networking, leadership and competitiveness”

C3.2. Develop better linkages between knowledge production, development, and market uptake

TEC4SEA, with the support of INESCTEC.OCEAN and gathering also the infrastructural competences of INESCTEC, such as the Aguçadoura test-site, TEC4SEA infrastructure and Hub Azul de Leixões I, aims to accelerate the pathway from fundamental research to market-ready marine technologies by integrating testing infrastructures, demonstration campaigns, and industry-driven pilot projects. With its various ongoing initiatives, TEC4SEA promotes the INESCTEC full value-chain competencies in technology development and upscaling, from early concept to lab testing, ocean-basin testing, and pre-commercial tests at the Aguçadoura Test-site.

C3.5. Increase our international networking, leadership and competitiveness

TEC4SEA together with INESCTEC.OCEAN aims to expand its role in leading European consortia on ocean robotics and offshore systems, thereby strengthening global partnerships and positioning INESC TEC as a leading reference in the blue-technology landscape.

Commitment 5 – Strive for a sound, sustainable and effective operational model

The combined set of initiatives and commitments to 2026, both in terms of the consolidated initiatives like INESCTEC.OCEAN and new initiatives (e.g., regional innovation valley, EU Atlantic strategy, Excellence Hubs), R&D projects and collaborative infrastructure´s, supports the Strategic Commitments: “C5.1. Strengthen the sustainability and resilience of our economic model”.

C5.1. Strengthen the sustainability and resilience of our economic model

TEC4SEA with INESCTEC.OCEAN will diversify its funding sources by combining competitive European and National projects, service provision to industry, and strategic collaborations, ensuring financial stability for large-scale ocean research infrastructures.

7.8.3 Action plan

Table 7.7 - Action Plan TEC4SEA

Initiatives	Key Results	Strategic Objectives
Consolidating INESCTEC.OCEAN	New high-prestige grants Contracts with national and international industries Stakeholders' engagement and increased national and international visibility	C1.4; // C2.3; C2.4; C2.7 // C3.2; C3.5; // C5.1
Led the shared research infrastructures for ocean technologies and energy transition (Hub Azul de Leixões I)	Engage with the national and international stakeholders. Advances in the operation, management of the Hub Azul de Leixões I	C2.3 // C3.2 // C5.1
Leverage the TEC4SEA infrastructure and the Aguçadoura test-site	Contracts with national and international industries Stakeholders' engagement and increased national and international visibility	C2.3 // C3.2 // C5.1
Support the establishment of regional innovation ecosystems connected with other leading regions of Europe	The establishment of formal and informal networks of stakeholders and regions aligned with common strategies and objectives.	C1.4 // C2.3; C2.4 // C3.2; C3.5 // C5.1
Expand the R&D+I activities around the Atlantic Ocean	Support the strategy alignment, connections, and activities with strategic players in the Atlantic Contracts with national and international industries	C2.3; C2.4 // C3.2 // C5.1
Promote national visits and contacts with the ecosystem	Strengthen and connect the regional and national ecosystem, develop new opportunities and projects	C1.4 // C2.7 // C3.5
Participation in international fairs, expositions, and relevant conferences	Promote INESC TEC results and activities in relevant forums Develop international activities with key players	C1.4 // C2.7 // C3.5
Develop marine resources business awareness for the Galicia, Canarias, and Atlantic African countries.	Develop awareness and positioning for INESC TEC activities and results	C1.4 // C2.3; C2.4; C2.7 // C3.2; C3.5 // C5.1

8 RESEARCH AND DEVELOPMENT CENTRES

8.1 CTM - Centre for Telecommunications and Multimedia

Coordinators: Filipe Ribeiro and Vitor Grade Tavares

8.1.1 Centre scope and vision

The Centre for Telecommunications and Multimedia (CTM) consists of about 100 full researchers and other 100 students and external researchers working on scientific and technological challenges related to Artificial Intelligence (AI), Bioengineering (BIO), Communications (COM), and Computer Science and Engineering (CSE) scientific domains. CTM is fully committed to the vision and mission of INESC TEC and specialises them as follows:

Vision: A lively and sustainable world where networked intelligence enables ubiquitous interaction with sensory-rich content.

Mission: To research and develop advanced systems and technologies that enable autonomous communications systems, media knowledge extraction, and immersive ubiquitous multimedia applications.

Aligned with the related scientific domains (SD), vision and mission, research at CTM is organised in five research lines: optical, radio and electronics engineering, wireless networking, media platforms and audio-visual content management, machine perception, and medical image analysis.

8.1.2 Main objectives for 2026

Highlights

Aligned with INESC TEC Strategic Plan 2023-2030, in 2026 the Centre is prioritising significant advances in the following Strategic Objectives:

Raise the contribution and visibility of our research: Keep improving the quality of journal publications (KPI: % Q1 journals; Target ≥ 85%) and conference papers (KPI: % CORE A*/A/B or equivalent h5-index; Target: ≥ 75%). Create flagship prototypes around the solutions and technologies developed within the Centre (KPI: number of prototypes; Target: 4).

Involvement in the leadership of scientific initiatives: Promote and support the engagement of researchers in editorial boards of leading journals (KPI: number; Target: 3). Support in all levels the submission to the ERC program (KPI: number; Target: 1).

Increase the international embedment of our community: Attract visiting researchers and promote mobility of CTM researchers (KPI: number of researchers; Target: 3) through INESC TEC International Visiting Researcher Programme, Erasmus programs, or other interchange programs.

Improve attraction of talent: Attract new PhD students by developing and sustaining longer-term engagement initiatives, such as extracurricular research and innovation projects, within a genuine research environment. (KPI: number of new students; Target: 8).

CTM will keep a strong effort to develop new project proposals.

Research

In 2026, CTM aims to achieve the following key research outcomes:

Hardware integration and compilation support for spatial accelerators in RISC-V SoCs: a SoC design and supporting compilation flow where fast mapping methods offload computations onto spatial array–type accelerators coupled to a host RISC-V core, leveraging an ISA extension for direct accelerator control and embedding accelerator usage into binary code, thus unifying compilation for heterogeneous SoCs. (SD: CSE)

Sustainable Reconfigurable Intelligent Surface (RIS): Experimental demonstration of a RIS prototype integrating memristor-based tuneable elements, enabling bistable control states with zero static power consumption. The system highlights the potential of non-volatile electronics for sustainable and energy-efficient control of large-scale electromagnetic surfaces, with direct implications in energy-autonomous reconfigurable networks. (SD: COM)

Zero-touch node positioning and link optimisation in robotic-borne wireless networks: development of algorithms and mechanisms for autonomous node positioning and resource management in robotic-borne wireless networks, optimising LoS for improved performance in next-generation networks. (SD: COM)

ML-based solutions to model, optimise, and enhance wireless networks: development of semantic encoders/decoders, cross-layer algorithms, and Network Digital Twins using ML-based approaches to achieve context-aware, self-adaptive and robust communications solutions for demanding scenarios. (SD: COM, AI)

Vision-aided closed-loop control of Reconfigurable Intelligent Surfaces (RIS): Experimental validation of a vision-aided RIS platform implementing closed-loop beam steering based on real-time RGB-D video input. The system tracks user movement and dynamically adjusts the RIS reflection pattern, enabling adaptive link optimisation. A robotic arm executes pre-programmed motion trajectories to emulate mobile users, while a marker-based multi-camera motion capture system provides ground truth for performance evaluation. (SD: COM)

Theory and methods for high-level semantic analysis of music: A model of musical structure ambiguity from Fourier periodicities in symbolic and musical audio signals. It aligns with auditory perceptual qualities and fosters applications in digital humanities for style recognition and description, as well as supporting explainable AI descriptions of musical latent spaces. (SD: SCE)

Large-Scale synthetic industrial human–machine operation dataset: a large-scale image dataset for video captioning and future event prediction fin industrial environments. (SD: AI)

Efficient-Proto-Caps - a parameter-efficient and interpretable capsule network for lung nodule characterisation: a lightweight and inherently interpretable model that combines capsule networks with prototype learning, promoting clustering of lung nodule visual attribute representations using an innovative Davies-Bouldin Index. (SD: AI, BIO)

AI-based tool for a safer and evidence-based clinical decision in locoregional treatment towards patient engagement and data retrieval: models specific to each type of breast cancer treatment and aesthetically aware content-based image retrieval module with a data-driven optimised similarity measure. (SD: AI, BIO)

Generative multimodal reasoning: novel methods aiming at understanding, synthesising, and explaining complex real-world phenomena by integrating and generating data across text, vision, audio, and other modalities. (SD: AI)

Innovation

In 2026, CTM aims to achieve the following key innovation outcomes:

Modular RIS demonstrator with distributed control: Design and implementation of a large-scale reconfigurable intelligent surface based on modular, tile-level architecture with local control and distributed intelligence. The system will be assembled as a scalable demonstrator, enabling live testing of programmable reflection patterns and integration with user-tracking systems.

Wi-Fi + RIS based localisation system: A deployable node platform/device for localisation, with firmware, control API, and cloud integration for industrial testbeds. Potential integration into industrial pilot sites.

Digital Twin of Next-generation Networks using Multimodal Sensing: software for digital representation of a 6G network, capable of reproducing realistic RF propagation conditions and sensing the environment through RF and video. This will enable testing of different implementations of the multimodal RAN Intelligent Controller (mmRIC – patent pending), for example, using video to proactively detect occlusions between a gNB and a UE, and act on the gNB repositioning and/or link adaptation.

Repositionable Mobile 5G Base Station: development of a Mobile 5G Base Station prototype for the establishment of novel on-demand self-adaptable networking infrastructures that can transparently extend wireless connectivity to terminals operating in terrestrial and maritime environments. This year, the focus will be on the integration with a commercial 5G Core, the miniaturisation and packaging of the prototype for ease of deployment, and its demonstration in a real environment.

Wine detection and label processing toolkit: Mobile app for detecting wine bottles and grocery products in home environments and automatically process labels to support visual impaired consumers.

Augmented-Vision-Based Smart Quality Control in industrial environments: a solution for automating quality control of plastic packages using Computer Vision and Augmented Reality.

Automated Perforator Analysis for Breast Reconstruction: streamline integration of AVA into medical imaging platform PACScenter leveraging DICOM encapsulation for seamless data exchange within a Vendor Neutral Archive (VNA), aiding surgeons and improving pre/intra-operative planning and guidance.

CINDERELLA APProach: AI-based tool for patients to visualise photographs of "similar" cases of locoregional treatment in breast cancer through a cloud-based healthcare platform optimising the match of expectations and the satisfaction.

Complementary advances

Jointly with these key advances, in 2026, the other main objectives for the Centre towards its vision are:

Commitment 1 - Excel and innovate across the missions of academia, harnessing the collective strength of our community.

Raise the contribution and visibility of our research: Keep improving the quality of journal publications (KPI: % Q1 journals; Target ≥ 85%) and conference papers (KPI: % CORE A*/A/B or equivalent h5-index; Target: ≥ 75%).

Provide innovative learning experiences: Organise extracurricular projects and/or workshops for undergraduate and master's students to promote experiential learning and bridge academic knowledge with practical applications (KPI: number of initiatives; Target: 2).

Develop closer and deeper relationships with our innovation partners and the broader community: Strengthen the collaboration between companies, Master's students and researchers to develop PhD topics that are aligned with the needs of industry and competitive for the FCT PhD Studentships calls in a non-academic environment. (KPI: number of applications; Target: 5).

Commitment 4 – Cultivate an attractive, people-centred and talented community

Improve attraction and retention of world-class talent: Actively participate in summer internships and capstone projects, involving students in R&D activities, in a true research and team environment, to promote retention. (KPI: number of students in these programs; Target: 40).

Commitment 5 – Strive for a sound, sustainable and effective operational model

Strengthen the sustainability and resilience of our economic model: Organise meetings with TEC4 and centres to take a higher advantage from INESC TEC's ecosystem on opportunities seeking. Pursue international project opportunities through competitive funding calls and collaboration with industry to drive applied research and innovation (KPI: number of projects; Target: 4).

8.1.3 Main initiatives planned for 2026

The Centre will carry the following initiatives and actions towards the above objectives and as part of its continued activity towards its vision:

Table 8.1 - CTM

Initiatives	Key Results	Strategic Objectives
Multidisciplinary, multi-partner international demonstration at EuCNC 2026.	High-visibility demonstration showcasing INESC TEC's research infrastructures and integrated capabilities across communications, sensing, computer vision, and AI.	C1.1, C1.2, C1.6 C2.7, C3.1
CTMeet Up meetings.	Team interaction, science communication, and training.	C2.7
Building up Lab capacity, visibility and outreach to potential companies.	Improve external visibility, demonstrate expertise, and showcase the ability to provide innovative solutions to create new service opportunities.	C1.3, C2.3
Continue to lead the research and innovation component of the new laboratory facilities at Leça.	Improve the quality of our infrastructures. Strengthen multidisciplinary R&I.	C5.3, C3.1, C3.2
Organize meetings with INESC TEC Centres and TEC4.	Identify cross-centre research possibilities to foster stronger project proposals and better define the R&D opportunities.	C3.1
Internships and workshops for undergraduate and MSc students.	Attraction of future MSc and PhD students Higher visibility and recognition in the partner academic institutions.	C1.1, C1.5, C4.1, C4.3
Promote the "World Sleep Day Initiative".	Introduce and showcase the sleep research within INESC TEC collaborators and the public.	C2.6

8.2 CAP - Centre for Applied Photonics

Coordinators: Paulo Marques and Luís Coelho

8.2.1 Centre scope and vision

CAP research activities objectives are grounded in fundamental physics and optical engineering, driven by the demonstration of practical solutions to demanding problems and by the development of intellectual property with envisaged economic valorisation.

CAP activity spans integrated optics and microfabrication, optical sensing, and quantum optical engineering. The overall objective is to work towards the incorporation of devices as novel perception tools, such as: 1) spectral imaging technologies, including analytical laser induced breakdown spectroscopy (LIBS) and ultraviolet/visible spectroscopy systems, providing real-time analysis in hazardous environments, 2) optical sensing technologies enabling in situ and remote detection of physical, chemical and biological parameters detection in demanding application scenarios and 3) the deployment of accessible and versatile analogue quantum simulators and all-optical processing systems.

8.2.2 Main objectives for 2026

Highlights

Aligned with INESC TEC Strategic Plan 2023-2030, in 2026 the Centre is prioritising significant advances in the following Strategic Objectives:

Commitment 1 – Excel and innovate across the missions of academia, harnessing the collective strength of our community

C1.1. Raise the contribution and visibility of our research

The CAP laboratories are in the Department of Physics and Astronomy, Faculty of Sciences, University of Porto. Each year, CAP hosts numerous students from the Department, offering opportunities for master's theses, internships, and PhD programs. CAP also makes some of its research infrastructure available to support advanced master's and PhD courses, ensuring that students have access to high-quality research equipment and contributing to course development. These activities help to disseminate our research and enhance its visibility.

Commitment 2 – Make an impact on the toughest challenges of our time in science, technology, and society through bold creativity and transformative action.

C2.2. Better align and deliver R&I with industry's needs

A key aspect of CAP's activities is maintaining a portfolio balanced across technology readiness Levels (TRLs). Although achieving this balance remains a challenge, significant efforts have been made in strengthening relationships with industry both as project partners and through service provision. These collaborations have increased steadily in recent years, and we will continue to pursue this objective.

C2.5. Communicate scientific and technological achievements and their impact

The communication of R&D activities and results should be carried out more systematically, using the available channels to reach both scientific and broader audiences.

Research

CAP's scientific domains focus on photonic sensing and on optical systems and devices for analogue quantum simulation, organised around a set of core research pillars. The advancement of photonic-based Intelligent tools explores innovations in optical materials and sensing technologies for environmental monitoring, medical diagnostic, and industrial applications. The development of photonic-based devices represents a transformative approach to real-time monitoring and analysis across a range of sectors. By integrating cutting-edge optical materials with advanced biological and chemical sensing capabilities,

these solutions aim to provide accurate and reliable data collection for applications in environmental monitoring, aquaculture systems, biomass production, and energy distribution.

Enabling resilient and reliable photonics-based solutions for biological and chemical sensing

This approach combines state-of-the-art fabrication techniques, such as femtosecond laser direct writing, with the development of dielectric photonic crystals, plasmonic sensors, and molecularly imprinted systems. By integrating high-performance spectroscopy, sensor fusion strategies, and plasmonic materials, we address complex biological and chemical challenges. This direction will enhance monitoring accuracy while ensuring the scalability and adaptability of solutions to meet dynamic industry demands. To achieve these objectives, the focus for the coming year will include:

- Employ the femtosecond laser direct writing technique to process optical materials and develop integrated optics, gratings, and waveguides. This technology will be used to fabricate integrated optical devices in thin film Lithium Niobate.
- Continue fabricating neuromorphic integrated optical devices which involves very low loss optical waveguides and devices (e.g., directional couplers, MMI's, interferometers). We will continue to evaluate the feasibility of hybrid integration of glass written waveguides with electro-optic polymers, allowing fast switching.
- Micromachining three-dimensional glass structures for optofluidics and cantilevers for sensing.
- Process optical materials using femtosecond-laser direct writing to create assisted-lithography 3D structures, combined with one-dimensional thin-film technology to enhance optical sensors sensitivity.
- Developing optofluidics systems that support multiparameter sensing in fluidic environments.
- Innovate in advanced photonic structures, such as dielectric photonic crystals and plasmonic sensors, enhanced by high-quality nano-coatings.
- Synthesize and integrate custom-designed nanoparticles to improve sensitivity and detection performance.
- Deliver environmental monitoring solutions by combining chemical processes with optical transducers for improved air and water quality assessment; address complex industrial challenges by integrating complementary optical methods to meet intricate sensing requirements.
- Prioritize real-time biological and chemical monitoring in inshore and offshore aquaculture systems; optimize biomass production through tailored optical sensing; and customize sensing systems for large-scale industrial energy-distribution monitoring.
- Advance oceanographic sciences by developing integrated biological and chemical optical sensors for comprehensive environmental monitoring of marine ecosystems.
- Initiate clinical-domain research using dual-mode optoelectrochemical systems for liquid biopsies.
- Develop early-stage optoelectrochemical sensors capable of detecting circulating biomarkers at low concentrations, either at point-of-care or in centralised settings, aiming for cancer diagnostics.

Photonic Sensing for Extreme Environments

This activity will focus on the development and optimisation of distributed sensing systems for permanent deployment in infrastructure and extreme environments, using two distinct technologies: HDAS and OPTODAS. These approaches aim to deliver complementary and innovative results:

- Monitor ultra-long-distance submarine cables already installed; conduct seismic detection and oceanographic studies on the island of Madeira; and enable maritime surveillance by integrating DAS with submarine fibre-optic cables and machine-learning algorithms for vessel detection and classification.

- Monitor high-voltage power-distribution cables for bird-collision detection, including installing cameras for direct impact observation, contributing to the assessment of deterrence measures and biodiversity conservation.
- Compare state-of-polarisation (SOP) techniques with HDAS and OPTODAS to evaluate the complementarity and robustness of measurements along the cables.
- Develop optical-fibre sensors exploiting the Vernier effect for railway applications.
- Develop Fano-like FBGs for use as high-frequency acoustic sensors (above 100 kHz), aimed at advanced monitoring of rail bogies.

Quantum Technologies, Optical computing devices, and Spectroscopy

- Design and deploy a reconfigurable optical setup for fast and energy-efficient optical computing in the optical domain, integrated with a sensing technology for an edge computing proof-of-concept.
- Develop quantum technologies for hyperspectral imaging and sensing, exploring Hong-Ou-Mandel Microscopy and Undetected Photons framework, committing to deploy new quantum microscopy setups with world-unique wavefront shaping capabilities.
- Design flexible multimodal spectral imaging hardware architecture with modular and scalable configuration to be adapted to diverse industrial applications (e.g. raw materials, contaminant detection, recycling).
- Build digital twins for quantum photonic devices: modelling and forecasting optical quantum coherence research challenge to optimise chip topology and operating set-points to preserve quantum states of light (fidelity, indistinguishability, squeezing level) under realistic imperfections and disturbances.

Innovation

On the topic of quantum technologies and optical computing we will deliver two world-unique solutions:

- Reconfigurable all-optical computing setup for the interrogation of speckle-based sensors using the extreme learning machine architecture, with unmatched time and energy-efficiency comparing with electronic counterparts.
- Hyperspectral imaging system using the concept of Quantum Imaging with Undetected Photons, entering mid-IR and applying it for the first time for mineral identification.
- Integration of optical, electrochemical, and microfluidic modules into a single compact unit, optimised for performance and already undergoing patenting (Project eSPRCancer).
- Installation of a prototype for real-time monitoring of water parameters in an aquaculture pilot - a fully autonomous system with sampling, onboard data processing, and communication (Project INNOAQUA).
- Deployment and validation of two prototypes in distinct pilots: (i) real-time monitoring of the fabrication of concrete floating platforms and their long-term operation; (ii) gas-leak detection in energy storage and distribution lines using spectroscopy and nanotechnology (Project PRR ATE).

Complementary advances

Jointly with these key advances, in 2026, the other main objectives for the Centre towards its vision are:

Commitment 3 – Increase our relevance by closely integrating across science and innovation, disciplines, and ecosystems, **C3.3. Increase our international networking, leadership, and competitiveness**

The number of participations in international projects, particularly European, has been steadily increasing, and the Centre will continue to encourage such involvement.

Commitment 5 – Strive for a sound, sustainable, and effective operational mode, **C5.2. Improve quality, management, and usage of our infrastructures**

CAP's activity relies heavily on laboratory-intensive work, making the maintenance, replacement, and management of such infrastructures a constant challenge. Every opportunity has been used to improve laboratory functionality through space optimisation (which remains limited) and the acquisition of new equipment. Making certain equipment available to the surrounding scientific community will also be considered, and a pay-per-use model will be implemented for selected equipment.

8.2.3 Main initiatives planned for 2026

The Centre will carry the following initiatives and actions towards the above objectives and as part of its continued activity towards its vision:

Table 8.2 - CAP

Initiatives	Key Results	Strategic Objectives
Monitor the journals and conferences where the Centre's researchers aim to publish and present their work.	Increase the quality and volume of publications and enhance visibility at top-tier conferences.	C1.1
Strengthen consortium-building and proposal development via EU-call scouting, partner matchmaking, and PI mentoring.	Increase the number of international funded projects	C.3.5
Co-create R&I roadmaps with industry, expand service provision, and rebalance the portfolio for a healthy TRL mix.	Increase industry-funded revenue with new industrial partners and increase service contracts.	C2.3

8.3 CRAS - Centre for Robotics and Autonomous Systems

Coordinators: José Miguel Almeida and Nuno Cruz

Assistant to the Centre Coordinator: Bruno Fernandes

8.3.1 Centre scope and vision

The Centre for Robotics and Autonomous Systems (CRAS) at INESC TEC advances research and innovation in robotics, intelligent systems, and autonomous technologies to address environmental, industrial, and societal challenges. Operating at the intersection of science, engineering, and technology, CRAS develops solutions that enable autonomous systems to perform safely, sustainably, and cooperatively in complex and dynamic environments - from the deep sea to the sky, and from industrial plants to natural ecosystems.

CRAS's research combines autonomy, perception, and interaction to empower robotic systems capable of operating in harsh, unstructured, and GNSS-denied environments. The Centre leverages advances in AI, perception, decision-making, and control to promote autonomy that is explainable, robust, and trustworthy. Its scientific activities cover all stages of technological maturity, from fundamental research to demonstration in operational scenarios, ensuring direct societal and industrial impact.

Aligned with INESC TEC's Strategic Plan 2023–2030, CRAS aims to be an international reference in robotics and intelligent autonomy, contributing to the digital and green transitions. Through scientific excellence, innovation, and collaboration with academia, industry, and public institutions, the Centre strives to create the next generation of autonomous systems that extend human capabilities, accelerate environmental sustainability, and reinforce Europe's technological sovereignty.

8.3.2 Main objectives for 2026

Highlights

Aligned with the INESC TEC Strategic Plan 2023–2030, in 2026 CRAS will concentrate its efforts on advancing research excellence and operational sustainability, consolidating the Centre's position as a key national and international player in robotics and autonomous systems.

Commitment 1 - Excel and innovate across the missions of academia, harnessing the collective strength of our community

CRAS will continue to increase the quality, visibility, and global reach of its scientific activity, promoting high-impact publications in leading journals and conferences in robotics and intelligent autonomy. The Centre will reinforce its commitment to open science, through the publication of datasets, field data, and open-source tools, and by deepening its engagement in international scientific initiatives.

CRAS has strong representation in international organisations that range from scientific societies to industry consortia and regulatory bodies, ensuring that its expertise contributes to shaping the global robotics and autonomy agenda. The Centre also plays an active role in the organisation of international events and workshops, contributing to the dissemination and exchange of knowledge within the scientific and industrial communities.

A significant focus will be placed on international collaboration and training, expanding CRAS's hosting of foreign students and visiting researchers. The Centre maintains ongoing collaborations with Grenoble INP (France) and IIT Madras (India), typically receiving around ten students per year for internships, and regularly welcomes researchers through the INESC TEC International Visiting Programme. These initiatives promote the international embedment of the CRAS community and contribute to the development of young scientific talent in robotics and intelligent systems.

Commitment 5 – Strive for a sound, sustainable and effective operational model

In 2025, CRAS achieved a significant increase in income from services, both in value and in the diversity of clients and solutions offered. Building on this success, the Centre will continue to expand its portfolio of R&D and technological services, establishing new partnerships with industry and public entities, while consolidating recurring collaborations.

CRAS will also capitalize on the funding secured under the Portuguese Recovery and Resilience Plan (PRR) to develop and demonstrate industrial solutions supporting the exploration of offshore renewable energy. These efforts will strengthen CRAS's position as a trusted partner for innovation in marine and industrial robotics, ensuring long-term engagement in strategic national and European initiatives.

The Centre will maintain its focus on infrastructure sustainability, particularly within the TEC4SEA platform, optimising asset management and promoting shared access, service provision, and industry collaboration to ensure an efficient and resilient operational model.

Research

In 2026, CRAS will advance research in autonomous systems operating in harsh, dynamic, and GNSS-denied environments, focusing on the integration of navigation, perception, and control across marine, aerial, and terrestrial domains.

RL1 – Navigation and Control

Research will address robust and cooperative navigation for heterogeneous robotic systems, improving multi-vehicle coordination and decision-making under communication constraints. Key developments will include information-driven path planning, environment-aware control, and advances in autonomous underwater docking for long-duration operations.

RL2 – Interaction with the Environment

Work on autonomous underwater manipulation and intervention will continue, with focus on grasping and object handling under uncertain and dynamic conditions, and on safe interaction from moving platforms, supporting inspection, maintenance, and sample collection tasks.

RL3 – Perception, localisation and Mapping

CRAS will expand research on multi-modal perception and semantic mapping, combining visual, LiDAR, Radar, acoustic, and fibre-optic (DAS-based) acoustic sensing. These capabilities will support a cross-border surveillance system integrating multiple detection technologies across fixed and mobile platforms (UAVs, ASVs, AUVs, and buoys), enabling localisation, 3D mapping, target tracking, and early detection of environmental or security threats, in all types of operational scenarios.

RL4 – Platforms and Operations

Efforts will target innovative robotic platform design and autonomous docking and recharge systems, increasing endurance and energy efficiency. Research will also include digital twin-based mission planning and cooperative operations among multiple vehicles.

Through these coordinated research lines, CRAS will reinforce its contribution to intelligent, sustainable, and cooperative autonomy, supporting European and national goals in environmental monitoring, maritime security, and offshore renewable energy.

Innovation

CRAS's innovation activities in 2026 will focus on translating its research advances into operational robotic systems and industrial applications, particularly in the marine and offshore domains, from shallow to deep sea. The Centre will consolidate its role as a technology provider and demonstration partner in projects supporting environmental monitoring, infrastructure inspection, and sustainable energy exploration.

INNOV1 – Robotic Systems Prototyping and Upscaling

CRAS will continue developing and demonstrating autonomous surface and underwater vehicles for monitoring and inspection of offshore infrastructures, including cables, moorings, and subsea platforms. These systems will integrate new sensors and modules for early detection of anomalies and biofouling, supporting industrial partners in offshore renewable energy initiatives funded under the Portuguese Recovery and Resilience Plan. In the scope of Trident HEU Project, tests of a new innovative AUV and seabed nodes for deep sea monitoring operations will start in 2026.

INNOV2 – Navigation, Mapping, and Cooperative Operations

Innovation will focus on cooperative navigation and mapping solutions, extending CRAS's expertise to real-world deployments. Key demonstrations will include autonomous docking operations, adaptive underwater mapping, and cross-domain cooperation between aerial, surface, and underwater vehicles.

INNOV3 – Component Development for Robotics Systems

The Centre will advance specialised sensing components such as underwater stereo vision modules, structured-light systems, and multi-frequency acoustic transducers. Particular attention will be given to integration with distributed fibre-optic sensing (DAS), enabling robotic interaction with large-scale acoustic monitoring networks for multiple applications.

INNOV4 – Underwater Acoustics for Positioning and Communications

CRAS will strengthen its expertise in underwater acoustic systems, focusing on cooperative positioning, low-power modems, and adaptive communication strategies for heterogeneous robotic fleets. New developments will emphasize interoperability with existing observatories and support networks for multi-robot operations.

Together, these innovation lines will ensure that CRAS's scientific outputs evolve into mature, field-tested technologies, reinforcing the Centre's position as a strategic partner for industry and public institutions in domains ranging from ocean observation to sustainable offshore development.

Complementary advances

Jointly with these key advances, in 2026, the other main objectives for the Centre towards its vision are:

Commitment 1 - Excel and innovate across the missions of academia, harnessing the collective strength of our community.

CRAS will reinforce its international scientific presence, maintaining active representation in scientific, industrial, and regulatory organisations, and contributing to the organisation of international conferences and workshops. The Centre will continue to host international students and visiting researchers, strengthening ongoing collaborations with Grenoble INP (France) and IIT Madras (India), and supporting knowledge exchange within the INESC TEC International Visiting Programme.

Commitment 2 - Make an impact on the toughest challenges of our time in science, technology, and society, through bold creativity and transformative action.

Research and innovation will continue to address environmental and societal challenges, particularly through the development of robotic technologies for sustainable ocean use, offshore renewables, and critical infrastructure inspection. CRAS will maintain its contribution to EU Missions and national priorities related to the ocean, climate adaptation, and digital transformation.

Commitment 3 – Increase our relevance by closely integrating across science and innovation, disciplines, and ecosystems.

CRAS will strengthen collaboration with other INESC TEC centres and external partners to combine expertise in AI, sensing, energy, and communications. These synergies will promote cross-domain innovation and support the transition of scientific results into operational solutions with industrial and societal relevance.

