



Strategic Research & Innovation Agenda (SRIA)

CASRI Deliverable 4.1

Authors:

Marie-Christine Dictor, Corinne Merly, Mariësse van Sluisveld, Ina Aneva, Marlene Glauser, Jari Lyytimäki, Sanja Varajic, Darragh O'Neill, Boris Liptak, Karl Eckert, Linda Maring, Helmut Gaugitsch, Dominique Mathieu-Huber, Bastien Breton, Leena Kunttu, Kester Savage, Stefania Minestrini, John van Aardenne, Luke Maggs, Camilo Molina, Judith Neumann, Stephan Bartke



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During the preparation of the SRIA, generative AI tools were used selectively to support the compilation, comparison, structuring and presentation of information from CASRI project outputs and referenced sources. All AI-assisted content was subsequently reviewed and validated by the responsible authors against the underlying evidence and revised where necessary. AI tools did not determine stakeholder priorities, research priorities or project conclusions. Final responsibility for the content remains with the authors.

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CASRI

Collaborative Action coordinating and enhancing systemic, actionable and transversal Sustainability Research and Innovation

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EXECUTIVE SUMMARY

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 CASRI – Collaborative Action coordinating and enhancing systemic, actionable and transversal Sustainability Research and Innovation – to co-create this Strategic Research and Innovation Agenda (SRIA).

This CASRI SRIA is a strategic working result of the CASRI project, developed in close connection with the EPA Network Interest Group on Sustainability Research and Solutions (IG EPAS). It consolidates transnational knowledge needs identified and further developed through the CASRI co-design process and provides 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 is intended for European and national funders, programme owners and partnerships seeking opportunities for coordinated programming and investment, as well as for 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 & topic prioritisation

The CASRI SRIA comprises eight interconnected themes and 20 transnational R&I 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 R&I, 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. The priority levels P1 [very high] to P4 [low] therefore indicate the degree of interest and further elaboration achieved within CASRI, rather than an absolute ranking of scientific or societal importance. The topics remain open to further development and provide starting points for programming, collaboration and implementation in different European and national contexts.

Synthesis of topics, priority levels based on the co-design process, main gaps, outcomes and impacts (prepared with AI assistance and validated against the detailed topic descriptions).

Topic	P	Main Gap	Main Outcome	Main Impact
A.1 Security of Resource Supply	P1	No transnational monitoring linking local needs with global supply risks.	Scenarios linking climate pathways to raw material demand + EPA governance guidance.	Stronger EU resource sovereignty via coordinated risk monitoring.
B.2 Effectiveness of Climate Policy	P1	Implementation gaps; weak behavioural science and evaluation.	Tools translating regulations into real-world pathways and outcome measurement.	Faster research-to-policy translation and harmonised evaluation.
E.2 Social Vulnerabilities of Adaptation	P1	Adaptation actions may worsen inequalities (e.g., green gentrification).	Indicators and mapping tools ensuring adaptation reduces inequalities.	More equitable adaptation; lower maladaptation costs.
F.1 Inclusive Science-Policy-Practice-Interface	P1	Interfaces remain unilinear; implementation knowledge, local perspectives and societal actors insufficiently integrated.	Tested, context-sensitive governance, co-creation and knowledge-brokerage linking science, policy, practice, society.	Better-aligned science societal needs; institutional learning, improved conditions for trust.
B.3 Biodiversity Monitoring	P2	Scattered monitoring; poor data on genetics, soil, transboundary indicators.	Harmonised monitoring across ecosystems, species, and genetics using DNA, remote sensing, citizen science.	Better conservation outcomes supporting EU biodiversity targets.
H.1 Advanced Data Generation and utilization	P2	Fragmented digital tools not organised into coherent knowledge systems.	Interoperable digital twins, AI analytics, and dashboards embedded in policy cycles.	Stronger agency capacity for monitoring and decision support.
A.3 Innovation for Circular Production	P3	Fragmented innovation ecosystems block cross-border circular scaling.	Governance tools, procurement models, and digital passport prototypes.	Better EU–national and cross-border policy cohesion.
C.1 Green Space Provision	P3	Insufficient evidence on co-benefits; poor stakeholder coordination.	Pilot tools and policy guidance for scaling urban nature-based solutions.	Improved urban well-being and ecosystem restoration.
D.1 Governance of Energy Transition	P3	Fragmented frameworks can't balance renewables, biodiversity, and justice.	Inclusive governance and incentive systems balancing all dimensions.	Better policy coherence, fewer barriers, stronger public trust.
E.1 Data Security & Environmental Data	P3	Gap between governance recommendations and practical security implementation.	Technical guidance and cybersecurity protocols for environmental data ecosystems.	More reliable, interoperable monitoring and stronger evidence base.
F.2 Environmental & Health Data	P3	Environmental, health and socio-economic evidence fragmented, limiting identification of burdens and effects.	Integrated indicators and decision-support approaches to target and evaluate urban interventions.	Improved health and well-being, especially for vulnerable groups; with improved policy learning.
G.1 Smart, Adaptive Regulation	P3	Weak impact assessment, contradictory rules, underused digital tools.	Better assessment methods, AI tools, and living labs raising environmental standards.	Less administrative burden; Green Deal delivered in practice.
A.2 Equity and Actor Influence	P4	Poor understanding of power imbalances and fair transition conditions.	Frameworks linking equity, power, and governance in transitions.	Fairer transitions by levelling playing fields across sectors.
B.1 Data-Driven Climate & Biodiversity	P4	Siloed data prevents identifying climate–biodiversity synergies.	Integrated datasets and models revealing trade-offs and feedback loops.	Improved evidence-based decisions and synergistic policy actions.
C.2 Land Use & Mobility	P4	No integrated land-use and mobility planning; car-dependent sprawl.	Demonstrator sites and tools for compact, mixed-use, green-infrastructure planning.	Reduced land take, lower emissions, better accessibility.
C.3 Social Inclusion & Impact	P4	Community needs insufficiently integrated into urban project design.	Methods to assess and monitor social outcomes of urban projects.	Stronger legitimacy, transparency, and community trust.
D.2 Societal Engagement	P4	Poor understanding of behavioural change and participation mechanisms.	Participation frameworks embedding citizen engagement in institutions.	Greater social acceptance and ownership of energy transition.
D.3 Comparing Scenarios	P4	No integrated methodology across environmental, social, economic dimensions.	Decision-support systems translating foresight into policy options beyond 2030.	Better decision-making under uncertainty; clearer trade-offs.
G.2 Sustainable Competitiveness	P4	Competitiveness defined by short-term costs, not resilience or ecological limits.	Wellbeing indicators and sufficiency benchmarks redefining competitiveness.	Economies operating within planetary boundaries.
H.2 Sustainability of Digital Transformation	P4	Digitalisation's environmental footprint (energy, e-waste, AI) poorly governed.	Footprint indicators, green AI criteria, circular hardware principles.	Reduced digital environmental footprint through better governance.

NB: P = Priority level with P1 = very high priority (topics of very high interest which underwent the full co-design steps); P2 = high priority (topics which were considered of high interest which underwent the most of the co-design steps); P3 = medium priority (topics which were selected based on the first co-design steps); P4 = low priority (transnational topics which were not selected on the first co-design step).

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 (NCs) who invited National Key Stakeholders (NKS) 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 R&I 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.

Four P1 topics underwent the full CASRI co-design process – Security of Resource Supply (A1), Effectiveness of Climate Policy (B2), Social Vulnerabilities of Multi-scaled Adaptation (E2) and Inclusive Science-Policy-Practice Interface (F1) – while Comprehensive and Timely Biodiversity Monitoring (B3) and Capacities for Advanced Generation and Responsible Utilization (H1) received P2 status. These six topics provide a pragmatic starting point for CASRI pre-implementation activities, without reducing the longer-term relevance of the remaining topics.

Implementation is understood as an iterative process rather than a final stage following research. CASRI Work Package 5 will therefore explore how the SRIA can inform agenda-setting, funding and programming, collaborative R&I, practical implementation and learning, while developing structures for continued cooperation beyond the project.

Keywords

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

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Abbreviations

AI	Artificial Intelligence
B&C	Biodiversity and Climate
CSA	Coordination and Support Action
EC	European Commission
ECF	European Competitiveness Fund
EEA	European Environment Agency
EIT KICs	European partnerships and Knowledge and Innovation Communities
EGD	European Green Deal
ERC	European Research Council
ES R&I	Environmental and Sustainability Research and Innovation
EPA	Environmental Protection Agency
EU	European Union
FP10	Framework Programme 10
HEU	Horizon Europe
IPCC	Intergovernmental Panel on Climate Change
IPCEIs	Important Projects of Common European Interests
IRP	International Resource Panel
ISP-CWP	Intergovernmental Science-Policy Panel on Chemicals, Waste and Pollution
MFF	Multiannual Financial Framework
NC	National Contacts
NE(S)FET	Nature & Environmentally (& Socially) Friendly Energy Transition
NKS	National Key Stakeholders
R&I	Research and Innovation
RNZCPS	Resilient, Net-Zero, Circular Production Systems
SDGs	Sustainable Development Goals
SPPI	Science, Policy and Practice Interaction
SRIA	Strategic Research and Innovation Agenda
STI	Science Technology Innovation
SU	Sustainable Urbanisation
UN	United Nations
WP	Work package

CASRI Strategic Research & Innovation Agenda (SRIA)

1. SRIA challenges and expected impacts

1.1 SRIA rationale and challenges

The overall aim of the CASRI Strategic Research and Innovation Agenda (SRIA) is to facilitate a coordinated European framework for **systemic**, **actionable** and **transversal** sustainability research and innovation (Figure 1), with research priorities to be aligned, investments to be mobilised, science-policy-practice interactions to be strengthened, and the uptake of knowledge and innovation to be accelerated to address major environmental challenges and achieve the Sustainable Development Goals (UN SDGs) and build an effective sustainability agenda beyond 2030.

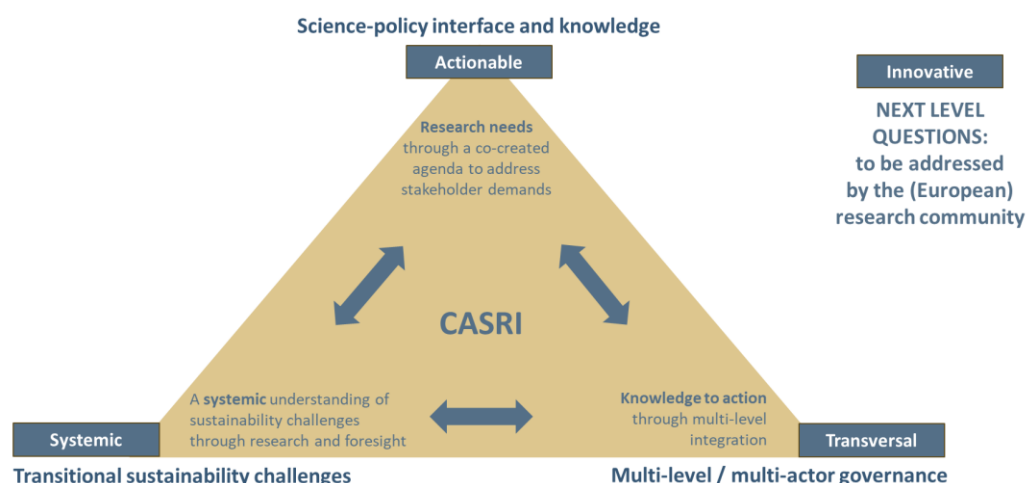


FIGURE 1 - THE 3 KEY PREMISES OF ES R&I TO ADDRESS GLOBAL CHALLENGES AND SDGS

Europe is facing a range of interconnected sustainability challenges, including climate change, biodiversity loss, resource depletion, pollution, the transition to clean energy, and the development of sustainable cities. To tackle these challenges, we need a new generation of environmental and sustainability research and innovation (ES R&I) that is systemic, actionable and transversal. Environmental Protection Agencies (EPAs) play a critical role as knowledge producers, policy advisers, regulators and research funders. However, their research and innovation activities throughout Europe, and funding programmes remain fragmented and could be better coordinated.

