EUROPEAN CROSS-BORDER DOCTORIALS

Collège Doctoral Languedoc-Roussillon

DIVE INTO THE EXPERIENCE OF A EUROPEAN PROJECT

creativity, innovation, training, networking ...

CALL FOR PROJECTS
NextGen Horizon
Pathfinder

LIVE EVENT

From 6th to 8TH October, 2025
• Aigues-Mortes (Gard)

CONTEXT

Europe is facing unprecedented challenges: climate disruption, an ageing population, scarcity of critical resources, geopolitical tensions over access to strategic technologies, and weakened democracies facing digital misinformation.

To remain a global leader in responsible innovation, the Cross-Boarder Doctoriales has launched a new phase of its program: NextGen Horizon – Pathfinder. This strategic pillar funds collaborative and transdisciplinary research projects designed to profoundly transform our economic, social, and environmental systems. Support the development of new scientific concepts and emerging technologies, at an early stage, that could tomorrow transform entire sectors or solve global crises.

In this context, the Cross-Boarder Doctoriales focuses on supporting innovative technologies capable of creating new value chains, high-quality jobs, and European technological and strategic sovereignty, by investing in the new generation of researchers.

SCENARIO

You are a consortium of young researchers.

Your mission: respond to the NextGen Horizon – Pathfinder call by designing an innovative solution to a major societal challenge, with the dual goal of creating knowledge and value.

Your proposal must demonstrate scientific and technological innovation, true interdisciplinarity (sciences, humanities, social sciences, law, economics), tangible impact for European citizens and industrial competitiveness, and a clear valorisation strategy (IP, technology transfer, spin-off creation, or licensing).

EXPECTED RESULTS

> **Generation of new high-potential knowledge and technologies**
> **Creation of synergies between disciplines**
> **Identification and protection of Intellectual Property (patents, know-how, trademarks)**

CONSORTIUM FORMATION

Doctoral students are invited to select three challenges to which they believe they can contribute, based on their research expertise, within a consortium of five to eight participants.
Groups will be formed according to these preferences in order to ensure interdisciplinarity and complementary expertise within the consortia.

Challenge 1 — Brain Health & Neuro-Invasive Technologies

Cutting-edge Neurotechnologies for Diagnosis, Prevention and Regeneration in Neurodegenerative Disorders

Description: Neurodegenerative diseases such as Alzheimer's and Parkinson's pose urgent medical and societal challenges as populations age. This challenge aims to advance next-generation neurotechnologies that enable earlier diagnosis, slow disease progression, and support regeneration of brain functions. Possible research directions include developing innovative brain–machine interfaces, miniaturised biosensors, advanced biomaterials for neural repair, and targeted therapeutic delivery systems that cross the blood–brain barrier. Integration of neuroscience, microelectronics, and health data science is essential to unlock new insights into brain disorders and personalise interventions. Equally, the development and deployment of neuro-invasive technologies must address ethical, social, and legal implications, including patient consent, data privacy, and the equitable access to new treatments. Public engagement and interdisciplinary ethical research will ensure that technological progress respects human dignity and fundamental rights. This challenge combines fundamental research in brain science and engineering with clear pathways for clinical translation, opening opportunities for technology transfer to medical device companies, biotech startups, and health systems working to tackle one of the century's most pressing health burdens.

Challenge 2 — Vulnerabilities, Care and Territorial Justice

Inclusive Territories, Equitable Care: Rethinking Access, Rights and Dignity in Fragile Contexts

Description: Across Europe, millions face structural barriers to accessing care and essential services — especially people with disabilities, the elderly, chronically ill individuals, or those living in remote or disadvantaged territories. These cumulative vulnerabilities often result in increased health risks, social isolation, and the erosion of dignity and rights. This challenge invites interdisciplinary teams to develop socially innovative, territorially adapted responses to these inequities. Research directions may include mobile or digital healthcare systems adapted to local contexts, inclusive infrastructure and urban design, rights-based frameworks for access to care, coordination of health and social services, or co-designed solutions with users and caregivers. The challenge intersects disability studies, public health, architecture and urban planning, law, political science, social work, digital innovation, and ethics. Proposals should prioritise user participation, recognise intersectional vulnerabilities (age, income, gender, geography), and propose systemic changes that enhance the autonomy, visibility, and care of marginalised populations.

Challenge 3 — Smart Materials for Energy Transition

Adaptive Materials and Structures for Energy-Positive Buildings and Resilient Infrastructure

Description: To meet climate targets and build resilient cities, next-generation materials and structures must deliver higher energy efficiency, durability, and sustainability. This challenge focuses on developing multifunctional smart materials — such as photovoltaic textiles, adaptive coatings, or self-healing composites — that enable energy-positive buildings, extend infrastructure lifespan, and integrate seamlessly into urban environments. Research directions span nanomaterials, eco-design, sustainable architecture, and circular economy strategies to ensure that new materials are resource-efficient, recyclable, and compatible with diverse construction contexts. Alongside technical innovation, this challenge addresses social, economic, and regulatory dimensions: how to ensure market adoption of advanced materials, how to support circular supply chains, and how to update building codes and standards to accommodate new technologies. Public acceptance and stakeholder engagement are key to integrating smart materials in ways that align with local needs and promote just, inclusive urban transformation. By bridging fundamental material science with design, policy, and sustainability research, this challenge paves the way for technology transfer into the construction and infrastructure sectors — driving greener cities and climate-resilient communities for decades to come.

