

COLLABORATIVE DOCTORAL PARTNERSHIPS – CALL 2025

POSITION IDENTIFIER: 25-01

THEMATIC FIELD: Digital transformation: technologies, cybersecurity, and socio-economic impact

COLLABORATION TOPIC: Horizontal cybersecurity

SHORT DESCRIPTION: PhD projects in this field will focus on emerging digital technologies cybersecurity, and their impact on society. They will contribute to the development of key concepts aiming at ensuring a secure by design European digital transition, critical to achieve a more prepared Union, increase the digital competitiveness and productivity of the EU's economy and foster an inclusive uptake of digital technologies (artificial intelligence, next generation Internet, virtual worlds, quantum computing, etc.), among other priorities identified in the political guidelines of the European Commission. More specifically, the project will provide evidence, analytical frameworks and tools to support a comprehensive and integrated cyber security ecosystem that leverages AI and ML techniques to enhance cyber defence, cyber-threat intelligence, and situation awareness, while providing a robust and resilient network security framework and effective governance policies.

SCIENTIFIC PERSON OF CONTACT (SPOC): Igor NAI FOVINO (JRC-ISPRA), Unit T.2 Cybersecurity and digital technologies.

KEY TOPICS WITHIN THIS PROJECT

- **AI-driven Cyber-defence and Cyber-threat Intelligence:** Developing and applying AI and techniques to enhance the collection of weak signals, detection, correlation, analysis, and prediction of cyber threats. Research could explore how deep learning, LLM and other advanced AI paradigms can improve threat detection accuracy, identify attack patterns, and automate responses to emerging cyber risks. Additionally, projects may focus on creating AI-enhanced frameworks for cyber threat intelligence correlation and sharing, enabling better collaboration between governments, businesses, and international entities to strengthen collective cyber resilience.
- **Cyber-ranges and Simulation Environments for Cybers-Defense exercises and tests:** Investigating the use of AI and ML to improve the design and effectiveness of cyber-ranges—virtual environments used to simulate realistic cyber-attacks and defence scenarios. PhD students may explore how these technologies can be used to create adaptive simulations that evolve based on real-world attack data, offering increasingly sophisticated training environments for cybersecurity professionals. This research could also include the development of autonomous systems within cyber-ranges that respond to simulated attacks in real-time, providing hands-on learning and stress-testing for cybersecurity protocols and tools.
- **Cyber Situation Awareness Using AI and ML Techniques:** Advancing cyber situation awareness through the use of AI, ML, and data analytics. This research line could focus on creating real-time monitoring systems that integrate vast amounts of data from different sources (e.g., network traffic, threat feeds, incident reports) and use machine learning algorithms to generate actionable insights. PhD students may also investigate the application of deep learning to improve threat prediction models, enabling proactive rather than reactive cyber-defence strategies. The focus would be on developing intelligent systems that not only detect and respond to cyber threats but also anticipate potential attack vectors and advise on risk mitigation strategies.

- **Network Security, Stability, and Resilience:** Exploring the intersection of cybersecurity and network stability, with a particular emphasis on how AI and ML can be used to optimize network security protocols and improve resilience against large-scale cyber-attacks. Projects may focus on developing intelligent algorithms that can dynamically adjust network configurations to prevent or mitigate threats, identify vulnerabilities, and ensure network reliability under adverse conditions. This research could extend to studying the role of LLMs and natural language processing (NLP) techniques for analysing cyber threat reports, policy documents, and other unstructured data sources to extract actionable intelligence and enhance decision-making in real-time.
- **Cybersecurity Policy and Governance:** Investigating the broader policy implications of cyber-defence and threat intelligence, with a focus on how scientific research and technological advancements can inform regulatory frameworks and governance structures. PhD students may study how to integrate AI and ML into national and international cybersecurity policies, ensuring that governance models can keep pace with the rapid evolution of cyber threats. Research could also examine how to establish best practices for public-private partnerships, enhance international cooperation, and develop standards for cross-border cyber threat intelligence sharing.

The collaboration will be developed within the context of the portfolio and the cyber-horizon project, which will enhance the CDP program by providing doctoral students with extensive training opportunities on advanced topics in the cyber-security and cyber-defence domain, exploiting the access to a rather unique cyber-range platform infrastructure such as the European Internet Contingency Platform (EPIC) and through the interaction with a team of researchers with a very diverse set of skills and competencies.

OUTPUTS: PhD projects in this field will contribute to the design and development of advanced, science-based data, methods, and tools to support the next phase of cybersecurity innovation, ensuring the protection of critical digital infrastructures while enhancing the overall security and resilience of cyberspace.

IMPACT OUTLOOK: With the increasing complexity and scale of cyber threats, the project will leverage state-of-the-art technologies, including AI (deep learning, generative AI and traditional ML), to inform policy solutions and improve decision-making in cyber-defence and threat intelligence.

LINKS / REFERENCES TO PUBLICATIONS

Publications of the Team working in this project can be found here:

- **Igor Nai Fovino:** <https://scholar.google.com/citations?hl=it&user=Fueq5BAAAAAJ>
- **Ioannis Kounelis:** <https://scholar.google.com/citations?hl=it&user=ty5uAVcAAAAAJ>
- **Georgios Karopoulos:** <https://scholar.google.com/citations?hl=it&user=VIqmTJkAAAAAJ>
- **Gary Steri:** <https://scholar.google.com/citations?hl=it&user=4Hz0ZPAAAAAJ>
- **Andraz Krasovec:** https://scholar.google.com/citations?hl=it&user=YAKB_NkAAAAAJ
- **Raimondo Giuliani:** <https://scholar.google.com/citations?hl=it&user=C-AxhoYAAAAAJ>

COLLABORATIVE DOCTORAL PARTNERSHIPS – CALL 2025

POSITION IDENTIFIER: 25-02

THEMATIC FIELD: Digital transformation: technologies, cybersecurity, and socio-economic impact

COLLABORATION TOPIC: Data driven innovation

SHORT DESCRIPTION: Data, scalable cloud infrastructures and high-performance computing are essential enablers for digital transformation, including the multiple emerging opportunities for increasing competitiveness, burden reduction, simplification and sustainability. PhD projects in this field will focus on these key aspects of the digital transition critical to achieve more prepared economies and societies, increase the competitiveness of the EU's businesses, and foster an inclusive uptake of digital technologies, among other priorities identified in the political guidelines of the European Commission.

SCIENTIFIC PERSON OF CONTACT (SPOC): Alexander KOTSEV and Anders FRIIS-CHRISTENSEN (JRC-ISPRA), both Unit T.4 "Data governance and services".

KEY TOPICS WITHIN THIS PROJECT

Data and the availability of computational capabilities to a large extent determine the success of digital initiatives. At the same time, within a rapidly emerging technological context, there are multiple aspects related to data-driven innovation and the associated digital infrastructures that are to be investigated in a scientifically-sound manner. Important topics include:

- Business models and value creation, financial sustainability, incentives and disincentives for participation within the context of distributed digital ecosystems, including the awareness and trust in data and digital technologies;
- Pathways for ensuring sustainability, competitiveness, simplification and burden reduction through data-driven innovation;
- Interconnectivity of distributed digital infrastructures, including the FAIRness of data sharing practices, and the choice of appropriate standards, interoperability, data accessibility, discoverability;
- Approaches for ensuring sovereignty, privacy and ethical use of data and digital infrastructures with a specific emphasis on the identification and analysis of power asymmetries and the specific challenges and opportunities for SMEs.

OUTPUTS: The projects might provide evidence, analytical frameworks and tools to investigate the role of data, computational capabilities, and standards in determining the success of digital initiatives, with a focus on ensuring privacy, ethics, and FAIRness of data sharing practices.

IMPACT OUTLOOK: In the context of the ENABLED (Data Ecosystems and Enablers) project, the JRC studies the current and emerging facets of digital transformation, and its impacts on the European economy, society and environment, in support of EU digital policies.

LINKS / REFERENCES TO PUBLICATIONS

- Ponti, M., Portela, M., Pierri, P., Daly, A., Milan, S., Kaukonen Lindholm, R., Maccani, G., Peter de Souza, S. and Thabit González, S., **Unlocking Green Deal Data: Innovative Approaches for Data Governance and Sharing in Europe**, Thabit Gonzalez, S. and Maccani, G. editor(s), Publications Office of the European Union, Luxembourg, 2024, JRC139026. <https://doi.org/10.2760/2422339>,

- Hurtado Ramírez, D., Porras Díaz, L., Rahimian, S., Auñón García, J.M., Irigoyen Peña, B., Al-Khazraji, Y., Gavín Alarcón, Á., González Fuente, P., Soler Garrido, J. and Kotsev, A., **Technological Enablers for Privacy Preserving Data Sharing and Analysis**, Publications Office of the European Union, Luxembourg, 2023, JRC134350. <https://doi.org/10.2760/427718>
- Farrell, E., Minghini, M., Kotsev, A., Soler Garrido, J., Tapsall, B., Micheli, M., Posada Sanchez, M., Signorelli, S., Tartaro, A., Bernal Cereceda, J., Vespe, M., Di Leo, M., Carballa Smichowski, B., Smith, R., Schade, S., Pogorzelska, K., Gabrielli, L. and De Marchi, D., **European Data Spaces - Scientific Insights into Data Sharing and Utilisation at Scale**, EUR 31499 EN, Publications Office of the European Union, Luxembourg, 2023, ISBN 978-92-68-03166-7 [JRC129900](https://doi.org/10.2760/301609), <https://doi.org/10.2760/301609>,

COLLABORATIVE DOCTORAL PARTNERSHIPS – CALL 2025

POSITION IDENTIFIER: 25-03

THEMATIC FIELD: Digital transformation: technologies, cybersecurity, and socio-economic impact

COLLABORATION TOPIC: Digital Society

SHORT DESCRIPTION OF THE THEMATIC FIELD: PhD projects in this field will focus on emerging digital technologies, cybersecurity, and their impact on society and economy. They will contribute to key aspects of the digital transition critical to achieve a more prepared Union, increase the digital competitiveness and productivity of the EU's economy and foster an inclusive uptake of digital technologies (artificial intelligence, virtual worlds, quantum computing, etc.) among other priorities identified in the political guidelines of the European Commission.