Societal challenges (SDGs) as a starting point of CASRI SRIA

Globally, sustainable challenges seem to keep on gaining in complexity: the triple planetary crisis (climate change, air pollution and biodiversity loss) is accelerating according to worst case scenario, conflicts are reversing development gains, and economic instability threatens to widen inequalities. The CASRI SRIA deployment must adapt to this rapidly changing world.

Themes addressed by CASRI SRIA are very much aligned with the SDGs (see Table 1) to be achieved in 2030. Recent communication on SDGs (Martin, 2025) reported that current progress is falling short of what is required to achieve the 2030 agenda and its underlying 169 targets. It stressed that the SDG framework remains an indispensable blueprint for global sustainable development and should be continued beyond 2030. To realize its full potential, it emphasises the importance of the need of coordinated efforts to deepen Science, Technology and Innovation integration, enhance governance, and engage citizens as active partners in shaping a just and resilient future. The CASRI SRIA, through its strong connections with SDGs and its network of actors, aims to support Science Technology Innovation (STI) before and beyond 2030.

TABLE 1 – ALIGNMENT OF CASRI THEMES AND SDGS

CASRI theme	Sustainable Development Goal (SDG)																
	No poverty	Zero hunger	Good health	Quality Education	Gender equality	Clean water & sanitation	Affordable and clean energy	Decent work and economic growth	Industry innovation and infrastructure	Reduces inequalities	Sustainable cities and communities	Responsible consumption	Climate action	Life below water	Life on land	Peace and justice	Partnership for the goals
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Resilient, net-zero, circular production systems	x						x	x	x			x	x				
Biodiversity & climate		x				x					x	x	x	x	x		
Sustainable urbanisation			x			x	x		x		x	x	x		x		x
Nature, environmentally and socially friendly energy transition	x						x	x	x		x	x	x				x
Security	x								x	x	x		x			x	
Democracy and participation					x		x	x	x			x	x				x
Regulatory efficiency and Competitiveness	x							x	x			x	x	x	x	x	x
Digitalisation				x		x	x	x	x		x	x	x				

CASRI (Collaborative Action coordinating and enhancing systemic, actionable and transversal Sustainability Research and Innovation) aims to strengthen collaboration between European EPAs and EPA-like organisations, the European Environment Agency (EEA), research funders, policymakers and stakeholders. The initiative seeks to see improvements made to the alignment of national and European sustainability research priorities, enhanced science-policy-practice interactions (SPPI) (Lyytimäki et al., 2026), facilitated knowledge transfer, and prepared coordinated funding mechanisms capable of delivering transformative solutions for the European Green Deal and the UN SDGs. The CASRI approach is built on the following three core principles (Figure 1):

- **Systemic** as addressing sustainability challenges through integrated and cross-sectoral perspectives.
- **Actionable:** as generating knowledge that directly supports decision-making and implementation.
- **Transversal** as fostering collaboration across disciplines, sectors, governance levels and stakeholder groups.

CASRI seeks to strengthen long-term pan-European collaboration among EPAs, research funders, policymakers, researchers, businesses and societal actors around shared sustainability knowledge needs.

The CASRI SRIA is intended to provide a strategic basis for connecting environmental governance, sustainability science and research funding across Europe, helping research priorities to respond to implementation needs and societal transformation challenges.

1.2 SRIA in action through the CASRI impact cycle

Europe is facing growing pressures from sweeping climate change extremes, economic and technological shifts, conflicting political priorities and armed conflicts causing internal and external instability. Consequently, European policy is increasingly focusing on competitiveness and regulatory simplification, security of supply, resilience and strategic autonomy. These priorities should not reduce the relevance of sustainability research and innovation. They should make sustainability research and innovation more strategically important and urgent.

The CASRI impact cycle describes how the knowledge needs consolidated in the SRIA can contribute to research and innovation, implementation and, ultimately, societal impact. It clarifies the roles of different actors and emphasises that knowledge creation, policy development and implementation should form an iterative learning process rather than a linear sequence.

1.2.1 CASRI added value: Impact through priorities and collaboration

CASRI produces two complementary outputs that together aim to generate long-term outcomes and societal impact.

First, the SRIA provides an evidence-based R&I agenda for action. Drawing on national reviews, stakeholder engagement (knowledge users, developers and funders) and transnational analysis, it identifies shared sustainability R&I needs and areas where systemic, actionable and transversal knowledge can support European and national objectives.

Second, CASRI provides a collaboration pathway encouraging EPAs and EPA-like organisations to co-facilitate R&I agenda-setting, co-design and implementation. EPAs bring in a unique position between environmental science, policy, regulation and implementation practice and needs: they hold long-term monitoring data, understand implementation barriers, interact with regulated sectors and public authorities, and observe where knowledge is missing in practice.

1.2.2 A multi-level pathway to impact

The CASRI impact pathway connects four groups of actors in an iterative process:

- 1. EPAs and stakeholders identify and articulate knowledge needs.** Environmental monitoring, regulatory implementation, policy advice, foresight and interaction with societal and economic actors reveal knowledge gaps, emerging risks and opportunities. Transnational cooperation helps distinguish context-specific needs from challenges that benefit from coordinated European R&I.
- 2. European and national institutions** use these knowledge needs for strategic agenda-setting. The SRIA provides implementation-grounded evidence that can inform research priorities and cross-sectoral dialogue where sustainability intersects with areas such as industrial transformation, competitiveness, resilience, health, digitalisation and security.
- 3. Funders and programme owners** translate priorities into portfolios and collaborative instruments. European and national funders, programme owners and partnerships can use the SRIA together with the funding mapping in D4.2 to identify opportunities for coordinated programming, complementary investment and joint initiatives. The SRIA is not a catalogue of calls, but a strategic basis for developing instruments in response to shared and evolving knowledge needs.
- 4. Research, innovation and implementation actors** co-design, test and scale solutions. Research organisations, businesses, public authorities, cities and regions, civil society and EPAs translate priorities into collaborative activities. EPAs can contribute environmental data, regulatory and implementation knowledge, test environments, stakeholder networks and evaluation capacities, supporting R&I designed from the outset for usability and implementation.

Improved implementation capacities from continuous learning

The pathway is iterative, not linear. Implementation experience from regulation, monitoring, experimentation and practice feeds back into the definition of knowledge needs and R&I priorities. Evidence and innovation generated through R&I in turn inform policy, regulation, investment and future research. The cycle can therefore be summarised as:

Implementation experience → Knowledge needs → Strategic priorities → Programme and funding design → Co-designed R&I → Testing and implementation → Monitoring and learning → Renewed priorities and knowledge needs. (Figure 2).

CASRI therefore treats implementation knowledge and implementation capacity as integral elements of the R&I system.

The CASRI Knowledge-to-Impact Cycle

An iterative process linking knowledge needs, strategic priorities, research and implementation

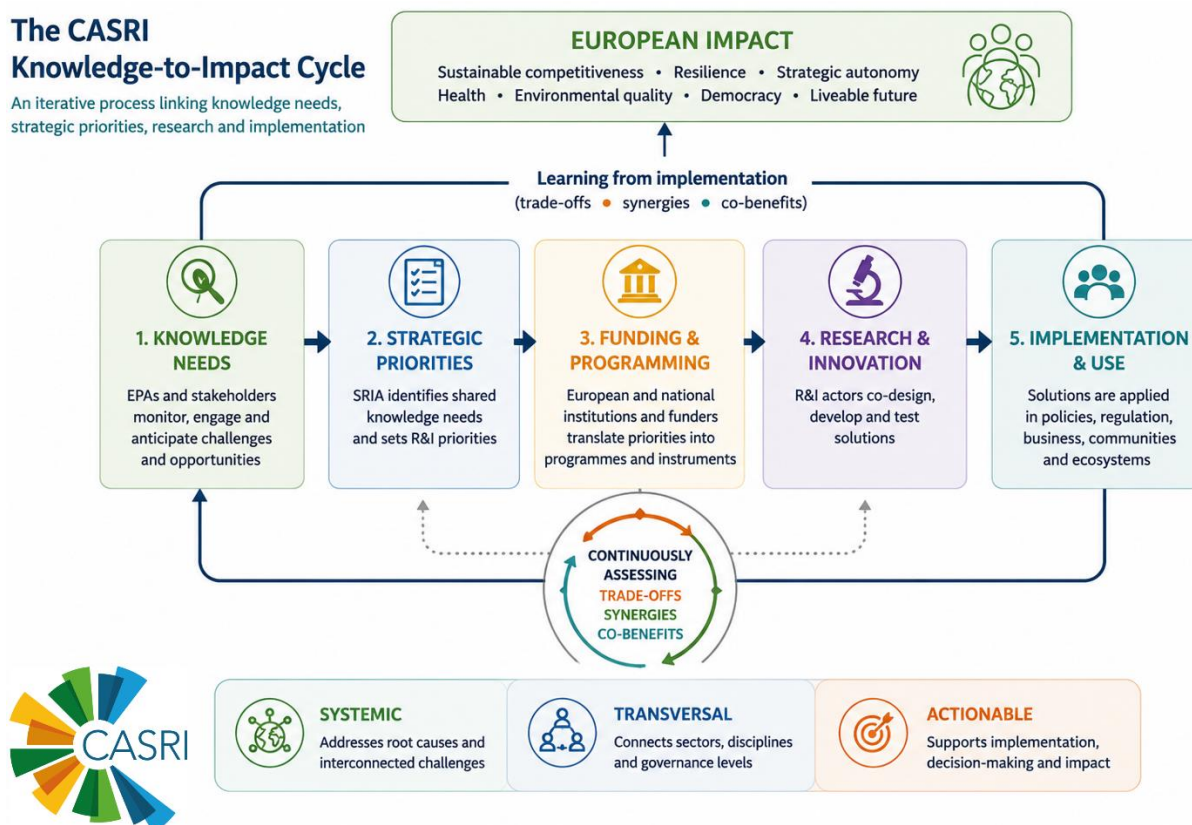


FIGURE 2 - CASRI KNOWLEDGE TO IMPACT CYCLE

1.2.3 Expected Outcomes

Together, these feedback loops support better strategic agenda-setting, stronger science-informed decision-making and more durable collaboration across the European knowledge ecosystem.

