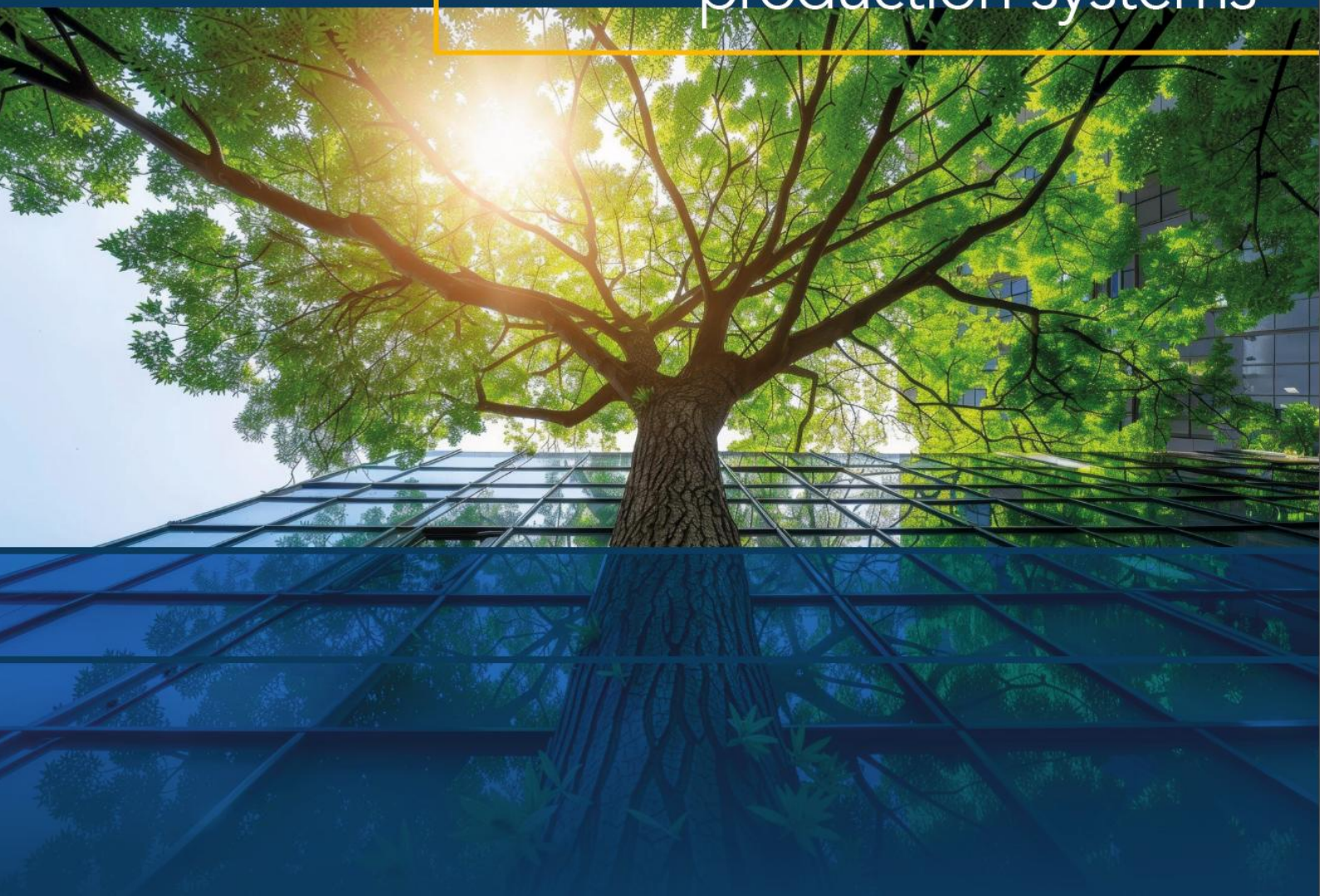
Funded by
the European Union

Resilient, net-zero, circular production systems



Theme A – Excerpt of the CASRI Strategic Research & Innovation Agenda (SRIA)

CASRI
Collaborate . Innovate . Sustain .