SCIENTIFIC PERSON OF CONTACT (SPOC): Néstor DUCH BROWN (JRC-SEVILLA) and Sven SCHADE (JRC-ISPRA), both Unit T.1 Digital Economy.

KEY TOPICS WITHIN THIS PROJECT

- **Innovation of Public Services and Digital Transformation of Governance:** contributing to the evolution and resilience of the EU, larger efforts on public sector reforms, and the seamless cross-border access to public services by citizens and businesses.
- **Digital Innovation in the private sector:** comprehensively exploring the economic aspects of digital innovation and digitalization and examining how technological advancements are reshaping the way of doing business and are altering industries and market structures.
- **Data and Platform Economy and Regulation:** contributing to the evaluation of the economic impacts associated with changes in these regulations, and particularly, the assessment of the economic effects of reduced fragmentation, increased scale economies, and enhanced competition within the EU digital ecosystem.
- **Social implications of the Digital Transformation:** investigating the social impacts of the digital transformation on European societies and citizens, including competency and skill needs.
- **Digital Techno-Economic Ecosystem and the Digital Transformation of the Economy:** mapping the digital ecosystem to analyse the Digital Transition's impact on the EU's economy, competitiveness, and economic security.

The JRC studies the current and emerging facets of digital transformation, and its impacts on the European economy, society and environment, in support of EU digital policies. This research will happen under the umbrella of digital society, namely the JRC projects [INNPULSE](#) (Innovation of Public Services and Digital Transformation of Governance), [DIGINNOVA](#) (Digital Innovation in the Private Sector), [D-PER](#) (Data and Platform Economy and Regulation), [SiDiT](#) (Social Implication of the Digital Transformation) and [DGTES](#) (Digital Techno-Economic Ecosystem and the Digital Transformation of the Economy).

OUTPUTS: The PhD projects will provide evidence, analytical frameworks and tools to support (digital) market integrity, economic security and competitiveness, societal resilience (including key public services), digital governments, digital skills for all, and promoting emerging, highly specialised, value-added jobs.

IMPACT OUTLOOK: This work will provide techno-socio-economic research on the impacts and strategic role of digital technologies, data and digital platforms for the society, economy and environment - in support of EU digital policies.

LINKS / REFERENCES TO PUBLICATIONS

- Millard, J., 2023. **Impact of digital transformation on public governance**, Manzoni, M. and Schade, S. (eds.), Publications Office of the European Union, Luxembourg, <https://doi.org/10.2760/204686>.
- Tangi, L., Ulrich, P., Schade, S., Manzoni, M., 2024. **Chapter 12: Taking stock and looking ahead - developing a science for policy research agenda on the use and uptake of AI in public sector organisations in the EU**. In Research Handbook on Public Management and Artificial Intelligence. Cheltenham, UK: Edward Elgar Publishing, <https://doi.org/10.4337/9781802207347.00023>.
- Duch-Brown, Néstor, Lukasz Grzybowski, André Romahn, and Frank Verboven. 2023. "**Evaluating the Impact of Online Market Integration—Evidence from the EU Portable PC Market.**" American Economic Journal: Microeconomics, 15 (4): 268–305, <https://doi.org/10.1257/mic.20200254>.
- Vuorikari, R., Kluzer, S. and Punie, Y., 2022. **DigComp 2.2: The Digital Competence Framework for Citizens - With new examples of knowledge, skills and attitudes**. Publications Office of the European Union, Luxembourg, <https://doi.org/10.2760/115376>.
- Fabiani, J., Soguero, J., Calza, E., Dunker, C. and De Prato, G., **Strategic Insights into the EU's Advanced Manufacturing Industry: Trends and Comparative Analysis**, Publications Office of the European Union, Luxembourg, 2024, <https://doi.org/10.2760/7959469>, JRC139092.

COLLABORATIVE DOCTORAL PARTNERSHIPS - CALL 2025

POSITION IDENTIFIER: 25-04

THEMATIC FIELD: Socio-Economic and Territorial Impact

COLLABORATION TOPIC: Macroeconomic monitoring and fiscal surveillance

SHORT DESCRIPTION: The importance of economic analysis for policy evaluation encompasses multiple dimensions such as the territorial and sectorial dimension, the macro-economic and governance assessment as well as the monitoring and impact of funding instruments and regulatory reforms – especially related to Commission’s initiatives. The thematic field reflects the support to the Commission's priorities and contribute to the substantiation of the [Draghi Report](#).

SCIENTIFIC PERSON OF CONTACT (SPOC): Luca ONORANTE (JRC-ISPRA), Unit B.1 Economic and Financial Resilience, in collaboration with Andrea CONTE (JRC-SEVILLA), Unit B.7 Innovation Policies and Economic Impact.

KEY TOPICS WITHIN THIS PROJECT

- Advanced econometric and modelling analysis and policy evaluation to support the Socio-Economic and Territorial Impact portfolio, working at the juncture of two complementary JRC projects focussed on modelling.
- Analyse territorial dynamics and the implications of European Union funding programs.
- Develop a set of forecasting and nowcasting models and techniques at regional level.
- Contribute to the formulation and assessment of policies aligned with the new Commission priorities.
- Utilize “big data”, artificial intelligence techniques and text analysis to derive insights from qualitative data sources.
- Model-based assessments and scenarios, using advanced macro-econometric models.

The research will happen as part of an interdisciplinary team, in support of the Socio-Economic and Territorial Impact portfolio.

OUTPUTS: PhD projects in this field will contribute to, amongst other things, the European economic forecasts.

IMPACT OUTLOOK: The research ultimately helps to inform the European economic outlook and as such contributes to the European Semester and to the Commission priority “An economy that works for people (Ensuring social fairness and prosperity)”.

LINKS / REFERENCES TO PUBLICATIONS

- [JRC MACFIS Webpage](#)
- [JRC Nowcasting page](#)
- [JRC Nowcasting Dashboard](#)
- [Euro Area Macroeconomic nowcasting](#)
- [JRC Nowcasting publications](#) (*Research* tab)
- [The Global Multi-country model](#)

COLLABORATIVE DOCTORAL PARTNERSHIPS - CALL 2025

POSITION IDENTIFIER: 25-05

THEMATIC FIELD: Socio-economic and territorial impact

COLLABORATION TOPIC: Urban Trends, Analysis of Cities and Territories

SHORT DESCRIPTION: The PhD research will investigate European urban and socioeconomic growth trends at high spatial granularity, with focus on the interactions with sectors such as housing and real estate, tourism, innovative sectors and/or migration. Leveraging innovative methods and data sources, the PhD research will provide new insights into the mechanisms underlying urban trends and develop methodological approaches to predict urban change.

SCIENTIFIC PERSON OF CONTACT (SPOC): Filipe BATISTA e SILVA (JRC-ISPRA), Unit B.3 Territorial Development.

KEY TOPICS WITHIN THIS PROJECT: The PhD research is part of the wider JRC Analysis of Cities and Territories (ACT) project. This project provides a diverse and articulated environment that will enable the development of a successful Doctoral partnership. ACT maintains and develops a territorial knowledge base, or ‘repository’ of highly granular geographical data, methods and scientific tools and models. The project leverages such knowledge base to provide insight on the impacts of EU trends and policies such as socioeconomic and territorial cohesion (urban, rural and regional development), demography, housing, tourism, cross-border issues, transport and accessibility. The student will benefit from the access to these knowledge resources and from the interaction with the project’s scientific team, and is encouraged to engage in interdisciplinary and innovative research approaches.

OUTPUTS: PhD projects in this field will contribute to investigating the complex spatiotemporal dynamics and factors contributing to urban trends, including densification, suburbanisation, and decline, as well as the role of smaller cities and towns.

IMPACT OUTLOOK: The research aims to provide insightful information for EU’s Cohesion policy and investments, to promote adequate regional and urban planning in the context of macro trends and challenges such as demographic decline.