- 1) Agenda-setting on what is needed for Europe's future
 - continued attention to unresolved sustainability challenges and emerging opportunities in European policy development and in the international agenda beyond 2030.
- 2) Improve science-informed decision making in a complex world
 - systematic use of EPA data, regulatory experience and implementation knowledge in priority-setting and project design;
 - R&I portfolios that address synergies and trade-offs between environmental objectives, competitiveness, resilience, health, resource security and social well-being;
 - faster translation of knowledge and innovation into policy, regulation and practice and legitimising practises that already work via science
- 3) Strengthened collaboration across the European knowledge ecosystem
 - stronger alignment between sustainability knowledge needs and European and national R&I agendas;
 - durable collaboration between EPAs, European and national institutions, funders, researchers and implementation actors;
 - stronger learning loops from implementation back into R&I agendas.

2. SRIA co-designed methodology

2.1 CASRI partners' vision

The CASRI vision combines five elements: a systemic perspective integrating environmental, societal and economic dimensions; demand-driven research addressing real-world knowledge needs; strong science-policy-practice collaboration to enhance the usability and impact of research; European coordination and joint investment to align priorities and funding across countries; and support for major sustainability transitions, including climate neutrality, biodiversity protection, circular economy and societal resilience.

2.2 Bottom-up demand-driven research needs

The CASRI SRIA approach is driven by bottom-up demands, meaning research priorities are defined not only by scientific opportunities, but also by the needs of those dealing with environmental and sustainability challenges and involved in designing, implementing and evaluating policies and solutions. In CASRI these stakeholders are represented by the NKS and NC.

Through the active engagement of EPAs, public authorities, practitioners, businesses, civil society and researchers, the agenda seeks to ensure that research and innovation investments address the most pressing environmental challenges and generate actionable knowledge with tangible societal impact. The SRIA also tie the best possible transfer of results and knowledge.

The four environmental and sustainability themes – alongside an open theme for other potential issues – guided data collection and stakeholder engagement during the first phase of the CASRI project, gathering 600 demands (Maring et al. 2025). These themes cover the following:

- Resilient, net-zero, circular production systems;
- Biodiversity and climate;
- Sustainable urbanisation;
- Nature and environmentally friendly energy transition.

Four cross cutting themes were identified and added to the framework based on the initial screening and analysis of the data (Lyytimäki et al. 2025):

- Security;
- Democracy and participation;
- Regulatory efficiency and competitiveness;
- Digitalisation.

As a result, the CASRI SRIA is grounded in 20 transnational common R&I needs presented in D3.2 (Lyytimäki et al., 2025), referred to in this SRIA as the 20 transnational R&I topics. These were consolidated from around 600 R&I demands raised by the participating NKS (Maring et al., 2025).

2.3 Co-design process steps

The steps of the co-design SRIA process are presented in Figure 3 and are further described in Annex 1. It encompasses communication and involvement through emails, on-line events and one face to face workshop. Info day, surveys and workshops were organised to discuss, prioritise and elaborate on the common R&I needs (topics) compiled in D3.2.

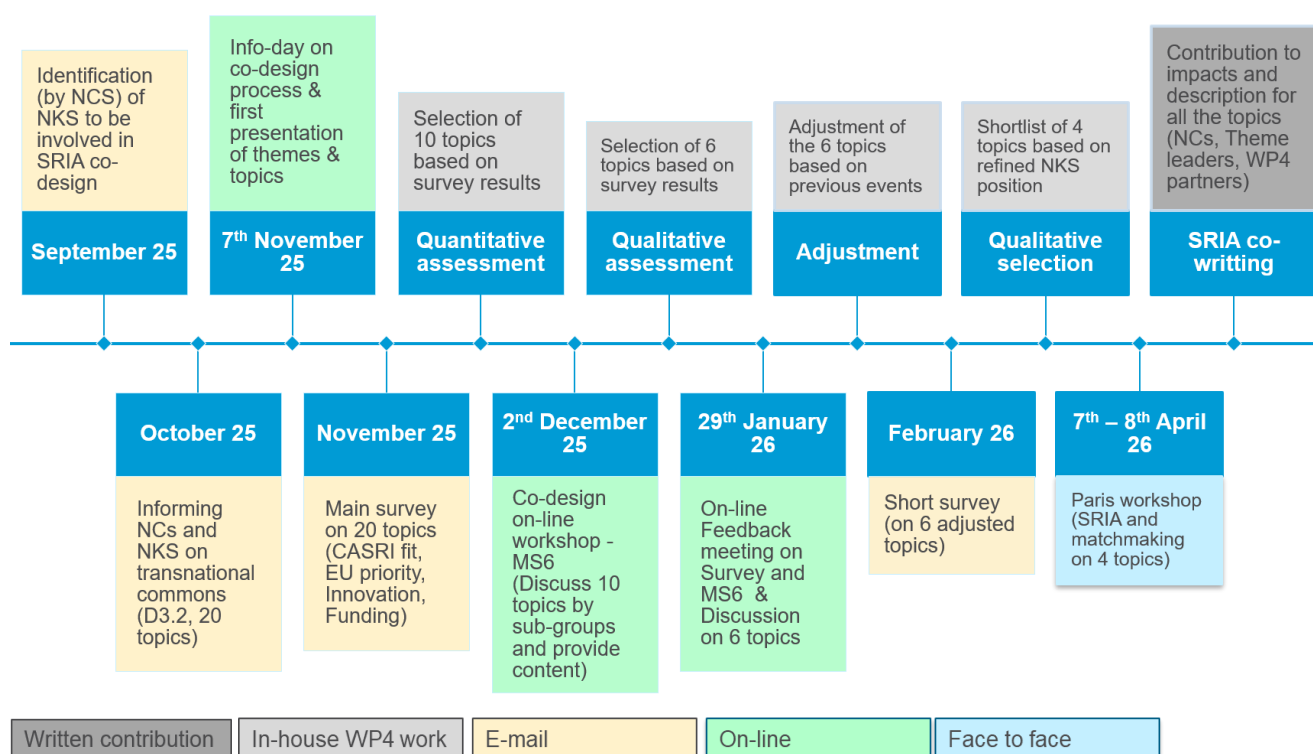


FIGURE 3 - STEPS FOR THE CO-DESIGN SRIA PROCESS

2.4 NC (EPA and EPA-like) & NKS roles

CASRI has brought EPAs and EPA-like organisations together across countries to identify knowledge needs, compare priorities and explore how implementation experience can inform research agendas. Through enhancing connectivity between actors, it plays an important part of the added value in the process and collaboration model itself.

Building on the CASRI co-design methodology (Firus et al., 2024), the SRIA development strongly involved EPAs and EPA-like organisations as National Contacts (NCs) and National Key Stakeholders (NKS). NKS represented public and private organisations, including research funders, policymakers, researchers and knowledge users from policy and practice. NCs and NKS took part in the development of the SRIA in the following ways:

- According to their expertise and know-how in regional and national R&I in sustainability, **NCs invited 2 or 3 NKS** to be part of the co-designed process. Overall, 40 NKS from countries / regions represented by CASRI were gathered and included in the CASRI SRIA development.
- Participation in **online meetings**: An info day meeting was organized at the start of the process to inform the NCs and NKS of the CASRI co-designed process. A feedback meeting was set to discuss advancement of the SRIA development and further steps.
- Answering **surveys**: A couple of surveys (main survey and short survey) were launched during the co-design process in order to collect views from NCs and NKS on the topics to be tackled in the SRIA.

- Participation in **workshops**: First an online workshop aimed to specify the content of the topics in formulating R&I associated and relevant questions. Second a face to face workshop in Paris aimed to deepen some topics and discuss ways towards pre-implementation.
- **Co-writing** of the SRIA: Finally, the NCs supported by some NKS were strongly involved in drafting the topic content.

The intensity of participation varied between countries and regions, reflecting differences in institutional capacity, organisational changes and evolving policy and funding priorities (see Figure 4). This variation should be taken into account when interpreting the prioritisation results..

Country/ Region	Infoday			Survey			On-line codesign workshop (MS6)			On-line feedback workshop			Quicksurvey			Parisworkshop			SRIAco-writing	
	October 25			November 2025			December 2025			January 2026			March 2026			April 2026			June 2026	
	NKS	NC	Total	NKS	NC	Total	NKS	NC	Total	NKS	NC	Total	NKS	NC	Total	NKS	NC	Total	NC/NKS	
Austria																			x	
Belgium																			x	
Bulgaria																			x	
Finland																			x	
France																			x	
Germany																			x	
Ireland																			x	
Italy																			x	
Montenegro																			x	
Pays Basque																			x	
Netherlands																			x	
Slovakia																			x	
Switzerland																			x	
Wales																			x	
TOTAL	13	11	23	14	9	23	8	13	21	10	10	20	16	10	26	10	11	21	12 countries /region	

1 participant; 2 participants; 3 participants; 4 participants; 5 participants

FIGURE 4 - INVOLVEMENT OF THE NATIONAL CONTACT POINTS AND THE KEY NATIONAL STAKEHOLDERS THROUGH THE SRIA DEVELOPMENT

The CASRI process includes countries with different territorial scales, administrative capacities, research ecosystems and levels of integration into European R&I programmes. These differences are relevant for the implementation of the SRIA, as smaller countries may have a relatively limited number of institutions responsible for a broad range of environmental, climate and sustainability functions.

The perspective of smaller EU candidate countries is therefore relevant to the CASRI implementation model. Such countries can benefit from stronger connections to European research networks, transnational knowledge exchange, coordinated programming, capacity building and access to European funding instruments. At the same time, their specific geographical, ecological, economic and institutional conditions need to be reflected when translating European R&I priorities into national and territorial action

2.5 Topics prioritisation

The 20 transnational CASRI topics cover a wide range of technical and transversal themes. In the SRIA development course, the topics were addressed at various levels of details depending on the level of interest and importance raised by the NC and NKS. For pragmatic reasons, it was decided

to focus on a workable number of topics, hence only a selection of topics were discussed and further elaborated in the course of the co-design process according to NC and NKS priorities.

The first stages of the co-design process considered all 20 transnational R&I topics. Following their presentation at the Info Day, a survey collected stakeholder views and priorities. Quantitative and qualitative assessment of the responses identified ten topics for further discussion in the online co-design workshop. This workshop resulted in six topics of particular interest. A subsequent quick survey among NCs and NKS selected four topics for in-depth discussion at the Paris workshop::

- Security of resource supply (A1)
- Effectiveness of climate policy (B2)
- Social vulnerabilities of multi-scaled adaptation (E2)
- Inclusive science-policy-practice interface (F1)

Through the process, it was therefore possible to set priority levels for the topics. Four topic levels were defined as follows (Table 2):

- Very high priority (P1) = Topics of very high interest discussed at the Paris workshop
- High Priority (P2) = Topic which was considered of high interest further to the co-design on-line workshop, but was not further selected for the Paris workshop
- Medium Priority (P3) = Topic which was selected based on the quantitative and qualitative assessment of the survey results, but which was not further chosen beyond the co-design workshop (MS6).
- Low Priority (P4) = Transnational topic which was not considered as a priority from the first wide survey

It is important to note that these priority levels are solely the current picture in a given time and space of the project. They give a view on what the NCs and NKS found the most important over the course of the project.