Commitment 4 – Cultivate a people-centred and talented community

The Centre will continue to attract, mentor, and train young researchers, providing opportunities for scientific and technological development through participation in national and international projects. Training activities, PhD supervision, and research internships will support the development of a skilled, diverse, and inclusive robotics community.

Commitment 5 – Strive for a sound, sustainable and effective operational model

CRAS will consolidate the growth in service income achieved in 2025, expanding the diversity of clients and solutions. The Centre will leverage PRR funding to develop and demonstrate industrial robotic solutions for offshore renewable energy, while ensuring the sustainability of research infrastructures, particularly within TEC4SEA, through efficient management and shared use.

8.3.3 Main initiatives planned for 2026

The Centre will carry the following initiatives and actions towards the above objectives and as part of its continued activity towards its vision:

Table 8.3 - CRAS

Initiatives	Key Results	Strategic Objectives
Update and disseminate the list of journals and conferences in which the Centre researchers will endeavour to publish	Increase the quality of the publications	C1.1
Organisation of international events for industry and research partners (WAVES, SOE)	Strengthen scientific leadership; obtain new or deepen current leads with industry	C2.7
Participation in demonstration events with international visibility (REPMUS26).	Increase cooperation with NATO Navies and other participating institutions	C3.2, C3.5
Exhibition in the European Robotic Forum 2026, in Stavanger, Norway	Positioning of INESC TEC as a relevant player in the Robotics community	C3.5, C4.1

8.4 C-BER - Centre for Biomedical Engineering Research

Coordinator: João Paulo Cunha

Assistant Coordinator: Duarte Dias

8.4.1 Centre scope and vision

The Centre for Biomedical Engineering Research (C-BER) vision is to be a "promotor of scientific knowledge excellence through fundamental and applied research, advanced training and innovation in Biomedical Engineering".

To accomplish its mission, C-BER is guided by the following scientific goals:

- To create interdisciplinary knowledge enabling the innovation and technology transfer with economic impact.
- To develop bioengineering methods, instruments, products and tools for the prevention, early detection and diagnosis of different types of diseases, aging-related impairments, rehabilitation, occupational health and wellness.
- To contribute to the development of advanced neuro-technologies at the frontier of engineering and neuroscience.

C-BER scientific activity is mainly inserted in the Bioengineering research domain of INESC TEC, but the biomedical engineering transversal scientific application also inserts C-BER at other research domains such as Artificial Intelligence, Robotics and Photonics.

8.4.2 Main objectives for 2026

Highlights

Aligned with INESC TEC Strategic Plan 2023-2030, in 2026 the Centre is prioritising significant advances in the following Strategic Objectives:

C1.1 and C1.2 by continuing our strategic plan to develop the "**Porto.Neuro+: Centre of Excellence for Translational Neuroengineering**", a 30M€ joint project, led by C-BER, with all related regional labs within U.Porto and our close international partners: Pisa BioRobotics Institute and Munich LMU Neurology Department submitted to EU Teaming for Excellence tender. This strategic path is now underway, disrespectful of the tender result and all partners are aligned to progress towards the plan we proposed together to the EU.

Four new FCT projects had their kick-off in 2025 and will expand throughout 2026 reinforcing key research lines from C-BER, namely the cardiac imaging line (CardioComplete), the multimodal cardiac auscultation line (Pulse) and the gastroenterology imaging line (EndoRadiomics, Gate). All of these are multidisciplinary projects involving highly relevant national clinical partners, namely the Cardiology Service of the ULS Gaia e Espinho and the Gastroenterology Service of IPO Porto.

In 2026 the two ongoing RRP projects Texp@ct and HfPT will come to an end, and we will focus on the technology transfer to the respective consortium industrial partners. Additionally, to continue the long-lasting research efforts on wearable systems for rehabilitation and sports and EMG analysis, we plan to submit new project proposals at national and European levels in cooperation with key international partners.

Research

The main objectives of the 3 Research Labs (RL) for 2026 will be the following:

RL1. Biomedical Imaging Lab - Coordinator: Miguel Coimbra - Given the team, funding and partner relationship maturity of four of our key research lines (lung imaging, cardiac imaging, gastroenterology imaging and multimodal auscultation) we expect 2026 to be a productive year for scientific breakthroughs

and publications, paving the way for innovation actions in 2027. This maturity will also be used to explore EU-funded opportunities.

RL2. BioInstrumentation Lab - Coordinator: Miguel Velhote Correia - Enhance the test and measurement capabilities for the development of wearable and flexible electronic devices and sensors.

RL3. NeuroEngineering Lab - Coordinator: João Paulo Cunha Further evolve our Neuroengineering Lab infrastructure by installing a brain functional near-infrared spectroscopy (fNIRS) system integrated with our video-EEG system, improving our R&D capacity and differentiating our lab in the neuroscience community. Furthermore, we will study the possibility to purchase a Portable Low-Field brain MRI machine to complete our brain imaging infrastructure.

Innovation

C-BER spin-off startup#3 - inSignals Neurotech - has raised a 400k€ grant to support the planned development of a ground-breaking digital health platform for movements disorders. After a clinical trial at Maastricht University Hospital, we supported our startup to start a new international clinical study in Santiago de Compostela University Hospital, Spain, for Parkinson Disease patient's data collection. These trials aim to improve and validate at an international level the medical device we've been developing for the evaluation of Parkinson Disease motor symptoms. In 2024 we co-founded one more startup (#4 SeedSight) that has raised 1.78M€ of seed VC capital in 2025 and we plan to explore more tech transfer by 2026 to improve the startup's potential to be successful. One more startup (#5) is being incubated resulting from IP of our lab (not disclosable at this moment).

European patent application (EP25166487.6) for RePick Annotator with favourable opinion of evaluators through European Search Report

Under the RRP projects, innovative software solutions are being developed for sports activities recognition and evaluation, indoor localisation from a single inertial measurement unit, and high-density electromyography advanced signal processing and pattern recognition. These solutions will be registered and licensed to industrial partners in the respective consortia and eventually to other interested companies.

Complementary advances

Jointly with these key advances, in 2026, the other main objectives for the Centre towards its vision are:

Commitment 1 - Excel and innovate across the missions of academia, harnessing the collective strength of our community.

C1.1. Raise the contribution and visibility of our research

- C-BER is a very active centre in high impact publications (Q1). In the next year we plan to increase our percentage in Q1 publication, but also to participate in more clinical national and international conferences. We believe that such publications jointly with clinicians will increase our visibility and will allow to foster further research lines internationally.

C1.2. Increase our involvement in the leadership of scientific initiatives

- C-BER is currently, and for the first time in INESC TEC, the leader (jointly with CTM) of an 18 organisation from 10 countries European Project in the Health area. AI4Lungs, a ~7M€ project is pursuing a disruptive new research line on lung diseases AI approach to patients' stratification at a European level which we believe will show INESC TEC potential in this area for further projects. In 2026, C-BER also aims to do the first submission to the European Research Council (ERC) aiming solidify international cooperation with key groups that have been cooperating in a high impact scientific area.

Commitment 2 - Make an impact on the toughest challenges of our time in science, technology, and society, through bold creativity and transformative action.

C2.3. Better align and deliver R&I with industry needs

- In 2026, C-BER aims to develop some P2030 projects led by industry. Furthermore, we will continue to develop joint contracted developments with our spin-offs.

C2.6. Engage in direct dialogue with the public

- C-BER and its spin-offs will be running in 2026 a least 2 clinical studies with ethical approval in national and international clinical centres, which is of major importance to retrieve not only clinical feedback from the results we are achieving (with new data processing methodologies), but also patients (public) feedback on the systems themselves. Newly submitted projects may expand this aspect of our outreach.

Commitment 3 – Increase our relevance by closely integrating across science and innovation, disciplines, and ecosystems.

(e.g. Ecosystems and technology transfer)

C3.1. Build stronger knowledge-based and multidisciplinary R&I ecosystems

- Multidisciplinarity is key for Biomedical Engineering. C-BER is constantly partnering and bringing to our ecosystem different profiles related with this area. In 2026, besides engineers and data scientist from different fields (electrotechnical, informatics, biomedical, ...) we envision to bring new experts on the field of biology, medical doctors and nursing to support in co-design our systems, data collection and annotation.

C3.5. Increase our international networking, leadership and competitiveness

- Besides the AI4Lungs leadership that will leverage INESC TEC and C-BER networking at an international level, C-BER members are the main organizers of the IEEE EMBS flagship conference on Body Sensors Network that will be held in Porto in 2026 (IEEE BSN 2026) and resulted from our involvement on IEEE by leading for the last 8 years the IEEE EMBS Portugal Chapter, gaining access to the worldwide IEEE network. Such network will also endorse our visibility for a higher competitiveness at a European level. Also, strong relation with Brazil and Rwanda (CMU-Africa) will endorse C-BER competitiveness in the area of Point-of-Care (PoC) technologies.

Commitment 5 – Strive for a sound, sustainable and effective operational model

C5.3. Improve quality, management and usage of our infrastructures

- C-BER is expanding its laboratories and enabling to perform a higher number of experiments with state-of-the-art equipment. Recently, a new 64-channels video-EEG system was acquired with fMRI synchronisation capabilities in order to support new studies on the neuroscience field. For 2026 we are planning to add a functional near-infrared spectroscopy (fNIRS) capability to our video-EEG system. Also, a new laboratory for students was created at FEUP, and we are equipping it with several medical/health systems that are already supporting student projects to be performed with a much better support and guidance, increasing students' motivation to pursuit new research areas.

8.4.3 Main initiatives planned for 2026

The Centre will carry the following initiatives and actions towards the above objectives and as part of its continued activity towards its vision:

Table 8.4 - C-BER

Initiatives	Key Results	Strategic Objectives
Purchase of state-of-the-art fNIRS technology; Lab re-design and small construction	Cutting-edge laboratory facility for INESC TEC and students' scientific research	5.3
Enter ERC ecosystem	Submit 1 proposal to the ERC program	1.2
Porto.Neuro+: Centre of Excellence for Translational Neuroengineering	Continue efforts, visit partners and submit more proposal(s) at EU level for this strategic R&D centre	3.5

8.5 CPES - Centre for Power and Energy Systems

Coordinators: Manuel Matos and Ricardo Bessa

Assistant to the Centre Coordinator: Catarina Oliveira

8.5.1 Centre scope and vision

CPES envisions a sustainable, decarbonised, and intelligent energy system that accelerates the energy transition towards resilience, efficiency, and climate neutrality. It promotes the large-scale integration of renewable energy sources (RES), supports electrification, and enhances energy efficiency across all sectors. Its mission contributes to reducing greenhouse gas emissions and fostering an inclusive, sustainable energy ecosystem for citizens, communities, and industries. The Centre focuses on modelling, optimisation, and operation of energy systems at multiple scales, addressing both isolated and interconnected networks. It combines model-based and data-driven approaches to capture system dynamics under uncertainty and high-RES variability. Leveraging emerging technologies such as artificial intelligence (AI), data spaces, and interoperability frameworks, and combining them with conventional tools, CPES advances forecasting, decision-making, and coordination across the energy value chain. Its outcomes (concepts, models, methodologies, and software tools) support decision-making by diverse stakeholders, including citizens, energy utilities, system operators, regulators, and policymakers.

8.5.2 Main objectives for 2026

Highlights

Aligned with INESC TEC Strategic Plan 2023-2030, in 2026, the Centre is prioritising significant advances in the following Strategic Objectives:

- **C1.1 – Raise research contribution and visibility.** Promote high-impact publications and active participation in major conferences (EEM, ISGT, MEDPOWER, SEST), while reinforcing leadership in global working groups (IEEE, CIGRE, ETIP SNET, GridFM).
- **C1.2 – Strengthen leadership in scientific initiatives.** Expand participation in the Linux Foundation (LF) Energy ecosystem through the CUPID and InterConnect projects, shaping open-source and interoperability standards.
- **C1.3/C3.2 – Advance technology commercialisation and market readiness.** Mature software platforms (e.g., RECreation, MOMENTO, CEVESA, GDBN, Predico) to TRL 8-9 via industrial pilots and licensing partnerships. Promote interoperability of grid-forming converters to support vendor-agnostic commercialisation.
- **C1.6 – Increase international embedment.** Foster global partnerships and leadership in EU-funded projects to enhance visibility and competitiveness.
- **C2.1 – Develop impactful research aligned with SDGs.** Advance hybrid AC/DC grid modelling, AI-driven control, and digital twins using Sentinel, OPAL-RT, and TEF platforms. Integrate AI agents and microservices to expand adoption.
- **C2.3 – Deliver demonstration-oriented innovation.** Collaborate with PRR ATE and EU partners on pilots combining open- and closed-source licensing to accelerate technology uptake.
- **C3.1/C3.5 – Build multidisciplinary and international ecosystems**. Leverage synergies across energy systems, AI, and statistics in projects such as HE HYNET, HE BeFlexible, HE AI4REALNET, and PRR ATE, coupling Energy Data Space components with digital twins to enable interoperable solutions.

Research

Research activities on high-RES integration in power systems will focus on advancing understanding and control of power system dynamics. Efforts will include integrating epistemic uncertainty into dynamic simulations to capture the effects of inaccurate models or parameters in new grid assets, thereby

improving the reliability of system-wide stability assessments and exploring hybridisations between physical models and classical statistical theory. Work will also address the definition of functional requirements and interoperability guidelines to enhance dynamic stability in future hybrid networks, as well as the dynamic behaviour of systems with large electrolysers, employing a Kuramoto-based dynamic model of the Iberian system calibrated to the April 2025 blackout.

For offshore hybrid power plants, optimisation strategies will minimise losses and enhance reliability through improved internal grid layouts, while integrated energy management frameworks will coordinate hydrogen and battery storage assets. New control strategies will enable offshore farms to actively support grid restoration procedures.

The growing complexity of grid operation with RES requires new software tools for planning and managing power system infrastructures. Developments will include multi-domain computational models capturing steady-state, dynamic, and transient behaviour across LV and MV hybrid AC/DC networks. Optimisation-based control algorithms will be proposed for power flow, voltage, and reactive power management in multi-terminal DC grids. Further work will develop coordination, islanding, and restoration methods for secure MVDC system integration based on hybrid AC/DC modelling and analysis. Leveraging digitalisation, research will advance neuro-symbolic models to explain power system dynamics, define remedial actions for congestion management, and evolve operational heuristics. Investigations will also cover dynamic protection adaptation using SCADA/PMU data and wide-area control, alongside ML-based adaptive protection for IBR-dominated grids, considering virtualised online adaptation, fuzzy clustering, and real-time fault detection under non-standard inverter transients. Reliability and resilience will be further enhanced through sequential Monte Carlo simulation and AI-accelerated load-flow computation, supported by the GridFM initiative for foundation models, to improve hybrid AC/DC grid planning.

In multi-energy systems, research will advance the AI-driven integration of renewables, batteries, and green hydrogen through forecasting and model predictive control, enabling the creation of rigorous digital twins for multiple facilities. Reinforcement learning and advanced optimisation will support the predictive scheduling of electrolysers, batteries, and electric vehicle (EV) charging, improving flexibility, reducing costs and emissions, and providing decision-aid to the industry. Network-aware optimisation frameworks will be developed in both centralised and decentralised forms, employing secure multiparty computation and ADMM for tractable multi-energy dispatch.

The integration of RES and demand-side flexibility will drive the rethinking of wholesale electricity markets. Research will design mathematical formulations to include emerging markets (inertia, voltage control, hydrogen), capacity mechanisms, and assess the influence of decentralised generation and mobility sectors on market outcomes and system stability, including V2X-enabled EVs. Water value assessment methods will also be explored through hybrid and data-driven approaches.

Finally, low-TRL research will explore Wi-Fi sensing for demand-side management, with applications such as presence detection and load disaggregation. LLMs and foundation models will be leveraged to enhance forecasting and interpretability of optimisation models. Circular business models will integrate uncertainty-aware data envelopment analysis, while a causal and stochastic optimisation framework for EV charging stations will dynamically optimise flexibility envelopes and market bids to maximise profitability.

Innovation

Innovation activities will focus on four main areas: (a) construction of test beds and enhancement of simulation capabilities with digital twins; (b) development of closed- and open-source software for licensing and community creation; (c) hardware solutions and embedded intelligence; and (d) addressing energy industry requirements such as interoperability.

For test beds and simulation, two TEFs for AI in energy will continue to be built through EU-funded projects - AI-EFFECT for local energy communities and microgrids, and EnerTEF for offshore renewable energy. Digital twins for wide-area protection validation will be coupled with real-time hardware-in-the-loop and virtual IEC 61850 IED environments, enabling pre-deployment validation, operator training, and scenario generation. A simulation model of the Portuguese power grid will also be developed, providing an accessible framework for analysis and validation. At the building level, a technical management system for

monitoring and operation will be deployed, supporting the execution and verification of agents, microservices, and optimisation models.

Closed-source software developments will expand RECreation and introduce new platforms for business model assessment (PRR ATE), aggregation of distributed energy resources via MOMENTO (PRR NGS), and an enhanced CEVESA simulator for evaluating technology profitability under alternative market and policy designs. Additional work includes state estimation and control for the GE Vernova zonal control product, a transmission network planning tool, and pre-commercial software for predictive management of green hydrogen. A digital twin-based optimisation framework will integrate multiple pilots - ports, microgrids, H_2 hubs, EV charging, and thermal storage - through interoperable APIs, dashboards, and KPIs. In open-source software, major projects include Predico for the Elia Group, integration of CUPID and InterConnect into LF Energy for interoperability, and further development of HEMS on top of the FlexiHome platform (from InterConnect), incorporating new microservices, human-machine interfaces, and agentic AI for tariff optimisation and maintenance support. A central platform to host open-source LLMs will be finalised to support research and innovation activities within the centre.

Hardware developments will target smart DER gateways for distributed control and resilience under cyber or communication incidents (PRR ATE), laboratory-scale wireless power transfer for mobility and robotics (CRIIS), an edge test bed on RPi5 devices with IEEE2030.5 LPC over NATS and embedded LLMs (HE COSMIC), and an innovative buck–boost converter interface for hydrogen electrolysers enabling voltage support (PRR H2DRIVEN).

Finally, interoperability will be advanced through the consolidation of the SEMAPTIC framework (HE ENPOWER), ensuring seamless data and service exchange across forecasting, optimisation, and digital twin tools.

Complementary advances

Jointly with these key advances, in 2026, the other main objectives for the Centre towards its vision are:

Commitment 1 - Excel and innovate across the missions of academia, harnessing the collective strength of our community.

Consolidate multi-energy digital twin and optimisation methods into open benchmarks and reference implementations. Strengthen international collaboration through joint PhDs, MSCA DN, and EU networks. Maintain leadership in global WGs (GridFM, IEEE, ETIP SNET, EERA, Adra, CIGRE) and reinforce scientific excellence via high-impact publications and conferences. Expand advanced training in flexibility, reliability, and renewable integration. Foster open-source (LF Energy) and open-data (Sentinel) communities with HASLab and enhance PhD collaboration through MSCA and WIDERA Twinning initiatives.

Commitment 2 - Make an impact on the toughest challenges of our time in science, technology, and society, through bold creativity and transformative action.

Achieve large-scale gains in flexibility, reliability, and CO_2 reduction by advancing validated multi-energy solutions into industry-adopted tools and guidelines. Shape national and EU agendas on multi-energy integration. Develop operator and promoter tools for resilient, decarbonised power systems. Enhance market tools beyond energy, integrating decentralisation, AI-based scenario analysis, and uncertainty modelling. Demonstrate resilient protection under cyber-physical failures to strengthen critical infrastructure and grid resilience. Push for industrial adoption of the analytics market, building on proven readiness with Elia Group (Belgium TSO).

Commitment 3 – Increase our relevance by closely integrating across science and innovation, disciplines, and ecosystems.

Promote real-world pilots showcasing CPES tools with local impact, strengthening ties with municipalities. Build an innovation pipeline linking research, standards, and market uptake through open interfaces, data spaces, and co-creation with industry. Coordinate EU projects to shape scientific and innovation agendas, lead at least three Horizon Europe proposals, and release open-source software integrated into LF Energy.

Commitment 4 – Cultivate an attractive, people-centred and talented community

Advance targeted recruitment and mentorship, supporting young researchers through progressive responsibilities, recognition, and BII/BI grants in power systems. Attract top talent with cutting-edge research, advanced tools, and international collaboration. Promote diversity and inclusion through a multicultural, multidisciplinary approach. Expand MSc supervision to attract candidates, and foster continuous learning via basic courses, open seminars and scientific sessions, and internal sessions to strengthen integration and knowledge sharing within CPES.

Commitment 5 – Strive for a sound, sustainable and effective operational model

Diversify the project portfolio through EC public procurement, multilateral tenders with consultancies, WIDERA Calls, and additional EU funding such as LIFE, PATHFINDER, and MSCA, while leveraging EC cascading opportunities. Expand TEF and laboratory outreach with a catalogue of services. Establish structured onboarding workflows, promote modular and reusable tool development, provide advanced software training, and explore licensing strategies for sustainable commercialisation of CPES software assets and research outputs.

8.5.3 Main initiatives planned for 2026

The Centre will carry the following initiatives and actions towards the above objectives and as part of its continued activity towards its vision:

Table 8.5 - CPES

Initiatives	Key Results	Strategic Objectives
Promote project management practices within the centre by progressively adopting structured and recognised methodologies (Agile, Scrum, hybrid models), particularly for high TRL projects.	Improve planning and execution, while enhancing adaptability and delivery efficiency. Alignment with industrial partners, fostering cross-functional collaboration, and contributing to the maturity and scalability of INESC TEC's innovation outputs.	C1.3
Implement automatic routines for software analysis and validation for high TRL prototypes and OSS. Access to large language models (open-source) supporting R&D and operational activities across the centre	Ensure software is properly documented, replicable, and does not contain sensitive information. Central platform to access open-source LLMs. Increased accessibility and adoption of LLM-based AI tools by research teams.	C5.3
Promote an internal coordination and integration initiative focused on tools for dispatching and bidding flexible resources in both local and wholesale markets, with the aim of identifying existing solutions, assessing differences and synergies, and defining a coordinated roadmap for future development and improvement.	Unified and integrated suite of tools to enable the coordinated dispatch and market participation of diverse resources across multiple markets, sectors, and energy carriers. This includes defining a consistent yet customisable vision that consolidates INESC TEC's capabilities in market-oriented resource optimisation, supporting various asset types and business models.	C1.1, C1.3, C2.3
Development of different algorithmic and software solutions for decarbonising energy systems.	> 7 new tools and algorithms for, e.g., grid stability analysis, predictive operation of a green-hydrogen hub, energy management in seaports, and EV charging optimisation.	C1.1., C2.1, C2.3, C2.7

Initiatives	Key Results	Strategic Objectives
Actively contribute to open-source software projects (especially promoted by INESC TEC) on the LFE.	Provide a credible continuation of the project's key exploitable results, leveraging past efforts and learning from others. Support our partners and internal efforts. Active participation in LF Energy.	C1.2, C1.6
Collaborate with reference initiatives, such as AI factories and GridFM, to develop innovative digital solutions.	Be a reference in digitalisation applied to energy systems, and an active contributor to policy-making initiatives.	C5.3, C1.6
Development of AI-based decision systems for distribution and transmission grids.	Neuro-symbolic learning, compatible with recent legislation, such as the AI Act and is capable of exploring existing domain knowledge.	C1.2
Develop new hardware prototypes and edge control capabilities.	Distributed control and multi-vendor protocol in a DER Gateway. Wireless charging prototype for EV and robotics. Power electronics converters for hydrogen electrolysers, providing voltage support to the grid.	C2.3, C3.2, C2.1, C5.3, C2.7

8.6 SYSTEM - Centre for Industrial & Systems Engineering and Management

Coordinators: António Almeida, António Lucas Soares and Maria Antónia Carravilla

8.6.1 Context and Evolution

SYSTEM brings together the complementary strengths of the Centre for Enterprise Systems Engineering (CESE) and the Centre for Industrial Engineering and Management (CEGI) in a coordinated process initiated in early 2025. Throughout 2025, both centres continued to develop their activities while progressively building joint research directions and collaborative projects. As a result, this first integrated activity plan includes elements that remain specific to each of the former centres, together with a growing core of joint initiatives that will continue to expand and consolidate over time. During 2026, SYSTEM will deepen collaboration across teams, strengthen shared scientific and innovation agendas, and consolidate the organisational and research convergence that supports the long-term vision of the new centre.

8.6.2 Centre scope and vision

SYSTEM is a multidisciplinary research centre dedicated to advancing systems engineering and management, with a focus on designing and governing complex socio-technical systems in industry and society. Its work integrates data intelligence, digital architectures, operations research, and human-centred approaches to promote sustainable and resilient operations. The centre develops methods and technologies that support decision-making, systems interoperability, and organisational transformation. By combining scientific research with innovation, SYSTEM collaborates with academia, companies, and policymakers to co-create solutions that enhance industrial performance, promote circularity, and facilitate the responsible adoption of technology. Ultimately, SYSTEM aims to shape next-generation socio-technical systems that are robust, trustworthy, and sustainability-oriented, contributing to Europe's innovation capability.

8.6.3 Main objectives for 2026

Highlights

Aligned with INESC TEC's Strategic Plan 2023–2030, in 2026, SYSTEM will strengthen its role as a leading research and innovation centre in systems engineering, management science, and data-intensive decision support. As this year marks the start of a shared journey for two previously independent research structures, the first joint activity plan reflects a path of convergence that will be progressively reinforced. It focuses on consolidating SYSTEM's scientific excellence, deepening international collaboration, and expanding its impact across industry and society. SYSTEM's priorities for 2026 are organised around the following Strategic Objectives:

C1.1. Raise the contribution and visibility of our research – SYSTEM will strengthen its international visibility through high-impact publications and leadership in Systems and Industrial Engineering and Management Science. It will consolidate its presence in top-tier journals and expand collaboration across major research and professional networks - including technology and industrial innovation (EARTO, ADRA, EFFRA, MANUFUTURE, ALICE, VANGUARDA), operations and systems research (EURO, INFORMS, POMS), and service science and human-centred innovation (EUASM, SERVSIG, ServCollab).

C1.2. Increase our involvement in the leadership of scientific initiatives – SYSTEM will take an active role in coordinating interdisciplinary F10 proposals and leading working and expert groups across European alliances such as AIM-NET, Quantum Europe, the International Data Space Association, the Net-Zero Europe Platform, ECR Retail Loss, and the European Commission's Food Waste initiatives. The centre will lead strategic research clusters focused on data governance, AI for industrial decision-making, asset management aligned with the Net-Zero Industry Act, strategies for twin transition and circular economy, logistics efficiency, food loss, and collaborative innovation ecosystems that bring together people, organisations, and technologies, reinforcing INESC TEC's contribution to the European research agenda.

C1.4. Develop closer and deeper relationships with our innovation partners and the broader community – SYSTEM will strengthen collaborations with companies and industrial associations, building

long-term partnerships that transform scientific knowledge into tangible societal and economic value. Engagements with regional and sectoral associations will focus on supporting effective digital transformation, deepening the understanding of Industry 5.0 principles, and developing data governance frameworks that enable the efficient and trustworthy adoption of artificial intelligence. At the national level, SYSTEM will expand its involvement with key industrial associations, including APLOG, Produtech, AIMMAP, INOMMOB, and APGEI, as well as their member organisations. In parallel, the centre will play a central role in orchestrating the emerging network of Technology Infrastructures in the North region, establishing a strong connection with the iiLab and ensuring alignment with European innovation ecosystems. Through this integrated approach, SYSTEM will reinforce its position as a strategic actor in shaping a more competitive, sustainable, and digitally empowered industrial future for Portugal and the European Union.

C2.1. Develop impactful research and innovation aligned with the SDGs – SYSTEM will strengthen its contribution to the Sustainable Development Goals by advancing research in four main areas: (1) proactive asset management, circularity, and remanufacturing for resource efficiency, energy savings, and decarbonisation; (2) digital technologies in agro-food value chains and retail to reduce food waste and losses; (3) human-centred technologies that enhance well-being and support physical and cognitive augmentation; and (4) data governance and management for trustworthy and ethical AI.

C3.1. Build stronger knowledge-based and multidisciplinary R&I ecosystems – SYSTEM will serve as a convergence hub connecting engineering, management, and social sciences, promoting systemic approaches to innovation grounded in the Complex Systems Management body of knowledge. In 2026, the centre will focus on strengthening collaboration among its research teams and fostering synergies with other INESC TEC Centres and leading external institutions. These efforts will support the creation of cross-disciplinary consortia capable of addressing FP10 and ECF challenges through integrated scientific, technological, and organisational perspectives.

C4.1. Improve attraction and retention of world-class talent – SYSTEM will invest in attracting talented PhD students and retaining outstanding researchers, fostering a culture of collaboration, inclusivity, and scientific excellence. Internal mentorship programmes (e.g., summer schools), international mobility opportunities, and leadership development initiatives will be prioritised to build a vibrant, diverse, and future-ready research community.

Research

In 2026, SYSTEM's research activity reflects the fact that the centre is bringing together scientific traditions that have developed along different paths over the years. Some research lines continue the work that has been carried out for a long time within each of the former teams, and several topics have already shown consistent joint work, which began to take shape in 2025 and is expected to deepen progressively. This organisation acknowledges the centre's current stage of integration, while allowing research teams to continue developing their strengths and gradually building common ground where it naturally emerges. Throughout 2026, collaboration across all topics is expected to increase, supported by shared projects, closer interactions among researchers, and opportunities to address challenges that benefit from combining different perspectives. Together, these research lines provide SYSTEM with a broad and solid scientific foundation across systems engineering, operations research, industrial information systems, management science, and service innovation, while also highlighting the path of convergence that will guide the centre's evolution in the coming years.