LINKS / REFERENCES TO PUBLICATIONS

- Alessandrini *et al.*, 2024, **Rethinking City Population Growth: How Reclassification Matters**. Population and development review. <https://doi.org/10.1111/padr.12661>
- Batista e Silva *et al.*, 2020, **Uncovering temporal changes in Europe’s population density patterns using a data fusion approach**, Nature Communications, 4631. <https://doi.org/10.1038/s41467-020-18344-5>
- Batista e Silva F, Dijkstra L (eds.), 2024, **Challenges and opportunities for territorial cohesion in Europe - Contributions to the 9th Cohesion report**, Publications Office of the European Union, Luxembourg, JRC138304. <https://doi.org/10.2760/466949>
- Curtale *et al.*, 2022, **Impact of COVID-19 on tourism demand in European regions - An analysis of the factors affecting loss in number of guest nights**, Annals of Tourism Research Empirical Insights, 4 (2), 100112. <https://doi.org/10.1016/j.annale.2023.100112>

- Curtale *et al.*, 2024, **The Demography-Economy-Land use interaction (DELi) model**, Publications Office of the European Union, Luxembourg, JRC136498. <https://doi.org/10.2760/025883>
- Jacobs-Crisioni *et al.*, 2024, **Does Density Foster Shorter Public Transport Networks? A Network Expansion Simulation Approach**, *Land*, 13(1), 77. <https://doi.org/10.3390/land13010077>
- Perpiña Castillo, *et al.*, 2024, **Are remote rural areas in Europe remarkable Challenges and Opportunities**, *Journal of Rural Studies*, 105, 103180. <https://doi.org/10.1016/j.jrurstud.2023.103180>
- Pesaresi *et al.*, 2024, **Advances on the Global Human Settlement Layer by joint assessment of Earth Observation and population survey data**, *International Journal of Digital Earth*, 2390454. <https://doi.org/10.1080/17538947.2024.2390454>
- Sannier *et al.*, 2024, **Does Density Foster Shorter Public Transport Networks? A Network Expansion Simulation Approach**, *Land*, 13(7), 1087. <https://doi.org/10.3390/land13010077>
- Schiavina *et al.*, 2022, **Built-up areas are expanding faster than population growth: regional patterns and trajectories in Europe**, *Journal of Land use Science*, 17. <https://doi.org/10.1080/1747423X.2022.2055184>
- Baranzelli, C., Vandecasteele, I., Aurambout, J. and Siragusa, A (eds.) **The future of cities – Opportunities, challenges and the way forward**, 2019, Publications Office of the European Union, Luxembourg. JRC116711. <https://doi.org/10.2760/375209>

COLLABORATIVE DOCTORAL PARTNERSHIPS - CALL 2025

POSITION IDENTIFIER: 25-06

THEMATIC FIELD: Socio-economic and territorial impact

COLLABORATION TOPIC: Analyses of labour taxation with the use of EUROMOD-HHoT

SHORT DESCRIPTION: The research will combine cutting-edge microsimulation techniques ([EUROMOD](#), the tax-benefit microsimulation model for the EU, and its Hypothetical Household Tool extension (HHoT)) with empirical analysis based on rich administrative data to explore the complex interactions between fiscal policy and work incentives.

SCIENTIFIC PERSON OF CONTACT (SPOC): Andrea PAPINI and Kateryna BORNUKOVA (JRC-SEVILLA), both at Unit B.2 Fiscal Policy Analysis.

KEY TOPICS WITHIN THIS PROJECT:

The work will focus on the potential disincentives to work created by existing labour taxation systems, and the design of reforms to stimulate labour market participation, especially for certain groups. Key topics for a PhD candidate to work on in this project include:

- Empirical investigation of taxpayer behaviour around tax schedule discontinuities ("bunching analysis") using administrative data, with special attention to recent policy reforms in EU countries and their impact on different demographic groups.
- Comparative analysis of flat versus progressive tax systems, including assessment of implemented and hypothetical reforms on labour supply responses and fairness outcomes.
- Assessment of redistributive effects of national tax and benefit systems through innovative methodological approaches.

OUTPUTS: The project will contribute to the delivery of in-depth analysis of labour taxation in the EU, in collaboration with DG TAXUD and DG EMPL, as a part of the project PRJ 33365 EUROMOD/HHoT in PTF 18 - Socio-economic & territorial impact (WP 2025).

IMPACT OUTLOOK: PhD projects in this field will contribute to advancing our understanding of how tax systems and welfare benefits in the EU influence economic outcomes, including labour market behaviour and distributional impacts. Results are expected to inform the policy debate about the optimal design of tax-benefit systems to attain economic and social objectives in the EU27.

LINKS / REFERENCES TO PUBLICATIONS

- Barrios, S., Ivaškaitė-Tamošiūnė, V., Maftai, A., Narazani, E., & Varga, J. 2019. **Progressive Tax Reforms in Flat Tax Countries**. *Eastern European Economics*, 58(2), 83–107. <https://doi.org/10.1080/00128775.2019.1671201>
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COLLABORATIVE DOCTORAL PARTNERSHIPS CALL 2025

POSITION IDENTIFIER: 25-07

THEMATIC FIELD: Strategic (bio) technologies for EU competitiveness

COLLABORATION TOPIC: Innovative Health Biotechnologies in a Competitive Europe

SHORT DESCRIPTION: The project will focus on 1) Advanced Therapeutic Medicinal Products (such as gene therapies, mRNA therapeutics); 2) Nanotechnology-enabled medical products; or 3) Biotherapeutics and vaccines.

SCIENTIFIC PERSON OF CONTACT (SPOC): Aisha SAUER and Luigi CALZOLAI (JRC-ISPRA), both at Unit F.2 Technologies for health.

KEY TOPICS WITHIN THIS PROJECT

- Supporting the development and application of innovative biotechnologies in the biomedical sector
- Contributing to standardisation initiatives in the area of innovative biotechnologies
- Identifying and analysing strategic health biotechnologies, including drivers and barriers to their exploitation from lab to fab and hurdles in knowledge valorisation and translational research

The project will provide doctoral students with an extensive training opportunities on innovative health biotechnologies within the EU policy context. This includes access to the state-of-the-art JRC Nanobiotechnology laboratory (hosting a unique interdisciplinary array of instruments and expertise) and a large international network of collaborations with leading universities, research institutions, regulatory agencies, and metrology organisations.

OUTPUTS: PhD projects in this field will contribute to designing new methods and tools to support a faster translation of innovative health biotechnologies from the laboratory to the market, with a strong focus on regulatory science.

IMPACT OUTLOOK: The research will be framed within the INNOBIOTECH project and will hence contribute to EU policies in health and biotechnology.

LINKS / REFERENCES TO PUBLICATIONS

- Guerrini, Giuditta, et al. Characterization of nanoparticles-based vaccines for COVID-19. **Nature Nanotechnology** 17 (2022): 570-576. <https://doi.org/10.1038/s41565-022-01129-w>
- De Gasparo, Raoul, et al. Bispecific IgG neutralizes SARS-CoV-2 variants and prevents escape in mice. **Nature** 593, 7859 (2021): 424-428. <https://doi.org/10.1038/s41586-021-03461-y>
- Guerrini, Giuditta, et al. Monitoring anti-PEG antibodies level upon repeated lipid nanoparticle-based COVID-19 vaccine administration. **International Journal of Molecular Sciences** 23, 16 (2022): 8838. <https://doi.org/10.3390/ijms23168838>
- Simon Jr, C. G., et al. Orthogonal and complementary measurements of properties of drug products containing nanomaterials. **Journal of Controlled Release** 354 (2023): 120-127. <https://doi.org/10.1016/j.jconrel.2022.12.049>

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COLLABORATIVE DOCTORAL PARTNERSHIPS - CALL 2025

POSITION IDENTIFIER: 25-08

THEMATIC FIELD: Zero Pollution and Biodiversity and Sustainable Materials and Products

COLLABORATION TOPIC: Advanced Materials for Safe and Sustainable Innovation

SHORT DESCRIPTION: The project will address 1) system definition for integration of safety and sustainability along defined innovation chains; 2) the dual role of advanced materials to reduce pollution through innovative safe and sustainable solutions, related information gaps and how to close them; or 3) multicriteria decision applied to safe and sustainable by design along the innovation chain.

SCIENTIFIC PERSON OF CONTACT (SPOC): Hubert RAUSCHER (JRC-ISPRA), Unit F.2 Technologies for health.

KEY TOPICS WITHIN THIS PROJECT

The SAMSON project, which will host the PhD project, enhances the CDP programme by providing doctoral students with:

- Application of the EC/JRC Safe and Sustainable by Design (SSbD) framework to innovation chains strengthening the EU's competitiveness, e.g. advanced construction materials
- Safe and sustainable by design: Integrated approach for impact assessment of advanced materials
- Multicriteria decision in safe and sustainable by design along the innovation chain for advanced materials

The project will provide doctoral students with extensive training opportunities in the thematic area of safe and sustainable by design chemicals and materials and chemical safety. The project is at the centre of the EC's SSbD network, the original SSbD framework being co-developed within the project. The project is moreover embedded within an extensive network of policy, regulatory and scientific partners and stakeholders, within the EC, the EU and beyond also on global level.

OUTPUTS: PhD projects in this field will contribute to the operationalisation and further development of the framework and its specific application for Advanced Materials in areas crucial for EU's industrial leadership.

IMPACT OUTLOOK: The project will be framed within the SAMSON project and will hence will support implementing the Advanced Materials for Industrial Leadership Communication and the JRC priorities EU competitiveness and innovation and Green Deal ambitions and climate neutrality.