The priority level of each of the 20 transnational topics is presented in Table 3

TABLE 2 – TOPIC SELECTION THROUGH THE CO-DESIGN PROCESS

Theme	Topic	Survey			On-line co-design WS (MS6)			On-line WS	Feedback	Quick Survey		Paris WS	
		Topic	Assessment		Topic	Co-interest	R&I question	Topic	Discussion	Topic	Interest	Topic	Discussion
			Quantitative	Qualitative									
A .Resilient, net-zero, circular production systems	A.1 Security of Resource Supply	x		1st					Circular economy	x	Strong	x	
	A.2 Equity and Actor influence	x		3rd									
	A.3 Innovation for resilient, net-zero, circular production systems	x	x	1st	x	Weak		x					
B. Biodiversity and climate	B.1 Integrated data-driven climate and biodiversity policies	x		1st									
	B.2 Effectiveness of climate policy	x	x	1st	x	Strong	2	x	x	x	Strong	x	
	B.3 Comprehensive and timely biodiversity monitoring	x	x	1st	x	Strong	1	x	x	x	Strong		
C. Sustainable urbanisation	C.1 Green Space Provision	x	x	3rd	x								
	C.2 Land Use and Sustainable Mobility	x		2nd									
	C.3 Achieving social inclusion and assessing social impact	x		3rd									
D. Nature, environmentally and socially friendly energy transition	D.1 Governance of nature-, environmentally and socially friendly energy transition	x	x	2nd	(x)								
	D.2 Societal engagement	x		1st									
	D.3 Comparing scenarios	x		2nd									
E. Security	E.1 Comprehensive data security and environmental data	x	x	3rd	x	Strong	1						
	E.2 Social vulnerabilities of multi-scaled climate adaptation	x	x	2nd	x	Strong		x	Just Transition	x	Strong	x	
F. Democracy and participation	F.1 Inclusive science-policy-practice interface	x	x	1st	x	Strong	1	x		x	Strong	x	
	F.2 Integrating environmental and health data for socially just urban transformation	x	x	3rd	x								
G. Regulatory efficiency and competitiveness	G.1 Smart, adaptive and effective regulation	x	x	3rd	x								
	G.2 Governance for sustainable competitiveness	x		3rd									
H. Digitalisation	H.1 Capacities for advanced generation and responsible utilisation of data	x		1st				x		x	Medium		
	H.2 Environmental sustainability of digital data transformation	x		3rd									

The prioritisation results should be interpreted in the context of the stakeholder composition and co-design process. The resulting priorities provide a European-level picture of shared interests and knowledge needs, while national and territorial implementation may require additional consideration of country-specific environmental, institutional and socio-economic conditions.

TABLE 3 – PRIORITY LEVEL OF EACH OF THE 20 TRANSNATIONAL TOPICS

Topic	Priority
A.1 Security of Resource Supply	P1
B.2 Effectiveness of climate policy	P1
E.2 Social vulnerabilities of multi-scaled climate adaptation	P1
F.1 Inclusive science-policy-practice interface	P1
B.3 Comprehensive and timely biodiversity monitoring	P2
H.1 Capacities for advanced generation and responsible utilisation of data	P2
A.3 Innovation for resilient, net-zero, circular production systems	P3
C.1 Green Space Provision	P3
D.1 Governance of nature-, environmentally and socially friendly energy transition	P3
E.1 Comprehensive data security and environmental data	P3
F.2 Integrating environmental and health data for socially just urban transformation	P3
G.1 Smart, adaptive and effective regulation	P3
A.2 Equity and Actor influence	P4
B.1 Integrated data-driven climate and biodiversity policies	P4
C.2 Land Use and Sustainable Mobility	P4
C.3 Achieving social inclusion and assessing social impact	P4
D.2 Societal engagement	P4
D.3 Comparing scenarios	P4
G.2 Governance for sustainable competitiveness	P4
H.2 Environmental sustainability of digital data transformation	P4

2.6 SRIA development

The development of the SRIA included four main actions:

- assess stakeholder interest and support prioritisation;
- qualify expected impacts;
- compare topics with existing R&I initiatives to identify synergies, gaps and potential funding pathways;
- clarify the significance and added value of the CASRI topics and formulate specific R&I questions based on workshop results and the original list of 600 R&I needs.

3. CASRI Themes & Topics

For each of the 20 transnational common topics, the CASRI SRIA describes the priority level, expected impacts, background and rationale, topic content, and significance and added values (based on identifying synergies and gaps with relevant R&I initiatives).

3.1 A. Resilient, net-zero, circular production systems

Background

Industrial production systems are under increasing pressure to transition towards sustainability while maintaining resilience in the face of global disruptions (e.g., climate change, geopolitical instability, and supply chain shocks). Traditional linear take-make-dispose models are no longer viable due to resource scarcity, environmental degradation, and rising societal expectations.

Net-zero targets and circular economy principles are reshaping industrial value chains. This transformation requires the redesign of production systems to minimise emissions, eliminate waste, and retain material value. At the same time, production systems must become more resilient, capable of adapting to disruptions, maintaining continuity, and recovering rapidly from shocks. This requires to optimise existing and develop and collaborate within and between various systems and actor bases to future-proof societies.

Drivers and enablers

Various European partnerships and Knowledge and Innovation Communities (EIT KICs) are currently driving and enabling research and innovation in the field of Resilient, net-zero, circular production systems (EC, 2025). CASRI aligns closely with the European Strategic Research and Innovation Agendas (SRIAs) designed under these initiatives (see Annex 2). Shared priorities include securing access to critical raw materials, reducing external dependencies through innovation, and addressing systemic risks such as geopolitical instability and water scarcity within the water-energy-food ecosystem nexus. Elements like technology sovereignty and inclusive governance, by securing socially legitimate industrial ecosystems across key value chains like raw materials, energy, mobility, chemicals, construction, textiles, and electronics, are therefore well in scope of the Horizon Europe strategic plan 2025-2027.

Impacts

Regardless of the existing comprehensive scope of the European innovation agenda, a gap analysis between the CASRI priorities and the Strategic Research and Innovation Agendas (SRIAs from the various European partnerships) reveal several underexplored areas. These gaps mostly address the complex human, institutional and regional realities of implementation, which are generally overshadowed in the more technical and macro-economic focus of many SRIAs, and understanding the complexities, (unintended) behaviours and needs in fields with overlapping policy objectives and approaches. The CASRI SRIA adds value to these specific elements by targeting more public needs and competences. It does so by recognising and stimulating research and innovation around multi-level and multi-actor understanding of policy design to policy implementation across (administrative) borders, creating understanding in the compatibility of (specialization) strategies in a wider frame and non-linear impacts imposed on and created by European production systems.

SDG relevance

Fulfilment of the core areas of development of theme A will result to contributions to the following UN Sustainable Development Goals (SDGs). Security for Resource Supply (A1 - Enhanced system-level understanding of resilience in industrial ecosystems), through smart allocation and risk reduction, will address Decent work and economic growth (**SDG 8**), Responsible consumption and production (**SDG 12**) and Climate action (**SDG 13**). Equity and Actor Influence (A2 - Policy integration of sustainability principles into industrial system design), enabling just, barrier-free responsible systemic change shall contribute to SDG 8, SDG 12 and **SDG 7** – affordable and clean energy (SDG 7). Innovation (A3 - Evidence-based guidance for scaling net-zero industrial technologies), emphasising on scale deployment and adoption innovations shall address SDG 7, SDG 8 and Industry, Innovation and Infrastructure (**SDG 9**).

3.1.1 A.1 Security of Resource Supply

Priority level: Very High (P1)

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

Impacts

Topic A1 ‘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 research and innovation needs related to efficiency improvement, regenerative materials and substitutes and enjoys a clear and geographically broad policy interest, resulting in a strong alignment with ongoing and planned SRIA activities both on the national and European level. The added value of the articulated R&I actions under Topic A1 ‘Security of resource supply’ are mostly oriented towards coordinated monitoring systems of global supply chains across administrative layers and the development of (transnational) indicators or deliberation processes that can articulate risk and priority. It therefore orients at connecting local level needs with (trans)national dependencies through improved coordinated policy design, instrumentation and implementation.

Background & Rationale

The R&I questions articulated under Topic A1 particularly relate to strategic decision making and coordination within Europe. The R&I questions articulated under this topic align most closely with the current policy discourses and R&I infrastructures on a European and national level (as indicated in Annex 3 through SRIAs such as ERA MIN (2024)¹, BATT4EU (2024)², IAM4EU (2024)³, Processes4Planet (2021)⁴ that aim to strengthen Europe’s sovereignty and resilience by improving resource efficiency, circularity, and technological leadership). Despite a clear presence of multiple comprehensive innovation ecosystems around various elements, additional efforts are structurally asked for, throughout the CASRI process as well as other influential venues (e.g. EEA, 2026a). Being a current hot topic that touches upon many policy domains that need to walk in tandem and become communicating vessels, it offers potential for EPA agencies and alike organisations to

¹ https://www.era-min.eu/sites/default/files/docs/eramin_sria.pdf

² <https://bepassociation.eu/our-work/sria/>

³ <https://www.iam-i.eu/wp-content/uploads/2025/02/SRIA-Innovative-Advanced-Materials-for-Europe.pdf>

⁴ https://www.aspire2050.eu/sites/default/files/users/user85/p4planet_07.06.2022._final.pdf

support decision-making in contexts of high uncertainty and trade-offs and supporting constructive debates on risks and priorities.

For smaller and highly interconnected economies, research should also examine how resource-security risks affect energy, water, tourism, construction and other strategically important sectors, and how national authorities can integrate resource-risk information into investment and resilience planning.

Topic Description

Throughout the CASRI process Security of resource supply has been significantly underscored across all participating regions. It is described according to the CASRI perspectives below (Table 4).

TABLE 4 – SECURITY OF RESOURCE SUPPLY (SOURCE CASRI D3.2)

Proposed topic	Security of resource supply
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.
Contribution to E&S challenges	The topic addresses predominantly the circular economy E&S 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. <ul style="list-style-type: none"> • 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 fuelling, 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. <ul style="list-style-type: none"> • 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. <ul style="list-style-type: none"> • Reduction of (energy) demand in specific sectors; • Specific tools to balance energy fluctuations from renewable energy sources.

Significance of the topic and CASRI added values

Through the CASRI deliberative process three following R&I questions have been articulated for topic A1 'Security of resource supply':

R&I 1: Resource sovereignty and climate neutrality pathways

R&I 1 consists in developing scenario based analyses of Europe's internal and external resource supply options to clarify the implications of different climate neutrality pathways for resource sovereignty, including the role of Environmental Protection Agencies (EPAs) in resource governance. Outputs of R&I 1 can be described as follows:

- Integrated scenarios linking climate neutrality pathways with demand for critical raw materials (for renewables, batteries, hydrogen)
- Comparative analysis of trade-offs and co benefits between decarbonisation, competitiveness, and resource sovereignty
- Policy relevant guidance on the strategic role of EPAs in resource management and coordination

R&I 2 – Territorial cohesion under resource and competitiveness pressures

R&I2 supports analysis of differences in resource vulnerabilities across urban, peri urban, and rural territories, and assessment on how global geopolitical developments interact with local industrial competitiveness and environmental constraints. Outputs of R&I 2 can be described as follows

- Territorial typologies of resource vulnerability and exposure to global supply risks
- Evidence on differentiated impacts of climate and industrial policies across territories
- Policy options for integrating territorial cohesion into competitiveness driven transitions

R&I 3 – Analytical tools for geopolitical and supply risk assessment

R&I3 aims to develop and test analytical tools that distinguish actual resource scarcity from inefficiencies, governance failures, or distributional inequalities, and that assess political and geopolitical risks linked to external suppliers and export controls. Its main outputs are expected to be:

- Decision support tools integrating geopolitical risk, trade dependencies, and supply concentration
- Indicators differentiating structural scarcity from system inefficiencies
- Guidance for regional authorities and sectoral stakeholders on risk aware integration into EU value chains

Synergies with other relevant R&I initiatives

Next to formal R&I infrastructures and R&I programmes, the recent SC EEA recommendations on Sustainability R&I (EEA, 2026a) raised some research needs aligned with CASRI topic A1. These include 1) developing evidence that informs decision-making in contexts of high uncertainty, anticipating trade-offs and supporting constructive debates on risks and priorities and 2) investigating new sources of critical raw materials to ensure their availability in EU, given the current geopolitical situation and the associated risks of supply chain disruptions, including through the development and maintenance of adaptable database of materials stocks and flows. CASRI topic A1 significance is therefore supported and re-enforced by SC EEA recommendations.