Manufacturing Systems Design – One of the ambitions for 2026 is to consolidate INESC TEC's scientific leadership in AI-based systems for manufacturing, developing the foundations for designing and managing sustainable, resilient, and human-centred manufacturing systems. Expected outputs include methodologies and demonstrators for circular and resilient system design, as well as explainable AI frameworks for production planning. Another strong and ongoing research direction involves architecting simulation models - discrete-event, agent-based, and hybrid - combined with optimisation techniques, digital twins, and reinforcement learning. This integrated framework supports the design and reconfiguration of manufacturing systems while enabling the anticipation of system disruptions and the proactive adaptation of production plans. This will enable resilience-by-design strategies, supporting the rapid reconfiguration of production layouts, resource allocation, and process planning in the face of

uncertainty. Special attention will be given to Generative Design methodologies supported by foundation models, enabling the exploration of alternative system configurations that maximise productivity and efficiency while minimising carbon footprint, energy consumption, and waste. Work will additionally advance capacity planning and industrial network design, producing models for facility location, capacity adjustment, and supply network configuration, validated through real industrial case studies

Operations Planning and Management – In 2026, SYSTEM's research on operational planning and system management will focus on developing models and tools that support day-to-day, mid-term, and lifecycle decisions. These tools will support the analysis of how systems can be adapted when demand patterns, constraints, or operational requirements change. The goal is to provide practical and data-supported ways to compare alternatives and understand their operational implications, helping organisations select configurations that improve efficiency, flexibility, and robustness. Research in operations management and data-driven decision support will advance predictive and prescriptive models for routing, production planning and scheduling, cutting and packing, lot sizing, and inventory management. Approaches such as optimisation algorithms, metaheuristics, machine learning, reinforcement learning, and generative-AI-supported model adaptation will be explored to enhance responsiveness to dynamic conditions. SYSTEM will also lead research on dynamic decision support systems, integrating real-time data, adaptive algorithms, and sequential decision-making processes to support complex and high-stakes decisions in uncertain environments. These systems will follow sequential decision-making processes, enabling them to operate effectively in unstructured and volatile environments influenced by multiple interacting variables. Human-in-the-loop mechanisms will ensure that resulting tools remain explainable, reliable, and aligned with user expertise. Research in asset management and lifecycle planning, leveraged by smart products' digital twins, will develop decision-support models to compare investment, maintenance, and renewal strategies for industrial and energy systems assets. Using optimisation, simulation, and data-driven performance analysis, these models will help organisations evaluate long-term reliability, operational efficiency, and cost-effectiveness. Together, these approaches will support continuous performance assessment, enabling organisations to balance lifecycle investment needs with operational constraints. Across all topics, research will be validated through real industrial case studies, ensuring that SYSTEM's contributions remain practical, robust, and directly aligned with industrial decision-making requirements.

Industrial AI and Data Ecosystems – This research line advances the design of industrial information systems by integrating socio-technical principles, artificial intelligence, and data ecosystems supporting sustainability, circularity, and human-centred innovation. First, in Socio-Technical Design of Industrial AI-Based Systems, we aim to develop models, methods, and tools that align human, organisational, and technological dimensions. The envisaged work in this topic includes the development of a methodology for eliciting human–system interaction requirements for Multi-Agent Systems (MAS), a human-centred MAS reference architecture with context-aware, auditable, and transparent user interactions, as well as human-AI interaction and collaboration models in the production management domain. Also, open Large Language Models will be investigated to understand how they can be adapted and curated to address industrial needs and sustainability goals. Second, the research on Data and Digital Twin Ecosystems addresses the development of shared data ecosystems and digital twin frameworks that enable transparency, interoperability, and circular value creation across industrial networks. For this period, this includes developing design theories and governance models for shared data ecosystems that integrate physical and digital assets, investigating how data sovereignty, semantics, and interoperability contribute to industrial collaboration and trustworthy data exchange, and studying how digital twin ecosystems can be supported by models of data spaces. Finally, in Traceability and Product Life Cycle Management, we are developing the conceptual and technological foundations for Digital Product Passport (DPP) governance and life cycle management within the circular economy.

Supply Chain Systems and Collaborative Networks – During this period, this research line will continue to study sustainability and resilience in supply chains through the integration of digital technologies for traceability, collaboration, and circular strategies. We will be developing predictive models for demand, disruptions, emissions, and material flows behaviour, supported by digital technologies such as QR Codes, RFID, smart sensors, digital twins, and generative AI, enabling the creation of a digital thread and enhancing system explainability. Specific attention will be given to digital traceability in the agro-food industry for food waste mitigation. In parallel, we will be conducting case study research on supply chain resilience models

and tools that help SMEs anticipate and adapt to disruptions. The results will feed prescriptive optimisation tools that recommend resource allocation, inventory strategies, pricing, supplier selection, and risk mitigation measures. A second goal is to research innovative models for assessing circular supply chains (including R-Strategies and Triple-Bottom-Line Sustainability indicators), integrating environmental, social, and economic criteria, with particular emphasis on remanufacturing processes and circular design strategies. Also, regarding the adoption, research on the socio-technical integration of artificial intelligence in supply chains will enhance the understanding of how AI can improve visibility, collaboration, and decision-making in complex networks.

Logistics and Transport – The ambition for this period is to explore new pathways in transportation, logistics and mobility, going far beyond purely technical domains, in particular by delving deeper into aspects such as the environmental impacts of transport, the development of participatory instruments and the co-creation of human-centric decision support tools, based on the integration of multiple, advanced technologies and incorporating the different stakeholders' perspectives. To achieve this, we will develop predictive models for freight flows, transport demand, vehicle utilisation, and service variability across logistics networks. Modelling approaches, such as simulation, digital-twin-based methods, and AI-supported planning, will be used to analyse warehouse operations, routing, scheduling, inventory placement, and container and pallet loading. Research will also explore integrated multimodal logistics models to improve coordination across different transport modes and support more efficient and sustainable freight operations. The centre will also explore emerging freight transport solutions that improve vehicle utilisation and reduce emissions, using modelling and simulation tools to assess their operational and environmental impact.

Mobility Systems – Research on mobility systems will focus on methods that help design transport solutions for people in urban and metropolitan areas. The work will include developing predictive models for travel demand, mode choice, and network performance, supported by modelling techniques such as simulation, digital twin-based approaches, and real-time data analytics. Prescriptive planning tools will be used to evaluate interventions in public transport, shared mobility, and last-mile services. Research will also explore participatory methods and co-creation processes to understand user needs, social inclusion, and the wider impacts of mobility policies. Environmental and equity considerations will be central to this work to support mobility systems that are accessible, sustainable, and responsive to societal needs. Digital technologies such as AI, real-time data analytics, and digital twins will support scenario evaluation and policy design. The goal is to develop mobility systems that are adaptable, accessible, and aligned with environmental objectives.

Service Design and Technology Management – In 2026, research in this area will examine how people, organisations, and technologies interact to create value and drive transformation within manufacturing and private and public service ecosystems. A central research topic focuses on value co-creation processes, analysing how individuals, organisations, and technologies jointly shape systems' performance, user experience, customer engagement, citizen participation, and sustainability-related behaviours. Predictive behavioural and data analytics will support the design of more effective, inclusive, and resilient services and manufacturing systems. A second major line of work will study how organisations adopt, integrate, and govern emerging technologies, developing human-centred and sustainability-oriented models of technology adoption. SYSTEM aims to advance theoretically grounded and empirically informed frameworks that explain how socio-technical, organisational, and behavioural factors shape technology-driven change in the context of Industry 5.0. This includes analysing adoption drivers and barriers, organisational readiness, change dynamics, and the interactions between technological capabilities and work systems, yielding evidence-based strategies for responsible, ethical, and effective implementation. The study of AI-based system adoption will be developed during this period, addressing guidelines and diagnostic tools for change management and the adoption of AI in production, as well as identifying underserved industrial domains as emerging research opportunities for sustainable and responsible AI adoption. Additionally, human-machine collaboration will be explored in human-in-the-loop systems that integrate advanced analytics with cognitive ergonomics and trustworthy AI to support operators' decision-making. The goal is to model AI-augmented workplaces where productivity, safety, and operators' satisfaction are aligned. The research will also address explainable AI models and inclusive interaction paradigms that ensure transparency and ethical alignment between autonomous systems and human decision-makers. Prototypical implementations will be demonstrated in the iiLab, integrating Digital Twins

and mixed-reality tools for training and validation. Research will also employ Living Labs as experimental infrastructures to observe real-world adoption processes and to prototype digital transitions with stakeholders, accelerating systemic learning and socio-technical transformation. Finally, SYSTEM will contribute to the advancement of technology management and innovation policy frameworks, promoting the responsible governance of emerging and dual-use technologies, supporting inclusive innovation, and informing broader debates on sustainability transitions and the long-term evolution of industrial and service systems.

Forest, Natural Resources, and Territorial Systems Planning – In 2026, research in this area will focus on methods and tools that support forest management, natural-resource planning, and territorial resilience. The work will include modelling the forest value chain, planning wood supply, analysing biomass logistics, and developing strategies that contribute to the circular bioeconomy. Methods such as optimisation, simulation, remote sensing, and geospatial analytics will be used to develop predictive and prescriptive models for fire risk, fuel management, emergency response, and post-fire restoration. These approaches will help assess vulnerabilities, compare intervention strategies, and support more effective planning. Additional research will focus on territorial planning, ecosystem services assessment, and sustainable land-use strategies, supporting public authorities and industry in the development of climate-adaptive and resilient landscapes.

Innovation

In 2026, SYSTEM will strengthen its role as a bridge between scientific research and industrial impact, marking the transition from the PRR R&D phase to the industrialisation and scale-up of results across key sectors such as automotive, aerospace, paper, textile, footwear, and agro-food. This new phase will focus on integrating the outcomes of flagship projects - including Produtech R3, Bioshoes, Transform, and NEXUS - into production environments, enhancing the competitiveness, sustainability, and digital maturity of Portuguese industry. Building on its achievements in operations optimisation and digital twin development, SYSTEM will scale up and bring to market, in collaboration with partners such as The Navigator Company, SONAE, Luís Simões and Burgers Group, digital solutions for pallet mosaic building and container loading, enabling more efficient and automated logistics planning. The centre will also expand its portfolio of industrial services based on discrete-event simulation and digital twins, supporting system design, operational planning, and decision-making across manufacturing, retail, and logistics networks.

In Operations Management & Decision Support, the centre will consolidate a unified real-time, interoperable simulation and decision platform applicable across sectors. It will develop tools that integrate simulation, optimisation, and sustainability impact assessment to support circular operations, create low-code instantiation tools for multilevel decision-making, and design an AI-driven Co-Meta-Scheduler that autonomously generates explainable and adaptive scheduling models from natural language system descriptions. In Information Systems, Architectures and Data Management, work will extend and refine the SC-STAI socio-technical AI maturity tool, transforming it into an AI-enhanced diagnostic system. The centre will validate user-centred multi-agent architectures for organisational interaction, build secure and decentralised data-sharing ecosystems that raise data-management maturity, and develop data-governance and OT/IT integration models supporting Digital Twins and Digital Product Passports. In Technology Adoption and Management, the focus is on digital-maturity assessment services and technology roadmaps for adopting digital twins, IIoT, shop-floor digital technologies, and AI agents. The centre will develop circular business-model assessment tools, enhance the Twin-Transition Maturity Framework with new metrics and AI-supported pre-assessment, and identify the required skills for digital technology adoption, to be addressed through targeted training.

Regarding the participation of the centre in the iiLab, our goals are to (i) update the Digital Twin architecture (introduction of AAS) and integrating automated inspection into the Prolynk line; (ii) introduce models based on multi-agent AI architectures for interaction with the Digital Twin system and simulation - FlexGPT; (iii) design a demonstrator for new circular economy concepts and sustainability principles - optimisation of multi-objective processes and activation of different strategies depending on the state of the product with connection to Twin4X. SYSTEM's collaboration with AEP and national industrial associations through SIAC projects will further reinforce its engagement with industrial clusters, promoting large-scale technology transfer and supporting the adoption of Industry 5.0 principles. Through its iiLab and initiatives

such as DECODIT and SystemEU, the centre will continue to foster technology innovation and adoption, offering advanced training programmes (e.g., Industry 4.0 and AI at the Shop Floor) and applying socio-technical methodologies to guide human-centred digital transformation, promoting responsible, inclusive, and sustainable technology uptake across industries.

Complementary advances

Jointly with these key advances, in 2026, the other main objectives for the Centre towards its vision are:

Commitment 1 – Strengthen excellence and collaboration across the centre. In 2026, SYSTEM will focus on building a cohesive and collaborative research environment, bringing together the teams that now form the new centre. The priority is to align methods, practices, and goals so that researchers can work more effectively across domains. By strengthening internal cooperation, SYSTEM aims to ensure that its collective contribution is stronger, more visible, and more impactful than the work of individual teams alone.

Commitment 2 – Strengthen our contribution to emerging scientific and technological priorities. In 2026, SYSTEM will strengthen its contribution to emerging scientific and technological priorities by reinforcing its participation in the Artificial Intelligence in Manufacturing NETwork (AIM-NET) and expanding its involvement in European Commission initiatives on Food Loss and Waste Reduction. The centre will continue to explore disruptive technologies, particularly Quantum Computing for Operations Research (ORQC), positioning INESC TEC among institutions advancing quantum methods for complex optimisation and decision-support problems. At the European level, SYSTEM will align its activities with the main thematic priorities of FP10 and the European Competitiveness Fund (ECF), namely clean transition and industrial decarbonisation, digital leadership, and resilience across defence, industry, and space.

Commitment 3 – Strengthen integration across science, innovation, and ecosystems. SYSTEM will strengthen integration across research, innovation, and disciplinary boundaries by promoting joint initiatives with other INESC TEC units in areas such as artificial intelligence, quantum and high-performance computing, international data spaces, robotics, and energy efficiency. The centre will reinforce collaboration with industrial and public-sector partners through testbeds, living labs, and other innovation infrastructures that support co-development, experimentation, and validation of solutions in real environments. SYSTEM will also deepen its participation in European networks such as EARTO and YEAR – Young European Associated Researchers, sharing knowledge from ongoing work and contributing to discussions on the role of engineering and management sciences in addressing socio-technical challenges.

Commitment 4 – Cultivate an attractive, people-centred, and talented community. SYSTEM will work closely with the University of Porto, the Polytechnic Institute of Porto (IPP), and international universities to attract and host highly talented PhD students, offering research opportunities developed in collaboration with industry and public-sector partners. The centre will promote a supportive and inclusive research environment by encouraging collaboration across teams, strengthening supervision practices, and expanding opportunities for international mobility and advanced training. This approach aims to make doctoral research more appealing to young professionals while ensuring that graduates develop skills and experience aligned with market needs, organisational challenges, and broader societal priorities

Commitment 5 – Ensure a sound, sustainable, and effective operational model. SYSTEM will reinforce sustainable management practices and long-term institutional resilience by developing stable strategic partnerships with industrial companies that support the continuity and scaling of applied research and innovation activities. The centre will expand the capabilities and ambition of the iiLab, positioning it as a European-level infrastructure for experimentation, prototyping, and technology validation. SYSTEM will also promote advanced training programmes developed in collaboration with industry, ensuring a continuous exchange of knowledge and contributing to a sustainable, mutually beneficial innovation ecosystem.

8.6.4 Main initiatives planned for 2026

The Centre will carry the following initiatives and actions towards the above objectives and as part of its continued activity towards its vision:

Table 8.6 - SYSTEM

Initiatives	Key Results	Strategic Objectives
12th EurOMA Sustainable Operations and Supply Chains Forum	Promote a debate on the need to rethink the current predominant linear global supply and demand model.	C1.2
Food Waste Workshop event	Organisation of an international workshop to discuss the new traceability technology and information systems evolution in the retail industry for food waste mitigation	C1.2, C2.1
Digital Technologies Demonstration at the Industry and Innovation Lab (iiLab).	Active participation and development of 1 to 2 demonstrators at the Industry and Innovation Lab (iiLab).	C1.4, C3.1
Promote the dissemination of high-quality research aligned with responsible research assessment principles, following COARA guidelines.	Publish research outputs that emphasise their intrinsic value and societal impact, ensuring high-quality dissemination in key journals.	C1.1
Summer School	Identification and attraction of talented and motivated students for research	C4.1

8.7 CRIIS - Centre for Robotics in Industry and Intelligent Systems

Coordinators: Luís Freitas Rocha and Manuel Santos Silva

8.7.1 Centre scope and vision

The Robotics and Intelligent Systems Centre designs and implements innovative solutions within industrial, agricultural, and forestry robotics and intelligent systems. The Centre closely cooperates with companies, other INESC TEC Centres, and other institutes and universities, following the lemma from research and development to innovation and passing through design, prototyping, and implementation.

8.7.2 Main objectives for 2026

Highlights

Aligned with INESC TEC Strategic Plan 2023-2030, in 2026, the Centre is prioritising significant advances in the following Strategic Objectives:

Commitment 1 - Excel and innovate across the missions of academia, harnessing the collective strength of our community

C1.1. Raise the contribution and visibility of our research

- Increase the number of publications, at least 2, in top-tier indexed journals (including T-RO, RA-L, IJRR, SRJ, RA Magazine, T-ASE, T-RL) and international conferences, at least 1 (including ICRA and IROS), and foster multidisciplinary collaborations that enhance citation potential.
- Encourage open-access dissemination (datasets, scientific articles, position papers) and strategic communication of research outcomes to broaden visibility and global reach.
- Implement internal monitoring and support mechanisms to track publication performance, citation metrics, and research visibility across scientific platforms.
- Establish a stronger institutional presence in major robotics events, as ADRA 2026 and ERF2026, by organising exhibition booths and technology demonstrations that showcase CRIIS's innovations and collaborative projects, stimulating collaboration and networking opportunities with leading academic and industrial partners.

C1.6. Increase the international embedment of our community

- A strong network of international collaborations is critical to increasing the Centre's global recognition and research excellence. CRIIS intends to increase the number of international visiting researchers. CRIIS aims to have at least four visiting senior researchers from internationally renowned institutions.

Commitment 3 – Increase our relevance by closely integrating across science and innovation, disciplines, and ecosystems.

C3.2. Develop better linkages between knowledge production, development, and market uptake.

- Materialisation of one of the three CRIIS spin-offs currently under development.
- Encourage active search for new partnerships with companies to diversify and improve technology transfer channels and create at least one long-term programme contract.

Research

Human-Robot Interaction: CRIIS will advance the development of a novel human-centric interaction frameworks that merge immersive technologies, teleoperation, and adaptive intelligence to enable safer, more intuitive and trustworthy collaboration between humans and robots. The research will leverage mixed reality and virtual reality devices to create immersive, multimodal interfaces supporting local and remote operations, enhancing operators' situational awareness and control. By integrating Digital Twins, robots

will be capable of perceiving and adapting to human states such as attention, intent, and fatigue, enabling context-aware collaboration and improved safety. Teleoperation data will be explored to support learning from demonstration, bridging virtual and real-world behaviours to accelerate robot learning. Furthermore, Large Language Models and Vision-Language Models will be incorporated to facilitate natural, conversational communication and task specification, allowing operators to interact with robots using speech and visual cues. These advancements aim to establish the foundations of an Industrial Metaverse for HRC, where immersive interaction, teleoperation, and AI-driven learning converge to enhance trust, efficiency, and resilience in collaborative industrial environments.

Robot Autonomy and Manipulation Capabilities: CRIIS is dedicated to advancing robotic autonomy by integrating cutting-edge artificial intelligence techniques, including concepts such as agentic AI and embodied robotics. The primary objective is to enable robots to better perceive, understand, and interact with complex and unstructured environments. To achieve this, CRIIS will explore advanced AI methodologies, such as Deep Reinforcement Learning, Federated Learning, and Generative AI, along with lifelong learning mechanisms, integrated with semantic and ontology-based mapping systems. These approaches will enhance decision-making, adaptability, and learning efficiency, facilitating the development of scalable and intelligent robotic systems that can operate safely and effectively in diverse and extreme real-world applications. These systems will address a broad range of industries, including textiles, recycling, construction, shipbuilding, and agriculture, and will be designed to handle both routine tasks and extreme conditions.

Sustainable Development of Robotic Systems: By harnessing cloud technology's extensive computational power and vast data resources, CRIIS seeks to establish an advanced, highly realistic simulation environment designed to support the sustainable development of robotic systems. This platform will enable robotic developers to rapidly design, test, and refine their software within virtual conditions that closely mirror real-world scenarios. It will also support the synthetic data generation, playing a pivotal role in enabling the creation of large, diverse datasets for training and testing, while mitigating limitations related to real-world data availability and costs. Such an approach enhances safety and efficiency in robotic applications and accelerates the overall development lifecycle by reducing dependence on costly and time-consuming physical testing. Moreover, the simulation environment will address the *sim-to-real* challenge, which involves ensuring the transferability of solutions from virtual to real-world environments. Furthermore, by integrating proven methodologies and best practices from modern software engineering - such as continuous integration, automated validation, and modular design - CRIIS will promote greater reliability, scalability, and maintainability in robotic solutions.

Leveraging Digital Twin Models and AI Integration for Advanced Industrial Robotics: The integration of Generative AI, Large Language Models (LLMs), and Vision Language Models (VLMs) will play a pivotal role in maintaining the accuracy and dynamism of Digital Twin models, ultimately enhancing Robotics and Industrial Internet of Things (IIoT) operations. This evolution will be supported by innovative strategies such as Retrieval-Augmented Generation (RAG) and Model Context Protocol (MCP). These will facilitate real-time data assimilation and context-aware insights, ensuring digital representations accurately reflect real-world conditions. Additionally, applying LLMs and Generative AI for improved observability of industrial robotic operations will usher in automated analysis of logs, metrics, and traces, borrowing principles from advanced observability frameworks found in other sectors.

Innovation

Teleoperation of Robots: CRIIS will advance its teleoperation research towards enabling immersive and data-driven control of robotic systems for industrial and field applications. The work will extend a modular teleoperation architecture that decouples autonomous navigation from remote operation through WebRTC low-latency video streaming and MQTT-based control communication. Beyond providing intuitive and safe human supervision of robots, this technology will serve as a foundation for learning from demonstration, allowing robots to learn directly from human teleoperation data and progressively improve autonomy through behavioural cloning and incremental learning.

Novel Long-term SLAM: CRIIS will expand the operation of AMRs to new environments previously inaccessible due to their high dynamics, through the development of the RicoSLAM solution. CRIIS aims to advance state-of-the-art long-term SLAM by combining sensor fusion techniques and AI, extending and enhancing AMR applications.

Robot Fleet Coordination: CRIIS will deploy a new fleet coordination system called "Maestro," which will enable the management of multiple AMRs of different types in confined spaces with maximum efficiency. It will also seek to scale current fleet coordination solutions to a 100-agent milestone implemented in a real use case (TRL7).

Mobile Manipulator for Trail Unloading: Building on its recent success in showcasing an autonomous mobile manipulator for intra-logistics operations within a retail warehouse, CRIIS will now shift its focus to automating trailer unloading operations, through new advancements in perception and robot path planning, with a comprehensive approach that considers the entire robot system as one complex kinematic chain.

Localisation of Pallets and Pallet Pockets: CRIIS is advancing its portfolio of technological solutions for mobile robots with a computer vision application (based on low-cost RGB-D sensors) for the detection and localisation of pallets and their pockets, allowing stacker-type AMRs to pick pallets from the shopfloor, even when these are not precisely placed on the expected locations.

To Support Sustainable Circularity of Textiles: The first national pilot line, incorporating the textile fibre classification system based on hyperspectral imaging developed by CRIIS, will be installed at LIPOR and fully operational. Furthermore, at CITEVE, an innovative robotic prototype cell for removing accessories from clothing will be deployed, integrating computer vision, robotics, and artificial intelligence.

Complementary advances

Jointly with these key advances, in 2026, the other main objectives for the Centre towards its vision are:

Commitment 1 - Excel and innovate across the missions of academia, harnessing the collective strength of our community

C1.6. Increase the international embedment of our community

A strong network of international collaborations is critical to increasing the Centre's global recognition and research excellence. CRIIS intends to increase the number of international visiting researchers. CRIIS aims to have at least four visiting senior researchers from internationally renowned institutions.

Commitment 4 – Cultivate an attractive, people-centred and talented community

C4.1. Improve attraction and retention of world-class talent

Encourage the enrolment of early career and senior researchers (at least 4) in advanced courses offered by esteemed institutions, such as ETH Zurich and Imperial College, focusing on training related to robotics and disruptive technologies in fields such as Artificial Intelligence, Agentic AI, and Embodied Robotics

8.7.3 Main initiatives planned for 2026

The Centre will carry the following initiatives and actions towards the above objectives and as part of its continued activity towards its vision:

Table 8.7 - CRIIS

Initiatives	Key Results	Strategic Objectives
iiLab Open Day and TRIBE Lab Synergy Day	To promote CRIIS's technologies and reinforce the centre position at both regional and European level.	Boost IP Valorisation and Increase contract research with Industry
Awareness sessions on Intellectual Property (IP) protection	Increase patent grants	To improve the awareness of young researchers about Intellectual Property (IP) protection and Improve Base Condition for technology commercialisation

8.8 CITE - Centre for Innovation, Technology and Entrepreneurship

Coordinator: Alexandra Xavier

8.8.1 Centre scope and vision

Vision: To empower researchers and organisations by advancing the adoption of socio-technical innovation systems, cultivating a dynamic culture of innovation, and fostering entrepreneurial excellence. We envision a world where research-driven outputs significantly contribute to building a sustainable economy and society.

Scope: CITE conducts multidisciplinary research at the intersection of technology, innovation, sustainability, and management to promote the adoption and use of responsible, human-centred innovations in engineering. By focusing on the research areas of Innovation Management and Front End of Innovation (RL1), Technology Management and Policy (RL2), and Entrepreneurship and Business Model Innovation (RL3), CITE explores theories, methods, models, and tools to support the innovation process. Through research and innovation activities, including advanced training and a strong collaboration with Entrepreneurship Support Initiatives, CITE addresses environmental, social, and economic challenges, contributing to research and innovation impacts aligned with the SGD goals.

8.8.2 Main objectives for 2026

Highlights

In line with INESC TEC's Strategic Plan 2023–2030, CITE is reinforcing its role as a key driver of innovation, aiming to support and amplify the impact of all INESC TEC research units, prioritising significant advances in the following Strategic Objectives:

Commitment 1 - Excel and innovate across the missions of academia, harnessing the collective strength of our community.

C1.1. Raise the contribution and visibility of our research.

- **Innovation Room:** Promote knowledge dissemination and exploitation of non-technological R&D, such as innovation studies, models, use cases, and tools, by using Creative Commons licensing. Also contribute to C1.3.
- Launching an Internal "**Tech Value storytelling bootcamp**" leveraging the Cite knowledge and experience of the Energy Transformer and Energy Transition program under the ATE PRR project.
- Reinforced the dissemination of knowledge through participation in several scientific conferences: at least 3 scientific articles will be presented in ERS, DRUID and ISPIM.

C1.2. Increase our involvement in the leadership of scientific initiatives.

- Submission of The Journal of Innovation Management (JIM) to WoS. The Journal has already been indexed by Scopus since 2021.
- Participation as associate editors in the following journals: Journal of Innovation Science, European Journal of Innovation Management, Journal of Information Systems Engineering, Business Intelligence, and Educational Technology Quarterly. Water Policy.

C1.3. Improve the base conditions for technology commercialisation.

- **Entrepreneurship Office**: Contribution to the activity plan of the Entrepreneurship and spin-off Office| Also contribute to C4.1.
- Reinforce CITE's role in the innovation management and exploitation activities of European and National projects by joining new consortia and launching an internal Tech Value initiative to support INESC TEC researchers

C1.4. Develop closer and deeper relationships with our innovation partners and the broader community.

- Foster mission-driven, innovation-focused collaborations via EEN PT, enhancing engagement with SMEs, industry, NGOs, and social economy stakeholders. Explore research and collaboration opportunities across Sector Groups (Proximity & Social Economy, Digital) and Thematic groups (Sustainability, Single Market - Intellectual Property, Start-ups & Scale-ups, Women Entrepreneurship).
- Develop research partnerships through the Visiting Researchers (University of New Jersey and International School of Business and Media, Pune, India) in the field of Sustainable Cities and Public Policy.

Commitment 2 - Make an impact on the toughest challenges of our time in science, technology, and society through bold creativity and transformative action.

C2.1. Develop impactful research and innovation aligned with the SDGs

CITE will embed the SDGs in its research and innovation activities, developing new projects and scaling or exploiting outputs from previous research and innovation efforts, such as:

- Responsible Innovation Digital Self-Assessment Tool: Scale the deployment of the digital tool across R&D and innovation projects.
- Sustainable Occupational Health and Well-being: Develop this new research area by strengthening the team, proposing new projects, and contributing to C5.
- Sustainable Cities & Responsible Innovation: Strengthen these research lines through joint projects with the University "PUC" of Curitiba, Brazil.
- Resilience and Responsible Innovation for Mission-Oriented Innovation Ecosystems: Explore the topic to design ethical, adaptive, and SDG-aligned innovation systems. Advanced through a new PhD project by a team member.
- Corporate SDG Impact on Financial Performance: Investigate how SMEs' adoption of SDG-related policies affects their financial outcomes.
- Twin Transition in European SMEs: Examines how SMEs integrate Industry 4.0 and Circular Economy practices across 25 projects supported by the Mantra program. Emphasis will be placed on technology adoption factors.

C2.23 Better align and deliver R&I with the industry's needs

- Leverage researchers & EEN Advisors to capture and channel industry insights, enabling co-creation of R&I activities aligned with market and societal needs, delivering transformative outcomes for SMEs, industry, and society.

Commitment 3 – Increase our relevance by closely integrating across science and innovation, disciplines, and ecosystems. (e.g. Ecosystems and technology transfer)

C3.2. Develop better linkages between knowledge production, development, and market uptake

- As part of the **POEMS project** (poemscentre.eu), the Future-Ready Skills Mapping for the Semiconductor Industry contributes to identifying key technical and adaptive competencies required in the semiconductor sector, fostering stakeholder collaboration and strengthening connections between research and industry.

Research

The research efforts will focus on exploring the following research topics:

- **Ethical Business Models for Emerging Technologies** | RL1,3|Commitment 1,2 | C1.3 & C2.1– Redesign business models to embed ethics and social responsibility in AI, 5G, and other technologies, under the projects Ai4REALNET and Nexus. Study how tax benefits.

- **Green Hydrogen Socio-Technical Interdependencies** | RL2|Commitment 3 | C3.1 – Study governance, policy, and social factors alongside technical systems for sustainable energy transition.
- **Measuring Sustainable Research and Innovation** | RL1,3|Commitment 1,2 |C1.3 & C2.1– Scale and develop tools to track social, environmental, and ethical impacts of innovation, under the project ATE and Mantra project.
- **Co-Creation and Open Innovation** |RL1,2,3|Commitment 1,2|C1.3 & C2.3- Explore collaborative innovation models and measure their sustainability impact, under the project ATE.
- **Fuzzy Front End of Innovation** | RL1,3|Commitment 1,2 |C1.3 & C2.1– this area will focus on integrating AI, exploring the dual-use concept, and developing methods and tools to incorporate human-centred design through responsible innovation in early-stage development.

Innovation

Innovation efforts will focus on supporting the exploitation and valorisation of R&D results, while promoting executive education and active learning as a first step toward creating new opportunities for advanced consulting in sustainability and innovation management.

- Launch the 2nd edition of the Energy Transformer – Energy Transition, under the PRR ATE project, to accelerate the market adoption of ATE's innovative solutions.
- Launch a 1st edition of an advanced training program on the topic of "Sustainability in Health "as part of the HfTP PRR project.
- Co-Innovate@INESC TEC: Implement a structured initiative to promote cross-centre and cross-institution collaboration, fostering research and innovation opportunities, leveraging CITE's expertise in co-creation methods and tools. Also contribute to C1.3 and C5.1
- Inspire Program: launching an Industry-oriented, actionable innovation executive program to navigate the complex, interconnected innovation ecosystems. The program aims to strengthen strategic innovation planning and to facilitate the adoption of innovative solutions into corporate workflows, leveraging the business dynamic interactions.