LINKS / REFERENCES TO PUBLICATIONS

- Caldeira C., et al., 2022. **Safe and Sustainable by Design chemicals and materials - Framework for the definition of criteria and evaluation procedure for chemicals and materials.** EUR 31100 EN, Publications Office of the European Union, Luxembourg, 2022, ISBN 978-92-76- 53264-4, <https://doi.org/10.2760/487955>. JRC128591
- E. Abbate et al., 2024. **Safe and Sustainable by Design chemicals and materials - Methodological Guidance.** Publications Office of the European Union, Luxembourg, 2024, <https://doi.org/10.2760/28450>. JRC138035
- Caldeira, C., et al., 2022. **Safe and Sustainable by Design chemicals and materials. Review of safety and sustainability dimensions, aspects, methods, indicators, and tools.** EUR 30991 EN,

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<https://doi.org/10.2760/879069>. JRC127109.

- Caldeira, C., et al. **Safe and Sustainable by Design chemicals and materials - Application of the SSbD framework to case studies**. Publications Office of the European Union, Luxembourg, 2023, <https://doi.org/10.2760/329423>. JRC131878

COLLABORATIVE DOCTORAL PARTNERSHIPS - CALL 2025

POSITION IDENTIFIER: 25-09

THEMATIC FIELD: Anticipation, risks, resilience

COLLABORATION TOPIC: Innovative Safe Automated and Decarbonised Built Environment

SHORT DESCRIPTION: The project will focus on enhancing societal resilience by developing solutions for safe, affordable, sustainable, and easy to implement, both for the renovation of existing buildings and the construction of new ones. These approaches will incorporate advanced materials, modular designs, and circular principles to ensure minimal environmental impact and adaptability to future challenges.

SCIENTIFIC PERSON OF CONTACT (SPOC): Dionysios BOURNAS (JRC-ISPRA), Unit E.3 Built Environment.

KEY TOPICS WITHIN THIS PROJECT

- **Modular construction with reusable panels** to reduce demolition waste and support rapid assembly of safe, sustainable shelters for disaster recovery, including in conflict zones ([REUSE](#)). These adaptable systems prioritize resilience, circular economy principles, and swift deployment to support communities in crises.
- **Innovative Renovation of Buildings** exploiting advanced materials, [robotics, and automated systems](#) to enhance resilience and energy efficiency. This approach reduces structural risks, enhances energy efficiency in existing buildings, and ensures quick retrofitting and restoration of damaged structures.

The project will provide doctoral students with extensive training opportunities on advanced topics in the built environment. This is achieved through a robust network of partnerships with numerous universities.

OUTPUTS: PhD projects in this field are expected to produce scientific articles that help define pathways for the future built environment, benefiting all Europeans by addressing resilience to risks, energy efficiency, climate adaptation, sustainability, and circularity.

IMPACT OUTLOOK: The research will be framed within the iBUILT project and hence contribute to Europe's need for sustainable prosperity and competitiveness of the built environment, while enhancing its resilience, in line with the Commission's political priorities.

LINKS / REFERENCES TO PUBLICATIONS

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- Gandelli E, Lamperti-Tornaghi M., Bournas D. A., 2024. A simplified model for rocking panels with friction connections. *Eng Struct*, 315, Article 118369. <https://doi.org/10.1016/j.engstruct.2024.118369>

COLLABORATIVE DOCTORAL PARTNERSHIPS - CALL 2025

POSITION IDENTIFIER: 25-10

THEMATIC FIELD: Anticipation, risks, resilience

COLLABORATION TOPIC: Climate tipping point risks

SHORT DESCRIPTION: The PhD project will focus on hydrological extremes under climate change and tipping point scenarios. It will advance the understanding of the dynamics of complex concurrent extremes, such as drought and heavy rainfall, drought and heatwaves, and how such events may respond to key changes in the earth system.

SCIENTIFIC PERSON OF CONTACT (SPOC): Andrea TORETI (JRC-ISPRA), Unit E.1 Disaster Risk Management.

KEY TOPICS WITHIN THIS PROJECT

- Innovative development and use of AI methods and tools
- Advanced hybrid modelling framework
- Complex system analysis
- Dynamics and statistics of climate extremes
- Risk assessment and modelling

The project will provide doctoral students with extensive training opportunities on advanced topics where JRC is at the forefront. Furthermore, the Droughts Project offers the opportunity to connect with a multidisciplinary network of leading, European and International research institution and Universities.

OUTPUTS: The PhD project will leverage, amongst others, very recent simulations related to the collapse of the Atlantic Meridional Overturning Circulation and the forthcoming ones, which will be released in the next few years in the framework of new Horizon Europe Projects.

IMPACT OUTLOOK: The research is embedded in the Droughts project and will hence contribute to enhancing preparedness and security of the EU, as well as supporting the development of an emergency governance under crossing tipping point scenarios.

LINKS / REFERENCES TO PUBLICATIONS

- Cammalleri, C., Toreti, A. 2023. A generalized density-based algorithm for the spatiotemporal tracking of drought events. **Journal of Hydrometeorology** 24 (3), 537-548. <https://doi.org/10.1175/JHM-D-22-0115.1>
- Ceglar, A., Toreti, A., Zampieri, M., Royo, C. 2021. Global loss of climatically suitable areas for durum wheat growth in the future. **Environmental Research Letters** 16 (10), 104049. <https://doi.org/10.1088/1748-9326/ac2d68>
- Acosta-Navarro, J.C., Toreti A. 2023. Exploiting the signal-to-noise ratio in multi-system predictions of boreal summer precipitation and temperature. **Weather and Climate Dynamics** 4 (3), 823-831. <https://doi.org/10.5194/wcd-4-823-2023>
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- Toreti, A., Cronie, O., Zampieri, M. 2019. Concurrent climate extremes in the key wheat producing regions of the world. **Scientific Reports** 9, 5493. <https://doi.org/10.1038/s41598-019-41932-5>

COLLABORATIVE DOCTORAL PARTNERSHIPS - CALL 2025

POSITION IDENTIFIER: 25-11

THEMATIC FIELD: Anticipation, risks, resilience

COLLABORATION TOPIC: AI and ICT in the European Crisis Management Laboratory

SHORT DESCRIPTION: The new policy scenario requires a holistic, cross-sectorial and whole-of-government approach to crisis management, aimed at better tackling complex situations and anticipating emerging critical risks. For enhanced situational awareness, it is also essential to improve the ability to access, acquire and rapidly make sense of timely information (including from unstructured, publicly available sources such as mass media and social media), turning it into actionable knowledge to inform decisions. Intelligence gathering should be seamlessly combined with the process of verification, curation and integration with official sources and other information such as earth observation and sensor data.

SCIENTIFIC PERSON OF CONTACT (SPOC): Marzia SANTINI (JRC-ISPRA), Unit E.1 European Crisis Management Laboratory (ECML).

KEY TOPICS WITHIN THIS PROJECT

- Modelling of ontologies for the whole crisis management domain and/or specific sectors (public health, civil protection and humanitarian aid, conflicts, economic sector, etc.), including mapping to existing standards; that would imply the application of ontology design patterns and related modelling approaches and best practices, ensuring consistency and reuse
- Leveraging large language models (LLMs) and other emerging AI technologies for the extraction of concepts and relationships from text, to support ontology modelling and mapping, as well as knowledge curation and mining, while considering risks of mis/disinformation, community biases and inaccuracies; the application of AI-driven systems in real life scenarios requires particular attention, adding an ethical dimension to the research.
- Prototyping knowledge graphs including heterogeneous information extracted from relevant sources to support intelligence gathering, crisis anticipation and situational awareness.
- Experimenting user experience approaches (including retrieval-augmented generation, advanced data visualisations, etc.) to support data analytics, knowledge graphs exploration and curation in real-life crisis management scenarios.

Activities would be carried out in the context of the European Crisis Management Laboratory of JRC.E.1 Disaster Risk Management unit. Applied research will be in support of a number of new and existing initiatives within the European Commission (e.g., DG HERA's Advanced Technology for Health INtelligence and Action IT System – ATHINA platform, the Secretariat General's European Crisis Management Platform, DG ECHO Global Situation System) and beyond (e.g. UNDRR-ISC Hazard Information Profiles, the Epidemic Intelligence from Open Sources initiative – EIOS led by the World Health Organization Pandemic Hub, Global Disaster Alert Coordination System – GDACS in partnership with UNOCHA and other partners).

OUTPUTS: PhD projects will contribute to improving semantic interoperability across early warning and decision-support systems, as well as to enhancing intelligence gathering methodologies and tools for crisis management, leveraging semantic web technologies, and related approaches to knowledge representation.

IMPACT OUTLOOK: This project will be framed in the JRC Portfolio 14 on “anticipation, risks, resilience”, and hence contribute to improve EU preparedness and response, in support of a number of stakeholders such as the European Commission Secretariat General, ECHO, HERA, FPI, EEAS.

LINKS / REFERENCES TO PUBLICATIONS

- Initial prototype of SKOS vocabularies for Disaster Risk Management.
Available at: <https://drmkc.jrc.ec.europa.eu/science-for-drm/drm-taxonomy>
- European Commission, Communication to the European parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: European Interoperability Framework – Implementation Strategy, COM(2017) 0134 final, 23.03.2017.
Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52017DC0134>
- DG HERA Threat assessment and intelligence gathering.
Available at: https://health.ec.europa.eu/health-emergency-preparedness-and-response-hera/preparedness/threat-assessment-and-intelligence-gathering_en
- UNDRR-ISC Hazard Information Profiles (HIPs).
Available at: <https://www.preventionweb.net/drr-glossary/hips>
- Epidemic Intelligence from Open Sources (EIOS).
Available at: <https://www.who.int/initiatives/eios>
- Global Disaster Alert and Coordination System (GDACS).
Available at: <https://www.gdacs.org/Knowledge/overview.aspx>
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COLLABORATIVE DOCTORAL PARTNERSHIPS – CALL 2025

POSITION IDENTIFIER: 25-12

THEMATIC FIELD: Climate and Water Resilience

COLLABORATION TOPIC: Improving soil health to increase water quality and reduce eutrophication

SHORT DESCRIPTION: Healthy soils provide safe and nutritious food, and have the ability to filter contaminants and excess of nutrients, hence preserving drinking water quality and water ecosystems. Integrated/Integrating bio-physical models of nutrient applications (fertilizers, manure) with water management resources allows to prevent, minimise and remediate nutrient pollution and reduce ocean and inland water eutrophication.