3.1.2 A.2 Equity and Actor influence

Priority level: Low (P4)

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

Impacts

The topic A2 “Equity and Actor influence” 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. The topic itself is not so clearly embedded in national and European policy discourses and R&I infrastructures. For example, at the European and international level, there is a broad recognition of the European added value and innovation potential of the topic (as indicated by strong matching of R&I articulations with SRIAs of the STR partnership SRIA (DLR-PT, 2026⁵), CICERONE (EU Circular Cooperation Hub, 2020⁶), Blue Economy (SBEP, 2024⁷), EUFORE (2025⁸), Water4All (2020⁹), albeit these not necessarily being explicit on the scope implied here, see Annex 4), while on the national level momentum is expressed but with uneven institutional uptake, policy awareness and implementation. This limited momentum and absence of transnational initiatives offers potential for EPA agencies and alike organisation to position as a hub towards improved coordination, knowledge sharing, and policy alignment on this topic.

Background & Rationale

The R&I questions articulated under the topic A2 “Equity and Actor influence” address environmental and sustainability challenges through various social dilemma lenses that affect the course of action and how this action is perceived. It moves beyond the technological and macro-economic scope of regular public-private SRIAs, and covers context-sensitive knowledge needs around inclusive governance of (multi)national value chains. Throughout the CASRI process this topic has been perceived as the one with the greatest transnational potential (greatest number of votes during the transnational workshop, see D3.1). The relevance for dedicated initiatives is frequently echoed by academic networks (STRN, 2024), advisory committees advising on work programmes of (environmental) boundary agencies (EEA, 2026a, PBL 2022) and acknowledged through the set-up of the European STR-partnership (DLR-PT, 2026¹⁰). Only to a limited extent (trans)national initiatives and SRIAs co-exist in a space where theoretic and applied knowledge leads to action – EPAs and EPA-like organisations can help build further actionability by addressing power imbalances between (multinational) actors and how to create fair and leveled playing fields across sectors and beneficiaries.

Topic Description

⁵ <https://www.futures4europe.eu/post/towards-a-strategic-research-innovation-agenda-for-the-str-partnership-jizyw>

⁶ <https://circulareconomy.europa.eu/platform/en/knowledge/strategic-research-innovation-agenda-sria-circular-economy>

⁷ https://www.bluepartnership.eu/sites/bluepartnership.eu/files/documents/2024-12/sustainable_blue_economy_partnership_strategic_research_and_innovation_agenda_2024.pdf

⁸ <https://doi.org/10.36333/rs12>

⁹ https://www.water4all-partnership.eu/sites/default/files/2023-02/Water4All_SRIA-2022-2025_A4_2311_bd.pdf

¹⁰ <https://www.futures4europe.eu/post/towards-a-strategic-research-innovation-agenda-for-the-str-partnership-jizyw>

Throughout the CASRI process this topic A2 “Equity and Actor influence” (see Table 5) has been perceived as the one with the greatest transnational potential (greatest number of votes) across the participating stakeholders at the transnational stakeholder workshop.

TABLE 5 – EQUITY AND ACTOR INFLUENCE (SOURCE CASRI D3.2)

Proposed topic	Equity and actor influence
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.
Contribution to E&S 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 leveled playing fields across sectors and beneficiaries.
Systemic knowledge needs	Knowledge needs include but are not limited to the development of anticipatory governance knowledge around: <ul style="list-style-type: none"> • 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.

Significance of the topic and CASRI added values

Throughout the CASRI co-design process topic A2 “Equity and Actor influence” has received the greatest transnational potential during the prioritization workshop (see D3.1). The stakeholder survey taking stock of most feasible and interested topics did not result in selecting A2 for formulating specific research actions. Instead we lean on earlier formulations of research gaps to formulate directions for further action.

R&I 4 – Institutional Resilience under Geopolitical Shocks

R&I 4 consists of analysing how geopolitical crises affect institutional resilience, policy stability, and adaptive capacity, moving beyond supply chain perspectives (e.g. BATT4EU, IAM4EU) toward governance, behavioural, and institutional transformation. Outputs of R&I 4 include:

- Conceptual and empirical models of institutional resilience and adaptation pathways
- Comparative analysis of policy responses to geopolitical shocks across EU contexts
- Frameworks linking strategic autonomy to governance capacity and institutional behaviour

R&I 5 – Equitable Structural Change and Inclusive Transitions

R&I 5 addresses gaps in understanding and mitigating distributional effects, inequalities, and fairness in transitions, with emphasis on social, political, and institutional change. Outputs of R&I 5 encompass:

- Frameworks for analysing distributional impacts and fairness in industrial and circular transitions
- Methods for stakeholder engagement, knowledge transfer, and capacity building
- Evidence on how transitions affect different social groups, regions, and economic actors

R&I 6 – Integrated Analysis of Equity, Actor Influence, and Governance

R&I 6 aims to develop an integrated framework linking equity, actor power, and governance structures to better understand how these dimensions jointly shape the design, acceptance, and implementation of sustainability transitions. Main outputs of R&I 6 include:

- Integrated analytical models capturing power dynamics, institutional structures, and distributional effects
- Cross sectoral evidence on how actor influence shapes policy outcomes and transformation pathways
- Tools for analysing governance effectiveness, fairness, and political feasibility

Synergies with other relevant R&I initiatives

The topic equity and actor influence is already a main feature of several current R&I initiatives (see above). In addition, the recent SC EEA recommendations on Sustainability R&I (EEA, 2026a) raised some research needs aligned with CASRI topic A2. The transition of European industries and societies must be just and fair, including fair sharing of its cost and benefits, meaningful participation in decision-making, and a careful consideration of local realities and geographical differences. Research on justice must include all these elements. Understanding participation and inclusion mechanisms and their effectiveness in achieving socially accepted transition is of crucial importance. Capacity building and participation are integral to just and fair transition. Furthermore, innovative approaches to encourage behavioural change are needed. The SC EEA recommends to test the effectiveness of environmental storytelling, science communication strategies, of participatory experiments and as well transformative educational practices for sustainable lifestyles in influencing opinions and behaviours. The CASRI topic A2 significance is therefore supported and re-enforced by SC EEA recommendations.

3.1.3 A.3 Innovation for resilient, net-zero, circular production systems

Priority level: Medium (P3)

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

Impacts

The topic A3 “Innovation for resilient, net-zero, circular production systems” focuses on accelerating the development of sustainable transboundary production systems other than those related to topic A1 ‘security of resource supply’ (e.g. focusing on climate mitigation, pollution, health). This topic

resonates with existing European and national policy and (mission-oriented) innovation frameworks (such as the European Green Deal, Horizon Europe Missions framework), though emphasising the integration, resilience, and scaling of cross-border production systems. Although many initiatives exist that contribute to coordinated transboundary development around production systems (e.g. SRIAs like IAM4EU (2024¹¹), transboundary initiatives like the Important Projects of Common European Interests (IPCEIs), or coordination bodies like dedicated science-policy platforms, like UN IPCC, IRP, ISP-CWP¹², see Annex 5), these remain fragmented around specific issues or innovations. Wider applications articulated under this topic 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.

Background & Rationale

Topic A3 “Innovation for resilient, net-zero, circular production systems” addresses the traditional environmental and social challenges inherent in (inter)national production systems through a more physical and technologically driven transformation lens. Throughout the CASRI process ‘Innovation for resilient, net-zero, circular production systems’ has received overall interest in the national stock take of (national) ES R&I needs (see D2.1). Given how this aligns most closely with the technical and macro-economic focus of many national and European SRIAs, the added value is mostly found in overcoming the national scope of traditional innovation challenges. The focus on transboundary production systems, global value chains, and trade aligned circularity positions these research actions as key enablers of policy coherence beyond Europe. By addressing governance fragmentation, improving cross-border data interoperability, and aligning trade and procurement frameworks.

Topic Description

The topic A3 “innovation for resilient, net-zero, circular production systems” (see Table 6) covers the breadth of traditional innovation challenges to maintain a robust and competitive (trans)national economy. Innovations other than reducing dependencies on foreign entities (topic A1) belong here (e.g. focusing on climate mitigation, pollution, health).

¹¹ <https://www.iam-i.eu/wp-content/uploads/2025/02/SRIA-Innovative-Advanced-Materials-for-Europe.pdf>

¹² These are abbreviations for several global level science-policy platforms operated at the United Nations level:

- IPCC: Intergovernmental Panel on Climate Change
- IRP: International Resource Panel
- ISP-CWP: Intergovernmental Science-Policy Panel on Chemicals, Waste and Pollution

TABLE 6 – INNOVATION FOR RESILIENT, NET-ZERO, CIRCULAR PRODUCTION SYSTEMS (SOURCE CASRI D3.2)

Proposed topic	Innovation for resilient, net-zero, circular production systems
Description	Accelerating the development of sustainable transboundary production systems.
Contribution to E&S 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	<p>Systemic knowledge needs encompass technological innovation and development areas for specific sectors and value chains. Key areas include but are not limited to:</p> <ul style="list-style-type: none"> • 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.

Significance of the topic and CASRI added values

Throughout the CASRI process ‘Innovation for resilient, net-zero, circular production systems’ has received overall interest in the national stock take of (national) ES R&I needs (see D2.1). As the topic reflects traditional R&I articulations the most, this topic was explicitly not selected for further in-person articulation of research actions. Instead we utilise results from a gap analysis on transnational and cross-SRIA limitations to formulate research and innovation actions.

R&I 7 – Governance and Integration of Cross Border Production Systems

R&I 7 develops governance frameworks, coordination mechanisms, and innovation models for cross border circular and net zero production systems, addressing the lack of operational approaches for transnational production integration. R&I 7 outputs include:

- Frameworks for multi-country coordination of circular production systems
- Models for integrating cross-sector production systems (raw materials, industry, circular economy)
- Policy guidelines for aligning national and EU level governance across borders

R&I 8 – Systemic Resilience in Globalised Production Networks

R&I 8 develops frameworks and tools to assess and enhance **multi-dimensional resilience** (supply chain, geopolitical, trade, environmental) within globally interconnected production systems. R&I 8 will result in the main following outputs:

- Integrated resilience assessment models covering supply chains, trade, and geopolitical risks
- Scenarios of cascading transboundary risks impacting EU production systems
- Policy recommendations for embedding resilience into industrial and circular strategies

R&I 9 – Enabling Mechanisms for Cross Border Circular Deployment

R&I 9 proposes to design and test the economic, digital, and policy instruments required to scale circular production across borders, including procurement, trade alignment, and data infrastructures. It shall lead to the following outputs:

- Frameworks for transnational circular procurement and market instruments
- Models for aligning trade policy with circular and resilient production goals
- Prototypes for cross-border digital infrastructures (e.g. data standards, traceability systems, DPP interoperability)

Synergies with other relevant R&I initiatives

Research and innovation into the circular economy for electronics, covering the entire lifecycle, including R&I into design for disassembly and repair, the development of automated technologies for sorting and recycling e-waste to recover critical raw materials, and the piloting of innovative business models, such as "electronics-as-a-service," which incentivise producers to retain ownership and responsibility for their products at the end of life. This includes modular design for easy upgrades and repairs, software solutions that extend the useful life of older hardware.