Complementary advances

Jointly with these key advances, in 2026, the other main objectives for the Centre towards its vision are:

- RL1| C1.2: Participate actively in the National, European, and International Technical Committee of Innovation Management (CT169, CEN/TC 389, and ISO/TC 279).
- RL1| C1.2: Participation in the National Technical Committee CT194 - Standardisation of Nanotechnologies - SC4 - Health, Safety, and Environment) of IPQ.
- RL1| C1.2: Nomination of "European IP Helpdesk Ambassador" under EEN project.

8.8.3 Main initiatives planned for 2026

The Centre will carry the following initiatives and actions towards the above objectives and as part of its continued activity towards its vision:

Table 8.8 - CITE

Initiatives	Key Results	Strategic Objectives
Innovation Room	Innovation room launch 3 innovative tools will be available for download; reach 50 users of Responsible Innovation Digital Self-Assessment Tool	C1.1, C1.3

Initiatives	Key Results	Strategic Objectives
Tech Value storytelling bootcamp	1 bootcamp, 10 participants, 5 tech results	C1.1, C1.3, C2.7
Sustainability in Health executive training	1 edition, 15 participants	C1.5, C2.1, C5.1
Reinforced the dissemination of knowledge through participation in several scientific conferences, presenting scientific articles: (1) How are Tax Benefits for Innovation Accelerating the Digitalisation of Portuguese Companies? (2) The role of Digital Governance in entrepreneurial dynamism (3) Marketplaces as emerging sources of coopetition Crowdsourcing as an enhancer of innovation in SMEs	• TSE • ERSA • DRUI • ISPIM	C1.1, C1.4, C1.6
InSPIRE Program	1 edition, 1 corporate, 10 participants	C1.3, C1.4, C2.3, C1.5, C5.1
Second edition of Energy Transition Energy transformer under ATE, to accelerate Energy transitions systems.	1 program, 10 participants, 5 tech results	C2.3, C2.4
Co-Innovate@INESC TEC: (one on philanthropic business mode)	Pilot 1 editions, 10 participants, Philanthropic business model concept and strategy	C4.1, C5.1

8.9 HUMANISE - Human-Centred Computing and Information Science

Coordinators: Ademar Aguiar, Artur Rocha and Hugo Paredes

8.9.1 Centre scope and vision

The Human-Centred Computing and Information Science (HumanISE) is an interdisciplinary research centre at the forefront of human-centred computing (HCC), with broad and deep expertise in computer science (CS) and information science (IS). HumanISE engineers, scientists and designers focus on the research and development of software and systems, methods, and tools, capable of leveraging human abilities and practices within their communities and environments, involving high technical and managerial complexity due to large scale, high heterogeneity, high uncertainty, high integrity, severe compliance to standards and legal frameworks, or domain-specific organisational issues.

HumanISE mission is to pursue high-quality research, strongly linked to industrial partnerships, consultancy, and technology transfer, in six main research areas: Computer-Human Interaction, Computer Graphics and Interactive Digital Media, Information Management and Information Systems, Software Engineering, Large Scale and Special Purpose Computing Systems, Languages and Tools, and Computing for Embedded and Cyber-Physical Systems. In addition, innovation activities aim to leverage the research areas above in four primary application areas: Platforms and Methods for Personalised Health Research, Platforms and Methods for Earth, Ocean and Space Science, Geospatial Information Systems Engineering, and Information Systems and Applied Computing. Furthermore, the centre is firmly committed to training young researchers and professionals, with a significant yearly track record in supervising master and doctoral students.

8.9.2 Main objectives for 2026

Highlights

Aligned with INESC TEC Strategic Plan 2023-2030, in 2026, the centre is prioritising significant advances in the following Strategic Commitments and Objectives:

C1. Excel and innovate across the missions of academia, harnessing the collective strength of our community.

C1.1. Raise the contribution and visibility of our research. HumanISE will continue to prioritise the increase of publications in high-impact journals (prestige Q1) and CORE A* and A conferences, favouring relevance as much as possible, to further consolidate its international position across its research areas. In line with this objective, the centre will reinforce its involvement in PhD programmes to gradually increase the number of new and completed theses.

C1.2. Enhance our involvement in leading scientific initiatives. Considering the prestige of editorial roles in leading journals and conference proceedings, we will motivate our researchers to get more involved in these roles. We will also plan to be aware of opportunities to submit for major and high-prestige grants.

C1.3 Improve the base conditions for technology commercialisation. The centre will continue to pursue IP valorisation through software patents, Pre-Disclosures, Technology Disclosures, and technology transfer practices with the results of research projects. To achieve this, the centre will proceed with efforts to promote and streamline internal IP valorisation practices, thereby increasing the impact of its research.

C1.6. Increase the international embedment of our community: The centre will seek to host more international and visiting researchers, as well as engage researchers to enrol in international mobility programmes.

C3. Increase our relevance by closely integrating across science and innovation disciplines and ecosystems.

C3.1. Build stronger knowledge-based and multidisciplinary R&I ecosystems. The centre will actively look to be involved in multi-scientific domains and multi-stakeholder national and international initiatives.

C3.2. Develop better linkages between knowledge production, development, and market uptake. To further develop and exploit the intellectual property generated in projects Inno4vac, NOUS, and IMPROVE Preterm.

C3.5. Increase our international networking, leadership, and competitiveness. The centre will continue to be committed to increasing the participation and leadership in international networks, highly visible international events, and flagship EU and non-EU international projects, especially in the core innovation areas of the centre.

Research

In 2026, we envision the following research lines and activities for each of the centre's research areas:

Computer Human Interaction. This research area aims to understand how people interact with technologies and how technology influences society by designing innovative interaction techniques and interfaces, in line with the mission of ACM SIGCHI. Major research topics concerning human factors for interactive systems include human-centred artificial intelligence (HCAI), cooperative systems, and accessibility. Hybrid human-AI collaborations and committing to exploring human factors in AI through cooperative and crowd-empowered systems are currently hot topics within the CHI community. Cooperative systems' traditional research topics, namely groupware tools, now focus on humans teaming with AI and crowd computing, aiming to achieve a Human-AI symbiosis. Moreover, citizen science is experiencing a growing interest in Digital Twins, engaging stakeholders to contribute and participate in these digital ecosystems.

Computer Graphics and Interactive Digital Media. Computer Graphics is one of the primary drivers of innovation in the IT sector, serving as an underlying layer for Extended Reality solutions (including Multisensory VR and AR), Visualisation, Digital Games, and Interactive Multimedia applications. Our main challenge has been and remains to raise the contribution and visibility of the research we produce in these areas. We are committed to participating in and organising scientific and public events in the area, as well as serving on the boards of important international scientific associations, such as EUROGRAPHICS, the Immersive Learning Research Network, and the IEEE Digital Twin of the Earth working group. Our expertise in immersive environments, through regular industry collaborations and digital games, presents an excellent opportunity to increase our involvement with current and new partners and communities working in this area in 2026. Taking this into consideration, we will continue to utilize all available opportunities, including those created by our students' interest groups and e-learning organisations.

Information Management and Information Systems. This research area advances methods and technologies for managing, accessing, and interacting with information in complex, data-rich environments. It addresses both technical and social challenges in information management, retrieval, interaction, processing, digital preservation, and research data management. Current efforts emphasise integrating research data management practices into scientific workflows, promoting Open Science, and expanding the publication of open datasets and open-source software for the community. The area maintains active collaborations across INESC TEC centres, particularly through the StorySense and CitiLink projects, which investigate innovative approaches to information access in the contexts of news and administrative transparency. Research also leverages advanced instrumentation, such as eye-tracking, to study user engagement and behaviour in information-rich contexts. In 2026, the team will reinforce its international presence through the co-organisation of the CHIIR and iConference events.

Software Engineering. The Software Engineering area aims to develop novel methods, techniques, and tools that advance the design, construction, and assessment of software. It seeks to ensure that the research results have a lasting impact on software development practices and contribute to improving the industry's competitiveness. The main research lines are (1) software requirements, design, and construction: requirements management, software architecture and design, model-driven development, and cloud-native software engineering; (2) software testing: model-based testing, mobile testing, distributed systems testing, and IoT testing; (3) software process and tools: agile processes, process improvement, tools for collaboration and knowledge management; serious games in software engineering education.

Large Scale and Special Purpose Computing Systems, Languages and Tools (LaSPeCS). The research addressed by the LaSPeCS area focuses on methods, algorithms, techniques, software tools, and

compilers that map computations to new and emerging computing systems with heterogeneous, parallel, and distributed hardware support. This research track will explore the opportunities to develop code analysis and transformation targeting several languages including C/C++, Fortran and Android bytecode, which will be used, among other things, to improve MLIR-based compilation flows (e.g., support for streaming-oriented computations), capacitate and modernize Fortran compilation flows using source-to-source technologies, in the context of High-Performance Computing (HPC), and improve simulation capabilities of complex hardware systems.

Computing for Embedded and Cyber-Physical Systems. The development of embedded systems has evolved from the small-scale development of isolated embedded monitoring and control devices to the creation of complex, interconnected systems of systems, integrating hardware, software, control, and physical processes, known as Cyber-Physical Systems (CPS). Embedded and cyber-physical systems are omnipresent in our environment, with applications as diverse as autonomous automotive systems, air quality monitoring systems, and renewable energy generation control, serving as enablers of a smart society. The CECPS research area focuses on research and development in (1) middleware for CPS, Internet-of-Things (IoT), and edge computing; (2) high-performance and predictable management of advanced computation in IoT/edge ecosystems; and (3) methods, tools, and languages for the development, deployment, and maintenance of safe and secure intelligent embedded and cyber-physical systems.

Innovation

HumanISE research is applied in multiple sectors, with a focus on health, earth, ocean, space, and organisations.

[Platforms and Methods for] Earth, Ocean, and Space Science (EOSS). This area aims to support researchers and stakeholders in the EOSS field in achieving evidence-driven science by providing systematic and collaborative methods, assisted by data science tools, to address relevant societal challenges such as climate change or the sustainable management of the environment and its resources. Semantic interoperability, IoT, real-time data stream processing, simulation, big data analysis, reproducible data pipelines, immersive realistic visualisation and visual analytics, Human AI and Digital Twins are a few examples of trends and challenges this innovation area encompasses, which align with research challenges such as computing systems to empower human capabilities, methods, and tools to boost the quality of future software systems, and performance, interoperability, and dependability of critical information systems. This area contributes to best practices and standardisation efforts by active participation in IEEE and OGC work groups.

[Platforms and Methods for] Personalised Health Research. This area aims to empower health researchers with data-driven and AI-enabled tools to advance evidence-based and personalised healthcare. It is structured around two complementary sub-areas: a) Personalised and digitally delivered interventions, leveraging Internet-based and adaptive treatment platforms; and b) Human data management and governance, encompassing secure storage, semantic harmonisation, and controlled sharing of sensitive health data. Key emerging trends include the integration of collaborative, reproducible, and FAIR-aligned research infrastructures, the responsible use of distributed and federated machine learning, and the reinforcement of privacy, security, and data sovereignty. The area directly contributes to the overarching research challenge of enhancing human potential through intelligent and trustworthy computing systems by promoting transparent AI workflows, explainable models, and novel data visualisation paradigms.

Geospatial Information Systems Engineering. This area delivers R&I focused on applied research that leads to products and services better aligned with the industry's needs. One branch aims to provide specialised and advanced consultancy, technology transfer, and innovation, as well as support for adopting good practices and emerging standards by companies and public administration entities. This support places particular emphasis on AI-powered geospatial analytics and machine learning models for spatial pattern recognition and predictive mapping. Another branch aims to help induce a market-driven approach to research and technological development, generating a convergence of knowledge, competencies, and synergies to produce solutions for the Agro-Food and Industry sectors, involving companies and public entities.

Information Systems and Applied Computing. The ISAC area develops R&D activities centred on models, theories, and conceptual frameworks that frame the use of information and information technologies that support organisational processes, including human, social, and organisational phenomena that involve access and availability of information, when computers and computer applications are used for the processing and availability of information. Its key areas are Enterprise Engineering; Enterprise Computing; Data Management Systems and Applications; and Digital Business.

Complementary advances

Jointly with these key advances, in 2026, the other main objectives for the Centre towards its vision are:

C1 - Excel and innovate across the missions of academia, harnessing the collective strength of our community.

The Centre will continue to make efforts in publishing open-access datasets. Furthermore, the Centre will strive to provide innovative learning experiences by involving more students from master's and doctoral programmes in R&D projects and organising new training programmes, both internal and external.

C2 - Make an impact on the toughest challenges of our time in science, technology, and society, through bold creativity and transformative action.

Although the innovation areas of the centre already address global and national grand challenges, industry-specific needs, and public administration challenges, it is planned to create greater internal awareness about these initiatives. Another line of activity is to increase the centre's engagement with the local and regional community, including schools, citizens, and the public. It is of high importance to improve the communication of our achievements.

C3 – Increase our relevance by closely integrating across science and innovation, disciplines, and ecosystems.

HumanISE will advance multidisciplinary research ecosystems integrating computing, information science, and human-centred design, reinforcing the links between research and innovation by translating results from research and innovation projects into validated technological methods and tools. International collaboration and leadership will be strengthened through participation in major R&I networks and flagship projects.

C4 – Cultivate an attractive, people-centred and talented community

The centre will continue to improve the work environment (rooms, equipment, events, etc.) to bring people together, make them feel comfortable, and attract new individuals to join the centre, including foreign researchers, mobility students, and new hires.

C5 – Strive for a sound, sustainable and effective operational model

The centre will continue to operate on a healthy and sustainable operational model, ensuring a project portfolio that blends small and large projects, EU and national, research and applied research, and partnering with universities, research centres, industry, public organisations, and distinguished national and international consortia.

8.9.3 Main initiatives planned for 2026

The Centre will carry the following initiatives and actions towards the above objectives and as part of its continued activity towards its vision:

Table 8.9 - HumanISE

Initiatives	Key Results	Strategic Objectives
Continue to encourage publication in high-ranking journals and conferences.	Maintain or increase the number of publications in Q1 journals and Core A/A* conferences.	C1.1

Initiatives	Key Results	Strategic Objectives
Reinforce the involvement in PhD programmes.	Maintain or increase the number of active and concluded PhDs.	C1.1
Increase the involvement in the leadership of scientific initiatives	Foster the participation of researchers in the program committees for strategic venues.	C1.2
Submit proposals to major and high-prestige grants.	Submit at least one proposal to high-prestige programs, such as the ERC.	C1.2
Increase the effort in IP valorisation.	Encourage the practice of preparing pre-disclosure forms and license agreements.	C1.3, C3.2
Increase the number of international and visiting researchers	Attract more international/visiting researchers	C1.6
Enhance the proportion of researchers enrolled in international mobility programmes	Encourage researchers to participate in international networks and mobility programmes	C1.6
Strengthen the participation in knowledge-based and multidisciplinary R&I ecosystems.	Foster participation in multi-scientific, multi-stakeholder national and international initiatives.	C3.1
Increase international networking, leadership, and competitiveness	Encourage the participation of researchers in high-level and flagship events for selected application domains.	C3.5, C3.2

8.10 LIAAD - Artificial Intelligence and Decision Support Laboratory

Coordinator: Alípio Jorge

Assistant to the Centre Coordinator: Joana Dumas

8.10.1 Centre scope and vision

LIAAD works on Artificial Intelligence, Machine Learning and Mathematical Modelling for Decision Support. Our scientific foundations are computer science, machine learning, statistics, optimisation and mathematics.

Our activity is motivated by three main vectors: 1) Ubiquitous and interconnected data; 2) Complex and comprehensive models for inference and decision support; 3) Interaction of humans and the society with AI systems assuring safety, equity and transparency through a human-centred approach.

We aim to build AI systems that enhance human capabilities and improve society by increasing trustworthiness, transparency, and cognitive power, including grounding language, images, sounds, and other signals in extensive knowledge and enabling causal inference. These systems should have controlled autonomy, explain and trace their actions, interact safely with humans, and respect dignity and fairness. They should also leverage learned and human-provided models to accelerate safe AI adoption.

Our strategy is to exploit growing digitalisation and the rise of AI - especially ML - by developing algorithms and models that close the gap between data and knowledge, offer diverse modelling solutions and reusable resources, and support high-quality human–AI interaction. We conduct fundamental research in computer science and mathematics, supported by postgraduate programs, and maintain a strong presence in leading international venues. Our team is application-ready while pursuing fundamental research goals.

8.10.2 Main objectives for 2026

Highlights

Aligned with INESC TEC Strategic Plan 2023-2030, in 2026 the Centre is prioritising significant advances in the following Strategic Objectives:

C1.4. Develop closer and deeper relationships with our innovation partners and the broader community

LIAAD has a strong scientific base and has been growing in the interaction with public administration, companies and community in general. LIAAD will pursue its research on highly applicable areas as predictive maintenance, natural language processing and generative AI, where several of our projects include societal partners. We will promote the collaboration of the Portuguese NLP community. We aim to gather intelligence on the status of companies and public administration towards digitisation and AI.

C2.1. Develop impactful research and innovation aligned with the SDGs

As transversal technologies, Artificial Intelligence and Decision Support contribute to all the SDG, namely Good Health and Well Being (projects in the health domain), Industry, Innovation and Infrastructure (predictive maintenance and business intelligence) and Peace, Justice and Strong Institutions (responsible AI, environment and natural language processing in collaboration with journalists, finance and law).

C3.5. Increase our international networking, leadership and competitiveness

We will participate in the organisation of a wide variety of international conferences, workshops, tutorials, challenges and conference scientific tracks.

C5.3. Improve quality, management and usage of our infrastructures

Organise LIAAD meet-ups to promote interaction with other centres and strengthen LIAAD's team of hired PhD researchers as an important propeller of LIAAD's success, promote experience exchange in bimonthly meetings with previous, current, and aspiring project leaders.

Research

In **Machine Learning, AutoML, Large Scale ML and Human Artificial Intelligence** we work on the problems of data unbalance, complex networks, online and automated ML. These are some of our 2026 challenges are: (i) Improve causal inference from data using machine learning and Bayesian reasoning and use causal models for explainability and enable the transparency of black box fault models; (ii) Advance the state of the art in the prediction of extreme values and online outlier and event detection; (iii) Design ML techniques for imbalance data streams and obtain post hoc explanations for anomalies detected in predictive maintenance scenarios; (iv) New approaches to integrate multi-modal biomedical data (genomics, clinical, histopathological images) for fair and accurate clinical and healthcare predictive systems; (v) Improve algorithms for Edge AI, namely Federated Learning (FL) approaches and defense mechanisms for FL; and (vi) Develop methodologies for sustainable, efficient and effective Generative approaches for AI challenges.

In **Complex Data Analysis** we develop statistical and machine learning approaches for the representation and analysis of complex data, arising from the aggregation of large amounts of open/collected/generated, or directly available in a structured or unstructured form. Some of our main challenges are: (i) Improve data privacy guarantees, namely on the internet, and in official statistics; (ii) Develop methods for outlier detection in multivariate distributional data; (iii) Develop nowcasting approaches for macro-economic data using un-conventional and administrative data sources; and (iv) Develop algorithms to ensure time series data privacy.

In **User Modelling** we work on algorithms and methods for stream-based recommender systems and consumer modelling. In **NLP** we pursue the semantic and adaptive extraction of narrative structures from news, clinical records, business reports and tweets, their understanding and visualisation. Some important challenges are: (i) Improve semantic entailment using enriched language models; (ii) Deepen the semantic layers of narrative extraction and understanding from text in Portuguese; (iii) Exploit ontology-based semantic enrichment using Generative AI; and (iv) Contribute with models, datasets and applications for European Portuguese.

Modelling and Optimisation: Heuristic and exact methods are developed and applied to combinatorial optimisation problems in multiple fields, including scheduling, storage, and distribution. Agent-Based models are developed and used as computational tools in topics such as in Artificial Economics and Social Simulation. Main challenges for 2026 are: (i) Develop metaheuristic methods to evaluate the impact of considering perishable/deteriorating goods on production and manufacturing schedules; (ii) Developing efficient heuristics for a new variant of the order scheduling problem; (iii) Improve the prediction of crisis and pandemics using agent-based learning resorting to conscious and non-conscious learning models; and (iv) Forecasting crises using link prediction in multilayer bipartite networks.

Mathematical Modelling: We develop fundamental research on game theoretical modelling. Main challenges for 2026 are: (i) Analyse the persistence of the Barrett paradox for quasi linear utilities and (ii) Explain the mechanism of price formation in the presence of positive network effects.

Genomic Data Science and Biomedical Data Mining: we develop the full data analysis pipeline for large scale genomic datasets obtained from multi-modal high-throughput biomedical technologies. Main challenges for 2026 are: (i) Integration of multi-omics datasets to obtain disease insights and (ii) Using Large Language Models and Generative AI to Generate Pathology Reports from Whole Slide Images and other clinical data.

Innovation

Major innovation highlight for 2026 are:

- Natural Language Processing, Large Language Models and ontologies for information extraction, structuring and presentation in the contexts of Clinical Applications and Legal Reasoning using Agent based approaches (including RAG).
- Contribute to a stronger health system through AI.
- Large Language Models for assisting software configuration in a low-code setting.
- Data Science for accounting harmonisation in the context of Humanitarian Aid.

- Machine Learning and Transparent AI for Predictive Quality.
- Define guidelines for AI development best practices using repositories, MLOps and responsible AI.
- Automated Value Models for Real State.
- Generative AI for assistants.

Complementary advances

Jointly with these key advances, in 2026, the other main objectives for the Centre towards its vision are:

Commitment 1 - Excel and innovate across the missions of academia, harnessing the collective strength of our community.

Organisation of international workshops such as SoGood and Text2Story, the DataStreams track of ACM SAC, kick of the preparation for the organisation of RecSys 2028. Participation in the organisation of ECML-PKDD 2026 (core A) and ECIR 2026 (core A).

Commitment 2 - Make an impact on the toughest challenges of our time in science, technology, and society, through bold creativity and transformative action.

Aggregate the communities working in Computational Linguistics in Portugal, Brazil and Galicia for the development of joint scientific efforts, resources and applications with a strong emphasis in the collaboration with humanities (e.g. Linguistics).

Commitment 3 – Increase our relevance by closely integrating across science and innovation, disciplines, and ecosystems.

Collaborate with other centres to deliver more value to the market as a ONE INESC TEC multi-expert team and continue developing synergies with humanities experts in Linguistics in the context of a larger movement towards Computational Linguistics in Portuguese.

Commitment 4 – Cultivate an attractive, people-centred and talented community

Host visiting scientists and students as part of their PhD, postdoc or sabbatical.

8.10.3 Main initiatives planned for 2026

The Centre will carry the following initiatives and actions towards the above objectives and as part of its continued activity towards its vision:

Table 8.10 - LIAAD

Initiatives	Key Results	Strategic Objectives
Workshops Text2Story and SoGood, Conferences ECML PKDD 2026 and ECIR 2026	Increased visibility of the group, international community development	C3.5
Scope.AI and Greengrocer	AI for a more sustainable foodchain	C2.1
PhD student showroom	Yearly display of PhD student projects	C4.1
Tertúlias de IA	Scientific meet-up of the AI domain where LIAAD has a center role	C5.3
PI forum	Quarterly meeting of past, current and aspiring principal investigators. The expected outcome is an increase in project submission	C5.3
Coding principles sessions	Promote code reusability and share	C5.1
Host visiting researchers	Promote international contacts and raise scientific level	C4.1

8.11 CRACS – Centre for Research in Advanced Computing Systems

Coordinator: João Vilela

Assistant to the Centre Coordinator: Joana Dumas

8.11.1 Centre scope and vision

CRACS pursues scientific excellence in the areas of programming languages, parallel and distributed computing, information mining, security and privacy, with a focus on scalable software systems for challenging multidisciplinary applications in Engineering, Life Sciences, Social Networks and the Internet of Things.

8.11.2 Main objectives for 2026

Highlights

Aligned with INESC TEC Strategic Plan 2023-2030, in 2026 the Centre is prioritising significant advances in the following Strategic Objectives:

C1.1. Raise the contribution and visibility of our research. Consolidate CRACS's international visibility, notoriety and publication output, prioritising more publications in high-impact journals and high-ranked conferences. Four young researchers are expected to complete their PhD theses with publications in leading journals/conferences.

C1.2. Increase our involvement in the leadership of scientific initiatives. We estimate the participation in the organisation of 5 international events and 2 advanced training courses conferences, keeping the same participation in 7 journals as editor.

C1.5. Provide innovative learning experiences. Further develop the improvement in efficiency of programming education and its student-perceived experience, focusing our research on the automatic generation of courses using generative AI, and in deploying educational chatbots able to deliver accurate, context-aware, and pedagogically relevant responses.

Research

The following research achievements are envisaged for 2026:

Restartable Sequences (rseq) for transparency and efficiency in non-blocking data structures. Rseq is a Linux kernel concurrency mechanism that enables the use of data structures tied to physical CPU cores, rather than virtual threads. We propose using rseq to overcome the limitation of creating and destroying threads dynamically, enabling transparency in non-blocking data structures, while also improving performance through more efficient memory management.

Machine Learning Models (MLMs) for indoor positioning and species identification. We plan to continue developing and publishing the results of ongoing multidisciplinary projects that use cutting-edge MLMs, including the design, implementation, and deployment of indoor positioning systems (IPS) for venues based on models trained with multimodal datasets, and automatic identification of Portuguese native species of multiple taxa for which we aim to develop vision transformer-based models to boost model accuracy (c.f., https://rubisco.dcc.fc.up.pt/biolens).

Scalability in high-performance computing and distributed systems. Research will focus on: (i) latency-aware autoscaling in distributed event systems, in particular Apache Kafka, to develop predictive mechanisms that balance resource usage under dynamic workloads; (ii) concurrency management in data structures, emphasising lock-free synchronisation techniques, such as lock-free locks, to enhance scalability in multicore environments; and (iii) GPU-accelerated high-performance simulation to predict aeroelastic loads in flexible aircraft structures.

Quantitative Types for Programming Languages. We aim at defining a unifying theory that can deal with several effects relevant to programming languages (work in collaboration with IRIF at Université de Paris).

We are also using quantitative types to explore the relation between functional and concurrent calculi. We hope this will lead to a new collaboration with the University of Groningen.

Access control. We are currently starting the study on the relationship between the Category Based Access Control (CBAC) metamodel, and the Next Generation Access Control (NGAC) model. NGAC is known for its fine-grained, relationship-based representation of policies, while CBAC emphasises structured abstraction through categories. Our goal is to understand how CBAC's metamodel maps onto NGAC (and vice-versa). This is a new joint line of research with King's College London and the University of Marseille.

Resilience and Cascade Failures in Decentralised and Censorship-Resistant Systems. Emerging decentralised infrastructures rely on trust-independent communication and localised consensus, but their distributed nature makes them susceptible to cascading failures triggered by localised disruptions. This research will explore probabilistic connectivity models, such as random K-out graphs, to enhance robustness and quantify the tolerance of these networks to targeted disruptions without requiring topological redesign. In parallel, censorship resistance in peer-to-peer communication is being redefined through ephemeral and adaptive network architectures, leading to complex interdependencies between nodes and relay points, where targeted blocking can induce cascade effects across communication paths. This research will target understanding and mitigating how such propagation dynamics is essential for ensuring both robustness and availability.

Early attack detection & blockage based on ML and Visibility Graphs. The future digital ecosystem will integrate billions of connected devices, accompanied by an exponential rise in risks, attacks and security problems. We plan to design and implement early attack detection mechanisms capable of identifying malicious behaviour and of activating automated blockage procedures. To achieve this, we will combine ML models with the generation of Visibility Graphs (VG), whereby the ML framework will enable continuous model training across distributed nodes without centralising sensitive information increasing the model's accuracy, while visual graphs will detect already known communication flows, dependency chains, or anomalous activity.

Joint communication and sensing privacy aspects. Joint communication and sensing is pointed as one of the transformative technologies for future generation networks, whereby wireless signals are used not for communication, but also for sensing the environment through a pervasive and already available infrastructure. This work will address the application of these techniques on new and unseen environment, where the models These techniques are already effective when trained in specific environments, but lack the ability to be employed in new, unseen environments without further training. Moreover, the pervasive nature of such technologies warrants appropriate privacy mechanisms. These two aspects will be addressed in this research topic.

Digital forensics. We plan to apply Benford's Law, which predicts the frequency distribution of leading digits in naturally occurring numerical datasets, to the contexts of fraud, deepfake and anomaly detection. This integration can be used to identify irregularities that may signal manipulation or tampering of data, strengthening the capacity to identify subtle inconsistencies, detect anomalies and uncover fraudulent activities.

Detecting anomalies and patterns in networks. We plan to apply machine learning models to the detection of anomalies in IoV and IIoT environments, namely those that use CAN and MODBUS protocols, as well as leverage our extensive knowledge on pattern finding in networks, with emphasis on subgraph discovery, to adapt and extend our algorithms to novel domains such as multiplex and signed networks.

Gamified approaches applied to cyberawareness. Leverage game design elements and mechanics to enhance engagement, motivation, and retention of cybersecurity knowledge among diverse user groups that show, traditionally, low user participation and limited retention of information. By integrating elements like rewards, challenges, storytelling, and real-life simulations, gamified methods can create interactive and immersive learning experiences that foster proactive security behaviours, with the potential to transform how individuals and organisations approach cyberawareness, driving more effective risk mitigation and a culture of security.

Time series forecasting and synthetic data generation with privacy guarantees. Develop methods for collaborative time series forecasting in electrical energy time series data with privacy guarantees, and

synthetic multivariate time series generation via complex networks. In particular, (1) designing a link prediction method that encompasses both quantile graphs and visibility graphs derived from univariate time series, and developing an inverse mapping method that transforms the graphs into synthetic interval time series data, and (2) employ time series–to–network transformation mappings as a mechanism for generating synthetic multivariate time series concealing sensitive information while preserving the essential properties of the original data.

Generative AI for adaptive e-learning systems, generation of exercises and educational chatbots. We will fine-tune generative and large language models to automatically generate personalised exercises tailored to each student's profile, as well as explore LLMs generative power with the precision of curated knowledge bases by leveraging the Retrieval-Augmented Generation (RAG) paradigm to train and deploy educational chatbots to deliver accurate, context-aware, and pedagogically relevant responses. The power of data-driven insights and generative algorithms will be used to tailor educational content to individual learners' profiles.

Descriptive Ontology Generation. Descriptive ontologies can be built by asking a group of domain experts to describe how they use the concepts in their domain. In this research, instead of relying on domain experts, we will use large language models (LLMs) to estimate semantic distances about the domain concepts. The identification of relationships between terms, including the taxonomical relationship (is-more-general-than), will be driven by this estimation of the distance between them.