SCIENTIFIC PERSON OF CONTACT (SPOC): Panos PANAGOS (JRC-ISPRA), Unit D.3 Land Resources and Supply Chain Assessments.

KEY TOPICS WITHIN THIS PROJECT:

The research will focus on reverse land degradation in the EU in order to increase food security, competitiveness, agricultural productivity, biodiversity and resilience to extreme weather events and climate change, see also [State of Soil Report](#). In order to do so, it will involve:

- Developing a nexus between soil and water systems by integrating nutrient inputs with management of soils and water fluxes;
- Advancing the understanding of interaction between farming systems and water sources; and
- Sustainable competitiveness through advancing knowledge on hotspots of eutrophication and mitigating the causes for the water pollution.

The project will provide doctoral students with extensive training opportunities on advanced topics in the built environment through a robust network of partnerships with numerous universities.

OUTPUTS: The project will develop integrated innovative and reproducible approaches to prevent, minimise and remediate soil and water pollution from excess nutrients (especially nitrogen and phosphorus) in the landscape-river catchment-sea system and transition waters in the Mediterranean Sea basin and other major EU basins.

IMPACT OUTLOOK: The research will be framed within the EU Soil Observatory (EUSO) project and, as such, inform EU policies in land, soil and water.

LINKS / REFERENCES TO PUBLICATIONS

- Arias Navarro, C., Jones, A., Baritz, R. et al., 2024. **The state of soils in Europe. EUR 40054**, Publications Office of the European Union, Luxembourg, 2024, <http://dx.doi.org/10.2760/7007291>
- Panagos, P., Köningner, J., Ballabio, C., Liakos, L., Muntwyler, A., Borrelli, P. and Lugato, E., 2022. Improving the phosphorus budget of European agricultural soils. **Science of the Total Environment**, 853: 158706. <https://doi.org/10.1016/j.scitotenv.2022.158706>
- Panagos, P., Jiskra, M., Borrelli, P., Liakos, L. and Ballabio, C., 2021. Mercury in European top soils: Anthropogenic sources, stocks and fluxes. **Environmental Research**, 201: 111556 <https://doi.org/10.1016/j.envres.2021.111556>

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COLLABORATIVE DOCTORAL PARTNERSHIPS – CALL 2025

POSITION IDENTIFIER: 25-13

THEMATIC FIELD: Water Resilience and Earth

COLLABORATION TOPIC: Earth system modelling for a sustainable and profitable use of marine ecosystems

SHORT DESCRIPTION: Changes in freshwater quantity and quality have profound consequences on the ecological status of the marine ecosystems downstream. Climate change and anthropogenic pressures are altering the natural water cycles and changing the nutrient carried by rivers and streams. In order to understand how to make the best, most cost-efficient and sustainable use of marine resources, the whole water cycle should be contemplated. The research will use previously developed models and tools to assess the best way to make a sustainable and profitable use of marine ecosystems within the framework of the ‘from source to sea’ approach. .

SCIENTIFIC PERSON OF CONTACT (SPOC): Diego MACIAS MOY (JRC-ISPR), Unit D.2 Ocean and Water.

KEY TOPICS WITHIN THIS PROJECT

- Use of novel, integrated modelling tools that link all aspects of the water cycle (land, freshwater, ocean)
- Clear links to the policy cycle (implementation, impact assessments and revisions) of EU water legislations.
- Further integrations of sectorial policies (e.g., MSFD and MSP) that are not yet sufficiently aligned.

The project will provide doctoral students with extensive training opportunities on the application of state-of-the-art water-related modelling approaches (freshwater and marine) that currently underpin the development and implementation of EU water policies. Activities are supported by a robust network of partnerships with experts from all Member States, and collaboration with scientific partners.

OUTPUTS: The PhD student will have the opportunity to build, develop and use numerical modelling tools building on the existing framework (Blue2) already available at JRC. Simulations and scenarios will be linked to multiple policies.

IMPACT OUTLOOK: The research will be framed within the WatErS project group. The results from those investigations should feed into decision making regarding a more resilience and prepared society to future climatic and societal changes, and more specifically support the Water Framework Directive, Marine Strategy Framework Directive (MSFD), Marine Spatial Planning (MSP), and the Common Fisheries Policy (CFP).

LINKS / REFERENCES TO PUBLICATIONS

- Piroddi, C., Coll, M., Macias, D., Steenbeek, J., Garcia-Gorriz, E., Mannini, A., Vilas, D., Christensen, V. (2022). Modelling cumulative impacts across the Mediterranean Sea at high spatial resolution to inform regional and local ecosystem-based management. **Scientific Reports**, 12, 19680. <https://doi.org/10.1038/s41598-022-18017-x>
- Piroddi, C., Heymans, J.J., Macias, D., Gregorie, M., Townsend, H. (2021). Editorial: Using Ecological Models to Support and Shape Environmental Policy Decisions. **Frontiers in Marine Science**, 23, 121. <https://doi.org/10.3389/fmars.2021.815313>

- Duteil, O., Polimene, L., Stips, A., Macias, D. The major role of riverine outflows in shaping the current and future habitats of Harmful Algal Blooms: the case of the North Sea. **Environmental Research Communications**, 6, 121004. <https://doi.org/10.1088/2515-7620/ad97ab>.
- Macias, D., Guillen, J., Duteil, O., Garcia-Gorriz, E., Ferreira-Cordeiro, N., Miladinova, S., Parn, O., Piroddi, C., Polimene, L., Serpetti, N., Stips, A. 2025 Assessing the potential for seaweed cultivation in EU seas through an integrated modelling approach. **Aquaculture**, 594, 741353. <https://doi.org/10.1016/j.aquaculture.2024.741353>
- Macias, D., Bisselink, B., Carmona, C., Duteil, O., Garcia-Gorriz, E., Grizzetti, B., Guillen, J., Miladinova, S., Pistocchi, A., Piroddi, C., Polimene, L., Serpetti, N., Stips, A., Trichakis, Y., Udias, A., Vigiak, O. The overlooked impacts of freshwater scarcity on oceans as evidenced by the Mediterranean Sea. **Nature Communications** (in press, 2024).
- Piroddi, C., Akoglu, E., Andonegi, E., Bentley, J., Coll, M., Friedland, R., De Mutsert, K., Girardin, R., Garcia-Gorriz, E., Grizzetti, B., Hernvann, P-Y., Heymans, S., Lynam, C., Macias, D., Miladinova, S., Moullec, F., Mueller Karulis, B., Palialexis, A., Parn, O., Serpetti, N., Steenbeek, J., Stips, A., Tomczak, M., Travers-Trolet, M., Tsikliras, A. (2021). Effects of nutrient management scenarios on marine food webs: a Pan-European Assessment in support of the Marine Strategy Framework Directive. **Frontiers in Marine Science**, 8, 179. <https://doi.org/10.3389/fmars.2021.596797>.
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COLLABORATIVE DOCTORAL PARTNERSHIPS – CALL 2025

POSITION IDENTIFIER: 25-14

THEMATIC FIELD: Water Resilience and Earth

COLLABORATION TOPIC: Earth observation tools for monitoring and assessment of European freshwater ecosystems

SHORT DESCRIPTION OF THE THEMATIC FIELD: the project will revolve around (1) Using novel analytical tools to compare the Water Framework Directive (WFD) assessment outcomes deriving from WFD in-situ monitoring data by MS on a European scale, and from Earth Observation (EO) data of lakes and coastal waters; (2) Demonstrating the importance of incorporating EO data on climate change and biodiversity decline into WFD assessments; (3) Guiding the use and providing best practice examples on how to incorporate EO methods with nationally-approved and intercalibrated methods; (4) Defining a suite of knowledge gaps that can be complemented by EO data to ensure improved spatial and temporal information coverage that meets quality requirements on a waterbody specific basis; or (5) Providing recommendations of common practices and reporting standards, when using EO-derived water quality metrics to support WFD implementation.

SCIENTIFIC PERSON OF CONTACT (SPOC): Sandra POIKANE and Ioanna VARKITZI (JRC-ISPRA), Unit D.2 Ocean and Water.

KEY TOPICS WITHIN THIS PROJECT

- Use of novel analytical approaches to explore the level of agreement between the outcomes of water quality assessments under the remit of the WFD on the basis of earth observation data vs. in-situ monitoring data.
- Effectiveness of climate change indicators for WFD support when incorporating EO data.
- EO data in support of biodiversity monitoring and research.

The project will provide doctoral students with extensive training opportunities on the application of state-of-the-art EO approaches that underpin the development and implementation of EU water policies. Activities are supported by a robust network of partnerships with experts from all Member States, and collaboration with scientific partners.