Resilient, net-zero, circular production systems – *Theme A*

Abstract

European industrial systems must transition towards sustainable, resilient, and circular models to address climate change, geopolitical instability, supply chain disruptions, and resource scarcity. CASRI aligns with European Research and Innovation priorities, promoting resource security, reduced external dependencies, technology sovereignty, and inclusive governance. Its Strategic Research and Innovation Agenda (SRIA) addresses gaps in existing initiatives by emphasising human, institutional, and regional dimensions, including cross-border coordination, multi-actor policy implementation, and societal needs. By integrating resource security, equity, and innovation, CASRI supports systemic industrial transformation and resilient production systems. Its priorities contribute to UN Sustainable Development Goals 7, 8, 9, 12, and 13, supporting clean energy, economic growth, industrial innovation, responsible production, and climate action.

Keywords

Sustainability Research and Innovation; Environmental Protection Agencies (EPAs); environmental governance; co-design; science-policy-practice; sustainability transformation; implementation; research coordination

Expected Impacts

Security of Resource Supply (Topic A1)

Resilient, net-zero, circular production systems connect local level needs with (trans)national dependencies through improved coordinated policy design, instrumentation and implementation — securing the productivity of (trans)national industries and functionality of the European single market.

Equity and Actor Influence (Topic A2)

Address power imbalances between (multinational) actors and create fair and levelized playing fields across sectors and beneficiaries — enabling just and fair transitions towards resilient, net-zero, circular production systems.

Innovation for Resilient, Net-Zero, Circular Production Systems (Topic A3)

Enhance vertical (EU–national) and horizontal (cross-border and international) policy cohesion, supporting a more integrated and globally relevant European innovation and industrial policy landscape for sustainable transboundary production systems.

Further Information

For topic-related information on Background & Rationale, Significance and CASRI added values, expected outputs of the research questions and synergies with other relevant R&I initiatives, please refer to the full SRIA (Dictor et al., 2026).

Topic A1 - Security of Resource Supply

***Keywords**: critical raw materials; resource sovereignty; supply-chain resilience; geopolitical risk*

Description: Security of resource supply collates all the expressed knowledge needs that cover securing the productivity of (trans)national industries and functionality of the European single market (for existing and infant industries). The topic covers innovation needs related to efficiency improvement, regenerative materials and substitutes.

Impacts: The topic addresses knowledge needs related to securing industrial productivity and the European single market through resource efficiency, regenerative materials, and substitutes, with strong policy interest and alignment across national and European SRIAs. Its added value lies in coordinating global supply-chain monitoring, developing transnational indicators and risk-assessment processes, and linking local needs with broader dependencies through improved policy design and implementation.

Contribution to Environmental and Sustainability Challenges: The topic addresses predominantly the circular economy environmental and sustainability challenge through an economic and territorial resilience lens. EPAs have a special role to overcome the narrow framing to ensure that environmental sustainability is addressed broadly.

Transnational Societal and Policy Relevance: The topic connects local level needs with (trans)national dependencies. As a result, while accounting for the subsidiarity principle, it intertwines with European and global processes.

Systemic Knowledge Needs: (Technological) progress in, and estimating impacts from, required systemic changes that advance (trans)national sovereignty. Including but not limited to e.g.:

- Regenerative (bio)economy;
- Sustainable utilisation and conservation of biological and genetic resources supporting bio-based innovation and long-term resource resilience;
- Resilience and shock prevention;
- Deducting critical resource needs;
- Diversification of fueling, feedstock or sourcing.

Transversal Knowledge Needs: Knowledge needs that look into monitoring risks, potentials, maturities, dispositions and how those affect (political) agendas. Including but not limited to e.g.

- Influence of concerns around resource supply on (political) agendas;
- Appropriate policy instruments supporting the desirable systems.

Actionable Knowledge Needs: Deducting key application areas (specific industries, tools), for e.g.

- Reduction of (energy) demand in specific sectors;
- Specific tools to balance energy fluctuations from renewable energy sources.

Research and Innovation (R&I) Questions:

- R&I 1 – Resource sovereignty and climate neutrality pathways;
- R&I 2 – Territorial cohesion under resource and competitiveness pressures;
- R&I 3 – Analytical tools for geopolitical and supply risk assessment.

Topic A2 - Equity and Actor influence

Keywords: *distributive justice; actor power; transition fairness; governance*

Description*:* This topic integrates all expressed knowledge needs related to understanding structural change and the behaviours and conditions for just and fair transition towards resilient, net-zero, circular production systems.