Innovation

The following innovation achievements are envisaged for 2026:

Multidisciplinary applications of MLMs. MLMs provide a novel approach to the problem of indoor localisation and the development of indoor positioning systems. Additionally, developing MLMs for automatic species identification contributes to a better knowledge of Earth's biodiversity and ecosystems.

Access control. CBAC and NGAC are both high-level models of access control that emphasise different organising principles - categories in CBAC (grouping subjects, objects, and actions by shared properties) and attributes and relationships in NGAC. Studying their relationship can reveal a common semantic foundation, enabling interoperability between systems designed with different paradigms. This could support policy translation, hybrid enforcement architectures, or migration from legacy CBAC-based systems to NGAC-compliant infrastructures. This cross-model analysis can yield stronger security guarantees and better understanding of policy consistency and safety.

Innovative methods to detect fraudulent activity. Assess the use of innovative and not so used techniques, namely ones grounded in statistical natural laws like Benford's law, to detect anomalies and fraudulent activities.

NIS-2 directive. Study how the NIS-2 directive's expanded scope, which includes stricter risk management measures, incident reporting requirements, and cross-border collaboration mandates, can influence organisational practices and regulatory compliance. We seek to identify best practices and to propose innovative solutions for enhancing resilience, such as harmonising standards across diverse sectors and scaling its provisions to small and medium-sized enterprises. Additionally, the study could assess the effectiveness of NIS-2 in fostering a culture of cybersecurity and its implications for global organisations operating within EU jurisdictions.

Adaptive Learning Companions for Personalised Education intelligent learning companions powered by fine-tuned LLMs, Model Context Protocols (MCPs), and Agent-to-Agent (A2A) communication. These AI-driven bots will guide students throughout the learning process, generating adaptive exercises, explanations, and feedback aligned with each learner's profile and progress. Through MCP, different AI agents will share context seamlessly, from tutoring and assessment to motivation, ensuring coherent and personalised guidance. The A2A framework will enable these agents to collaborate dynamically, adapting to evolving learning needs. Together, these technologies will create continuous, personalised, and context-aware learning ecosystems, transforming education into an adaptive and responsive experience.

8.11.3 Main initiatives planned for 2026

The Centre will carry the following initiatives and actions towards the above objectives and as part of its continued activity towards its vision:

Table 8.11 - CRACS

Initiatives	Key Results	Strategic Objectives
Prioritise publications in high-impact venues	Raise research visibility	C1.1
Increase involvement in scientific initiatives	Foster international recognition and promote networking	C1.2
Organize events and advanced training courses on big data analysis, distributed memory programming, formal methods, and gamification	Develop new relationships to unlock collaboration opportunities	C1.4
Submit proposals to national and European calls	Increase leadership and competitiveness	C3.5

8.12 HASLAB - High-Assurance Software Laboratory

Coordinator: António Luís Sousa

Assistant to the Centre Coordinator: Catarina Leones Fernandes

8.12.1 Centre scope and vision

HASLab is focused on the design and implementation of high-assurance software systems: software that is correct by design and resilient to environment faults and malicious attacks. To accomplish this mission, HASLab covers three main research areas within INESC TEC Computer Science and Engineering domain - Information Security and Cybersecurity, Distributed Systems, and Software Engineering - complemented by other competencies such as Human-Computer Interaction, Programming Languages, Mathematics of Computing, and Quantum Computing. Through a multidisciplinary approach based on solid theoretical foundations, HASLab aims to provide solutions - theory, methods, languages, and tools - for developing complete ICT systems that provide strong guarantees to their owners and users.

8.12.2 Main objectives for 2026

Highlights

Aligned with INESC TEC Strategic Plan 2023-2030, in 2026 the Centre is prioritising significant advances in the following Strategic Objectives:

C1: Excel and innovate across the missions of academia, harnessing the collective strength of our community

- Raise the contribution and visibility of our research

In 2026 we aim to continue to increase the relevance of our publications, namely we aim to have at least 25 papers submitted to CORE A* and A conferences or equivalent top-ranked journals, in the key research areas of HASLab, including distributed systems (DS), software engineering (SE), and cryptography and information security (CIS). In what concerns the DS team, we aim to submit research papers for international conferences such as VLDB, OSDI, FAST, SOSP, HPDC, EuroSys, Middleware, SIGMETRICS, and SIGCOMM.

Under the CIS team, we aim to continue developing formally verified implementations of the ML-DSA, ML-KEM, and SLH-DSA postquantum standards and deploy formally verified cryptographic code in production environments to support the postquantum transition.

- Strengthen the sustainability and resilience of our economic model

In 2026, HASLab will continue to work on different R&D projects, several of them international and funded by Horizon Europe, EuroHPC, and the UTAustin and CMU partnerships, but also some national projects funded by P2030, FCT and PRR. Our main goal to 2026 is to increase our funding in research projects, and our goal is to submit, at least, ten new project proposals for competitive funding of different typologies.

C2: Make an impact on the toughest challenges of our time in science, technology, and society, through bold creativity and transformative action and C3: Increase our relevance by closely integrating across science and innovation, disciplines, and ecosystems.

In 2026, HASLab aims to establish itself as a vertically integrated research and innovation centre dedicated to addressing key challenges in data-intensive computing. These challenges rely heavily on distribution and parallelism to ensure interoperability, scalability, and dependability. HASLab will contribute to solving the most pressing issues in the emerging data economy while collaborating across research and innovation with other teams at INESC TEC and engaging in various global research and industry partnerships.

Research

Increase our involvement in the leadership of scientific initiatives

Another goal for 2026 is to enhance our engagement with international scientific societies. Specifically, we expect that HASLab members will represent Portugal in at least one additional IFIP Technical Committee.

Increase the international embedment of our community

HASLab will also continue developing international partnerships and collaborations with HPC centres and research institutions in Europe, USA, and Japan. HASLab will aim at visiting and hosting researchers from these institutions and submit new proposals for ten international collaborative research projects. Also on SE area, HASLab aims to increase the mobility of senior researchers, namely have at least 4 visits of senior researchers to internationally renowned institutions (UCL, Cornell, MIT, Toulouse).

Raise the contribution and visibility of our research

HASLab will continue to contribute to systems research with emphasis on data management and high performance computing. In data management, the team will address a range of research challenges related to storage systems and architectures, query and transactional processing in database systems, large scale and replication, middleware and interoperability, and data intensive applications. In high performance computing, the team addresses challenges related to high performance storage, energy and sustainability, and applications. It is also planned that three Ph.D. students will graduate.

In the CIS area, HASLab will continue to be a key partner in the Formosa Crypto project, which federates several initiatives in machine-checked cryptography and high-assurance cryptographic engineering. In the upcoming year, the main goals within this project are to continue the development of formally verified implementations of post-quantum cryptographic standards ML-KEM, ML-DSA, SLH-DSA. Enhancements to the formal verification framework comprising Jasmin and EasyCrypt will be pursued, including new automatic proof generation techniques that will reduce proof effort and widen the set of formally proved end-to-end security guarantees.

Innovation

HASLab is an active contributor to the development of several formal methods for software engineering. In 2026, we intend to focus our research on applying formal methods to application domains that are aligned with the industry needs, for example to transactional database systems or safety-critical interactive systems. More specifically our goal is to have at least 3 papers focusing on industry relevant application domains.

The DS team at HASLab will in 2026 deliver concrete results with high TRLs related to storage systems, software monitoring and testing, data processing pipelines, privacy-preserving database systems, Data Space connectors, and Digital Product Passports.

In CIS area, HASLab will be working with industrial partners and open-source initiative Post-Quantum Code Package to deploy formally verified cryptographic code in production environments to support the postquantum transition. We will also be working on the development of new cryptographic standards in domains like identity management and secure communications.

These tangible outputs, planned for 2026, correspond mainly to activities in collaborative projects funded by Horizon Europe and national P2030 and PRR projects, as well as to national and international direct development and consultancy contracts with individual companies. In fact, it is also a goal for 2026 to submit new applications for collaborative innovation projects as well as engage in new direct contracts with international companies.

Complementary advances

Jointly with these key advances, in 2026, the other main objectives for the Centre towards its vision are:

Commitment 1 - Excel and innovate across the missions of academia, harnessing the collective strength of our community.

- Provide innovative learning experiences

In 2026, we aim to increase the number of students conducting research in HASLab. In particular, we aim to have 50MSc theses concluded under the supervision of our senior researchers and 7 new grants for MSc theses within the context of R&D projects at the centre. We also want to continue to support key courses related to systems at the U.Minho and the U.Porto, at all levels (B.Sc. to Ph.D.) towards fulfilling the wider mission of academia.

Commitment 4 – Cultivate an attractive, people-centred and talented community

Cultivating and expanding the systems research community, from undergraduate students to professors and senior researchers, remains a top priority in 2026. Specifically, HASLab will expand outreach and dissemination activities and leverage visits and visitors to expand this effort internationally.

8.12.3 Main initiatives planned for 2026

The Centre will carry the following initiatives and actions towards the above objectives and as part of its continued activity towards its vision:

Table 8.12 - HASLab

Initiatives	Key Results	Strategic Objectives
Promote publications in high-ranked journals and conferences	30 submissions	C1.1
Promote the interaction and networking between members	6 lunches, 2 team building activities, PhD Bytes	C5.2
Support ERC grant application	2 submissions	C1.2
Increase researchers' mobility	1 outgoing visit; 1 outgoing student internships; 4 incoming visits	C1.6
Foster the expansion and the stabilisation of core teams	1 new PhD hire and retention of 2 employment contracts of PRR	C1.4
Attract MSc students	7 new grants for MSc students; 50 concluded MSc theses	C1.5
Increase the collaboration with other centres	2 new project proposals	C3.1
Promote new initiatives to enhance internal collaboration between us and other research centres	2 meetings to explore interest areas to collaborate	C3.1
Communicate scientific and technological achievements and their impact	4 visits and presentations to secondary schools	C2.7

9 SPECIAL PROJECTS

9.1 UT Austin Portugal Program

Coordinator: Rui Oliveira

Executive Team: Andreia Passos and Vera Pinto

9.1.1 Mission and positioning

In 2025, the Program entered a new phase running through 2030, under a renewed governance model designed to strengthen strategic planning, evaluation, and monitoring across all FCT's International Partnerships. This reform aims to ensure increased transparency and broader representation from higher education institutions and the national scientific and technological system, as well as more effective coordination between the Portuguese and American sides.

With this stronger foundation, UT Austin Portugal is poised to tackle new challenges through the unique collaboration between Portugal and Texas, led by the University of Texas at Austin. The Program now focuses on four strategic areas: Clean Energy (developing sustainable systems and hydrogen technologies), Advanced Computing (scaling tools for greener computing and AI), Nanotechnologies (advancing the discovery of critical materials), and Space-Earth Technologies (harnessing space technologies for Earth applications). To translate these scientific advances into innovation and business opportunities, the Program will also promote a range of close-to-market activities - from prototyping to customer discovery and market entry. With José Manuel Mendonça stepping down from the Program's leadership to serve as Chair of the new Mission Structure for the U.S. Partnerships, Rui Oliveira assumes leadership of the Program, alongside Rute André from the University of Aveiro. The Portuguese office will continue to be hosted by INESC TEC, through the SRI and its team.

9.1.2 Main objectives and actions planned for 2026

In 2026, the Program Leadership in Portugal, supported by the Executive Team, will work closely with UT Austin and the new agency replacing FCT (expected to be established in early January next year) to ensure the implementation of the activities outlined in the Technical Annex to the Phase IV Agreement, as well as other initiatives deemed essential for fulfilling the Program's mission. In some cases, this will require the Portuguese Leadership and the Executive Team to engage, over the coming year, in discussions and negotiations with the new research and innovation agency and other relevant stakeholders to secure complementary funding beyond the resources already allocated to the Partnership through last year's Ministerial Council Resolution.

Planned activities for 2026 include:

- Management, monitoring, and reporting of activities launched in 2025 and continued into 2026.
- Design, launch, and management of competitive calls for joint projects (e.g., exploratory and strategic), research internships, and PhD in-residence internships.
- Launch of the Startup2Scale Program and a new edition of TechLaunch.
- Development and implementation of a tailored training portfolio in collaboration with UT Austin's TxEEE and the McCombs School of Business.
- Communication and storytelling initiatives to raise awareness of opportunities, connect stakeholders from both sides of the Atlantic, strengthen community engagement, and highlight the Program's return on investment.
- Regular meetings with key stakeholders and governing bodies within the new governance model.
- Organisation of networking events (U.S. Partnerships Session at Encontro Ciência and Joint Annual Conference with CMU Portugal and MIT Portugal

9.2 INESCTEC.OCEAN

Coordinator: Diana Viegas

9.2.1 Mission and positioning

INESCTEC.OCEAN stands as Portugal's Centre of Excellence in Ocean Research and Engineering, strategically positioned to lead sustainable technological innovation across marine domains, and contributing to the sustainable and sovereign development of the ocean economy.

In alignment with INESC TEC's institutional strategy, the European Green Deal and the European Ocean Pact, this initiative advances an integrated vision of ocean sustainability that combines scientific excellence, technological innovation, and societal impact.

Through its multidisciplinary capacity in Marine Structures, Marine Robotics, Ocean Energy, and Ocean Data, INESCTEC.OCEAN delivers advanced R&D solutions from the deep sea to earth and space that respond to global challenges and policy priorities such as the EU Mission "Restore Our Ocean and Waters," the Digital Ocean Twin initiative, and the United Nations Decade of Ocean Science for Sustainable Development.

9.2.2 Main objectives and actions planned for 2026

The strategic goal for 2026 is to operationalise and scale up the Centre's integrated research, innovation, and training activities, ensuring long-term sustainability, strengthened partnerships, and greater impact across the quadruple-helix ecosystem - academia, industry, government, and civil society. The Centre will deepen its mission to foster effective and self-sustained R&D&I initiatives devoted to technologies for observing and operating in the Ocean environment, responding to the complexity and challenges of the Portuguese maritime space. In 2026, INESCTEC.OCEAN will consolidate its access to complementary national and European funding sources to reinforce human capital development (including the ongoing Brainware capacitation program), promote new collaborative projects, and sustain high-level scientific and technological infrastructures. This will include continued support for advanced training programs, with the aim of maintaining or expanding the current portfolio of research chairs and doctoral scholarships and fostering international mobility and talent attraction.

In line with INESC TEC's Strategic Plan 2023–2030, the specific objectives for 2026 are:

- Reinforce strategic alignment and collaboration with Higher Education Institutions, by consolidating and expanding academic protocols established in 2025, supporting joint laboratories, co-supervised PhDs, and collaborative teaching initiatives in key ocean engineering areas.
- Strengthen multidisciplinary and knowledge-based R&I ecosystems, by operationalising its scientific domains and launching cross-cutting programs connecting them, leveraging synergies across INESC TEC, and establishing new partnerships with international networks, clusters, and innovation platforms.
- Enhance industry collaboration and innovation transfer, by expanding the number of corporate research chairs with strategic partners in offshore energy, aquaculture, maritime transport, and digital ocean technologies and supporting pilot projects and testbeds that demonstrate new ocean technologies in real operational environments.
- Strengthen stakeholder engagement and societal dialogue, by consolidating the Stakeholder Forum as a permanent advisory body, ensuring continuous dialogue with over 30 international entities and expanding participation to new public and private actors and by promoting science communication and outreach initiatives to raise public awareness of sustainable ocean engineering and policy alignment.
- Improve infrastructure management, access, and utilisation, by implementing the cooperation protocols initiated in 2025 and expanding shared access models for national and European research infrastructures and promoting digital integration and data interoperability across platforms supporting ocean observation and operation.

10 OFFICES, COMMISSIONS AND ESG

10.1 Compliance Officers

10.1.1 Anti-corruption Compliance Officer

Officer: Ana Maria Mendonça

Presentation

The anti-corruption compliance officer (RCN) ensures and controls the application of the Regulatory Compliance Programme for the Prevention of Corruption, as well as the implementation, control and adjustment of the Risk Prevention Plan (PPR), which is an integral part of the above-referred Programme.

At INESC TEC, all these duties are performed independently, permanently and with decision-making autonomy, with the necessary human and technical resources made available by the Institute.

Main objectives and initiatives planned for 2026

The initiatives foreseen for 2026 are aligned with the strategic objective “Strengthen our commitment to independence and compliance of research with ethical principles”, although some are required to comply with the National Anti-Corruption Strategy.

The planned activities include some routine actions, such as:

- Control of the reporting channel on corruption and breaches of EU law in certain domains, including the reception and follow-up on reports;
- Answering of questions and doubts concerning the code of conduct and the risk prevention plan.

Other specific activities that are planned are:

- Elaboration of the interim and annual evaluation reports of the PPR and ensure the necessary interface with the competent entities in the field of prevention of corruption;
- Annual revision of the PPR or other revision to reflect any change in the organisational structure of INESC TEC;
- Elaboration of the reports of non-compliant practices and set-up of a record keeping of all information regarding the elaboration, implementation and review of prevention or risk management programmes.

Finally, we intend to repeat some of the Training Actions performed in previous years, namely those aiming at raising awareness against corruption, specially targeting the new members of INESC TEC Community. Other Training Actions, addressed to specific groups, will also be considered.

10.1.2 Data Protection Officer

Officer: Vasco Rosa Dias

Presentation

According to its legal statute the DPOs principal role is to inform, advise about and monitor compliance with data protection law provisions and with the policies of the controller in relation to the protection of personal data, including the assignment of responsibilities, awareness-raising and training of staff involved in processing operations, and the related audits.

Main objectives and initiatives planned for 2026

Overall, the DPO role is aligned with several of INESC TEC's strategic plan objectives, namely and first of all, by strengthening our commitment to independence and compliance of research with ethical principles, and also by indirectly contributing to a more impactful, socially responsible and multidisciplinary R&D, aligned with the SDG's, as well as to the resilience and sustainability of INESC TEC model.

Within the general tasks of the DPO we highlight in 2026 the following specific objectives:

- Strengthening of the internal awareness-raising initiatives, including as to the assignment of responsibilities within the organisation, thereby contributing to the dissemination of a data protection compliance culture across INESC TEC community;
- Keeping and developing the training plan for staff members and researchers;
- Particular emphasis shall be given, in the above-mentioned realm, to scientific research related topics and, in particular, the interplay between data protection and newly regulated fields such as AI systems design and deployment.
- Continuous implementation of the existing set of monitoring and auditing data protection tools available internally, following the activities conducted in the previous years;
- Continuous monitoring and assessment of the Institute's activities, including the R&D projects in close cooperation with the Ethics Committee;
- Advise to the Board on Data Protection related issues; contributions to AI related task forces/ working groups;
- Continuous cooperation and coordination efforts with ISPUP under the Protocol established in the field of Data Protection;
- Follow up on relevant regulatory and standardisation/ certification developments at the national, EU and international levels, including in what comes to the intersection between data protection and connected fields like digital markets, data governance, data spaces (special emphasis given to the European Health Data Space) and AI;
- Contribution to external awareness-raising, R&D and policy making initiatives, in close cooperation with INESC TEC research partners, international or EU agencies and networks or associations like Metared, EARTO.
- Cooperation with INESC TEC associates, INESC network and the INESC Brussels Hub.

10.2 Internal Commissions and Committees

10.2.1 Conflict of Interest Management Commission

Chairperson: José Carlos Marques dos Santos

Presentation

The concern over the existence of conflicts of interest in organisations became more common due to the growing complexity of society, the number and diversity of relations between collaborators of organisations and external entities, and the increasing sensitivity of society to these issues.

To ensure the independence and the integrity of the activities carried out, as well as to secure transparency regarding the interests of INESC TEC collaborators, that should be known by the Institution, by its bodies and services, by other collaborators and by the entities with which it has relations, INESC TEC adopted in 2017 a conflict of interest management policy which includes the Conflict of Interest Management Commission (CGCI) to ensure compliance throughout the Institution.

Main objectives and initiatives planned for 2026

The work of CGCI is a continuous process that in 2026 will carry out a set of initiatives and actions that fall under the Strategic Objectives 4.5 “Strengthen our commitment to independence and compliance of research with ethical principles” of the Strategic Commitment n.º 4, “Cultivate an attractive, people-centred and talented community”, and 5.4 “Strengthen the distinctive aspects of our institutional model” of the INESC TEC’s Strategic plan 2023-2030.

Below is a list of the main initiatives and actions to be carried out by CGCI:

- Regular contacts with the INESC TEC community, namely through e-mail announcements and/or by answering questions and publishing information in the dedicated area in the intranet, ensuring that all INESC TEC collaborators are perfectly informed regarding the Institution's Conflict of Interest Management Policy and its application;
- Regular analysis of submitted declarations of interest (DI) and preparation of conflicts of interest management plans (PGCI), if justified, to be approved by the Board of Directors;
- Supervision of the process of monitoring each PGCI by the designated monitor to ensure that each one is complied with by the employee to whom it has been assigned;
- Monitoring the compliance, considering due dates for DI presentation, through a weekly report that reflects the submission status of each collaborator;
- Monitoring the performance of the process, recently implemented on the conflict of interest management (GCI) IT platform, for the semi-automation of the preparation of half-yearly reports to be submitted by monitors of PGCI;
- Adaptation of the GCI IT platform to include the process that will make it possible to comply with article no. 5 (Offers, Gratuities and Advantages) of INESC TEC's Code of Conduct for the Prevention of Corruption, which the CGCI was tasked with;
- Prosecution of the promotion of training sessions on the application of the Policy for R&D centre coordinators and for monitors.

10.2.2 Diversity and Inclusion Commission

Chairperson: Ana Sequeira

Presentation

The INESC TEC Board of Directors established the Diversity & Inclusion Commission (D&IC) in September 2021. The D&IC is chaired by Ana Filipa Sequeira, and is composed by: Ana Isabel Lopes, Aurora Libânia Teixeira, Tiago André Silva, and two new elements to be welcomed in the commission. The D&IC's work is supported by the Internal Advisory Group, composed of a representative set of collaborators participating through brainstorming, discussion, and validation; and the External Advisory Group, composed of key players in the D&I field and providing strategic counselling.

In 2026, the D&IC will continue to focus on raising awareness, developing skills, monitoring the D&I landscape, and promoting initiatives in four priority areas: 1) **Gender Equality**: This area will prioritize gender-related issues by monitoring and assessing the implementation of the Gender Equality Plan and promoting events that emphasize the importance of gender parity; 2) **Interculturality**: The commission will collaborate with INESC TEC's various services to foster an inclusive environment and raise awareness of intercultural aspects related to different institutional initiatives and processes. 3**) Accessibility**: Efforts will be made to promote universal access to all INESC TEC activities, communications, and platforms. The committee will also assist collaborators and decision-makers in understanding how to achieve this goal.; 4) **Healthy Work Environments**, working on the outcomes of the survey to help create healthy conditions to all INESC TEC' members, special attention will be given to mental health, work-life balance, and the promotion of inclusive community engagement, as well as strengthening transparency in institutional decision-making

Main objectives and initiatives planned for 2026

In 2026, the Diversity & Inclusion Commission (D&IC) will continue to guide and empower the INESC TEC community in implementing inclusive practices aligned with its four priority areas and broader strategic goals. The Commission will focus on monitoring the institutional culture and environment while promoting a variety of events and initiatives that foster diversity and inclusion across the organisation.

To strengthen its consultative role, the D&IC will engage in learning opportunities through external training and partnerships within the scientific community. Internally, it will collaborate with services such as Social Responsibility, International Relations, and Human Resources to develop impactful projects and provide feedback that enhances inclusion. The Commission will also launch new initiatives and build on successful past events to deepen community engagement in diversity and inclusion efforts. The D&IC activities for 2026 include:

- Commitment to gender equality promotion across INESC TEC's policies and culture.
    - Increase gender balance and representation through the Gender Equality Plan dissemination and enforcement of the Gender Equality Plan in collaboration with other INESC TEC bodies.
- Increase the international embedment of our community.
    - Encourage networking opportunities among national and international collaborators, providing a safe space for learning and discussion. Promote initiatives to give visibility to foreign cultures.
    - Participate in international and external institutions' initiatives.
- Expand the diversity of our community / Promote a more dynamic and healthy working environment.
    - Monthly initiatives to promote a diverse workplace: i) events; ii) dissemination of information regarding specific dates and celebrations relevant to the Commission's work; and iii) sharing curated knowledge on inclusive practices. Encourage training on various diversity and inclusion topics identified as significant concerns within our community.

- Promote awareness of unconscious bias and related prejudicial practices, fostering inclusive leadership, and encouraging reflection on moral and sexual harassment.
- Enforcing the accessibility of activities and the facilities at INESC TEC for everyone, including people with impairments.

10.2.3 Technical Committee for Social Responsibility

Chairperson: António Baptista

Presentation

Social Responsibility is "a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis", as defined by the European Commission in 2011. Based on that, in 2019, the Technical Committee for Social Responsibility was created with the goal of working on INESC TEC's philanthropic dimension from an internal point of view, i.e., issues related to the institution itself and its employees; and from an external point of view, i.e., how INESC TEC can support the local community.

Main objectives and initiatives planned for 2026

Below we have listed the main initiatives and key actions planned for 2026, aligned with the Strategic Objectives, listed in Section 9, of INESC TEC's Strategic Plan:

- Provide a more dynamic and fulfilling working environment
    - Continuous awareness and dissemination of information on Safety and Health at Work, e.g. support the revision of institutional procedures and signage related to this topic and organisation of different initiatives (risk mapping by profiles, laboratories and workspaces including field areas, training, etc.) and promote a safety mindset outreach (work-family);
    - Organisation of initiatives that foster the mental health and well-being with activities, such as internal communication actions (Intranet, INESC TEC APP, etc.), workshops, group activities, for the INESC TEC community, in direct articulation with the Human Resources Service.
- Communicate scientific and technological achievements and their impact
    - Dissemination of scientific information about new occupational diseases through several initiatives. Maintain the current partnership with EU-OSHA through the dissemination of the new triennial campaign (2026-28), with new types of involvement with the community, namely the production and submission of articles and/or best practices to contribute to this European initiative;
    - Scientific and technological outreach activities across different areas and education levels (e.g. pre-school, high school, etc.) aimed at promoting INESC TEC's scientific domains, disseminating project results relevant to these communities, and encouraging interest in STEM fields. This includes, for instance, the promotion of the initiative "Levar a Ciência ao IPO Porto", which engages hospitalised children and teenagers in interactive and inspiring science and technology experiences.
- Develop closer and deeper relationships with our innovation partners and the broader community
    - Association with the student community through representation in the consortium of the "Escolhas com Futuro" project;
    - Promotion of volunteerism ("Dia do Voluntariado" and other related events) to encourage participation in community service or charitable activities;
    - Promotion of blood donation campaigns, in line with the growing need in Portuguese Hospitals, in INESC TEC's different hubs;
    - Organisation of a several social donation campaigns along the year (e.g. Christmas, Children's Month, etc.);
    - Collection of old batteries, electrical, and electronic products, a multiple event campaigns dedicated to WEEE (waste electrical and electronic equipment), old products,

residues, for the proper treatment, valorisation (including reuse and repair for donations), and increased circularity.

- Promote and contribute to environmental sustainability
    - Promote community and family engagement through sustainability-oriented initiatives, including recycling activities and games, tree planting, and environmental clean-up actions along beaches and riverbanks, etc.;
    - Support the strengthen of sustainability and resilience of our economic model;
    - Develop awareness campaigns about climate change, resilience threats and sustainability to INESC TEC community, as a first line action to address this topic;
    - Foster a climate-conscious and socially responsible culture by reducing carbon emissions from corporate and individual travel, promoting sustainable mobility practices among INESC TEC staff and the wider community.

The Technical Committee for Social Responsibility team will place a strong emphasis on communication and dissemination actions to ensure greater visibility and engagement with the planned initiatives through and with the community. These actions will be carried out through INESC TEC's internal communication channels, including updates to the intranet page, the INESC TEC APP, the internal chat, and internal email, as well as through the institutional newsletter BIP and INESC TEC's official social media platforms in direct articulation with SCOM service.

10.2.4 Ethics Committee

Chairperson: Pedro Guedes de Oliveira

Presentation

The INESC TEC Ethics Committee (E.C.) was appointed by the INESC TEC Board in 2022 and, since then, has been chaired by Pedro Guedes de Oliveira, Professor Emeritus at the University of Porto and Chairman Emeritus of INESC TEC. The Committee also includes Susana Magalhães, who holds a PhD in Bioethics and is the Coordinator of the Unit for Responsible Conduct in Research at i3S and a professor at Fernando Pessoa University; Vasco Rosa Dias, Data Protection Officer at INESC TEC and ISPUP; and Alípio Jorge, professor at the Faculty of Sciences of the University of Porto and researcher at INESC TEC.

Cristina Ribeiro, a retired professor at the Faculty of Engineering and former member of the E.C., has requested to be relieved of this role, and a new member will soon be appointed by the INESC TEC Board.

Main objectives and initiatives planned for 2026

The Ethics Committee is responsible for ensuring the promotion of standards of integrity, honesty and responsibility in all INESC TEC members' activities, particularly in their research, through compliance with the institution's Code of Ethics. Therefore, the main objective of the E.C. for 2026 remains as previously defined: to strengthen INESC TEC's commitment to the independence and ethical compliance of research activities.

To achieve this, the E.C. will continue to support INESC TEC researchers in maintaining high ethical standards in their work, both by assessing questionnaires related to ethical issues that may arise in projects and by interacting with and responding to questions from Principal Investigators concerning projects involving human participants, personal data, artificial intelligence or autonomous systems.

However, the evolving geostrategic situation and the European Union's renewed focus on defence - particularly through the funding of defence or dual-use projects - will lead us to include questions related to this topic in the ethics questionnaire and to coordinate the E.C.'s actions with the committee responsible for monitoring projects in these areas.

The following aspects should be highlighted:

- The coordination between the E.C. and other INESC TEC structures has already been implemented with regard to Data Protection, ensuring consistency in actions and procedures. Extending this coordination to defence-related ethics issues will pursue the same objectives.
- Following the successful series of six online conferences entitled INESC TEC Open Talks on Ethics in Research and Defence - which we consider having achieved their goals and will therefore not continue - a new cycle of quarterly online conferences will begin, dedicated to other themes yet to be defined.
- At the same time, the E.C. will continue to focus on ethical issues arising from research in Artificial Intelligence, following developments both internationally and at the level of the European Commission. In this context, we will encourage dialogue with other fields offering different and complementary perspectives, particularly philosophy - a dialogue already initiated through joint participation in workshops.
- The relationship and coordination with other ethics committees, both within the University of Porto and other R&D institutions, will also be strengthened with the aim of exchanging experiences and fostering mutual learning.
- Finally, we will maintain our continuous efforts to improve IT support for reporting and interaction.