OUTPUTS: PhD projects in this field will contribute to the application of novel advances in earth observation tools in the monitoring and assessment of European rivers, lakes, and coastal waters.

IMPACT OUTLOOK: The research will be framed within the Water4All project and as such help inform the EU Water Framework Directive (WFD) and AU Water policies.

LINKS / REFERENCES TO PUBLICATIONS

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- Ghirardi, N., Amadori, M., Free, G., et al. (2021). Using remote sensing and numerical modelling to quantify a turbidity discharge event in Lake Garda. **Journal of Limnology**, 80(1), 1-6. <https://doi.org/10.4081/jlimnol.2020.1981>
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COLLABORATIVE DOCTORAL PARTNERSHIPS – CALL 2025

POSITION IDENTIFIER: 25-15

THEMATIC FIELD: Climate and Water Resilience

COLLABORATION TOPIC: The water footprint: a system perspective to water resilience

SHORT DESCRIPTION: Producing sustainable, safe and nutritious food requires an urgent transition to more sustainable production practices and consumption patterns; namely, food is responsible for most global water consumption as well as associated environmental impacts, which calls for efficient and responsible water use. The transition to food system sustainability requires a system perspective, accounting for all stages of the supply chain and sustainability dimensions. This would allow to put into context the dependencies of production and consumption on water availability, as well as the impacts of production and consumption on water. In this respect, Life Cycle Assessment (LCA) allows to evaluate environmental impacts along supply chains, including the entire life cycle of products, from resource extraction, manufacturing, use, up to waste generation. LCA allows to identify, and thus prevent, potential trade-offs among life cycle stages and environmental impacts when analysing alternative pathways in the transition to sustainability, such as the move to more sustainable agricultural practices, the shift towards healthy and sustainable diets, product and process innovation. Currently, several methods are available to calculate water footprint, both volumetric (pressure level) and impact-oriented, that provide a complementary perspective while recognising the need for coherency in their use.

SCIENTIFIC PERSON OF CONTACT (SPOC): Serenella SALA and Giulia LISTORTI (JRC-ISPRA), both at Unit D.3 Land Resources and Supply Chain Assessments.

KEY TOPICS WITHIN THIS PROJECT

- Methodological updates and developments on water-related LCAs;
- Water footprint of alternative production and consumption patterns; and
- Water footprint and resilience of the food system.

The project will provide doctoral students with extensive training opportunities on advanced topics on sustainability and Life Cycle Assessment. LCA4Policies contributes to the continuous update and development of methods and models. This is achieved through a robust network of partnerships with numerous universities.

OUTPUTS: PhD projects in this field will contribute to the analysis of water footprint by means of LCA methods as an essential approach to connect production and consumption patterns with resilience issues.

IMPACT OUTLOOK: The research will be framed within the LCA4Policies project. The project plays a crucial role in supporting the integration of environmental and sustainability considerations into several key EU policy initiatives, such as the Circular Economy Action Plan, the Critical Raw Material Act, the Bioeconomy and Biodiversity strategies, the Zero Pollution Strategy, the Chemical Strategy and the Farm to Fork.

LINKS / REFERENCES TO PUBLICATIONS

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COLLABORATIVE DOCTORAL PARTNERSHIPS - CALL 2025

POSITION IDENTIFIER: 25-16

THEMATIC FIELD: Economic, social and territorial intelligence and energy.

COLLABORATION TOPIC: Digital Building Stock Model

SHORT DESCRIPTION: Buildings in the EU are responsible for 40% of our energy consumption and 36% of greenhouse gas emissions. Improving their energy efficiency is therefore key in achieving the ambitious goal of carbon-neutrality by 2050, set out in the European Green Deal. To guide this ambition and assess progress for the different cities, regions and countries, we need a more detailed dataset of the building stock in Europe, as national and regional aggregated statistics are insufficient. Socio-economic and demographic information can additionally guide the affordable housing plan, and make sure no one is left behind. More specifically, project will revolve around: 1) digital twin of the EU building stock; 2) greening the building stock using scientifically-developed data; 3) guiding the building renovation wave with detailed datasets; 4) support of the affordable housing plan; or 5) energy poverty.

SCIENTIFIC PERSON OF CONTACT (SPOC): Ana MARTINEZ (JRC-ISPRA), Unit C.2 Energy Efficiency and Renewables.

KEY TOPICS WITHIN THIS PROJECT (to select some of them)

- Per-building estimation of energy demand in the EU using machine learning tools and the [Digital Building Stock Model \(DBSM\) database](#). This can include e.g. the calculation of more accurate building heights in the EU considering Copernicus Data Surface Models, in order to better derive the compactness of a building as a key proxy for the estimation of energy demand or validation with available digital Energy Performance Certificates in Europe.
- Estimation of socio-economic and demographic insights to support the affordable housing plan, potentially leveraging the use of synthetic population datasets.
- Refinement of the type or use of a building (commercial, single/multi-family house, industrial, etc.) and building age of construction using machine learning methodologies.
- Estimation of potential per-building CO₂ savings after renovation using the previous characteristics.

The project will provide extensive learning opportunities to advance the topics related to the decarbonisation of buildings in Europe, leveraging the use of modern machine learning methodologies for the creation and exploitation of detailed datasets of the EU building stock. This includes the estimation of relevant energy-related characteristics for individual buildings and subsequent analyses of the impact of different what-if scenarios at the desired scale. It also comprises a robust network of partnerships with numerous universities, international, local and research entities.

OUTPUTS: The PhD student will have the opportunity to work with and further develop the DBSM database, exploit different types of Earth Observation data and other available resources to apply machine learning techniques in services of a more sustainable built environment.

IMPACT OUTLOOK: The research is embedded in the [DBSM project](#) and will hence contribute to the decarbonisation and digitalization of the building stock in Europe, reduce energy poverty and the [European Green Deal](#).

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COLLABORATIVE DOCTORAL PARTNERSHIPS – CALL 2025

POSITION IDENTIFIER: 25-17

THEMATIC FIELD: Machine-learning driven energy scenario analyses for climate neutrality

COLLABORATION TOPIC: EU Energy System Decarbonisation Scenarios

SHORT DESCRIPTION: PhD projects in this field will contribute to the further development of energy and climate scenarios and modelling tools with AI-based scenario discovery instruments. The two projects involved have started an informal collaboration with US Partners (PNNL, Stanford) based on the developments made in the JRC SIACES exploratory research project. Thanks to these novel techniques, machine-learning parameter selection may derive robust conclusions with a very limited number of model runs. This is particularly interesting as they can contribute to the assessment of options to deal with climate change and manage the pathways to climate neutrality at affordable computational cost.

SCIENTIFIC PERSON OF CONTACT (SPOC): Peter RUSS and Frederik NEUWAHL (JRC-SEVILLA), both at Unit JRC.C.6 Economics of Climate Change, Energy and Transport.

KEY TOPICS WITHIN THIS PROJECT

- Investigate advanced methods to process big data applying machine learning and artificial intelligence for
 - Data input preparation and validity checks
 - Model calibration
 - Scenario discovery
 - Decision-making under deep uncertainty
- Contribute to the further development of JRC tools such as the POLES and POTEnCIA models by applying specifically developed machine learning and artificial intelligence tools to reduce uncertainty gaps.

The project will provide doctoral students with extensive training opportunities on advanced topics in the field of energy and climate scenarios and analysis. This is achieved through a robust network of partnerships with numerous universities.

OUTPUTS: A PhD project in this field will contribute to the establishment of improved methods to apply techno-economic modelling tools for scenario analysis at global (POLES) and EU (POTEnCIA) level.

IMPACT OUTLOOK: The research ultimately contributes to EU policies in energy and climate.

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COLLABORATIVE DOCTORAL PARTNERSHIPS – CALL 2025

POSITION IDENTIFIER: 25-18

THEMATIC FIELD: Synergies for a stronger EU in space, security and defence

COLLABORATION TOPIC: Electricity Risk Preparedness and Exercises for Resilience

SHORT DESCRIPTION: Electricity systems are becoming a backbone of society, and many other critical infrastructures depend explicitly on electricity supply. Therefore the resilience of the power system and the security of electricity supply plays a vital role in any country or society. This project will develop methodology and tools to assess the resilience of the power system and contribute to innovative policy proposals.

SCIENTIFIC PERSON OF CONTACT (SPOC): Vytis KOPUSTINSKAS (JRC-ISPRA), Unit C.3 Energy Security, Distribution and Markets.

KEY TOPICS WITHIN THIS PROJECT

The Risk4RES project takes stake in the field of resilience and risk preparedness of electricity systems. The energy transition fosters new risks and threats that can affect society by compromising security of supply and resilience of power supply systems. In addition, climate change affects the frequency of natural hazards that might influence renewable energy generation. A new geopolitical security environment brings new hybrid, cyber and emerging threats and requires defence actions that will be addressed by the project by applying conventional and developing innovative tools for exercising resilience of power systems.

The project has long-standing cooperation with European Safety, Reliability and Data Association (ESReDA) and its academic partners: POLITO, Grenoble University, Riga Technical University and over 20 other universities.

OUTPUTS: The project will provide doctoral students the opportunity to develop state-of-the-art tools, and access to real TSO data of operating power systems on which the developed methodologies could be applied and tested.

IMPACT OUTLOOK: The work under this project contributes to the enlargement policy priority by providing scientific and policy implementation support to Ukraine and Moldova.