Impacts*:* CASRI topic A2 "Equity and Actor Influence" addresses the structural changes and social conditions needed for a just transition towards resilient, net-zero, circular production systems, priorities recognised in European and international SRIAs but unevenly integrated into national policies and research infrastructures. This gap creates an opportunity for EPAs to strengthen coordination, knowledge sharing, and policy alignment in the absence of dedicated transnational initiatives.

Contribution to Environmental and Sustainability Challenges*:* The topic addresses environmental and sustainability challenges through various social dilemma lenses that affect the course of action and how this action is perceived.

Transnational Societal and Policy Relevance*:* The topic addresses power imbalances between (multinational) actors, and how to create fair and levelized playing fields across sectors and beneficiaries. Throughout the CASRI process, topic A2 has been perceived as the one with the greatest transnational potential (greatest number of votes).

Systemic Knowledge Needs*:* Knowledge needs include but are not limited to the development of anticipatory governance knowledge around:

- Positive and negative social, political, institutional impacts (e.g. social disparities, benefits) from structural change;
- Responses (e.g. resistance, cross-cutting collaboration) to structural change.

Transversal Knowledge Needs*:* Expressed transversal knowledge needs included applying just transition lenses in designing strategies that enable knowledge transfer, capacity building and management.

Actionable Knowledge Needs*:* Facilitating enabling conditions and reducing barriers (e.g. promoting equitable wealth and resource distribution) and incentivising appropriate responsible behaviours.

Research and Innovation (R&I) Questions*:*

- R&I 4 – Institutional Resilience under Geopolitical Shocks;
- R&I 5 – Equitable Structural Change and Inclusive Transitions;
- R&I 6 – Integrated Analysis of Equity, Actor Influence, and Governance.

Topic A3 - Innovation for resilient, net-zero, circular production systems

***Keywords**: circular production; industrial transformation; sustainable value chains; cross-border innovation*

Description: Accelerating the development of sustainable transboundary production systems.

Impacts: CASRI topic A3 “Innovation for Resilient, Net-Zero, Circular Production Systems” promotes sustainable transboundary production systems addressing climate change, pollution, and health, complementing resource security priorities and aligning with the European Green Deal and Horizon Europe Missions. It aims to overcome fragmented initiatives by strengthening EU–national and international policy coherence and fostering an integrated, globally relevant European innovation and industrial policy landscape.

Contribution to Environmental and Sustainability Challenges: This topic addresses the traditional environmental and social challenges inherent in (inter)national production systems through a more physical and technologically driven transformation lens.

Transnational Societal and Policy Relevance: Innovation programmes are often developed within a national context, while many production systems operate on international scales. This topic aims to improve guidance and support for transboundary innovation systems.

Systemic Knowledge Needs: The needs encompass technological innovation and development areas for specific sectors and value chains. Key areas include but are not limited to:

- Developing industrial flexibility;
- Infrastructural changes;
- Integrated energy systems – particularly green hydrogen technologies;
- Strengthening innovation ecosystems through enhanced collaboration;
- Pollution prevention through strategies like Safe & Sustainable by Design (SSbD);
- Soil remediation for emergent contaminants;
- Construction (low-carbon materials and green buildings);
- Farming and food systems.

Transversal Knowledge Needs: Creating awareness and streamlining the adoption of innovations across systems and value chains.

Actionable Knowledge Needs: Adoption of innovations at application sites.

Research and Innovation (R&I) Questions:

- R&I 7 – Governance and Integration of Cross Border Production Systems;
- R&I 8 – Systemic Resilience in Globalised Production Networks;
- R&I 9 – Enabling Mechanisms for Cross Border Circular Deployment.