3.2 B. Biodiversity and climate

Background

Climate change and biodiversity loss are deeply interconnected environmental challenges manifesting in all types of ecosystems and in every environment. Global climate change can exacerbate local biodiversity loss by altering habitats and degrade ecosystems over time, while the loss of biodiversity reduces ecosystem resilience and undermines nature's capacity to regulate emissions and support ecosystem services. For example, deforestation releases stored carbon dioxide, contributing to climate change, while rising sea temperatures and ocean acidification caused by carbon emissions severely affect marine biodiversity and threaten coastal livelihoods. Ecosystems experiencing biodiversity loss open new possibilities for invasive species – a major case of continuous biodiversity decline and ecosystem deterioration.

Drivers and enablers

Addressing these challenges simultaneously is essential, given both the potential for synergies and the risk of trade-offs. Transnational and coordinated approach is a backbone of climate and biodiversity oriented European green policy implementation. Integrated strategies can generate multiple benefits; for example, climate mitigation measures such as reforestation can support biodiversity, while nature restoration efforts can contribute to long-term climate resilience and other sustainable solutions. Conversely, increasing demand for bioenergy and critical raw materials may place additional pressure on ecosystems and habitats.

Recognising the role of biodiversity as the foundation for nature-based solutions is crucial for effective climate adaptation. Integrating these approaches ensures a more comprehensive and resilient response across eco-social systems. Furthermore, diverging from the anthropo-centric worldview underscoring policy and management to a more nature-centric viewing opens ways to a more resilient society.

Impacts

Integrating climate and biodiversity goals is fundamental to ensure that economic growth does not compromise environmental sustainability, hence environmental sustainability can create economic growth in the long run, in return. Furthermore, addressing these issues requires consideration of cross-border impacts to prevent the externalization of climate emissions and biodiversity loss through long value-chains and transnational cooperation and synchronization.

SDG relevance

Climate change and biodiversity loss represent mutually reinforcing global crises, making their joint action essential for achieving the SDGs. The theme highlights strong sustainability perspective to SDGs, acknowledging environmental sustainability as the fundamental basis for achieving social goals. Biodiversity and climate issues are directly addressed by **SDG 13** (Climate Action), **SDG 14** (Life Below Water), and **SDG 15** (Life on Land). They are core element of all other SDGs. For example, climate change and biodiversity loss threaten food production (**SDG 2**), affect water cycle regulation (**SDG 6**), bioenergy (**SDG 7**) and urban resilience and green infrastructure (**SDG 11**). Both climate emissions and habitat destruction are driven by overconsumption (**SDG 12**).

3.2.1 B.1 Integrated data-driven climate and biodiversity policies

Priority level: Low (P4)

Keywords: *climate-biodiversity nexus; integrated data; policy synergies; trade-offs*

Impacts

While both climate change and biodiversity loss are individually recognised as critical global challenges, CASRI stakeholders stressed the need for a better understanding of their interconnectedness. Both issues are covered by multiple monitoring programmes and research initiatives on national, European and global level. Integrated data-driven climate and biodiversity policies emphasise impacts created by key integrative elements, including data utilization, governance of climate–biodiversity interactions, and regulatory and institutional frameworks for effective cross-sectoral policy implementation.

The key potential lies in establishing integrated R&I initiatives and data frameworks that bridge the gap between siloed ecological observation and socio-economic policy. By generating and integrating comprehensive, interconnected datasets, R&I provides the necessary foresight to identify complex policy opportunities and critical risks. For example, managing climate impacts of ecological restoration and enhancing the resilience of soil, water, and forest ecosystems are key components of integrated climate and biodiversity actions.

Background & Rationale

The topic of Integrated data-driven climate and biodiversity policies is related to various existing R&I initiatives (see Annex 6). Two relevant examples include:

- **The European co-funded Partnership on Biodiversity, Biodiversa+¹³**, was cited as a relevant document. The topical and cross-cutting themes from the Biodiversa+ SRIA are listed in the Figure 5, highlighting how integration is understood in a context of biodiversity protection.
- **The SRIA for Earth Earth Observation¹⁴** outlines key priorities for the Horizon Europe Work Programmes for 2025-2027 and beyond into the next Multi-annual Financial Framework, ensuring that Copernicus and its products and services remain state-of-the-art.

¹³ [Strategy & flagships – Biodiversa +](#)

¹⁴ [JRC Publications Repository - Earth Observation Strategic Research and Innovation Agenda](#)

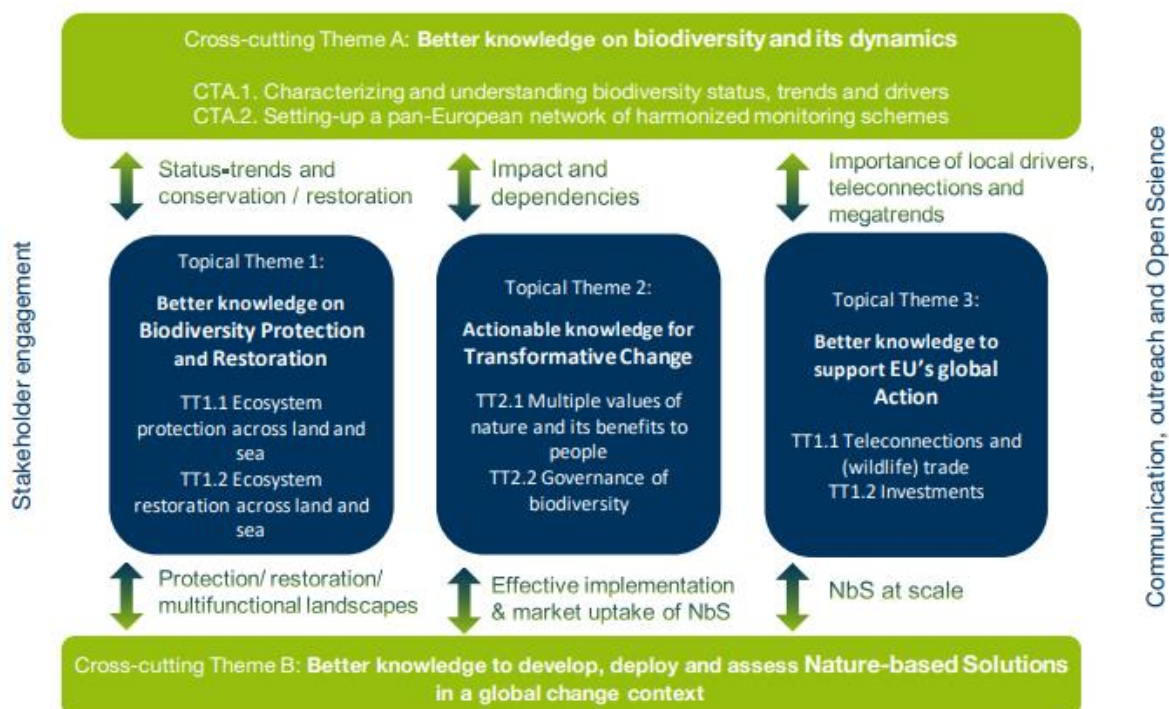


Figure 6: Overview of the Topical and Cross-cutting Themes that structure the Strategic Research & Innovation Agenda of the European Biodiversity Partnership.

FIGURE 5 - OVERVIEW OF THE TOPICAL AND CROSS-CUTTING THEMES THAT STRUCTURE THE STRATEGIC RESEARCH & INNOVATION AGENDA OF THE EUROPEAN BIODIVERSITY PARTNERSHIP (BIODIVERSA+).

Topic Description

The topic “Integrated data-driven climate and biodiversity policies” (Table 7) addresses the crucial need to understand the interactions between climate change and biodiversity loss – a fundamental requirement for achieving a sustainability transition.

TABLE 7 – INTEGRATED DATA-DRIVEN CLIMATE AND BIODIVERSITY POLICIES (SOURCE CASRI D3.2)

Proposed topic	Integrated, data-driven climate and biodiversity policies
Description	Generation and utilisation of climate and biodiversity data to identify and manage interconnected policy opportunities and risks.
Contribution to E&S challenges	Both climate change and biodiversity are widely studied, but their intersections have received less attention. The existing data is likely to provide 'low-hanging fruit' for the identification of synergistic policy actions addressing both challenges. Possibilities to avoid unintended policy outcomes from isolated policy actions or non-action.
Transnational societal and policy relevance	Development of innovative monitoring methods and enhanced use of spatial data integrating ecosystems, soil and water for detecting biodiversity–climate interactions. Identification of interconnected risks, long-term cascading effects and potential thresholds. Awareness creation on biodiversity–climate interactions, education and participation (e.g. land use).
Systemic knowledge needs	Focuses on interactions between different systemic issues and policy fields. Systemic assessments of combined effects of climate and biodiversity policies as well as the effects of climate and biodiversity policies to other challenges
Transversal knowledge needs	Cross-sectoral integration across different scales of activity. Connects understanding of global environmental changes with regional and local data for effective planning and decision-making.
Actionable knowledge needs	Guiding action in already established policy fields towards more integrative approaches. Recognising the potential cross-cutting effects of action and non-action.

Significance of the topic and CASRI added values

Several knowledge gaps were highlighted. By developing sophisticated systems for generating, analyzing, and modeling interconnected climate and biodiversity data, R&I can reveal relevant feedback loops, identify trade-offs, and map causal relationships between environmental stressors and human systems. Such capabilities are needed for identifying emerging policy opportunities (e.g., nature-based solutions) and mitigating complex risks (e.g., resource conflicts).

Potentially relevant **R&I questions** beyond current initiatives include at least:

- Possibilities to avoid unintended policy outcomes from isolated policy actions or non-action.
- Development of innovative monitoring methods and enhanced use of spatial data integrating ecosystems, soil and water for detecting biodiversity–climate interactions.
- Identification of interconnected risks, long-term cascading effects and potential thresholds.
- Data-based awareness creation on biodiversity–climate interactions, education and participation, focusing e.g. on land use issues. (link to monitoring with modern methods (B3) - so that this kind of interesting data can be produced cost-efficiently)

Improved understanding of ecosystem services, ecological connectivity and nature-based solutions can help policymakers anticipate resource-related risks, strengthen adaptive capacity and develop strategies that simultaneously contribute to biodiversity conservation, climate resilience and sustainable resource management.

Particular attention should be given to ecosystems that are critical for resource security, including forests, agricultural land, freshwater systems, coastal and marine ecosystems, whose resilience is increasingly challenged by climate change, land-use change and increasing socio-economic pressures. Integrated climate and biodiversity data can support evidence-based decision-making, improve monitoring capacities and facilitate the identification of policy interventions that generate co-benefits across environmental, economic and societal objectives.