LINKS / REFERENCES TO PUBLICATIONS

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COLLABORATIVE DOCTORAL PARTNERSHIPS – CALL 2025

POSITION IDENTIFIER: 25-19

THEMATIC FIELD: Small Modular Reactors and other innovative reactor systems

COLLABORATION TOPIC: Integrating Small Modular Reactors in future Hybrid Energy Systems

SHORT DESCRIPTION: Advanced nuclear reactors, and in particular Small Modular Reactors (SMR), are increasingly receiving attention worldwide as a potential nuclear contribution to substitute fossil fuels in concert with other clean energy sources. While some of these novel reactor designs rely on relatively conventional Light Water Reactor (LWR) technology, many others are of the more advanced Generation IV type. Common to all of them is that they propose considerably enhanced safety features together with attractive technical and economic characteristics through their design, appropriate materials and components, and by the used fuel.

The project will focus on: 1) policy support related to SMRs & innovative reactors; 2) safety, security, safeguards (3S) and licensing; 3) fuels and fuel cycles; or 4) materials.

SCIENTIFIC PERSON OF CONTACT (SPOC): Alessio CAVERZAN and Kevin MARTIN GIL (JRC-PETTEN), both at Unit G.I.4 Reactor safety and components.

KEY TOPICS WITHIN THIS PROJECT

The integration of SMRs into future Hybrid Energy Systems holds the potential to enhance grid reliability, reduce carbon emissions, and provide a flexible energy solution that can adapt to changing market demands and integrate seamlessly with renewable energy sources. For example, SMRs can be designed with load-following capabilities, allowing them to adjust their power output in response to fluctuating demand and the variable nature of renewable energy production.

Additionally, SMRs can work in tandem with energy storage systems to store excess energy during low demand periods and release it during peak demand. In this way, SMRs can provide reliable baseload power that compensates for the intermittency of renewables, enhancing the resilience and stability of the grid. On the other hand, it requires careful planning and coordination to ensure that the variable output from renewable sources is well-balanced with the more stable power supply from SMRs. Based on previous related work, e.g. in indirect actions, in GIF and at the IAEA, the potential and role of nuclear energy from SMR combined with electric, chemical or physical storage methods will be evaluated against a number of key performance indicators such as greenhouse gas abatement, avoided fossil imports, techno-economic parameters, and implementation of policy priorities, in particular competitiveness.

OUTPUTS: The PhD project will contribute to the system integration of SMRs in future Hybrid Energy Systems.

IMPACT OUTLOOK: To provide the policymakers with a realistic view of how SMRs and other innovative reactor systems can complement the European energy mixes, the portfolio will convert the results from the projects and know-how acquired through own work and collaborations to useful evidence in support to defining policy options.

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COLLABORATIVE DOCTORAL PARTNERSHIPS – CALL 2025

POSITION IDENTIFIER: 25-20

THEMATIC FIELD: Small Modular Reactors and other innovative reactor systems

COLLABORATION TOPIC: Safety, Security, and Safeguards by design for Small Modular Reactors

SHORT DESCRIPTION: Advanced nuclear reactors, and in particular Small Modular Reactors (SMR), are increasingly receiving attention worldwide as a potential nuclear contribution to substitute fossil fuels in concert with other clean energy sources. While some of these novel reactor designs rely on relatively conventional Light Water Reactor (LWR) technology, many others are of the more advanced Generation IV type. Common to all of them is that they propose considerably enhanced safety features together with attractive technical and economic characteristics through their design, appropriate materials and components, and their fuel management.

The project will focus on: 1) policy support related to SMRs & innovative reactors; 2) safety, security, safeguards (3S) by design, and its potential role in the pre-licensing and licensing stages; 3) fuels and fuel cycles.

SCIENTIFIC PERSON OF CONTACT (SPOC): Guido RENDA (JRC-ISPRA), Unit G.II.7 Digital systems for safeguards and non-proliferation.

KEY TOPICS WITHIN THIS PROJECT

All current and future Nuclear Energy Systems operating in the EU and in Non-nuclear Weapons States (NNWS) have to be compliant with the nuclear Safety, Security and Safeguards regimes. These have different legal bases, different objectives and are usually carried out independently from each other, but they all insist on the same technical infrastructure, causing them to interact with each other in complex ways. While nuclear energy systems are routinely designed taking into account safety needs, security and safeguards are often considered during construction and/or commissioning stages, requiring either costly retrofits to the design or sub-optimal trade-offs between the security and safeguards needs and the system's operation.

The advent of Small Modular Reactors (SMRs) and Advanced Modular Reactors (AMRs) provides a unique opportunity to incorporate safety, security and safeguards needs (including their interactions) in the design process from the earliest possible stages, enabling better effectiveness and efficiency in complying with the three regimes and maximising synergistic interactions among the various regimes.

OUTPUTS: The project will support the incorporation of safeguards needs (Safeguards by design) and the optimisation of Safeguards, Security and Safeguards interactions (3S by Design) into SMRs and AMRs at the earliest possible design stages.

IMPACT OUTLOOK: To provide the policymakers with a realistic view of how SMRs and other innovative reactor systems can complement the European energy mixes, the portfolio will convert the results from the projects and know-how acquired through own work and collaborations to useful evidence in support to defining policy options.

LINKS / REFERENCES TO PUBLICATIONS

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COLLABORATIVE DOCTORAL PARTNERSHIPS – CALL 2025

POSITION IDENTIFIER: 25-21

THEMATIC FIELD: Small Modular Reactors and other innovative reactor systems

COLLABORATION TOPIC: Modelling techno-economic conditions for the future role of nuclear energy

SHORT DESCRIPTION: Advanced nuclear reactors, and in particular Small Modular Reactors (SMR), are increasingly receiving attention worldwide as a potential nuclear contribution to substitute fossil fuels in concert with other clean energy sources. While some of these novel reactor designs rely on relatively conventional Light Water Reactor (LWR) technology, many others are of the more advanced Generation IV type. Common to all of them is that they propose considerably enhanced safety features together with attractive technical and economic characteristics through their design, appropriate materials and components, and by the used fuel.

The project will focus on: 1) policy support related to SMRs & innovative reactors; 2) safety, security, safeguards (3S) and licensing; 3) fuels and fuel cycles; or 4) materials.

SCIENTIFIC PERSON OF CONTACT (SPOC): Paul VAN UFFELEN (JRC-KARLSRUHE), Unit G.I.5 Nuclear Science and Innovation for Energy and Health.

KEY TOPICS WITHIN THIS PROJECT

With reduced baseload needs, it is much harder for nuclear power plants (NPPs) to recover money in electricity markets with a high proportion of renewable energy sources. Unless the nuclear industry moves away from the present paradigm of large, non-modular plants, the investment costs of NPPs are likely to continue rising. It is widely expected that – in the wake of the trend to move from large reactors to SMRs – the economics of new nuclear build projects could improve. However, many SMR projects also indicate excessive over-costs that have led to abandonment of new investment projects, at least for modular conceptualisations. Small reactors could have a better performance, but only if a single large investor provides the investment and is at the same time the main power consumer, which is a rather specific application.

A recent review of nuclear economics showed that there is a need for a standardised approach in the evaluation of the economic performance of SMRs. Based on a review of reported data and on approaches of high quality reporting in large infrastructure projects, this project aims at developing quality criteria for cost reporting for new nuclear build projects, particularly SMRs. The resulting set of criteria (“quality guide”) should be capable to guide potential investors, other decision-making bodies as well as the general public to develop an objective view on the competitiveness of nuclear under current energy market and energy policy conditions in Europe.

OUTPUTS: PhD projects will contribute to developing criteria for quality reporting on the costs of new nuclear builds.

IMPACT OUTLOOK: To provide the policymakers with a realistic view of how SMRs and other innovative reactor systems can complement the European energy mixes, the portfolio will convert the results from the projects and know-how acquired through own work and collaborations to useful evidence in support to defining policy options.

LINKS / REFERENCES TO PUBLICATIONS

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COLLABORATIVE DOCTORAL PARTNERSHIPS – CALL 2025

POSITION IDENTIFIER: 25-22

THEMATIC FIELD: Evidence-based policymaking for public governance and democracy

COLLABORATION TOPIC: New evidence-based tools and approaches for developing, supporting and evaluating policies in democracy

SHORT DESCRIPTION: The objective of the PhD project will be to support resilient democracies and better policymaking. Efforts should focus on enhancing public administrations' integrity, competencies and communication to address challenges like sustainability, digital transitions, and security especially in polarised political contexts. The project will gather evidence on transforming policymaking processes, changes in the uptake of scientific evidence and assess the impact on the functioning and perception of democracy. Additionally, developing the skills of researchers and policymakers to connect science with policymaking is essential.

SCIENTIFIC PERSON OF CONTACT (SPOC): Mario SCHARFBILLIG (JRC-BRUSSELS), Unit S.2 Science for Democracy and Evidence-Informed Policymaking.

KEY TOPICS WITHIN THIS PROJECT

- Supporting the development of a framework to evaluate the state of democracy in the EU, which identifies capacities that foster systems change, including citizen participation in policymaking, implementation, and evaluation;
- Supporting the advancement of evidence informed policymaking strategies, tools and approaches in Europe;
- Supporting the development of strategies to deal with mis- and disinformation; and
- Contributing to the development of a political intelligence service on text mining capacities coupled with behavioural insights and citizen perspectives.