Challenge 4 — AI & Societal Trust

Ethical AI for Information Integrity and Democratic Resilience

Description: In an era of pervasive misinformation and deepfakes, societies need transparent and explainable AI systems that help protect information integrity while safeguarding fundamental rights and cultural diversity. This challenge focuses on developing multilingual, trustworthy AI tools capable of detecting, analysing, and countering disinformation in ways that reinforce democratic resilience. Research directions combine natural language processing, cybersecurity, and advanced algorithm design with insights from digital sociology, ethics, and law to ensure that technical solutions respect human rights and societal values. Key aspects include designing AI models that are accountable and interpretable, building frameworks for human oversight, and developing governance models that balance innovation with robust protection against misuse. Alongside technological advances, this challenge explores legal and societal frameworks for regulating AI use in media and public discourse, promoting digital literacy, and engaging citizens in co-designing fair, transparent AI systems. By bridging fundamental research in AI with social and legal perspectives, this challenge offers clear opportunities for technology transfer to public institutions, media platforms, and civil society — strengthening trust in digital information and democratic processes.

Challenge 5 — Circular Economy and Consumer Behaviour

Behavioural and Regulatory Levers for a Sustainable Circular Economy

Description: Achieving a true circular economy depends not only on technological advances in recyclable and reusable materials but also on shifting consumer behaviours and shaping legal frameworks that encourage sustainable choices. This challenge brings together environmental scientist, chemist, behavioral economics, psychology, and law to generate new knowledge about how people buy, use, and discard products — and how these behaviours can be steered towards circular practices. Key research directions include developing strategies for eco-design, studying incentives and nudges that motivate repair and reuse, and designing regulatory measures that hold producers accountable for the full life cycle of their products. Socio-economic studies will explore how new circular business models can be scaled equitably and how policies can balance consumer freedom with sustainability goals. By connecting fundamental research on behaviour and regulation with innovation in materials and product design, this challenge creates clear opportunities for technology transfer to companies, policy-makers, and consumer-facing industries — supporting sustainable markets that make circular choices the default.

Challenge 6 — Water Security in a Changing Climate

Smart Monitoring, Sustainable Management and Governance Models for Water Resources

Description: Water scarcity, pollution, and uneven distribution are becoming critical challenges under climate change. This challenge integrates hydrology, biogeochemistry, and sensor technologies with environmental economics, law, and social sciences to design resilient water management systems. Research directions include developing real-time water quality and quantity monitoring systems, AI-based predictive models for drought and flood risk, and green remediation technologies for polluted water bodies. Socio-economic and legal perspectives will address equitable allocation, transboundary governance, and incentives for conservation. By linking fundamental science with governance and social innovation, this challenge enables technology transfer to utilities, municipalities, and international organisations, supporting fair and sustainable access to water resources worldwide.

Challenge 7 — One Health Surveillance & Zoonoses Prevention

Cross-Sectoral Biosurveillance and Governance for Emerging Zoonotic Diseases

Description: Emerging zoonotic diseases pose increasing risks at the interface of human, animal, and environmental health. This challenge advances molecular diagnostics, epidemiology, and bioinformatics, integrated with public health policy, sociology, and health economics to design holistic early-warning systems. Research directions include real-time genetic surveillance, smart data platforms, and predictive models that link wildlife, livestock, and human health trends. Legal and governance frameworks ensure ethical data sharing and community engagement. Outcomes enable technology transfer to health authorities and veterinary services to prevent future pandemics.

Challenge 8 — Space & Earth Observation for Resilient Communities

Multi-Source Observation Technologies, Data Integration and Social Innovation for Local Action

Description: Earth Observation (EO) technologies — from satellites to drones, in situ sensors, and citizen science — provide unprecedented opportunities to monitor environmental and societal changes. This challenge integrates space technologies, sensor engineering, and data integration science with urban planning, participatory governance, and environmental law to support communities in adapting to local risks. Research directions include developing interoperable platforms combining satellite, aerial, and ground-based data; creating digital twins of territories for real-time decision-making; and designing open governance models for fair data use and citizen participation. By bridging fundamental research in observation technologies with socio-economic and legal perspectives, this challenge enables technology transfer to municipalities, SMEs, and international organisations — helping communities anticipate and respond to diverse environmental, economic, and societal challenges.

Challenge 9 — Personalised Prevention & Health Equity

Molecular Diagnostics, Data Science and Social Equity for Tailored Disease Prevention

Description: Chronic and complex diseases such as cancer, cardiovascular disorders, and neurodegenerative conditions remain major health burdens worldwide. This challenge combines genomics, molecular imaging, and AI-driven diagnostics with health economics, medical ethics, and law to design affordable and personalised prevention strategies. Research directions include developing non-invasive biomarkers, predictive risk models across diverse populations, and secure frameworks for health data use. Social science insights ensure that these innovations reduce inequalities, respect privacy, and adapt to cultural contexts. By linking fundamental biomedical research with socio-economic and legal perspectives, this challenge opens pathways for technology transfer to clinics, public health systems, and industry — enabling more equitable, preventive healthcare worldwide.

Challenge 10 — Fragmented Territories, Repaired Spaces

Rethinking Territorial Planning: Towards Spatial, Social, and Ecological Justice

Description: Ecological transition risks deepening spatial inequalities between thriving urban centres and neglected rural or peri-urban areas. This challenge invites interdisciplinary teams to explore new territorial models that combine spatial justice, low-impact development, inclusive design, and democratic innovation. Merging geography, urban planning, sociology, circular economy, data science, environmental law, and participatory governance, the project teams will work on tools and approaches to repair territorial fractures: lightweight housing, community hubs, adaptive reuse of vacant spaces, collaborative mapping, or predictive modelling for mobility, energy, or access to essential services. Each team will choose a specific territory to work on — in collaboration with local governments or community groups — and design applied solutions or demonstrators that embody low-tech, inclusive, and replicable territorial innovations.