10.3 Other Institutional Initiatives

10.3.1 Foresight and Public Policy Office

Officer: Joana Almodovar

Presentation

The Foresight and Public Policy Office is INESC TEC's dedicated hub for promoting policy engagement and impact. It supports the dissemination of ongoing R&I activities and contributes to public policy agenda-setting, strengthening evidence-based decision-making.

As a key Research and Technology Organisation (RTO) acting as an interface between research, innovation, and firms, INESC TEC is well placed to leverage its stock of scientific and technological competencies to support public policy and collaborate with policymakers. This collaboration spans regional, national and European levels and involves Government, public administration (PA) officials, and PA Services.

The mission of the Office is to enhance the institute's impact on public policy at regional, national, and international levels. On the one hand, it helps align knowledge generated through INESC TEC's research and innovation activities with societal priorities, including Government and EU programmes, initiatives and instruments. On the other hand, by identifying megatrends and conducting foresight activities, it supports internal reflection on transformative areas of activity and their public policy implications. INESC TEC's policy engagement therefore targets not only the design or adaptation of current public policies but also the identification of trends that will shape future public instruments, particularly in a context of accelerated technological, economic and geopolitical change.

The Office acts as broker, articulating internally the activities and collaborations of key units – R&D Centres, TEC4 platforms and their teams – while working closely with other transversal services and offices, notably INESC Brussels HUB and SCOM. This coordination reinforces INESC TEC's contribution to multi-level public policies and the societal recognition of the institute.

Main objectives and initiatives planned for 2026

The Office will consolidate its mission through the following objectives and initiatives, supported by a dedicated repository as a key tool to systematise and disseminate INESC TEC policy outputs:

- Map the policymaking ecosystem – Identify public policy stakeholders (entities and people) at national, regional, EU and international levels; monitor public policies (legal documents, public consultation processes) and disseminate them internally (Strategic Objectives (SOs) 3.1, 3.4 and 5.4)
- Policy engagement – Facilitate the production of policy briefs and policy papers that contribute to national and EU frameworks, supported by dedicated training, and through contributions to the Science & Society Magazine. (SOs 1.1, 1.4, 2.5, 3.4 and 5.4)
- Stakeholder engagement – Promote the dialogue between INESC TEC and policymakers through: i) proactive networking and the organisation of events (Autumn Forum, workshops, high-level visits); ii) participation in external policy events; iii) institutional representation in relevant fora (associations, working groups); and iv) the Lisbon workspace, ensuring proximity to national authorities and integration with other INESC offices, notably INESC Brussels HUB, to strengthen INESC TEC's positioning as a trusted advisor. (SOs 2.5, 3.1, 3.4 and 3.5)
- Foresight and strategic planning – Survey emerging trends and integrate scenario planning into INESC TEC's annual strategic reviews (SOs 3.4 and 5.4)
- Strategic communication and outreach – Work with SCOM to improve INESC TEC's visibility in public policy (SOs 1.1, 2.7 and 3.5)

10.3.2 INESC Brussels Hub

Officer: Ricardo Miguéis

Presentation

The INESC Brussels HUB embodies the shared ambition of the five INESC institutes to position themselves as influential actors in the European Union's research and innovation (R&I) ecosystem. In 2026, the HUB will consolidate its evolution into a strategic intelligence and positioning engine, translating European R&I signals into institutional advantage. The plan builds on the 2025 framework while upgrading a Sensing & Seizing model into a structured mechanism for strategic readiness, institutional visibility, and consortium leadership, in alignment with the Strategic Objectives (SOs) defined in INESC TEC's Strategic Plan 2023–2030.

Main objectives and initiatives planned for 2026

The HUB will advance its mission through five objectives, each supported by a focused set of initiatives:

- Strengthen presence and visibility in the EU: expand structured participation in FP10 and European Competitiveness Fund (ECF) co-design processes; strengthen positioning in Coordination and Support Action (CSA) ecosystems through identification and co-leadership of strategically aligned CSAs; maintain EU institutional missions and visits, and organise Brussels-based pre-consortia workshops on key themes (e.g., digital sovereignty, net-zero technologies, AI governance); continue co-development of joint positioning papers with other RTOs and platforms (e.g., EARTO, Science|Business). (SOs 2.5, 3.4 and 3.5)
- Promote thought leadership through a Think Tank: launch the INESC Future Labs Forum as a Brussels strategic-dialogue series on technology-policy foresight with policymakers, researchers and industry; expand the Insider podcast into a bi-weekly flagship platform on EU R&I, featuring leading EU, RTO and industry voices; publish quarterly cross-sector European intelligence reports and disseminate strategic thought pieces in key channels (e.g., Science|Business, Euractiv, EUObserver); deliver advanced capacity building on the science-policy interface, CSA leadership and FP10 architecture. (SOs 1.1, 3.4 and 3.5)
- Deploy the Sensing & Seizing framework for R&D Centre readiness and positioning: implement a structured five-phase journey – from context sensing and readiness diagnosis to strategic positioning, partnership building, and 6-12-month roadmaps – supported by dedicated tools; offer two delivery modes – a full structured journey for baseline strategy alignment, and a modular toolbox mode responsive to specific centre needs. (SOs 1.3, 2.5 and 5.4)
- Reinforce strategic events, communication and brand visibility: maintain Winter and Summer Meetings with foresight and policy components; host a high-level event at the new Brussels office under the INESC Future Labs Forum umbrella. (SOs 1.1, 2.7 and 3.5)
- Expand the HUB's infrastructure and team: finalise relocation to the new Brussels office, enabling strategic hosting and co-creation; strengthen the team with expertise in stakeholder engagement and EU programme design; launch a Brussels Visiting Fellows Programme and structured secondment pathways between the HUB and INESC centres; create a digital coordination platform to support inter-institute strategic alignment. (SOs 1.4, 2.5 and 5.4)

10.3.3 Research Student Office

Officer: Sara Brandão

Presentation

The Research Student Office acts as a central coordination hub for initiatives involving research students across INESC TEC. It reinforces the institute's capacity in advanced training by bridging education and research and by supporting the Board with strategic insight and evidence-based guidance for decision-making. It also ensures a coherent institutional vision for a community that represents a significant share of INESC TEC's human resources and is a key driver of knowledge and innovation. The office's mission is threefold: to enrich the research journey of students, with a primary focus on PhD candidates, preparing them to achieve excellence and success through strong collaboration with academia and industry; to create the conditions for INESC TEC to perform as a distinctive agent for advanced training, enhancing institutional reputation and impact; and to promote an institutional culture that values research students as essential contributors to the organisation's scientific and innovation ecosystem.

Recently established and operating with a small core team, the office is laying the groundwork to achieve its vision of positioning INESC TEC as an international reference in doctoral research and training, and one of the best places to be a doctoral student. Adopting a holistic approach, the office will act across several dimensions - from improving the student experience and promoting good supervision practices, to strengthening academic and industry collaboration, enhancing communication and operational support, and establishing mechanisms to monitor student progress and related performance metrics. By engaging with all key actors - students, supervisors, academic partners, business partners, and internal structures - the office seeks to ensure that research students are effectively supported, mentored and equipped with all the skills, resources, and opportunities needed to excel, producing world-class research and reinforcing INESC TEC's global reputation.

Main objectives and initiatives planned for 2026

Following the initial implementation phase in 2025, the office will now focus on consolidating and expanding its foundations, strengthening institutional processes, and implementing strategic initiatives that support its mission and long-term vision, in alignment with INESC TEC's 2023–2030 Strategic Plan.

Student Experience and Development - Strengthen communication, belonging, and professional growth by launching a dedicated information channel, supporting the *PhD Representatives Committee*, and organising events and workshops that promote community, career planning, and engagement. In addition, the office will coordinate the **INESC TEC Summer Internships** initiative, aimed at undergraduate and master's students. This large-scale programme provides early exposure to research environments and fosters talent attraction for future colaborations within the institution. ***(Strategic Objectives C1.2, C4.1, C4.2)***

Supervision, Partnerships, and Support - Promote quality supervision through shared practices and collaborative reflection among supervisors; expand collaboration with universities and companies to explore new models for *collaborative doctoral programmes* and develop new joint initiatives with academic partners; ensure that students have access to guidance and funding opportunities that sustain their research journey. ***(Strategic Objectives C1.3, C4.1, C5.3)***

Institutional Recognition and Visibility - Strengthen the visibility of INESC TEC's doctoral environment by promoting achievements, highlighting partnerships, and contributing to the institute's reputation as an excellent environment for doctoral studies. These actions will support the attraction of top talent and help consolidate INESC TEC's distinctive value proposition in advanced training. ***(Strategic Objectives C1.1, C4.2, C5.2)***

Institutional Processes and Structures - A key priority for 2026 is the establishment of mechanisms and tools that enable effective oversight of doctoral activities. This includes consolidating data on PhD students, developing key indicators and monitoring tools, and mapping the *PhD Lifecycle at INESC TEC* to support informed decision-making and create appropriate mechanisms to ensure student progress and success. A dedicated survey will assess doctoral students' needs and satisfaction, providing insights to guide continuous improvement. ***(Strategic Objectives C1.2, C5.1, C5.3)***

10.3.4 Project Office

Team: Lígia Silva, Luís Carneiro and Mário Jorge Leitão

Presentation

The Project Office includes two main activities:

- One activity is related with the operation of a Project Management Office (PMO) at INESC TEC. The PMO responsibilities include the definition of processes, standards and best practices for project management; design and development of IT and methodological tools; training and capacitation of project managers; management of a portfolio of projects and the monitoring and reporting of projects performance. The PMO serves as a centralised support unit, aiming to ensure efficiency and effectiveness in the management of projects, both transversal and R&D centres projects; promoting stakeholders' satisfaction; compliance with funding requirements; maximising the project results, and alignment with the institute strategic goals.
- The other activity is related with the development and provision of tools to support the management and control of projects and the overall activity at INESC TEC (analytical accounting), enhancing the capabilities of the institutional ERP and other applications, especially in the areas of annual planning (initial and updates), budget control and management of compensation schemes for the participation of academic staff and grant holders in projects

Main objectives and initiatives planned for 2026

The objectives and initiatives planned for the PMO in 2026 are the following:

- Promote the adoption of the defined project management processes and tools, ensuring flexibility for different project contexts and progressive expansion across INESC TEC;
- Monitor project execution, supporting the use of best practices and responding to project managers' needs;
- Define mechanisms and practices that strengthen the alignment of project outcomes with INESC TEC strategic plan and maximise their potential impact;
- Promote training activities ensuring the project managers capacitation in the selected methodologies, best practices and tools;
- Collaborate with other structures in providing support tools and training activities to ensure the compliance with the rules and regulations of funded projects;
- Continuously improve and expand existing methodological and IT support tools (e.g.: Project Management Manual, checklists, templates, project management support in the IRIS system, including the documents archive).

The objectives and initiatives planned for general project support in 2026 are the following:

- Adapt all the existing tools and develop new ones to interact with the new ERP that began its operation in January 2025, enhancing present analytical accounting processes of the institution, aiming at greater accuracy and production of indicators both timely and with increased frequency (from quarterly to monthly);
- Adapt the existing processes to new requirements raised by internal users and by new financial models recently adopted in National and European R&D programmes.

10.3.5 Entrepreneurship and Spin-offs Office

Team: Alexandra Xavier, Daniel Vasconcelos, Alípio Torre and Vasco Rosa Dias

Presentation

The Entrepreneurship and Spin-offs Office (ESO) helps bridge the gap between research and the market by fostering entrepreneurial innovation and strengthening INESC TEC's entrepreneurial ecosystem. The vision for the Office is to act as a catalyst for entrepreneurial innovation within the INESC TEC research community, empowering researchers to bring to market impactful solutions that address global challenges and contribute to a more sustainable future.

The mission is driven by four complementary aims: (1) cultivate a culture of entrepreneurial innovation, encouraging creativity, responsible risk-taking, and entrepreneurial thinking across the INESC TEC community; (2) support spin-off creation, providing comprehensive support and resources for the development and growth of spin-off companies, from ideation to commercialisation; (3) foster entrepreneurship-oriented collaboration by building strong partnerships with industry, investors, and other stakeholders to reinforce the entrepreneurial ecosystem; and (4) drive entrepreneurial impact by translating research results into market-ready innovations with the potential to generate economic and social value.

Main objectives and initiatives planned for 2026

Building on the success of the "minimum viable product" (MVP) of key entrepreneurship-enabling activities in 2025, the ESO will consolidate and scale these activities in 2026. This will include structured processes, expanded mentoring, intensified monthly events, strengthened follow-up of spin-offs, and the introduction of a proof-of-concept (PoC) seed-funding instrument.

Aligned with INESC TEC's Strategic Plan 2023-2030, the Office has selected some Strategic Objectives (SOs) and is prioritising the following initiatives for 2026:

- **Organisation and foundations:** i) review and improve the INESC TEC spin-off policy; (ii) define spin-off guidelines; (iii) refine and consolidate the ESO organisation and internal processes; (iv) establish the governance model; (v) define and launch a communication strategy and a supporting platform tool; (vi) establish an informal network of mentors and an informal advisory board for the Office. (SOs 1.3, 3.2 and 5.4)
- **Community building:** (i) intensify entrepreneurship and innovation events; (ii) run an internal roadshow to R&D Centres; (iii) identify and appoint internal champions. (SO 1.4)
- **Support programmes:** (i) improve access to office hours; (ii) design and implement an ideation initiative and spin-off project development support; (iii) design and launch the first edition of a PoC seed-funding call. (SOs 3.2, 5.4 and 4.1)
- **Spin-off support:** (i) review and update the monitoring system; (ii) establish a structured spin-off support mechanism. (SOs 3.2,5.4 and 4.1)

10.3.6 ESG Planning/Reporting: Sustainability values within the organisation mission and goals

Within the main purpose of creating a "fulfilling and sustainable future through impactful science, technology and innovation", INESC TEC's mission and goals are foundational pillars of the organisation's commitment to sustainability materialised in specific organisational values such as: (i) Rigour and Excellence; (ii) Integrity, Transparency, and Ethics; (iii) Creativity, Boldness, Curiosity, and Innovation; (iv) Freedom to Create and Think; (v) Collaboration; and (vi) People-Centredness and Inclusion. These values are present in INESC TEC's explicit commitment to promote and contribute to environmental sustainability through its sustainable operations and the implementation and dissemination of best practices.

A set of key performance indicators (KPIs) are being collected to feed an ESG report, namely:

1) **Environmental KPIs:**
   - Total annual energy consumption (electricity and gas), per building/laboratory
   - Energy sources and percentage of renewable energy used
   - Water consumption
   - Quantity of waste by type (electronic waste, paper, coffee, batteries, plastic, etc)
   - Ongoing and/or planned energy efficiency initiatives
   - List of suppliers with environmental certifications
2) **Social KPIs:**
   - Total number of employees by category (researchers, technicians, administrative staff)
   - Gender distribution in research and leadership teams
   - Annual turnover rate
   - Training hours per employee (annual average)
   - Wee-being and work-life balance initiatives implemented
   - Diversity rates (nationalities) within the teams
   - Diversity rates (ages) in teams
3) **Governance KPIs:**
   - Number of patents registered in last year
   - Number of active licensing agreements
   - Revenue from technology licensing
   - Number of start-ups/spin-offs created in the last 3 years
   - Partnerships with industry and the public sector in sustainable projects
4) **Economic and Resource Management KPIs:**
   - Funding raised for R&D projects
   - Distribution of funding by source (national, European, private companies)
   - Number of research projects with an environmental and/or social sustainability component/impact
   - Number of jobs created directly through projects (fellows, contracted researchers)
   - Number of scientific publications in areas related to sustainability
   - Number of citations in areas related to sustainability

- Utilisation rate of the main laboratory and computing infrastructures
- Annual investment in equipment maintenance and upgrades
- Number of internal and external users of the main infrastructures
- Partnerships for infrastructure sharing

These indicators will be supported by the following planned initiatives in 2026.

ESG Initiatives: Sustainability as three-fold responsible practices

The sustainability journey at INESC TEC gains more visibility each year with an increase in activities in two types of contributions: one feeding ESG indicators, and the other embedded in INESC TEC research, including sustainability themes and impacts in projects' portfolio.

a) 2026 ESG planned initiatives

Within INESC TEC's Sustainability Commitments and Practices, the reinforcement of the statement that "we value good environmental and social practices in suppliers and partners, incorporating sustainability and social responsibility criteria into tenders and contracts." In line with this motto, several actions will take place in three-fold sustainability areas:

1 - At the Environmental pillar:

In the Environment domain, efforts will continue to reduce the carbon footprint through transport electrification, modernisation of air conditioning, collection of technological waste, recycling, replacement of plastics with glass/paper, and reduction of electricity, gas and water consumption. A complete set of actions will be taken place in 2026, such as:

Related to climate change

- Reduction of electricity and gas consumption through the replacement of equipment with more energy-efficient alternatives, maintenance of existing systems, and implementation of more fine-tuned set points appropriate to space conditions.
- Lights replacement, including PIR sensors.
- Foster electric mobility (vehicle charging) among employees by providing information on charging moments where the CO_2 level of the electricity produced is lower (including adequate communication with explanation on the composition of electricity production), and means, contributing to the reduction of greenhouse gas emissions.
- Celebrate the European Mobility Week by providing 100% sustainable charging to vehicles and remind more sustainable habits like car sharing, public transport and invite to register those actions in European portal as "Mobilityactions".
- Celebrate the International Day against Climate Change (24 October) and remind sustainable daily routines and tools usage as ClimateHero to better understand the impact of the daily choices in the environment.
- Celebrate the National Sustainability Day (25 September), reminding INES TEC contribution to SDGs and ask for collaborators' contributions and suggestions.
- Increasing visibility on consumption and fostering the adoption of corrective set points according to weather conditions with the reformulation of HVAC control systems.

Related to water resources

- Calibration of sensors and timers to reduce water usage.

Related to circular economy

- Dissemination of waste management plans and guidelines, including waste separation awareness and actions per building floor.
- Continue the campaign dedicated to electronic waste
- Foster research on the circular economy, energy and green transition
- Continue the actions under the commitment with Nespresso to recycle all coffee capsules consumed in the headquarters building and its satellite locations.

2 - At the Social pillar

In the Social domain, there is a commitment to gender equality, inclusion of people with disabilities, Portuguese classes for foreigners, a hybrid work regime, and the promotion of well-being, mental health, etc, reinforced by a set of actions, such as:

Related to working conditions and cultural inclusion:

- Collecting perceptions and understanding the needs of diverse people in terms of age, culture, nationality, ethnic origin, background, disability, sexual orientation, religion, etc., such as the Diversity & Inclusion (D&I) Survey, so that everyone feels welcome, accepted, and valued.
- Maintaining the meditation room, introducing mindfulness at work and promoting mental health.
- Promoting well-being and work-life balance, and especially supporting parental or care responsibilities and flexibility for family duties, regardless of gender, job, position and status, and creating appropriate mechanisms to identify individual psychological issues and offer support to overcome them while implementing flexible work arrangements.
- Organising training sessions for intervention teams on self-protection measures.
- Continue to offer fruit baskets in the work environments.
- Contributing to employees' healthy habits by providing workshops and training sessions
- Celebrating Mental Health Day (10th of October) with activities: yoga, meditation, workshops (sleep importance, nutrition) and a book club on mental health theme.
- Increasing communication and proximity between services and faculty, to avoid bureaucratic relationships.
- Invitation to participate in the Volunteer Day promoted by the Technical Committee for Social Responsibility (CTRS) and the Commission for Diversity and Inclusion (D&I).

Related to equal treatment and equal opportunities

- Dissemination of the “Gender Equality Plan” and promotion of initiatives such as “Women and Girls in Science”.
- Guaranteeing gender pay equity in the performance appraisal exercise, reducing gender imbalances.
- Committing to interculturality to foster the inclusion of different cultural backgrounds, languages and religions.
- Hiring persons with disabilities, with concrete valorisation in the merit evaluation and ensure that individuals with disabilities or impairments are not prevented from accessing a place or a document or undertaking a task freely and independently by implementing universal accessibility.
- Survey to identify training needs
- Continue trainee programs as an opportunity for students of different programs to experience involvement in research teams.

Related to Economic and social rights

- Encouraging the enhancement of personal skills, caring about matching everyone's potential to opportunities to contribute to collective fulfilment, and being recognised and rewarded.
- Salary increases, at the beginning of the year for all co-workers, favouring the lower salaries to support the economic difficulties felt by the families with the significant inflation felt in the country.
- Promotion and support of specific training beyond the legal framework.

3 - At the Governance pillar:

In the Governance domain, there is a technical committee on social responsibility that supports the definition and operationalisation of the institutional ESG strategy that will pursue a set of actions as the following:

Related to corporate culture:

- Celebration of the National Sustainability Day (25th September) with a full activities dissemination among INESC TEC community promoting awareness, involvement and action towards a more sustainable future, and highlighting the importance of environmental, economic and social sustainability for the country and the world, reminding the date of the United Nations' adoption of the Sustainable Development Goals (SDGs);
- Reinforce the commitment, in the fully disseminated Strategic Plan 2023/2030, to sustainable transformation, embracing the challenge of underpinning research on "the long-term preservation and improvement of social, economic, and environmental systems within the delicate balance of concurrent goals for each specific problem";
- Aligning R&I agendas with SDGs and ensuring an active participation in national and international thematic associations, high-level networks and forums;
- Nurturing a science-policy interface, supporting open access to research findings and evidence, and acting as consultation partners for policy and decision-makers, building on the support of the recently created Public Policy Office;
- Continue the training on the General Regime for the Prevention of Corruption and the Whistleblower Protection Regime;

Related to the suppliers' relationship management

- Extending social responsibility practices to the supply chain by ensuring that suppliers adhere to fair labour practices, particularly in cleaning and security services, guaranteeing the accomplishment of human rights standards, promoting diversity and inclusion in the elements of the suppliers of INESC TEC.

Related to corruption and bribery:

- Dissemination of the Code of Conduct for harassment prevention and combat.
- Dissemination of privacy-preserving computational architectures able to deliver digital transformation improvements while respecting the GDPR.
- Dissemination of the Programme for the Prevention of Corruption.
- Compliance of research with fundamental ethical principles provided in the Code of Ethics, and promotion of digital ethics awareness initiatives (e.g., avoiding biases in data sets and algorithms and critically analysing and interpreting the results),
- Compliance with INESC TEC Conflict of Interest Management Policy, ensured by the Commission for the Management of Conflicts of Interest of INESC TEC (CGCI), through the evaluation of Interest

Declarations submitted by the Institution's staff and the development, for cases where conflicts of interest are identified, of proposals for Conflict of Interest Management Plans (PGCI).

b) Strategy and research themes related to sustainability

In its 2023-2030 Strategic Plan, INESC TEC identifies “sustainable transformation” as a cross-cutting challenge, among others.

The institution participates in sustainable and resilient supply chain projects, for example the ReSChape project, which develops new management models focused on people and the sustainability of supply chains.

Moreover, the institute led “sustainable digital transformation” in Europe, with the publication of a manifesto on dataspaces that allows, for example, renewable energy communities with reduced energy consumption and energy inclusion.

11 SUPPORT SERVICES

11.1 Legal Support Service

Manager: Rita Barros

Presentation

The Legal Support Service ensures that INESC TEC's activities comply with national and European frameworks, promoting best practices in areas such as human resources, international relations, public procurement, and data protection. It also covers contractual matters, including intellectual property, commercial, and corporate law. Its mission is to safeguard INESC TEC's interests by proposing solutions that align the Institution's strategic objectives with its legal obligations, always considering its specific nature.

Service catalogue

- Support in public procurement procedures and contract management, including support in contract execution.
- Negotiation and preparation of different types of agreements (consortium, collaboration, licensing, NDA, DPA, MoU).
- Drafting and reviewing of grant, employment, and service contracts.
- Promotion of legal awareness and compliance.
- Contribution to the development and implementation of best practices in employment and labour law
- Support in the creation of and participation in other entities.
- Handling of litigation and other legal matters.
- Delivery of legal training to staff without legal background on key institutional topics.

Main objectives and initiatives planned for 2026

Aligned with INESC TEC Strategic Plan 2023-2030, the Service selected some Strategic Objectives, and it is prioritising the following initiatives in 2026:

- Improve the base conditions for technology commercialisation
    - Produce high-quality legal documents that align legal compliance with strategic objectives, supporting partnerships, technology transfer, safeguarding and dissemination of outcomes.
- Develop closer and deeper relationships with our innovation partners and the broader community
    - Strengthen R&D Centres' negotiation skills to foster industry collaboration, simplify stakeholder engagement, and reduce legal and bureaucratic obstacles.
- Increase the international embedment of our community
    - Analysis of international and comparative law to provide legal solutions for the Institution's challenges.
    - Examination of "dual use" issues, export/import regulations, and evolving EU policies in a complex geopolitical context.
    - Support for the sustainability of INESC TEC's operations and international partnerships through specialised legal expertise.
    - Reduction of legal risks and enhancement of collaboration opportunities in research, innovation, and technology transfer.

- Reinforce strategic alignment and close collaboration with HEI
    - Collaborate with Higher Education Institutions (HEIs) to create strategic opportunities, maximize their potential, and optimize collaboration for long-term benefits.
- Contribute to digitalisation of public administration
    - Support early-stage discussions on public service digitalisation projects by offering comprehensive legal guidance aligned with national and European frameworks, streamlining administrative procedures, reducing bureaucratic obstacles, and promoting effective collaboration among stakeholders.
- Promote our proactive participation in R&I agenda-setting at regional, national and EU level
    - Track legislative changes and take part in public consultations, including involvement in working groups, policy assessments, and thematic analyses, to contribute to a legislative framework that tackles Science and Technology challenges, supports advancement, and facilitates efficient knowledge transfer to society.
- Increase our international networking, leadership and competitiveness
    - Review best international practices to harmonize legal frameworks with knowledge, technology, and innovation, ensuring the required expertise to deliver effective solutions. This strengthens INESC TEC's engagement in global initiatives, promoting increased participation and impact.
- Improve attraction and retention of world-class talent
    - Provide strategic legal support to HR by implementing effective legal instruments, ensuring compliance, and supporting the attraction and retention of top scientific talent.
- Strengthen our commitment to independence and compliance research with ethical principles
    - Strengthen research independence and ethical compliance through ethics awareness, anti-corruption efforts, data protection training, and legal tools aligned with national and European standards.
- Promote and contribute to environmental sustainability
    - Promote eco-friendly and socially responsible public procurement, ensuring compliance with national and European standards and supporting social improvements, including gender equality.
- Strengthen the distinctive aspects of our institutional model
    - Develop Legal Instruments: Design and adapt legal tools and internal processes, including proposals, agreements, and contracts, to ensure compliance with national and European regulations.
    - Compliance Monitoring: Implement ongoing oversight to guarantee that research and innovation activities meet legal standards and promptly address any issues.
    - Data and Privacy Protection: Ensure adherence to data protection laws, safeguarding individual rights across all processes and projects.
    - Support Strategic Partnerships: Provide clear, legally compliant contracts for international collaborations, enhancing INESC TEC's global position and secure cooperation.
    - Regulatory Oversight: Continuously track and assess changes in national and international legislation, updating compliance strategies to maintain effectiveness.

11.2 Accounting and Finance Service

Managers: Paula Faria and Libânia Caetano

Presentation

The Accounting and Finance service is responsible for coordinating and executing the accounting operations, ensuring compliance with fiscal obligations, for managing INESC TEC´s cash flow and ensure the availability of enough funds to meet the payments due. Acting as a liaison between the institute and external stakeholders, the service operates in alignment with the Board's guidelines.

From an administrative perspective, it is also responsible for the purchasing and travel processes and for managing the institute insurances and fixed assets.

Service catalogue

The Accounting and Finance department provides a wide range of services to several recipients both internal and external to the organisation:

- Purchasing Process
- Travel Process
- Procurement Process
- Invoicing R&D Services and collection
- Tax and Reporting Obligations
- Accounting records
- Financial Management
- Fixed Asset Management
- Insurance Management

Main objectives and initiatives planned for 2026

Aligned with INESC TEC Strategic Plan 2023-2030, the Service selected some Strategic Objectives, and it is prioritising the following initiatives in 2026:

- Improve quality, management and usage of our infrastructures
    - Improve efficiency and ensure that Fixed Assets Management provides relevant and actionable insights.
    - Enhance the organisation procurement process, in articulation with AJ.
    - Optimize the use of the ERP system and its integration with complementary systems.
- Strengthen the sustainability and resilience of our economic model
    - Reinforce continuous improvement of activities and practices.
    - Increase financial logistics for organising events.
- Promote and contribute to environment sustainability
    - Consolidate the digital archive process.
- Improve attraction and retention of world-class talent
    - Provide financial guidance and resources to assist new transnational hires.
- Increase our international networking, leadership and competitiveness
    - Develop efficient systems for managing international payments, tax compliance, and currency exchange to support global collaborations.

- Engage with international finance and accounting networks to adopt best practices and showcase INESC TEC's financial excellence.
- Benchmark financial and operational performance with international peers to identify areas for improvement and align with global standards.

- Expand the diversity of our community
  - Enhance support for international initiatives through a robust understanding of tax frameworks and compliance.
- Increase the international embedment of our community
  - Leverage tax frameworks to support participation in international initiatives effectively.
  - Provide the ERP system with robust international functionalities, enabling seamless transactions.

11.3 Management Control Service

Managers: Vanda Ferreira and Bárbara Maia

Presentation

The Management Control Service is responsible for supporting INESC TEC's financial and strategic decision-making processes through accurate, timely, and reliable management information. It ensures the alignment between operational performance and the organisation's strategic objectives, providing tools and analysis that enhance efficiency, accountability, and sustainability. The service acts as a key partner across INESC TEC's units, promoting a culture of informed management, continuous improvement, and transparency in the use of resources.

Service catalogue

The main areas of responsibility of the Management Control Service include:

- Budget planning and monitoring – coordination of the annual budgeting process and regular follow-up of financial execution.
- Performance reporting and analysis – preparation of periodic management reports, indicators, and dashboards to support informed decision-making.
- Internal control and compliance – ensuring adherence to internal financial procedures and institutional guidelines.
- Support to management and projects – financial monitoring of projects, cost control, and contribution to audits and institutional reporting.
- Strategic planning support – collaboration in the design and monitoring of the organisation's strategic goals and key performance indicators (KPIs).

Main objectives and initiatives planned for 2026

Aligned with INESC TEC's Strategic Plan 2023–2030, the Management Control Service will focus on consolidating its analytical capabilities, improving efficiency through digitalisation, and reinforcing its role as a strategic partner to management. Here are the key objectives and initiatives:

- Strengthen management information systems
    - Implement improvements to existing dashboards and reporting tools to enhance data accuracy and usability.
    - Develop new performance indicators aligned with strategic objectives.
- Enhance efficiency and automation in financial processes
    - Introduce or upgrade digital tools for budget control, forecasting, and reporting.
    - Streamline internal workflows to reduce manual tasks and improve data consistency.
- Promote organisational performance culture
    - Support centres in the interpretation and use of KPIs for decision-making.
    - Develop training or guidance materials for non-financial managers on budget and performance management.
- Contribute to institutional planning and control
    - Support the preparation and follow-up of the institutional activity plan and performance reports.
    - Collaborate in strategic discussions to ensure resource alignment with INESC TEC's priorities.
- Team development and internal communication
    - Encourage knowledge sharing and continuous improvement within the team.
    - Reinforce collaboration with other administrative and financial services.