3.2.2 B.2 Effectiveness of climate policy

Priority level: Very high (P1)

Keywords: *climate policy effectiveness; implementation gap; policy evaluation; behavioural change*

Impacts

The effectiveness of climate policy stood out as an issue of increasing importance. The topic focuses on regulatory frameworks and policy implementation for effective climate action. It includes developing comprehensive, consistent and applicable long-term pathways to climate neutrality, taking into account different societal contexts, where public and policy attention is often focused to other pressing social and economic goals. Management of synergies and conflicts related to different policy options requires consideration of justness and resilience across different scales and actor groups. It is noted that while climate policies are widely supported with R&I initiatives based on natural sciences and technology development, social science approaches (including the humanities) to the implementation of climate policies are often lacking.

Knowledge gaps are related to the relationship between climate mitigation and adaptation, opportunities related to ecosystem-based mitigation, cross-sectoral climate governance and relationships between climate action and other policy goals. National Environmental Protection Agencies play a special role as boundary organisations between global and local levels, addressing international level climate goals and national and local level implementation.

Background & Rationale

“Effectiveness of climate policy” is related to a range of existing climate change and R&I policies and plans, including, for example, **JPI Climate Strategic Research & Innovation Agenda (SRIA 2016-2025)**¹⁵, **Equinox Workshops**¹⁶ (December 2025, Brussels) on Societal transformation in the face of Climate change, **EU Mission: Adaptation to Climate Change**¹⁷, **EU Strategic R&I Agenda on Health & Climate Change**¹⁸ (2025), **EU Adaptation Strategy (2021+)**¹⁹, **European Climate Resilience and Risk Management**²⁰ (Integrated Framework, 2026), amongst many others (Annex 7). These highlight the need for increased emphasis on a sustainable societal transformation, improved climate related decision making and governance, bridging research and policy implementation, the need for more effective multi-level governance, cross-sectoral integration and

¹⁵ https://jpi-climate.eu/wp-content/uploads/2022/11/JPI-CLIMATE_SRIA.pdf

¹⁶ <https://jpi-climate.eu/event/workshop-societal-transformation-in-the-face-of-climate-change/>

¹⁷ https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/adaptation-climate-change_en

¹⁸ <https://op.europa.eu/en/publication-detail/-/publication/616cce9c-39e5-11f0-8a44-01aa75ed71a1>

¹⁹ https://climate.ec.europa.eu/eu-action/adaptation-and-resilience-climate-change/eu-adaptation-strategy_en

²⁰ https://climate.ec.europa.eu/eu-action/adaptation-and-resilience-climate-change/european-climate-resilience-and-risk-management-integrated-framework_en

policy coherence. This is further highlighted by the EEA Report: *From adaptation planning to action* (EEA, 2025a), which reports persistent gaps in monitoring, evaluation, local capacity, funding, and clarity of roles, as well as weak evidence on effectiveness of climate policy implementation across Member States.

This topic will address the need for actionable, policy-relevant research that supports national planning, investment decisions and implementation. A key priority is improving policy implementation and the uptake of scientific evidence into decision-making, with a need to better understand how governance systems, institutions and monitoring processes can operationalise climate policy in practice. Climate change is a systemic and cross-sectoral challenge, and research is needed to better understand interdependencies across domains such as infrastructure, ecosystems, health and economic systems (cost-efficiency of action is often at the centre of discussion, at the national and EU level: Who shall pay and the cost of inaction need to be addressed), and that will take account of trade-offs and co-benefits between policy areas. Strengthening the link between mitigation and adaptation will also be an important area of research within this topic, including understanding how integrated and nature-based approaches can both reinforce or conflict with one another. Central to addressing these areas is the integration of social sciences in supporting societal transformation, with research needed on behavioural change, public engagement, social drivers and equitable transitions. This also highlights the need for research to address multilevel governance to align global, EU, national and local action, as well as issues of climate justice and inequality and distributional impacts and fair adaptation for vulnerable groups.

Topic Description

Related to climate change, challenges related to the effectiveness of climate policy stood out as the major topic (Table 8). Climate policy was recognised as an already well-established policy area with considerable implementation gaps and a need for knowledge focusing on means to close those gaps. Earlier research has noted the lack of funding directed to social science investigations of climate-change and energy transition as well (Overland & Sovacool 2020).

TABLE 8 – EFFECTIVENESS OF CLIMATE POLICY (SOURCE CASRI D3.2)

Proposed topic	Effectiveness of climate policy
Description	Regulatory frameworks and policy implementation for effective climate action
Contribution to E&S challenges	Tackling climate change including social science approaches. Developing comprehensive, consistent and applicable long-term pathways to climate neutrality, in a societal context where public and policy attention is more focused on social and economic objectives
Transnational societal and policy relevance	National and international implementation of science-based climate policies, including economic instruments and finance. Management of synergies and conflicts related to different policy options. Justness of climate adaptation, preparedness and resilience across different scales and actor groups.
Systemic knowledge needs	Relationship between climate mitigation and adaptation, opportunities related to ecosystem-based climate mitigation, cross-sectoral climate governance. Addressing relationships between climate action and other policy goals.
Transversal knowledge needs	International level climate goals and national and local level implementation. National EPAs may have a special role as boundary organisations between global and local levels.
Actionable knowledge needs	Need for R&I to design and implement more effective national climate adaptation and mitigation plans and policies.

Significance of the topic and CASRI added values

The added value of the topic originates from the development of R&I tools or models that translate regulatory frameworks into actionable, real-world implementation pathways. This includes approaches capable of effectively coordinating multi-level governance for transnational climate policies, identifying trade-offs and synergies, reducing cross-border fragmentation, and improving policy coherence. Specific recognition of the type of evidence needed to evaluate policy measures before implementation helps to identify the main implementation bottlenecks that prevent regulations from producing measurable outcomes. The key institutional capacities (skills, staffing, funding) needed to successfully implement ambitious transnational climate policies—linked to R&I development—include training, digital tools, and organisational models that enhance implementation capacity. Institutions confronting resource limitations in the context of multifaceted climate initiatives with complex policy mixes require pioneering advancements. Improved or new digital and analytical tools are needed to improve real-time measurement of policy outcomes. This allows better harmonization, monitoring, and evaluation across countries and governance levels. Overall, the topic focuses on innovation pathways that can speed up the process of turning research results into practical climate policy tools.

CASRI added value

Knowledge gaps are related to the relationship between climate mitigation and adaptation, opportunities related to ecosystem-based mitigation, cross-sectoral climate governance and relationships between climate action and other policy goals. National Environmental Protection Agencies play a special role as boundary organisations between global and local levels, addressing international level climate goals and national and local level implementation.

Potentially relevant R&I questions beyond current initiatives include but are not limited to:

- Development and implementation of comprehensive, socially acceptable long-term pathways to climate neutrality.
- National and international implementation of science-based climate policies, including economic instruments and finance.
- Management of synergies and trade-offs between climate mitigation and adaptation, ecosystem-based mitigation, cross-sectoral climate governance
- Justness of climate adaptation, preparedness and resilience across different scales

3.2.3 B.3 Comprehensive and timely biodiversity monitoring

Priority level: High (P2)

Keywords: *biodiversity monitoring; genetic diversity; remote sensing; harmonised indicators*

Impacts

Comprehensive, up-to-date, and policy-relevant ecosystem monitoring providing better understanding of biodiversity change remains a persisting challenge despite a variety of monitoring schemes. Understanding biodiversity change in dynamic environments experiencing stressors remains a gap in policy, risk assessments, associated decision making and planning. Knowledge varies over habitat types and species groups, and long-term data is often lacking. Establishing biodiversity thresholds in habitat assessments would greatly improve decision making, regulation and policy implementation targeting biodiversity. Biodiversity monitoring programmes remain scattered, lack intentionality and relevance often unable to provide timely information. Better coherence and strengthened monitoring capacity, with clearly defined benchmark references for group of species would significantly improve policy relevance, create indicators and support conservation outcomes on national and transnational level. This includes capacities for monitoring changes on the level of ecosystems, species and intraspecific diversity (DNA). Use of coherent methods allowing transboundary knowledge generation, biodiversity indicators utilisation and providing policy-oriented results relevant for management from local to European level. Sustained funding models for comprehensive and long-term monitoring are not fully established and remain disconnected due to lack of established biodiversity benchmarks.

Background & Rationale

The topic of B3 complements and connects with existing R&I initiatives described in Annex 8.

Topic Description

Focusing on biodiversity, comprehensive and timely monitoring for understanding ecosystem change emerged as the prioritised topic (Table 9). The importance of environmental monitoring was also emphasised, relating it to other issues, noting that data collection must be followed by knowledge generation and policy action.

TABLE 9 – COMPREHENSIVE AND TIMELY BIODIVERSITY MONITORING (SOURCE CASRI D3.2)

Proposed topic	Comprehensive and timely biodiversity monitoring
Description	Comprehensive, up-to-date, and policy-relevant ecosystem monitoring to create a better understanding of biodiversity change
Contribution to E&S challenges	Addressing fundamental knowledge deficits: Biodiversity monitoring programmes remain scattered, often unable to provide timely information. Several data gaps exist.
Transnational societal and policy relevance	Development of more comprehensive, coherent, up-to-date, policy-relevant biodiversity monitoring. Special attention to capabilities for: <ul style="list-style-type: none"> • Use of spatial data; • Aquatic biodiversity and management of water ecosystems; • Genetic diversity; • Soil biodiversity in natural and managed lands; • Monitoring and management of invasive species.
Systemic knowledge needs	Continuous accumulation of biodiversity monitoring data as a fundamental basis for understanding ecosystem functioning. Integration of biodiversity monitoring in protected-area management, ecological connectivity, freshwater and marine ecosystems, spatial planning and pressures associated with tourism and land-use change.
Transversal knowledge needs	Development of interfaces between different monitoring systems in national and European levels. Special opportunity for EPAs to serve as hubs of knowledge generation.
Actionable knowledge needs	Translation of biodiversity data into spatial planning, conservation management, restoration and investment decisions. Capacities to provide comprehensive and timely information for decision making. Citizen science approaches provide opportunities for actionable knowledge creation.

Significance of the topic and CASRI added values

The importance of comprehensive biodiversity monitoring has further increased with the adoption of the **EU Biodiversity Strategy for 2030**²¹, the **Nature Restoration Regulation**²² and the **Kunming-Montreal Global Biodiversity Framework**²³, all of which require harmonised indicators, measurable targets and long-term monitoring systems capable of assessing biodiversity status, trends and restoration outcomes. Particular challenges remain in the development of monitoring approaches addressing genetic diversity, despite its recognition as a key component of biodiversity conservation and ecosystem resilience.

CASRI added value

²¹ https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030_en

²² https://environment.ec.europa.eu/topics/nature-and-biodiversity/nature-restoration-regulation_en

²³ <https://www.cbd.int/gbf/introduction>

A major added value of CASRI is the explicit recognition of biodiversity monitoring across all three levels of biodiversity organisation: ecosystems, species and genetic diversity. Existing European monitoring initiatives are strongly focused on habitats and species, while genetic diversity remains underrepresented. Thus, CASRI can contribute by promoting the development of harmonised approaches for genetic monitoring, the use of DNA-based tools and the establishment of transnational biodiversity reference systems supporting both conservation and restoration policies for habitats and species.