Background on CASRI SRIA

SRIA Objectives, Positioning And Targeted End-Users. Europe is facing interlinked environmental, economic, technological and geopolitical pressures. Sustainability transformation therefore remains essential to Europe's long-term resilience, competitiveness and security. Sustained access to resources, resilient production systems and supply chains, climate-resilient infrastructure, healthy populations, functioning ecosystems, effective regulation and the societal capacity to manage transformation all depend on robust and actionable knowledge. Against this background, European Environmental Protection Agencies (EPAs) and EPA-like sustainability expert organisations have worked with actors across Europe through the project CASRI – Collaborative Action coordinating and enhancing systemic, actionable and transversal Sustainability Research and Innovation – to co-create this Strategic Research and Innovation Agenda (SRIA), which have been developed in close connection with the EPA Network Interest Group on Sustainability Research and Solutions (IG EPAS)**.** The CASRI SRIA consolidates transnational knowledge needs identified and further developed through the CASRI co-design process, providing a basis for further prioritisation, programming, collaboration and implementation. It is not a fixed research programme or a formally agreed policy position of European EPAs. Its topics and priority levels reflect the evidence, participants and timeframe of the CASRI process and are intended to be further developed with funders, policymakers, researchers and implementation actors. The SRIA addresses European and national funders, programme owners and partnerships seeking opportunities for coordinated programming and investment, as well as research organisations, businesses, public authorities, cities, regions, civil society and EPAs developing collaborative R&I and implementation activities. Through the SRIA, CASRI invites these actors to jointly develop and apply systemic, transversal and actionable knowledge for a sustainable, competitive, democratic, resilient and liveable Europe.

SRIA Content and Topic Prioritisation. The CASRI SRIA comprises 8 interconnected themes and 20 transnational Research and Innovation topics. For each topic, it describes expected impacts, background and rationale, the systemic, transversal and actionable knowledge needs, and the significance and added value of further Research and Innovation, including links and gaps in relation to existing initiatives. The topics were developed to different levels of detail according to the interest and evidence emerging through the co-design process.

CASRI SRIA Co-design Process. The SRIA was developed through a bottom-up co-design process involving EPAs and EPA-like organisations as National Contacts who invited National Key Stakeholders and European experts with backgrounds in knowledge production, funding, implementation, politics and use. Around 600 national knowledge needs were identified, clustered and consolidated into 20 transnational Research and Innovation topics, which were subsequently discussed, prioritised and further elaborated through surveys, online exchanges and workshops. The resulting agenda therefore combines national implementation experience with transnational analysis and European dialogue.

CASRI Added Value and Next Steps. The SRIA provides two mutually reinforcing contributions. First, it offers an evidence-based agenda of shared R&I needs, showing where systemic, transversal and actionable knowledge can support sustainability transformation. Second, it provides a basis for collaboration with EPAs and between those who identify knowledge needs, fund research, generate knowledge and innovation, and implement, regulate or scale solutions. EPAs can make a distinctive contribution to this collaboration because they operate between environmental science, monitoring, policy advice, regulation and implementation. Their data, institutional knowledge, stakeholder relations and experience with implementation barriers can help connect research agendas and innovation with real-world needs and support continuous learning between research, policy and practice. Implementation is understood as an iterative process rather than a final stage following research. CASRI will therefore explore how the SRIA can inform agenda-setting, funding and programming, collaborative Research and Innovation, practical implementation and learning, while developing structures for continued cooperation beyond the project.

Further information

Within the EPA Network, the Interest Group on Sustainability Research and Solutions (EPAS) serves as a collaborative platform to support the implementation of the SRIA and advance this thematic priority through knowledge exchange, cooperation and joint action. In case of interest, please contact **Mariësse van Sluisveld - PBL Netherlands Environmental Assessment Agency (mariesse.vansluisveld@pbl.nl)**.

Visit the CASRI website at CASRI.eu for more information.

This document is an excerpt of the CASRI Strategic Research & Innovation Agenda (SRIA). The full version can be found under: *Dictor M.-C., C. Merly, M. van Sluisveld, I. Aneva, M. Glauser, J. Lyytimäki, S. Varajic, D. O'Neill, B. Liptak, K. Eckert, L. Maring, H. Gaugitsch, D. Mathieu-Huber, B. Breton, L. Kunttu, K. Savage, S. Minestrini, J. van Aardenne, L. Maggs, C. Molina, J. Neumann, S. Bartke (2026). CASRI Strategic Research & Innovation Agenda. CASRI Deliverable 4.1. Project DOI: https://doi.org/10.3030/101131520*

Disclaimer

This document is an excerpt of the CASRI Strategic Research and Innovation Agenda (SRIA). For the statement of originality, AI-assisted synthesis and drafting and how to quote the SRIA, please refer to the full SRIA (Dictor et al., 2026).

This deliverable is licensed under a Creative Commons Attribution-ShareAlike 4.0 International (CC BY-SA 4.0).

Wizardcomunicazione.it for T6 Ecosystems Srl

CASRI

Collaborate . Innovate . Sustain .

Funded by
the European Union

Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency (REA). Neither the European Union nor the granting authority can be held responsible for them.