11.4 Human Resources Service

Managers: Margarida Gonçalves and Susana Rodrigues

Presentation

The Human Resources Service (HR) coordinates and executes all activities related to human resources administrative management, as well as the development and implementation of HR policies. The Service has a key role in the effective management of the institute's human capital, fostering a positive and fulfilling work environment and ensuring legal and regulatory compliance. In doing so, HR contributes directly to organisational performance and to the well-being and professional development of the INESC TEC community.

Service catalogue

To ensure a more strategic, efficient, and integrated HR management, the Service is structured into two main areas: Development & Culture, and Operations & Compliance. Each area brings together complementary functions and dedicated teams, fostering both innovation and operational excellence. The Development & Culture area focuses on talent attraction, people experience, well-being, career development, training, and organisational transformation. The Operations & Compliance area encompasses payroll and benefits, legal and financial compliance, HR analytics and systems, and administrative process management. This structure aims to strengthen collaboration, clarify responsibilities, and align HR initiatives with INESC TEC's strategic goals.

Main objectives and initiatives planned for 2026

Activities in the Development and Culture area

Strategic Objectives: 4.1 Improve attraction and retention of world-class talent; 4.2 Ensure opportunities and recognition of career achievements; and 5.4 Strengthen the distinctive aspects of our institutional model.

- **Talent attraction:** implement the recruitment and selection policy, incorporating Board of Directors feedback; ensure efficiency and consistency in job-posting and approval workflows; improve candidate experience and institutional presence in job fairs by providing clearer application guidance, collecting candidate feedback, and modernising INESC TEC's visibility in recruitment events (e.g., digital materials, interactive stand, post-event follow-up).
- **People experience:** enhance internal communication by ensuring timely and clear responses to daily inquiries and improving access to HR information through a more organised and user-friendly intranet structure; reinforce connection and engagement (e.g., redefine the purpose and format of the *Connect* network); promote small mobilisation initiatives to strengthen the sense of belonging.
- **Career development:** implement and communicate new job descriptions and competencies; implement and communicate the new career policy, including promotion and progression mechanisms; gradually implement the revised performance-appraisal policy by introducing an objectives-based component to support a more structured and results-oriented evaluation process.
- **Organisational transformation:** advance implementation of the HR Excellence in Research (HRS4R) process, aligning HR practices with the European Charter for Researchers to strengthen institutional reputation and talent retention.

Strategic Objective: 1.5 Provide innovative learning experiences.

- Training: implement the training policy and develop the 2026 training plan based on needs assessment and stakeholder input, making it available through the HR intranet section; explore the Moodle platform for delivering training courses.

Strategic Objective: 4.4 Provide a more dynamic and fulfilling working environment.

- **Health and well-being:** create mechanisms to assess health and well-being within the INESC TEC community (e.g., annual well-being survey, suggestion box); raise awareness on health and well-being topics (e.g., monthly newsletter, training, sessions on health and safety at work); provide resources and partnerships to promote well-being (e.g., partnerships with external services, sharing of OPP/OSHA, and other relevant resources).

Activities in the Operations and Compliance area

Strategic objective: 5.4 Strengthen the distinctive aspects of our institutional model.

- **Compensation and benefits management:** review and update compensation policies, ensure alignment between fixed and variable compensation and institutional strategy; improve management of complementary benefits by optimising procedures related to cards, tuition payments, and other employee benefits.
- **Legal and financial compliance:** optimise response times and improve workflow efficiency in legal and financial compliance processes; improve communication channels between organisational units to ensure alignment on compliance and legal matters and faster resolution of issues; strengthen a culture of continuous improvement.
- **Systems and HR analytics:** automate key HR processes by digitalising workflows and reducing repetitive administrative tasks to improve efficiency and accuracy; develop and maintain HR dashboards and reports to provide accurate, up-to-date insights supporting data-driven decision-making; expand the use of HR indicators and statistics.
- **Administrative process management**: improve efficiency in administrative and document management; facilitate access to administrative information and standardise document requests.
- **Cross-cutting initiative:** implement a new HR Management Software, transversal to all organisational areas, streamlining processes, improving data integration and reporting, and enhancing overall efficiency and user experience across the institution.

11.5 Management Support Service

Manager: Isabel Macedo

Presentation

The Management Support Service coordinates institutional information management and oversees the planning and reporting of INESC TEC's activities. It supports the Board of Directors fostering strategic initiatives and facilitating decision-making at the General Council level. With a cross-cutting role, it drives process improvement, ensures institutional analytics, and enhances research support through FAIR data stewardship, open data and open access engagement, and research assessment.

Service catalogue

- Support internal and transformative initiatives of the Board
- Monitor organisational priorities, goals and performance metrics
- Prepare and operationalise decision-making processes at the General Council level
- Document management of general archives and content management of INESC TEC institutional platforms
- Support the development of Data Management Plans (DMP), data publication and project output reporting
- Process improvement proposals and actions

Main objectives and initiatives planned for 2026

Aligned with INESC TEC Strategic Plan 2023-2030, the Service selected some Strategic Objectives, and it is prioritising the following initiatives in 2026:

- Raise the contribution and visibility of our research
    - Advance the institutional adoption of FAIR practices by fostering institutional awareness and reinforcing INESC TEC´s position as a reference in Open Data.
    - Assess current practices and implement policies to align INESC TEC with international Open Access standards.
    - Support research assessment and the integration of Open Science across the institution through indicators, awareness actions, and alignment with CoARA principles, alongside the Board's engagement in related international initiatives
- Strengthen the distinctive aspects of our institutional model
    - Drive strategic initiatives and organisational change, including comprehensive restructuring and enhancement of administrative areas, process reengineering, and the optimisation of workflows and management practices to strengthen institutional efficiency and agility.
    - Optimise the curation of institutional databases and systems, ensuring the quality and consistency of information and strengthening indicator analysis to support decision-making.

11.6 Secretarial Coordination

Managers: Ana Isabel Oliveira and Grasiela Almeida

Presentation

The Secretarial team is responsible for effectively executing the tasks required for the development of the activities of the Board of Directors, Research Centres and Services they support, in accordance with INESC TEC´s internal rules and processes.

This team, composed of 20 employees, develops their work directly under the responsibility of a coordinator within a structure, centre or service, being also coordinated by one of the above-mentioned managers: Ana Isabel Oliveira manages the team of Executive Assistants of the Board of Directors and Grasiela Almeida manages the team of Assistants that support the Research Centres and Services.

Service catalogue

Team Coordination:

- Promotion of training and coaching sessions, to assure compliance with internal rules and processes;
- Development of skills to allow continuous growth, motivation, and recognition of the team;
- Recruitment and onboarding training of new assistants, performance evaluation and feedback.

Focus on Continuous Improvement:

- Identification of improvement opportunities in the institutions' processes, tools, and best practices;
- Contribution to the design, implementation and testing of new processes and tools.

Supplier Relationship Management:

- Contract management with specific suppliers, such as travel agencies, rental car companies and other private transport companies, hotels, catering and other frequent service providers.

Information Management:

- Development and maintenance of Information Directory with useful information, templates, and documents necessary for the team's daily activity.

Main objectives and initiatives planned for 2026

Aligned with INESC TEC Strategic Plan 2023-2030, the Service selected some Strategic Objectives, and it is prioritising the following initiatives in 2026:

- Strengthen the distinctive aspects of our institutional model
    - Implement Continuous Training Programs: Deliver targeted training sessions and workshops to ensure that all team members acquire updated skills and knowledge, promoting excellence, innovation, and adaptability in their roles
    - Encourage Interdisciplinary Collaboration: Development and implementation of Improvements with the Simplify at Work initiative, particularly the Event Management Platform that will promote stakeholder interaction, enabling the exchange of knowledge and experiences.
    - Create an area for sharing procedures: Create a Knowledge Base dedicated area to centralise and share internal processes, guidelines, and good practices - enhancing internal training, regulatory compliance, and operational efficiency.
    - Enhance Team Capacity: Strengthen team cohesion and knowledge-sharing through regular meetings with service leaders, cross-functional teams, and individual assistants. Special focus will be given to mentoring and developing the new assistants recruited in 2025.

- Provide a more dynamic and fulfilling working environment
    - Strengthen Partnerships: Organise Show & Tell sessions to showcase best practices, reinforce collaboration across secretariats, and deepen connections with internal and external partners.
    - Promote Well-being Initiatives: Plan and implement activities that support work–life balance, well-being, and engagement - fostering a healthier, more motivated, and inclusive workplace culture.

11.7 Funding Opportunities Office

Manager: Marta Barbas

Presentation

The service core activities include the identification of opportunities to access the necessary and appropriate funding for the institution's Research, Development and Innovation (RDI) activities, aligned with the mission and with the strategic objectives of the institution, and also the monitoring of the preparation and submission of proposals to the different funding programmes in articulation with the R&D Centres.

Service catalogue

The service portfolio includes the following:

- Search and identification of the most suitable funding opportunities and dissemination of information about external events related to funding programmes (e.g., information days, webinars, etc.).
- Monitoring and supporting the preparation and submission of proposals to the different funding programs and support the contracting process of approved proposals, ensuring a smooth transition of projects to management control service.
- Acting as institutional contact point with funding entities.
- Following up of the registration of proposals on the Intranet.
- Compilation and dissemination of indicators of proposals submissions and approvals.

Main objectives and initiatives planned for 2026

Aligned with INESC TEC Strategic Plan 2023-2030, the Service selected some Strategic Objectives, and it is prioritising the following initiatives in 2026:

- Increase our international networking, leadership and competitiveness
    - Recruitment of new human resources to reinforce the European Funding team to increase the number of EU projects approved in coordination role and other international projects, namely ERCs initiatives and EC tenders.
    - Raise awareness among our researchers about existing funding opportunities by providing training on how to prepare applications by promoting workshops with contributions from internal and external specialists about Horizon Europe proposal writing.
    - Promotion of tailored training sessions for new researchers, aimed at informing them about the services provided by the SAAF, as well as equipping them with the necessary skills to identify the appropriate types of funding for the different lines of research.
    - Promotion of awareness of funding opportunities for Human Resources mobility, aligned with strategy of capacitation for ERC initiatives, aligned with International Relations Service initiatives
- Strengthen the sustainability and resilience of our economic model
    - Improvement of “proposals workflow” together with SIG
    - Continuous improvement of the area in the internal website for funding opportunities to better serve our researchers and update the pages with 2026 opportunities.
    - Launch a new questionnaire survey on service satisfaction to continuously improve the funding and opportunities’ office services.
    - Increased efforts to publicize tenders’ opportunities and explain the advantages of the centres’ participation in them.

11.8 Technology Transfer Office

Manager: Daniel Marques de Vasconcelos

Presentation

The Technology Transfer Office (TTO) is strengthening its role as a key internal partner in delivering societal and economic impact. “Making things happen that wouldn't happen” is the TTO’s guiding motto, reflecting an ambition to customise strategic alliances with relevant stakeholders and to build the trusted, shared understanding required for joint impact. An enhanced Intellectual Property (IP) strategy will be central to the value added by the TTO, combined with intensified training in IP and Technology Transfer (TT) and the exploration of an updated valorisation strategy.

Service catalogue

- Proactive scouting, registration of new R&D results, and awareness-raising and training on IP and TT;
- IP strategy combined with lean, impact-oriented portfolio management;
- Knowledge valorisation and TT, including customer discovery and IP negotiation.

Main objectives and initiatives planned for 2026

Aligned with INESC TEC’s Strategic Plan 2023-2030, the Service selected some Strategic Objectives (SOs) and is prioritising the following initiatives for 2026:

Transform the licensing office into a knowledge transfer hub (SO 3.1 Build stronger knowledge-based and multidisciplinary R&I ecosystems)

- Establish processes and rules to improve the management of open source software;
- Intensify training on IP and business development.

Develop a strategic IP management framework (SO 1.3 Improve the base conditions for technology commercialisation)

- Develop updated rules to ensure lean management of the current portfolio of 100+ IP assets;
- Simplify the process for disclosing new R&D results to the TTO, with particular attention to software.

Maximise the economic and social impact of R&D results (SO 3.2. Develop better linkages between knowledge production, development, and market uptake)

- Define IP models for strategic industry partnerships and strengthen IP valorisation through spinoffs;
- Refine the concept of success stories, pilot the approach, formalise it as an official output (KPI) and deliver 20 success stories.

Enhance partnerships and ecosystem development (SO 2.3 Better align and deliver R&I with industry’s needs)

- Increase TTO activity and strengthen IP support to SMEs in the context of the GAPI and PATLIB networks.

Strengthen internal and external capacity building (SO 1.4 Develop closer and deeper relationships with our innovation partners and the broader community)

- Co-define mid- to long-term IP and valorisation strategies with TEC4s and R&D Centres;
- Consolidate relevance in key forums (e.g., TTO Circle, EARTO) while exploring synergies with other RTOs.

Improve coordination with other INESC TEC support services (SO 5.4 Strengthen the distinctive aspects of our institutional model)

- Start regular meetings with key internal stakeholders involved in IP and TT processes to ensure alignment and streamline operations.

11.9 International Relations Office

Manager: Andreia Passos

Presentation

The Service remains committed to supporting the institution's Board of Directors and R&D Centres in maximising global opportunities, reach, and reputation. Its core activities include advising on international collaborations, supporting researchers' mobility and global engagement, producing analytical briefings on international trends, and promoting success stories of impactful international cooperation. In 2025, the coordination of the UT Austin Portugal Program was once again entrusted to INESC TEC - and consequently to the SRI. This reflects both the institution's recognised leadership in managing well-established international science and technology partnerships sponsored by the Portuguese Government, and the SRI's proven record in running the Program's office in Portugal. However, the Service's continued success depends on addressing underinvestment, especially in staffing and in digitising and automating its key information systems.

Service catalogue

The SRI service portfolio includes the following:

- International programmes coordination: Executive coordination of strategic international science and technology programs with a diplomatic component (e.g., UT Austin Portugal Program); Management of institutional mobility programs and joint initiatives under collaboration agreements with foreign partners.
- International matchmaking: Connection with prospective foreign partners for the establishment of partnerships.
- Information services to better understand trends shaping international scientific collaboration and talent attraction.
- Mobility advisory services: Guidance on inbound and outbound mobility opportunities and regulatory frameworks.
- International MoU support: Assistance in the negotiation, drafting, implementation, and evaluation of MoUs.
- Delegation advisory: Strategic advisory for the planning of visits by high-level international delegations.

Main objectives and initiatives planned for 2026

Aligned with INESC TEC Strategic Plan 2023-2030, the Service selected some Strategic Objectives, and is prioritising the following initiatives in 2026:

- Increase the international embedment of our community:
    - Continue managing the UT Austin Portugal Program according to the highest standards of both the sponsor and the U.S. partner, ensuring full compliance with the commitments set out in the Phase IV agreement.
    - Organisation of the INESC TEC International Visiting Researcher Programme and the NIAR - INESC TEC Call for Joint Research Projects, drawing on lessons learned from previous editions to refine these initiatives.
    - Support the implementation of additional mobility programmes with partners in South America and India.
    - Continue efforts initiated in 2025 to help INESC TEC establish a coherent and sustainable outbound mobility ecosystem.

- Organise training and information sessions on research security in international cooperation and on immigration legislation likely to affect the institution's talent attraction and retention strategies.

- Increase our international networking, leadership and competitiveness
  - Alignment of the international partnership development activities as closely as possible with the EU Global Gateway Strategy and the EU's international cooperation framework under Horizon Europe.
  - Organise a high-level NIAR - INESC TEC workshop on strategic topics of mutual interest aimed at deepening the existing partnership, building bridges with each side's partners to leverage new opportunities.
  - Ensure the implementation of the dashboard of internationalisation indicators proposed in 2025, providing systematic monitoring and analysis of the Service's contribution to INESC TEC's global engagement.

11.10 Communication Service

Managers: Joana Desport Coelho and Sofia Maciel

Presentation

The Communication Service (SCOM) works closely with the Board of Directors to define and implement INESC TEC's communication strategy, strengthening its reputation and positioning as a leading R&D institution. The activities cover internal communication - promoting knowledge sharing and engagement within the INESC TEC community - and external communication, enhancing the institution's visibility and supporting the dissemination of scientific and innovation activities. Following an integrated marketing communication approach, SCOM operates across five key areas: content production, design and multimedia, event organisation, leadership and support in R&D project communication, and translation. These competencies drive strategies in science communication (podcasts, videocasts, editorials), digital marketing (social media, website, newsletters), public relations (national and international media, events), and advertising (annual reports, institutional materials).

Service catalogue

SCOM encompasses five core competencies: content production, design and multimedia, organisation of events, leadership and support in R&D projects' dissemination and communication, and translation. Leveraging these competencies, the communication strategies implemented by the service include science communication (podcast, videocast, editorial and long-features), digital marketing (social media channels, website, newsletters), public relations (national and international press relations, events) and advertising (annual report, booklets, informative features).

Main objectives and initiatives planned for 2026

Aligned with INESC TEC's Strategic Plan 2023-2030, the Service selected some Strategic Objectives (SOs) and is prioritising the following initiatives for 2026:

- Strengthen Strategic Communication Management: Consolidate a long-term, impact-oriented communication approach that supports institutional priorities, enhances INESC TEC's reputation as a thought leader, especially at the European level, and aligns communication actions and strategic goals. (SOs 1.1, 3.5, 2.7)
- Consolidate the INESC TEC brand: Deepen the implementation of the new institutional identity, ensuring coherence across all materials and channels, and promoting consistent and differentiated brand recognition at national and international levels. (SOs 1.1, 3.1, 5.4)
- Foster internal communication and community building: Design and implement a new Internal Communication Strategy, with new ways of engaging the Community through emerging institutional tools, and creating internal communities to strengthen collaboration, identity, and knowledge sharing. (SOs 3.1, 4.1, 4.4)
- Advance the digital ecosystem: Optimise the new institutional website, expanding its functionalities to include new areas such as Open Science, and strengthening its integration with other digital tools and platforms, such as social media, to increase reach and impact. (SOs 1.1, 2.7, 3.5)
- Promote strategic positioning in public policy and societal impact: Develop communication approaches that reinforce INESC TEC's contribution to evidence-based policy and to public understanding of science and technology, consolidating its voice as a relevant national and international player. (SOs 2.5, 3.4, 3.5)
- Enhance international communication and visibility: Build on the Meltwater investment to strengthen global media presence, monitor international impact, and design targeted strategies to position INESC TEC as a European reference in science and technology communication; consolidate relevance in key international forums while exploring synergies and joint initiatives with communication departments of other RTOs. (SOs 1.1, 2.7, 3.5)

- Leverage digital innovation: Continue integrating AI-based tools and data-driven insights to optimise communication processes, content quality, and audience engagement. (SOs 1.1, 2.7)
- Empower researchers through science communication training: Continue developing internal capacity-building initiatives to improve the communication of scientific results and promote broader societal awareness of INESC TEC's research. (SOs 3.5, 4.4)

11.11 Networks and Communications Service

Manager: Fernando Sousa

Presentation

The Networks and Communications Service is responsible for the operation and maintenance of INESC TEC's voice and data infrastructures, the implementation of network-based services, and for providing users the respective support.

Besides daily operation and support in the utilisation of resources (e.g., network access, telephony, hybrid events, printing, etc.), permanent activities of the service include the continuous monitoring of the infrastructure, namely, to allow for corrective and preventive measures. Strategic modernisation and improvements (concerning e.g. performance, scale, security) is also conducted, for example in the provisioning of datacenter resources, network equipment, videoconferencing solutions, etc.

Service catalogue

- Local network connectivity: fixed and Wi-Fi network access, customised laboratorial networks.
- Internet and external network connectivity: national research and education network (RCTS), commercial operators and other external networks.
- Physical facilities management: INESC TEC's headquarters' datacenters, off-site disaster recovery.
- Cybersecurity: firewalls, network access control, intrusion detection/protection systems, anti-spam and anti-virus mechanisms within mail transfer agents, interface with official entities like FCCN, CNCS.
- Networked services: VPN, printing and scanning, telephony, videoconferencing.

Main objectives and initiatives planned for 2026

Aligned with INESC TEC Strategic Plan 2023-2030, the Service selected some Strategic Objectives, and it is prioritising the following initiatives in 2026:

- Enhance datacenter power systems:
    - Connect datacenter infrastructure to external battery banks
    - Replace Outdated Firewalls:
    - Deploy scalable solutions to accommodate evolving network demands and enable resource expansion as needed
    - Redefine internal network routing, increasing granularity on the enforcing of security policies across different network zones
- Advance towards NIS2 compliance
    - The creation of the working group for cybersecurity is an excellent opportunity to establish procedures and move towards their implementation as early as next year. It is crucial for the institution to begin its execution next year.
    - Formally create a Computer Security Incident Response Team (CSIRT) with permanent contacts and integrate it in the national CSIRT network
- Enhance Network Access Security:
    - Assess and implement safer network access measures, such as 802.1x for wireless and wired networks or Zero Trust Network Access (ZTNA)
    - Evaluate and potentially adopt Identity and Access Management (IAM) tools
    - Evaluate tools to implement micro-segmentation
- Restructure/update critical network services
    - DNS service, dhcp service, WiFi guest network
    - New VPN system

11.12 Management Information Systems Service

Managers: Fábio Alves and João Miguel Silva

Presentation

The Management Information Systems Service is responsible for coordinating and executing all activities related to the development and maintenance of INESC TEC's management information system.

The primary goal of the service is to provide technology-based solutions to support a wide range of processes, helping the organisation to work more efficiently.

The key systems under SIG's supervision include the Human Resources system, the Intranet (which supports automated workflow processes and facilitates internal institutional communication), the INESC TEC Research Information System (IRIS), the Institutional Repository, the official website, uONEConnect (a project management platform for European projects) and CRM. In addition, SIG offers support to various departments in their interactions with the financial SAP system.

Service catalogue

- User support and application maintenance
- Collaboration in the design and functional specification of new solutions
- Development of innovative technological solutions to enhance organisational processes
- Integrations with external systems

Main objectives and initiatives planned for 2026

Aligned with INESC TEC Strategic Plan 2023-2030, the Service selected some Strategic Objectives, and it is prioritising the following initiatives in 2026:

- INESC TEC Information System Redesign
    - Reduce the number of existing applications to ensure a more consistent and robust application ecosystem
- Project Management
    - Restructure the process for handling project proposals
    - Enhance project management support through new management tools
    - Develop new project portfolio management capabilities
    - Adopt IRIS as the central platform for project management
- Other Initiatives
    - Continues integration of new processes into IRIS
    - Explore a new workflow engine to support business processes
    - Design and implementation of a new Human Resources performance evaluation model
    - Deploy the SAP SuccessFactors platform, a cloud-based system for human capital management

11.13 System Administration Service

Manager: Jaime Dias

Presentation

The System Administration Service (SAS) manages servers, computer systems, common applications and services, and provides support to end users, administrative staff and research and development teams. SAS is responsible for the operation of core digital platforms, including virtualisation, storage, collaboration and identity services.

SAS plays a central role in INESC TEC's cybersecurity posture at the systems and identity level, contributing to security hardening, security monitoring and incident handling in coordination with the Security Operations Centre (SOC), the Computer Security Incident Response Team (CSIRT) and other IT services. SAS also collaborates with the Data Protection Officer in the evaluation and implementation of technical measures that support compliance with the GDPR.

Service catalogue

System administration

- Set up, configuration and management of compute, virtualisation and storage infrastructures.
- Backup of critical services, virtual machines and personal computers, both locally and at an off-site disaster recovery location.
- Management of identity and authentication infrastructures, including the INESC TEC Directory and the federated Identity Provider, to enable seamless authentication across INESC TEC resources and external resources on FCCN and eduGAIN.
- Website hosting.
- Email mailbox service with a disaster recovery site for enhanced data resilience.
- File-sharing and collaboration application services.
- Administration of the INESC TEC Microsoft 365 tenant and other Software as a Service (SaaS) subscription.
- Purchase and management of software volume licences.

End-user support

- Helpdesk, desktop support, and support for available services.

Cybersecurity and identity

- Security hardening and secure configuration of servers, virtual machines and common application services under SAS responsibility.
- Endpoint and server protection (antimalware/EDR) and support for security monitoring tools integrated with the SOC.
- Management of digital certificates and secure exposure of web and application services.
- Operational support to security incident handling for systems and services under SAS responsibility, in coordination with the CSIRT and SOC.
- Support for identity and access security, including strong authentication, conditional access and privileged access management, in coordination with institutional policies.

Data protection

- Evaluation and recommendation of computer systems' security and privacy controls to help ensure compliance with GDPR, in coordination with the Data Protection Officer and the Data Protection Team.

Main objectives and initiatives planned for 2026

Aligned with INESC TEC Strategic Plan 2023–2030, the Service selected some Strategic Objectives, and it is prioritising the following initiatives in 2026:

- MLOps. Set up an MLOps platform that leverages INESC TEC S3 data storage and integrates with third-party emerging ML/LLM services, in order to maximise the automation and reproducibility of ML tasks, increase resource usage efficiency and minimise energy costs.
- New storage infrastructure. Acquisition of a new primary storage system to replace the current one. This new storage will expand the capacity available on the virtualisation platforms, VMware and CCloud (OpenStack), and will also support cloud-native storage for Kubernetes workloads.
- CCloud computing cluster. Major upgrade of the OpenStack platform, and expansion of the CCloud cluster with new resources, primarily GPU-based, to meet the growing demand for GPU-based ML/LLM research.
- Computer installation service. Integration and configuration of Microsoft Intune to deploy and manage Windows computers.
- ITSM platform and IT asset inventory. Deploy an IT Service Management (ITSM) platform and an integrated IT asset inventory service to support IT management, information security asset management, and incident and change management processes, providing a consolidated view of INESC TEC's assets and services to support SOC and CSIRT operations.
- Security Operations Centre (SOC). Contribute to the establishment of the INESC TEC Security Operations Centre (SOC) by defining the monitoring requirements for systems and services under the responsibility of the SAS, and by ensuring the integration of logs and alerts from servers, virtualisation platforms, storage, identity and email services into the SOC tooling. The SOC will focus on continuous security monitoring, event correlation, and first- and second-line triage of security events.
- Computer Security Incident Response Team (CSIRT). Contribute to the formal establishment of the INESC TEC Computer Security Incident Response Team (CSIRT) as a cross-functional team including members from SAS, SRC and SIG. SAS will participate in the handling of significant security incidents, including technical analysis, coordination of containment and recovery actions for systems under its responsibility, evidence preservation and support to post-incident review. The CSIRT will operate in close coordination with the SOC, which will escalate incidents according to defined procedures.

11.14 Infrastructure Management Service

Manager: Jorge Couto

Presentation

The Infrastructure Management Service guarantees the support services necessary for adequate management and maintenance of INESC TEC's building and infrastructures.

Service catalogue

- General maintenance of INESC TEC buildings, including the ones in the associates
- Organise Managing rental cars
- Coordinate security and cleaning services
- Management of the various contracts for the purchase of civil/electrical works, furniture, security, hygiene and cleaning

Main objectives and initiatives planned for 2026

Overall, for 2026 a set of measures to improve the conditions for co-workers is the priority of the service, with a set of actions in the main buildings as well as in iiLab and Vila Real facilities in UTAD.

Additionally, we will support the R&D Centres in the management of the outsourcing car rental, an innovative service that will reduce operational costs and provide a significant gain in time and comfort to users.

Additionally, aligned with INESC TEC Strategic Plan 2023-2030, the Service selected some Strategic Objectives, and it is prioritising the following initiatives in 2026:

- Cost optimisation and energy efficiency.
    - Implement a heat pump for heating and cooling the air conditioning system, working in redundancy with the current system.
    - As an energy-saving measure, we will implement a system to recover hot air from the SITE in building A to heat the first and second floors, and use cold outside air to cool it.
    - Implement centralised management in buildings A and B for lighting, power and air conditioning.
    - Increase the number of solar panels to increase electricity production capacity, and continue to replace lighting with LEDs
- Building safety and emergency preparedness
    - Organise a training session for intervention teams on self-protection measures
    - Carry out a fire drill to test the self-protection measures and associated teams

12 RESEARCH INFRASTRUCTURES

12.1 Tec4Sea - Technologies for the Sea

Mission and positioning

The mission of the TEC4SEA research infrastructure remains unaltered: To promote and support research, development, and test of marine robotics, telecommunications and sensing technologies for operation in maritime environments. As such, it is an open infrastructure, accessible to outside users, committed to the support of the external academic and industrial communities (national or international). This research infrastructure will develop, validate and evaluate technological solutions designed for the ocean environment, allowing internal and external researchers to evolve from simulation/lab experiments to field trials. From the perspective of its internal scientific agenda, the focus will remain on addressing the main challenges presented by the sea under Portuguese jurisdiction: dimension and depth.

Main objectives and actions planned for 2026

The main objectives for 2026 are the following:

- Services to external communities – The objective for 2026 is to maintain the level of services achieved in 2025. The number of external services has been steadily increasing along the years, but 2025 was a particularly strong year in that regard. For 2026, the same rate of external services is to be desired.
- Consolidate the portfolio of offered services – There is a very high degree of dispersion in the rate with which specific services are requested from the infrastructure. Namely, some of the offered services have never been externally requested. The portfolio of services may, therefore, need consolidation.
- Infrastructure upgrade – Upgrades to infrastructure assets are planned.
    - The main upgrade for 2026 is the conclusion, testing, and entry into operation of the dynamic positioning system for the research vessel Mar Profundo.
    - Add a side post for mounting underwater sensors on the EPISEA rigid inflatable boat, something that has not been possible in 2025.

12.2 EMSO-PT - European Multidisciplinary Seafloor Observatory – Portugal

Mission and positioning

EMSO-PT is a research infrastructure lead by IPMA (Instituto Português do Mar e da Atmosfera) and involving 15 other research institutions working on ocean science or technology, including INESC TEC. The ultimate goal of EMSO-PT is to organize the Portuguese contribution to the EMSO-ERIC network, a large-scale European Research Infrastructure, networking fixed point, deep sea multidisciplinary observatories, with the scientific objective of real-time, long-term monitoring of environmental processes related to the interaction between the geosphere, biosphere, and hydrosphere.