OUTPUTS: The project will deliver reports under the Enlightenment 2.0 research programme including on the future of democracy and its challenges and develop a strategy on dealing with mis- and disinformation to uphold information integrity from the EU perspective.

IMPACT OUTLOOK: The project will contribute to setting the agenda for science for policy in the context of current threats to democratic that can feed into future TSI projects.

LINKS / REFERENCES TO PUBLICATIONS

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COLLABORATIVE DOCTORAL PARTNERSHIPS – CALL 2025

POSITION IDENTIFIER: 25-23

THEMATIC FIELD: Innovation, twin transitions, knowledge flows

COLLABORATION TOPIC: Composite indicators and scoreboards for policy monitoring

SHORT DESCRIPTION: The project will contribute to designing new science-based methods and tools to explore the drivers of the innovation capabilities of European firms or regions, especially in the green and the digital domains. More specifically, it will focus on: 1) green and digital innovation; 2) global value chains and foreign investment; 3) labour mobility and knowledge flows.

SCIENTIFIC CONTACT PERSON: Michela BELLO (JRC-ISPRA), Unit S.3 Science for modelling, monitoring and evaluation.

KEY TOPICS WITHIN THIS PROJECT

- Monitoring of the innovation performance of the EU and its Member States;
- Studying the factors explaining the development of “twin” technologies (green technologies relying on digital knowledge) in the EU; and
- Studying the implications of mergers and acquisitions for the digital innovation capabilities of European firms.

The project will provide doctoral students with a robust network of collaboration with other DGs (e.g., DG R&I and Eurostat) and universities.

OUTPUTS: The PhD project will aim at the development of indicators and econometric analysis on research and innovation performance.

IMPACT OUTLOOK: The research will be framed within the [INNOVA MEASURE](#) activities, part of the CC-COIN project and will hence contribute to DG R&I’s work on better evidence for policy making.

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COLLABORATIVE DOCTORAL PARTNERSHIPS – CALL 2025

POSITION IDENTIFIER: 25-24

THEMATIC FIELD: Behavioural Insights Applied to Policymaking

COLLABORATION TOPIC: Analysis of behavioural evidence aimed at informing policy initiatives

SHORT DESCRIPTION: Research in behavioural sciences has made great progress over the last two decades, and its contributions to the *understanding of human behaviour and decision-making are increasingly acknowledged*, not only through the award of several Nobel memorial prizes in economics (2002, 2017 and 2019). As science steps forward, this impacts both policy and academia. Policymakers explicitly incorporate behavioural evidence into the policymaking process. International institutions such as the UN, WB, WHO, OECD, ECDC, ILO, and FAO, as well as some EU governments have set up behavioural insights teams to support the design of new policies. Behavioural sciences offer new beneficial insights to policymaking, with past recognised applications in health, energy, consumer policy, competition, policy, migration, to name just a few. Similarly, most EU Universities now offer dedicated postgraduate courses in behavioural sciences.

The project will contribute to collect and interpret behavioural evidence aimed at informing policy initiatives the success of which is determined by the way EU citizens react to them. These include interventions on, amongst others, health, energy, environment, gender disparities. With respect to other social data, behavioural evidence has the advantage of identifying a causal relationship and lends itself very effectively to issuing clear policy recommendations.

SCIENTIFIC PERSON OF CONTACT (SPOC): Emanuele Ciriolo (JRC-BRUSSELS), Unit S.1 EU Policy Lab, Foresight, Design & Behavioural Insights.

KEY TOPICS WITHIN THIS PROJECT

The behavioural research will apply to different fields such as disaster preparedness, CEO's attitudes towards energy-efficient investments, and peoples' perception about migration. The project will include:

- Co-designing and conducting behavioural experiments, in so doing collecting primary behavioural data; and
- Running experiments with full control of all phases, by using the JRC in-house i-bex platform, an online platform to conduct behavioural experiments.

OUTPUTS: PhD projects in this field will contribute to collect and interpret behavioural data aimed at informing policy initiatives the success of which is also determined by the way EU citizens react to them. Outputs will consist in scientific articles, JRC policy briefs and JRC Science for Policy Reports providing a behavioural analysis of the issue(s) at stake, of the behavioural evidence collected and putting forward clear policy recommendations.

IMPACT OUTLOOK: The research is framed within the CCBI project, and will impact EU policies on pollution and biodiversity, demography and migration, and/or AI and data.

LINKS / REFERENCES TO PUBLICATIONS

- The EU Policy Lab: https://policy-lab.ec.europa.eu/index_en

- Competence Centre on Behavioural Insights: https://knowledge4policy.ec.europa.eu/behavioural-insights/about-behavioural-insights_en
- Krawczyk, M., Blasco, A., Gajdezowicz, T., Giergiczny, M. 2024. Support for temporary protection of displaced populations in the EU: A conjoint experiment, **European Journal of Political Economy**, Vol. 85. ISSN 0176-2680, <https://doi.org/10.1016/j.ejpoleco.2024.102601>
- Gaudeul, A., Arrigoni, O., Charisi, V., Escobar-Planas, M., Hupont, I., 2024. Understanding the impact of human oversight on discriminatory outcomes in AI-supported decision making, **Frontiers in Artificial Intelligence and Applications**. <https://doi.org/10.3233/FAIA240598>.
- Baggio, M., Marandola, G., 2023. Employees' reaction to gender pay transparency: an online experiment, **Economic Policy**, Volume 38, Issue 113, Pages 161-188. <https://doi.org/10.1093/epolic/eiac066>.
- Baggio, M., Ciriolo, E., Marandola, G., & van Bavel, R., 2021. The evolution of behaviourally informed policy-making in the EU, **Journal of European Public Policy**, 28(5), 658–676. <https://doi.org/10.1080/13501763.2021.1912145>.
- Ciriolo, E., Sousa Lourenço, J., Rafael Almeida, S., 2019. The application of behavioural insights to policy in Europe, in the **Handbook of Behavioural Change and Public Policy**, ISBN 978 1 78536 784 7, Edward Elgar Publishing.
- Ciriolo, E., 2007. Inequity aversion and trustees' reciprocity in the trust game, **European Journal of Political Economy**, Volume 23, Issue 4, Pages 1007-1024, ISSN 0176-2680. <https://doi.org/10.1016/j.ejpoleco.2006.01.001>.

COLLABORATIVE DOCTORAL PARTNERSHIPS – CALL 2025

POSITION IDENTIFIER: 25-25

THEMATIC FIELD: Zero Pollution & Biodiversity, Sustainable Food Systems and Climate & Water Resilience

COLLABORATION TOPIC: Technologies and methods for monitoring micro- and nano-plastics pollution

SHORT DESCRIPTION: The wide scale use and disposal of environmentally persistent, fossil fuel based polymers is resulting in build-up of microplastic particles in the environment. This is not only consuming valuable non-renewable resources but contaminating our air, food and drink and presents numerous poorly understood risks to the biosphere. To counter this global risk, one important strategy is to make use of advanced biotechnology to produce renewable raw materials, synthesis of non-persistent biodegradable polymers and offer novel biological strategies to remediate. This is an important step forward but not without risks and it is important that a biotechnology based transition to greener and more environmentally friendly plastics is evaluated critically and, if necessary, adapted to maximise the benefits and minimise negative consequences.

SCIENTIFIC PERSON OF CONTACT (SPOC): Douglas GILLILAND (JRC-ISPRA), Unit F.2 Technologies for health

KEY TOPICS WITHIN THIS PROJECT

- Development and use of analytical methods to detect and characterise bulk and micro-particle polymers in the pristine, aged and end-of-lifetime conditions
- Applying analytical methods to study the performance of sustainable polymers in health and medical applications
- Assessing interactions and possible hazards of sustainable polymers and associated by-products with biological systems

The project will provide doctoral students with extensive training opportunities on chemical analysis technologies.

OUTPUTS: PhD projects will support the development of analytical methods to detect and characterise the properties, presence and performance of sustainable polymers at all stages their lifetime and in various contexts including environment, health and nutrition.

IMPACT OUTLOOK: The research will be framed within the TEMPO project and support the implementation of the European green deal and support the economic and technological competitiveness in the European polymers industry.

LINKS / REFERENCES TO PUBLICATIONS

- Belz, S. et al. **Analytical methods to measure microplastics in drinking water**, Publications Office of the European Union, Luxembourg, 2024, doi:10.2760/109944, JRC136859. Commission Office of the European Union, Luxembourg, 2022, ISBN978-92-76-47560-6. <https://doi.org/10.2760/879069>, JRC127109.
- Belz, S. et al. **Current status of the quantification of microplastics in water - Results of a JRC/BAM inter-laboratory comparison study on PET in water**, EUR 30799 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-40958-8, <https://doi.org/10.2760/6228>, JRC125383.

- Seghers et al. **Preparation of a reference material for microplastics in water-evaluation of homogeneity.** Anal Bioanal Chem. 2022 Jan; 414(1):385-397. <https://doi.org/10.1007/s00216-021-03198-7>. Epub 2021 Feb 6. PMID: 33547482; PMCID: PMC8748356.
- Schymanski et al. **Analysis of microplastics in drinking water and other clean water samples with micro-Raman and micro-infrared spectroscopy: minimum requirements and best practice guidelines.** Anal Bioanal Chem 413, 5969–5994 (2021). <https://doi.org/10.1007/s00216-021-03498-y>.