It is a geographically distributed infrastructure at key sites in European waters, spanning the Arctic, the Atlantic, and the Mediterranean, up to the Black Sea. It will be in place by the end of the decade. INESC TEC involvement in EMSO-PT addresses the establishment of long-term non-fixed observatories. Such work is organised along two complementary lines: relocatable nodes and long-endurance mobile platforms. In the first case, INESC TEC had built an EGIM (EMSO Generic Instrument Module) for integration and use in a Turtle relocatable node. In the second one, INESC TEC is implementing a network of underwater gliders for collection of oceanographic data.

Main objectives and actions planned for 2026

The main objectives for 2026 are the following:

- Deployment of the Turtle node with an EGIM system – In the line of relocatable nodes, in 2026, it will continue the improvement of the Turtle energy system, to achieve longer deployments. Longer terms deployments in the northern Portuguese coast and in Setubal canyon will be performed.
- Deployment of a glider network – two operational gliders equipped with payload sensors will be deployed in cooperation with EMSO-PT partners to conduct several experiments.
- Studying the possibility to establish a second Portuguese node in northern of Portugal.

Building on the experience from the first implementation phase, ended in December 2022, INESC TEC continue strongly committed in the preparation of a successful plan for the second implementation phase. This includes an active participation in discussions and reporting of the first phase, participating in EMSO ERIC committees and workshops, welcoming and collaborating with new candidates for the infrastructure, and establishing priorities for the second implementation phase, to ensure a successful transition to the operational phase.

12.3 Robotics and Autonomous Systems Laboratory

Mission and positioning

The Laboratory of Robotics and Autonomous Systems has two physical locations within the ISEP and FEUP campuses. These dedicated facilities support R&D activities, technical training of human resources, and advanced education programs. In fact, as a research lab in an academic environment, it fosters undergraduate research and supports multiple engineering courses and educational activities.

Main objectives and actions planned for 2026

The main objectives of the Robotics and Autonomous Systems Laboratory for 2026 are the following:

- Modernising laboratory infrastructure - the continuous increase in R&D activities and the expansion into new areas of application demand state-of-the-art laboratory tools and equipment. The planned investments for 2026 aim to ensure the renewal and maintenance of development resources, enable rapid prototyping capabilities, and supply high-performance systems to support field experimentation.
- Technical staff training - efforts will be made to train technical personnel to assist in experimental activities, particularly those conducted onboard vessels, thereby allowing researchers to dedicate more time to innovation and research tasks.
- Integration with R&D Infrastructure - The services provided by research infrastructures, namely TEC4SEA, will be explored with the aim of optimising logistics, simplifying outsourcing processes and accelerating the development and testing of equipment. In addition, the use of infrastructures associated with INESC TEC, such as Companhia de Energia Oceânica (CEO), is envisaged.
- Continuation of the infrastructure improvement process update, ending on June 30, 2026.

12.4 Laboratory of Microfabrication

Mission and positioning

The Microfabrication Laboratory conducts fundamental research on laser direct-writing microfabrication using femtosecond laser technology and develops solutions in integrated optics, optofluidics, micromachining, and related fields. The laboratory also provides fabrication services to other research groups within the Centre for Applied Photonics (CAP).

Main objectives and actions planned for 2026

The Microfabrication Laboratory investigates non-traditional microfabrication techniques based on femtosecond laser direct-writing processes. These include high-resolution, three-dimensional localised refractive-index modification in transparent substrates; high-resolution 3D photopolymerisation via multiphoton absorption; and micromachining of silica. First-order Bragg gratings and optical structures in optical fibres are also produced through point-by-point laser writing, as well as more advanced processes aimed at developing new fibre-based devices.

Planned actions for 2026 include:

- Demonstrate the use of femtosecond laser writing as a high-resolution (sub-micron) lithographic tool.
- Use femtosecond laser machining to fabricate high-contrast waveguides and devices in thin-film lithium niobate.
- Explore the creation of nitrogen-vacancy centres in diamond and their related applications.
- Fabricate microfluidic and optofluidic devices using FLICE techniques for sensing applications.
- Perform machining and waveguide writing in alternative types of glass (e.g., borosilicate, fused silica substitutes, etc.).
- Develop 3D metallic micro-electrode fabrication.
- Install new equipment for semi-automatic fibre-to-chip alignment, including glue dispensing and curing capabilities.

The laboratory's fabrication capabilities are complemented by the equipment available at CEMUP – MNTEC. This cleanroom is a service-oriented facility managed by the University of Porto and has been supported by INESC TEC since its creation, with INESC TEC providing its micro-/nanofabrication equipment for broad community use.

12.5 x-Energy Lab - Smart Grids and Electric Vehicles Laboratory

Mission and positioning

The x-Energy Lab's mission is twofold: a) enable the application of concepts, algorithms, and scientific insights developed in the Power and Energy Systems domain, encompassing activities ranging from basic prototypes or proof-of-concept designs to fully operational demonstrators deployed in the field; b) foster the creation and transfer of scientific knowledge in collaboration with industry, while offering services, technical training and educational opportunities to industrial partners and academic institutions. The x-Energy Lab focuses on four primary areas: smart grids, electric mobility, energy management, and power electronics. x-Energy Lab activity is driven by its dedicated I&D staff and by senior academic researchers collaborating closely with the Power and Energy Systems domain, along with graduate students conducting their research at x-Energy Lab.

Main objectives and actions planned for 2026

The main objectives are the consolidation of human resources and enhance x-Energy Lab testing infrastructure to better support research activities in INESC TEC, provide services to industry, and support training and educational activities in accordance with CPES guidelines. These objectives will reach the defined targets at the end of the Portuguese Recovery and Resilience Plan (PRR). Additionally, the x-Energy Lab will also be reinforced with funding from the Portuguese Innovation Agency (ANI) through the Centros de Tecnologia e Inovação (CTI) program. The CTI program will also support advanced training for SGEVL human resources. Key focus areas include hybrid AC/DC distribution grids, EV charging, energy storage, hydrogen, converter-dominated power grids, energy management, real-time digital simulation with HIL, and Artificial Intelligence.

- Hybrid AC/DC distribution grids: Expand the laboratory scale hybrid AC/DC microgrid with the commissioning of a new AC/DC electric panel using PRR funding, which will add the main missing piece to integrate the existing AC/DC and DC/DC converter prototypes, two 30kW DC power sources, and a 50kW DC output from a power amplifier.
- EV charging: Continue developing the AC and DC EV smart charging testbed by integrating EVSE with V2G capabilities (and PRR), which faced unexpected delays due to regulatory challenges and absence of security certificates. The hybrid AC/DC grid will also integrate DC charging. This will support pre-certification services for EV smart charging appliances and create new solutions for interoperability between EVSE, distributed energy resources, and household/building loads. Additionally, it will provide a virtual domain for testing edge AI algorithms for e-mobility within low voltage grids and Energy Data Spaces.
- Energy Storage: Increase energy storage capacity to expand the microgrid testbed, funded by the PRR project Next Generation Storage (NGS). The acquisition of two systems will be completed, with one unit already operational.
- Hydrogen: Complete the implementation of a laboratory-scale green hydrogen test bed, allowing testing of a proton exchange membrane (PEM) electrolyser and controlling its power electronic interface (PRR H2Driven project).
- Power Grids dominated by Power Converters: Further improve the testbed for low inertia power grids with grid forming converters. A first version is already tested, but further improvements are possible, to proper support realistic emulation of static and dynamic behaviour of electricity grids with synchronous generator emulators.
- Real-time digital simulation: Expand Power-Hardware-In-the-Loop (PHIL) testing capabilities to support real-time simulation for detailed electronic power converters, protection systems, large power systems, and a control room simulator to train grid operators in futuristic operation scenarios.

- Energy efficiency and management, and Testing and Experimentation Facility (TEF): The infrastructure will continue its expansion to integrate a data-centric testing setup for energy efficiency, local energy communities, and low-voltage grid operations, in the context of a new Testing and Experimentation Facility for Energy Communities under the HE AI-EFFECT project.

The following is also planned: Promote the exploitation of CPES research by developing new value-added services for industry, including functional testing and validation of EV charging, hydrogen electrolysis, grid protection, synthetic inertia, and DC grid solutions; build a data infrastructure to provide industry actors with accessible data; and enhance dissemination efforts, foster international collaboration with scientific partners, attract new clients and strategic partners, publicize the x-Energy Lab website, and produce support materials to showcase developed services.

12.6 BRAIN Lab - Neuro-Engineering Lab

Mission and positioning

The main mission of this laboratory is to perform high-level interdisciplinary R&D in engineering and computational approaches applied and translational to basic and clinical neuroscience, namely crossing several areas, such as Physics; Engineering (Electronics; Computation; etc.); Neurology; Neurosurgery; Neurophysiology; Neuroradiology and Neurobiology. It is divided in 5 main research lines: 1) Brain imaging (&signals); 2) Man-machine symbiosis with edge-AI (a.k.a. “beyond Brain-Computer Interfaces & Human-Computer Interaction”); 3) Quantified Movement multimodal analysis in neurological diseases; 4) Neurosurgery Aiding Systems; 5) Macro-to-nano bio-neuro-sensing.

We operate several heavy R&D equipment of which our unique functional MRI simulator fully equipped with our new 64ch video-EEG medical & electrophysiology systems and a neurophotonics micro&nano laser sensing workbench.

BRAINlab long-term strategy is framed into our strategic plan to develop the “Porto.Neuro+: Centre of Excellence for Translational Neuroengineering”, a joint project, led by our lab, with all related regional labs within U.Porto and our close international partners: Pisa BioRobotics Institute and Munich LMU Neurology Department submitted to EU Teaming for Excellence tender. This strategic path is now underway, disrespectful of the tender result and all partners are aligned to progress towards the plan we proposed together to the EU.

Main objectives and actions planned for 2026

BRAINlab strategy defined for 2025 was a success with scientific and internationalisation achievements, mainly concerning high impact publication and increasing our visibility and partnership with several European and US research groups and organisations that endorsed our international network. Furthermore, the full operation of the new video-EEG 64ch electrophysiology integrated in the MRI simulator already started to get some return in clinical collaborations, namely with S. João University Hospital and LMU Grosshadern University Hospital in Munich.

For the next year of 2026, we aim to continue this effort aligned with some INESC TEC strategic objectives, namely:

C1.1. Raise the contribution and visibility of our research - We plan to start preparing a Neuroengineering Alliance that joins the Porto.Neuro+ partners with our close colleagues from the US Carnegie Mellon University Neuroscience Institute. A kick-off meeting is planned to June 2026 in Pittsburgh, PA, USA. Also, the integration of a joint new PhD students shared with LMU partner will continue to contribute for a higher visibility of our research. Our recent contacts with Carnegie Mellon University, also lead to a joint research project and joint PhD student that won a CMU-Portugal PhD Affiliated scholarship and will be moving to Pittsburgh based Neuromechatronic Lab of the Neuroscience Institute in January 2026.

C2.2. Better align and deliver R&I with industry's needs - Our lab spin-off startup#3 inSignals Neurotech has raised a 400k€ grant to support the planned development of a groundbreaking digital health platform for movements disorders. After a clinical trial at Maastricht University Hospital we supported the startup to start a new international clinical study in Santiago de Compostela University Hospital, Spain, for Parkinson Disease patient’s data collection. These trials aim to improve and validate at an international level the medical device we’ve been developing for the evaluation of Parkinson Disease motor symptoms. In 2024 we co-founded one more startup#4 (SeedSight) that has raised 1.7M€ of seed VC capital in 2025 and we plan to explore more tech transfer by 2026 to improve the startup’s potential to be successful. One more new startup will probably be created resulting from IP of our lab (not disclosable at this moment).

C5.2. Improve quality, management and usage of our infrastructures - For 2026 we are planning to add a functional near-infrared spectroscopy (fNIRS) capability to our video-EEG system, improving our R&D capacity and differentiating our lab in the neuroscience community. Furthermore, we will study the possibility to purchase a Portable Low-Field brain MRI machine to complete our brain imaging infrastructure.

12.7 iiLAB - Industry and Innovation Lab

Mission and positioning

Empowering companies and people for the digital transformation of industry.

iiLab's vision is to be the industry's preferred partner for development and innovation in the area of digital transformation.

iiLab brings together skills, competences and resources that provide a practical environment for exploring, experimenting and applying digital and analytical solutions along the value chain as part of the digital transformation of industry, by offering the following capacity-building actions:

- Developing and demonstrating advanced concepts and technologies in robotics, automation, cyber-physical systems, the Internet of Things (IoT) and the vertical and horizontal integration of AI in industry, in an environment close to that of industry.
- Carrying out experimentation and prototyping for technology companies, solving 'challenges' posed by the 'Client' and using the Laboratory as a demonstration facility for co-developed solutions.
- Providing consultancy to facilitate and reduce the risk of the digital transformation process and the development of solutions.
- Providing general or tailor-made advanced training for top managers and senior executives, with programmes in the areas of Digital Transformation Management and Advanced Production Technologies.

Main objectives and actions planned for 2026

Strategic Objective "Build stronger knowledge-based and multidisciplinary R&I ecosystems":

- Maintain a set of at least three demonstrators for the design of simple products in different industrial areas (those identified as having the greatest potential interest in using iiLab) that simulate production lines, using equipment, the results of projects carried out and other existing iiLab resources.
- Maintain base modules to enable the rapid configuration of 'production lines' and/or 'value chains' for specific demonstrations requested by external organisations (including for testing these organisations' own solutions).
- Upgrade the existing resources at iiLab, particularly with the inclusion of adequate generative AI modules.

Strategic Objective "Increase our international networking, leadership and competitiveness" - Increase iiLab's international networking, leadership and competitiveness

- Organize or participate in the organisation of at least one high-visibility international event (such as the FoF International Smart Factory Summit at SUPSI, Switzerland).
- Provide laboratory support to several EU-funded or other international projects.
- Promote the connection to, at least, one other international Industry Laboratory.

Strategic Objective "Provide innovative learning experiences":

- Conduct training activities, aligned with iiLab's area of expertise, for specific target audiences in manufacturing companies. These training activities will act as agents for promoting and marketing iiLab. A training activity entitled 'AI on the Factory Floor' is already planned for March.
- To support sustainable and effective digital transformation journeys and to help recruiting external users, four half-day hands-on workshops will be held, one per quarter, with a maximum of five participants from external entities.

Strategic Objective “Improve the base conditions for technology commercialisation” and Strategic Objective “Develop better linkages between knowledge production, development and market uptake”

- In collaboration with the Entrepreneurship and Spin-Off and the Licencing Support Offices, maintain close monitoring and development of solutions to ensure increase in licensing and patenting opportunities, as well as potential spin-off development.

Strategic Objective “Better align and deliver R&I with industry needs”

- Position iiLab as a key Technological Infrastructure for the testing and development of solutions in co-creation initiatives with industrial players, leveraging the Testbed infrastructure and adapted business model.
- Design, validate and disseminate a new business model grounded in services that make use of the current infrastructure, modules and integrated systems towards uprooting digitalisation initiatives for industrial players, as well as for adjacent players (upstream/downstream on the value chain).

Strategic Objective “Develop better linkages between knowledge production, development and market uptake”

- In collaboration with the main centres (CRIIS, SYSTEM, CTM), promote iiLab within INESC TEC as an infrastructure and systems integration environment capable of linking and developing internal research projects into demonstration pre-industry solutions – either through direct collaboration or through potential allowance of HR/infrastructure towards testing and co-developing initiatives.

Strategic Objective “Increase strategic integration in national and international tech-intensive value chains”

- Formerly assign iiLab as a Technology Infrastructure and link with TI Networks, national or European, pivoting the laboratory towards data-sharing and co-creation initiatives with partner RTOs and Industrial Players.

12.8 TRIBE LAB - Laboratory of Robotics and IoT for Smart Precision Agriculture and Forestry

Mission and positioning

Established in 2013, TRIBE LAB is dedicated to pioneering research and development in robotics, automation, and IoT-based solutions. Its mission is to enhance smart precision practices - ensuring the "right time, right product, right amount, and right place"- while improving the profitability, sustainability, and automation of agriculture and forestry. The lab primarily focuses on three environments:

1. Permanent Crops: Including steep-slope vineyards, olive groves, and fruit orchards.
2. Forest Biomass Harvesting: Aiming to optimize resource extraction while preserving environmental balance.
3. Protected Cultivation: Developing advanced solutions for controlled-environment agriculture.

Through multidisciplinary collaboration, agile methodologies, and design thinking, TRIBE LAB strives to establish itself as a global reference in IoT and robotics research and development for smart agriculture and forestry. By integrating iterative and user-centric approaches into its innovation process, the lab ensures that solutions are responsive to stakeholder needs and rapidly adaptable to emerging challenges. Guided by key European Union priorities, including the Common Agricultural Policy (CAP) Strategic Plans, the European Green Deal, the Farm to Fork Strategy, and the One Health approach, TRIBE LAB is committed to advancing sustainable, resilient, and health-conscious agri-food systems.

Main objectives and actions planned for 2026

Table 12.1 - TRIBE Lab

Initiatives	Key Results	Strategic Objectives
Define target journals and conferences	Increase in 10% the number of the publications, on top journals of Q1	Raise the contribution and visibility of our research
Increase patents originating from TRIBE LAB	Increase the numbers of patents to make easier the technology transfer	Improve the base condition for technology commercialisation
Coordinate one Horizon project	Coordinate a very competitive proposal to HORIZON framework for agriculture/forest. Submit ≥1 competitive proposal/year	Develop impactful research and innovation aligned with SDGs
Organise the 3rd Synergy Day of Robotics and IoT for agriculture	To promote the CRIIS-TRIBE lab technology and reinforce our position at the European level	Communicate scientific and technological achievements and their impact
Promote the creation of a Start-up with TRIBE LAB technology	Reach one start-up, to explore TRIBE technology that do not has potential technology takers	Develop better linkages between knowledge production, development, and market uptake
Actively promote new contracts in articulation with TEC4AGRO-FOOD	Increased number of contracts with industry	Develop better linkages between knowledge production, development, and market uptake
Keep organising regular team building activities	Improve employee satisfaction index and attract new applicants	Improve attraction and retention of world-class talent

12.9 MASSIVE - Multimodal Acknowledgeable multiSenSory Immersive Virtual Environments

Mission and positioning

MASSIVE is a state-of-the-art research infrastructure at INESC TEC dedicated to advancing multisensory virtual reality and immersive technologies. Equipped with unique conditions for experimentation, simulation, and validation, the lab explores how immersive systems enhance human perception and performance, fostering scientific innovation and collaboration across disciplines. Its mission is to leverage virtual reality technology to enhance human abilities, address global challenges, and improve quality of life.

Main objectives and actions planned for 2026

In 2026, MASSIVE will consolidate its position as a European reference in multisensory and immersive technologies, reinforcing its dual mission of scientific excellence and societal and industrial impact. The laboratory will focus on advancing the scientific foundations of immersive interaction, perceptual fidelity, and digital service innovation, while strengthening collaboration with academia, industry, and public institutions.

Aligned with the INESC TEC Strategic Plan 2023–2030, MASSIVE's objectives for 2026 aim to enhance excellence, interdisciplinarity, infrastructure quality, and societal relevance, fostering both high-impact research and the responsible dissemination of immersive technologies to the broader community.

Objective 1: Reinforce scientific excellence and international visibility

- Produce at least 10 peer-reviewed journal publications in 2026, 50% in open access, covering the laboratory's main research domains, including multisensory virtual environments, human performance, immersive authoring tools, artificial intelligence integration, and immersive digital service innovation.

Objective 2: Advance immersive frameworks and strengthen collaboration with industry

- Advance the design, validation, and certification of immersive frameworks, for example, based on perceptual equivalence and measurable performance transfer.
- Strengthen collaboration with industry partners through joint R&D projects focused on developing and deploying immersive digital services that translate research outcomes into real operational contexts.
- Promote knowledge and technology transfer through collaborative activities with companies and institutions, ensuring effective adoption and application of immersive technologies in relevant sectors.
- Engage the public through school visits, guided demonstrations, and outreach events, promoting awareness and digital literacy in immersive technologies.

Objective 3: Build a multidisciplinary and industry-oriented ecosystem

- Consolidate and expand industrial partnerships for the co-development of immersive solutions and digital services across diverse sectors, fostering innovation and knowledge transfer through applied research.
- Foster cross-disciplinary collaboration within INESC TEC and with external partners, integrating expertise in computer science, engineering, psychology, and design to develop comprehensive approaches to immersive technology research and application.

Objective 4: Strengthen human capital and knowledge sharing

- Promote researcher exchange and collaboration with international XR laboratories and consortia.
- Support internal training and mentoring programmes on experimental design, multisensory instrumentation, and XR content development workflows.

Objective 5: Ensure infrastructure excellence and sustainability

- Actively seek new funding and partnership opportunities to modernise and expand MASSIVE's experimental infrastructure, ensuring long-term sustainability and alignment with emerging trends in immersive technologies.

12.10 GIG - Graphics, Interaction and Games

Mission and positioning

GIG laboratory focuses on the interdisciplinary field of "Human Augmentation", addressing methods and technologies to improve the perception, performance and/or cognitive capacities of human beings, enhancing inclusion. The concept of immersion is central, integrating areas such as Computer Graphics, Human-Computer Interaction and Digital Games. Technologies and solutions are developed to improve the user experience and accessibility, being applicable to various domains.

Main objectives and actions planned for 2026

The research conducted at GIG in 2026 will focus on user experience and the creation of interactive, immersive, and engaging solutions, with applications in various fields, including industry, security/defence, health, training, tourism, and culture. The creation of location-based educational games and augmented reality, the use of haptic devices for immersive environments, 3D interaction, and immersive data analytics and visualisation are all components that will be studied, adapted, explored, and enhanced in different ways.

Research projects will be developed that integrate areas such as Computer Graphics, Human-Computer Interaction, Visualisation and Digital Games.

To attain this, the main objectives to accomplish are:

- Develop Extended Reality (XR) solutions by providing effective contributions based on multimodal and multisensory environments; importance will be given to advanced 3D interaction techniques that can guarantee proper usability and accessibility, as well as to authoring tools easy to use by non-technical staff.
- Study and define Interactive and location-based narratives that promote behaviour change in health and well-being. New opportunities for collaboration will be explored within the research network “Immersive for Health and Well-being”, in close cooperation with the EUGLOH project at UPorto.
- Study and develop procedural content generation techniques to adapt immersive media solutions to distinct locations and situations, namely in enhanced training scenarios.
- Innovate on co-creation methodologies applied to digital games and gamification strategies, focusing on immersive learning, applicable to game-based solutions for learning and behaviour change, and integrating performance metrics based on game analytics.
- Study and apply new information visualisation solutions and visual summaries/narratives to the context of ocean and earth sciences, as well as digital twins.

The dissemination of R&D activities continues through international events and high-impact journals, with the goal of attaining more than 20 articles. Attracting new talent, especially students, is a major objective. Three ongoing PhD projects are expected to be completed.

12.11 CLOUDinha Laboratory

Mission and positioning

The CLOUDinha Laboratory is designed to support a wide range of research and development activities at INESC TEC and the University of Minho, providing computational resources for experiments across the "Computer Science and Engineering" domain. Its mission is to offer a flexible and controlled testing environment, where researchers can design, implement, and evaluate software prototypes at different development stages, from early-stage prototypes to solutions ready for large-scale deployment or production use.

CLOUDinha plays a crucial role in supporting scientific publications, proof-of-concept demonstrations, and prototype development for both national and international projects. It thus acts as a key enabler between conceptual research and practical validation, fostering innovation and multidisciplinary collaboration.

The cluster provides both bare-metal and virtualised environments, comprising a heterogeneous set of 106 commodity servers spanning multiple hardware generations, equipped with Intel Core i3, i5, and i9 CPUs, with up to 64GB of memory, and different storage devices (NVMe and SATA SSDs, HDDs). The servers are interconnected through 1Gb or 10Gb networks. Complementing these, four Intel Xeon rack servers provide extended computational and storage capabilities, equipped with up to 192GB of memory, a heterogeneous storage stack that includes persistent memory devices, and programmable network stacks. The heterogeneous nature of the infrastructure is key to accommodating a variety of research needs.

Main objectives and actions planned for 2026

In 2026, the CLOUDinha laboratory will continue to support cutting-edge research and development by providing robust, flexible, and advanced computational resources. The infrastructure will remain a key enabler for research in the computer science and engineering areas, including distributed systems and scalable data management; storage systems, AI frameworks, and databases; privacy and security; emerging technologies such as blockchain, internet of things, and digital twins; and software engineering. This objective reinforces the strategic objective of building stronger knowledge-based and multidisciplinary R&I ecosystems.

A major focus for 2026 will be on improving the quality, management, and usage of our infrastructure, particularly regarding performance, resource usage, and energy efficiency perspectives. Planned actions include:

- Acquire emerging hardware like disaggregated memory and storage to replicate today's large-scale infrastructures maintained by Google, Microsoft, and Amazon.
- Deployment of a resource management and scheduling system to consolidate workloads across servers, improving overall resource utilisation and infrastructure efficiency.
- Implementation of load-aware allocation strategies to enable dynamic frequency scaling and selective server shutdown, reducing operational costs, energy consumption, and carbon footprint.
- Deployment of a centralised monitoring and management framework, integrating energy and performance metrics to guide future optimisations.
- Expansion of the storage capabilities with higher-capacity devices to support large datasets, backups, and data-intensive experimental results.

These actions align with INESC TEC's thematic lines, namely Digital Models, Sustainable Transformation, Tackling the Extreme, and Trustworthy Technology, by prioritising infrastructure enhancements and tailored support for researchers.

12.12 Communications Laboratory

Mission and positioning

The Communications Laboratory (CommsLab) supports the experimental evaluation and testing of next-generation communications, localisation, and sensing solutions in a controlled environment, bridging the gap between simulation and real-world testing. Established in 2006 at INESC TEC's main building through funding from the Foundation for Science and Technology (FCT) under the National Program for Scientific Hardware Renewal (PNRC), the CommsLab was initially named the "Optical Communications and Microwave Laboratory." Constantly evolving since its creation, the lab underwent major refurbishment in 2021 with support from FCT's National Roadmap for Scientific Infrastructures, gaining enhanced research conditions, upgraded network infrastructure, water supply, and uninterrupted power.

CommsLab is composed of optical and electronic test equipment for R&D in electronics, optical and RF communications, including modulation/demodulation of RF signals using custom digital vector/analogue modulations, as well as low frequency characterisation equipment and a 3D printing machine. Also, it includes a compact anechoic chamber (1.2 m x 0.6 m x 0.6 m) designed for evaluating different antennas at mmWave bands from 67 GHz to 170 GHz. The laboratory is also equipped with a Low Earth Orbit (LEO) Satellite communications gateway, Software Defined Radio (SDR) hardware, Faraday cage, programmable RF attenuator, 5G Open Radio Access Network (O-RAN) equipment, companion computing nodes, robotic platforms (e.g., drones, balloons, and a robot dog), and acoustic modems, supporting research activities on radio and acoustic communications targeting mobile air, land and waterborne scenarios. A small sized water tank supports the characterisation and validation of optical, acoustic and RF underwater communications solutions.

The Communications Laboratory has recently been expanded with a new experimental space, the CONVERGE Chamber, a cutting-edge environment designed for the integration of vision and radio technologies. This chamber is equipped with a set of instruments fully controllable via an API, enabling reproducible and remote-controlled experimentation. Key elements include a vision-aided OAI-based 5G mobile base station mounted on a 10 kg-capable robotic arm, a vision-guided FR2 reconfigurable intelligent surface (RIS), and a marker-based multi-camera motion capture system offering sub-millimetre precision. This infrastructure enables advanced experiments combining localisation, communication, and mobility, with automatic ground-truth annotation of moving entities.

Main objectives and actions planned for 2026

The following actions are planned for 2026, grouped by the objectives of INESC TEC's Strategic Plan 2023-2030:

Improve quality, management and usage of our infrastructures

- Establishment of EMC/EMI pre-certification capacity through the deployment of a technological infrastructure suitable for the characterisation electromagnetic compatibility and immunity testing.
- Establishment of a near-field to far-field measurement setup enabling the characterisation of antennas with large dimensions.
- Deployment of a state-of-the-art silicon photonics probe station with mm-wave capability up to 170 GHz
- Integration of a new equipment for characterisation of the dielectric properties of materials.
- Acquisition of a high-end Source-Measure Unit with nanosecond pulsing capability suitable for the characterisation of electronic devices.
- Develop and test obstacle-aware 5G and Wi-Fi backup communication solutions for emergency scenarios.

Provide innovative learning experiences

- Continue to foster the use of CommsLab in the context of research activities involving students, such as Summer Internships in CTM, Curricular Internships, and also hands-on demos for Telecommunications courses.

Better align and deliver R&I with Industry's needs

- Use of the improved CommsLab infrastructures, in close cooperation with mobile operators, to conduct at least two 5G pilots aligned with the validation of 5G-connected commercial solutions of different industrial players.

12.13 INESC TEC Datacenter

Mission and positioning

The INESC TEC Datacenter is a central digital infrastructure that enables research, innovation and advanced experimentation across the institution. It brings together enterprise virtualisation services and an OpenStack-based private cloud platform (CCloud) that allows researchers to deploy and manage virtual machines on demand, adapting computing and storage resources to the needs of each project.

The infrastructure includes more than 40 servers, offering approximately 2,500 CPU cores, 25 TB of RAM, and over 60 GPUs supporting high-performance computing, AI and data-intensive workloads. It provides over 300 TB of high-performance and high-capacity storage for virtualisation and cloud environments, together with two petabyte S3-compatible object storage clusters used across research activities. Conventional storage includes internal redundancy with selective backups, while the S3 clusters offer redundancy and versioning with replication enabled for selected buckets.

Interconnected through redundant 25 to 100 Gbit/s networks, the Datacenter delivers a scalable, reliable and energy-efficient computing environment that supports multidisciplinary R&D, national and international projects, and long-running scientific services, strengthening INESC TEC's capacity to translate research into operational technological solutions.

Main objectives and actions planned for 2026

In 2026, the Datacenter will continue its modernisation and expansion to support the growing demand for compute-intensive and data-driven research, focusing on four priority actions.

MLOps platform

- Deploy an advanced MLOps platform integrated with the Datacenter's computing and storage systems, enabling automated and reproducible ML workflows. This will improve collaboration, efficiency and resource usage in AI/ML research across INESC TEC.

New primary storage system

- Replace the current primary storage platform with a new all-flash high-performance system. This upgrade will increase performance and scalability, enable cloud-native storage for Kubernetes and containerised workloads, and strengthen resilience against cybersecurity threats.

CCloud cluster expansion

- Strengthen the CCloud private cloud with new high-performance servers equipped with modern CPUs, large memory and high-end GPUs. The expansion will increase computing capacity and better support AI/LLM and simulation workloads.

Sustainability and operational efficiency

- Improve energy efficiency and operational reliability through enhanced monitoring, resource optimisation and energy-aware workload management. In 2026, the Datacenter will explore a heat-recovery solution that reuses hot air to support the heating system of the building, reducing energy costs, and maximising the integration of local renewable energy sources.

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