Particular attention should be given to habitat monitoring, including the harmonisation of field-based vegetation and habitat surveys, indicators of habitat structure and functions, pressures and threats, reference conditions and thresholds, and their integration with Earth Observation and other innovative monitoring approaches.

R&I needs related to more comprehensive and timely biodiversity monitoring include at least:

- Development, validation and harmonisation of monitoring protocols combining established field-based methods with innovative observation technologies, ensuring comparability, reproducibility, quality assurance and fitness for policy and statutory reporting purposes
- Mobilisation, harmonisation and integration of existing long-term biodiversity datasets, including vegetation plots, habitat surveys and species occurrence data, to be considered as reference datasets for trend assessment, ecological modelling and validation of Earth Observation-derived indicators
- Monitoring and management plans for invasive species
- Aquatic biodiversity assessment and management of water ecosystems to achieve sustainable status of key ecosystems
- Genetic diversity in all environments, specially soil biodiversity in natural and managed lands
- Remote sensing and novel data sources allowing more timely and automated monitoring on the ecosystem level. Validation of Earth Observation and remote-sensing indicators through harmonised field-based ecological measurements should be considered an essential component of biodiversity monitoring innovation, particularly where remotely derived indicators are proposed for operational assessment or policy reporting.
- Modernizing monitoring, combining different data sources / methods, like eDNA and remote sensing.
- Cost-efficiency of new methods. More data on how innovative tools become full use. Creating indicators and benchmark references for restoration, conservation and policy management
- Utilisation of citizen science and participatory community-based approaches
- Develop biodiversity baselines and reference conditions to assess ecosystem restoration progress and success, ecological integrity and long-term resilience under climate change
- Research is also needed to determine how innovative monitoring approaches can be operationally integrated into established national monitoring frameworks, including the definition of sampling designs, indicators, reference conditions, thresholds, minimum data requirements and quality-control procedure
- European biodiversity data infrastructures should build on, and remain interoperable with, established national monitoring databases and institutional data architectures, avoiding duplication and ensuring that data generated by R&I projects can be integrated into long-term operational monitoring systems

3.3 C. Sustainable urbanisation

Background

Sustainable urbanisation refers to the planning of cities in ways that support economic growth, social well-being, and environmental sustainability. Cities are both a source of environmental and social challenges, often caused by the agglomeration of human population, but at the same time offer solutions and chances for sustainable development. Cities are therefore part of the problem as well as an important part of the solution. The concentration of environmental pressures such as greenhouse gas emissions, resource consumption and waste generation calls for new management and development activities to improve efficiency. It is here that innovation research views sustainable urbanisation as a transformative process through which cities adopt and generate technological, social, organisational, and policy innovations to address challenges. Researchers increasingly view cities as living laboratories where new solutions for energy, mobility, housing, governance, and environmental management can be developed, tested, and scaled.

Drivers and enablers

Expansion of urban uses, and often (but not always) population growth has increased demand for housing, transportation infrastructure, energy and water services, and other public infrastructure, creating pressure on land and urban systems. The impacts of climate change affect cities directly; risks associated with extreme weather events, flooding, heatwaves, and air pollution are increasingly occurring. The resource consumption for developing cities and urban uses is also a point of contention, as supply chains become rearranged and increasingly insecure. In addition, increasing social inequality in many cities has highlighted the need for more inclusive forms of urban development that provide equitable access to opportunities and services.

Innovation research is essential for sustainable urbanisation in many ways. Beyond widespread technological innovations which allow cities to improve efficiency and better monitor urban systems in real time, there are also many institutional aspects which are of relevance. Effective and new governance structures which aim for integrated planning approaches and supportive regulatory frameworks help coordinate the various interests and goals associated with sustainable urbanisation. Cross-silo thinking and acting is often complex to realize yet offer great areas of potential. Social participation is equally important, as community engagement and citizen involvement can improve the legitimacy and effectiveness of urban innovations. Financial mechanisms tied in closely with sustainable efforts offer capital infusion for action.

Impacts

Sustainable urbanisation aims to have a balanced impact upon economic, environmental, social, and governance dimensions. Focus is often laid upon environmental improvements in various sectors such as carbon emission reduction, climate adaptation, energy efficiency, improved waste management, and more sustainable use of land and natural resources. Innovations in building and construction technology as well as in consumer behaviour and demand structures drive the impact achievable by sustainable urbanisation. For example, through the impact on transport demand and transport network quality, demand for certain environmentally friendly forms of transport can be encouraged. Sustainable urbanisation may also reduce/ mitigate the amount of landtake and avoid

sealing and therefore support no net land take²⁴ and the soil monitoring law²⁵. The type and quality of services provided for cities and their populations have an impact on the quality of life, such as housing provision, sustainable mobility, proactive public health, and greater access to urban green. Social side effects and challenges such as exclusion from governance processes, gentrification, and unequal access to living spaces of high quality can create or enforce existing societal inequalities.

SDG relevance

Sustainable urbanisation is most directly linked to the **Sustainable Development Goals 11** (Sustainable Cities and Communities), which seeks to make cities inclusive, safe, resilient, and sustainable. This being said, sustainable urbanisation also has relevance for many other SDGs due to the diverse roles and duties associated with municipal and regional planning. Links exist to **SDG 3** (Good Health & Well-being), **SDG 6** (Clean Water and Sanitation), **SDG 7** (Affordable and Clean Energy), **SDG 9** (Industry, Innovation and Infrastructure), **SDG 12** (Responsible Consumption, Production) and **SDG 13** (Climate Action), **SDG 15** (Life on Land) and finally **SDG 17** (Partnerships for the goals).

3.3.1 C.1 Green Space Provision

Priority level: Medium (P3)

Keywords: *urban green space; nature-based solutions; ecosystem services; urban resilience*

Impacts

Green space provision is a core component of sustainable urbanisation because it integrates ecological systems into the built environment, reshaping cities to function more like adaptive socio-ecological systems rather than purely engineered spaces. It means deliberately embedding parks, green corridors, urban forests, wetlands, and nature-based infrastructure into urban planning actions to balance densification or land artificialization with environmental performance, liveability, and resilience. In practice, this shifts urban development away from grey, resource-intensive models toward hybrid green–blue infrastructures that regulate climate, manage water, support biodiversity, and improve human well-being.

Impacts can be expected and measured in various dimensions. Socially, improvements in physical and mental well-being can be observed. Further, green space provision offers further recreational opportunities in urban areas often lacking common spaces and points for communities to gather. Related to property prices, green spaces may have an impact on the attractiveness and price of certain neighbourhoods. If planned for restoring ecosystem services, the reduced need to treat stormwater for example may reduce cost associated with runoff infrastructure. The maintenance cost for green spaces vs. sealed areas should be considered in the planning phase to ensure continued viability of the parks. Environmental impacts are manifold and mainly relate to the restoring and improvement of ecosystem services, an important matter in times of accelerating climate change and associated climate risks.

²⁴ <https://op.europa.eu/fr/publication-detail/-/publication/f1ca6673-23cd-11e6-86d0-01aa75ed71a1/language-en>

²⁵ https://environment.ec.europa.eu/topics/soil-health/soil-monitoring-law_en

Background & Rationale

The topic of C1 “Green Space Provision” is included in existing R&I initiatives encompassing relevant SRIA or initiatives such as:

- **DUT (Driving Urban Transition)**²⁶ which is an European-wide partnership platform to address sustainable issues and fund future-oriented projects in intergovernmental research and innovation setting. The programme addresses key challenges of urban transitions such as mobility, digitalization and also green spaces,
- **Copernicus Land monitoring Service**²⁷ which is the Land Monitoring Service of the satellite observation platform Copernicus. It supports the use of open-source satellite imagery to support municipal and planning demands. By using the spectral information provided by certain Sentinel satellites, it is possible for users to monitor and manage urban green spaces more efficiently and with a stable time scale.
- The networking platform **Eurocities**²⁸ brings stakeholders from about 200 cities together to network and exchange on topics of importance to city planning and politics. One working topic of the network is dedicated to green areas and biodiversity.
- The New European Bauhaus²⁹ looks to address the broader public as well as architects and designers to engage in the transformation of urban areas to support the goals of the European Green Deal. Inclusive, sustainable and aesthetic and qualitative urban planning projects are supported in the very hands-on EU initiative, resulting also in the creation of innovative and socially important green spaces in existing city structures.

These programmes are examples of EU-wide initiatives which support the creation, management and politics related to green space provision. Further connections to other policies can be found in Annex 9.

Topic Description

The topic of green space provision (Table 10) derived from the research and innovation priorities collected by CASRI lies in finding solutions for more resilient urban areas, primarily through urban green and nature-based solutions. Knowledge needs include those related to coordinating stakeholders and scaling up the provision of ecosystem services (e.g. soil, rainwater capture, retention and reuse, prevention of urban heat islands) in areas in direct need of climate adaptation.

²⁶ [About | dut](#)

²⁷ [Understanding and managing urban green spaces — Copernicus Land Monitoring Service](#)

²⁸ [Eurocities - Home](#)

²⁹ https://new-european-bauhaus.europa.eu/index_en

TABLE 10 – GREEN SPACE PROVISION

Proposed topic	Green space provision
Description	This topic seeks to provide additional arguments and thematic connections to convince decision-makers to allocate resources and support initiatives aimed at increasing green spaces in urban areas. These are recognised to positively impact urban well-being and contribute to climate adaptation against weather extremes. At the site-specific level, future research could focus on addressing disturbed or contaminated soils in urban areas. Further, research on how to maximize environmental (biodiversity, climate resilience) and social (health, community engagement) benefits is of focus. Methods for research mentioned include living labs, with prioritization given to nature-based vs. technical solutions.
Contribution to E&S challenges	Land use decisions and changes significantly impact urban environments and quality of life. This research demand calls for a comprehensive and integrated approach to combine sectoral perspectives and achieve a more holistic understanding of the drivers, pressures and levers of change. The goal is to optimize land use for sustainable urban development through integrative thinking and policy design, alongside adequate data collection and monitoring. CASRI insights note the need for a better understanding of transformative change, requiring deeper insight into the processes of organisational, social, and behavioural shifts related to drivers of land use change, alongside improved utilization of data – including artificial intelligence, participatory citizen science, visioning exercises, and awareness-raising initiatives. The reconfiguration of the economy, incorporating considerations of sufficiency and justice, sustainable consumption, sustainable finance, incentives and disincentives for action, and regenerative economic paradigms, were also highlighted.
Transnational societal and policy relevance	This topic incorporates feedback from across CASRI themes. For sustainable urbanisation, the key issue of “land use and sustainable mobility” was prioritized highly. Similarly, within the biodiversity and climate theme, a better understanding of systemic interactions between different environmental challenges was stressed, addressing potential trade-offs and synergies – extending beyond biodiversity and climate-related activities. These key findings from both themes underscore the importance of an integrative approach to achieve innovative results. Furthermore, for the NESFET ³⁰ theme, “land use” was highlighted not only as a thematic priority but also as an integrative platform for exploring interlinkages.
Systemic knowledge needs	Addresses Green Deal goals (pollution-free environments, climate adaptation, biodiversity) with needs of integrated sectoral planning (city planning, energy and blue-green infrastructure, etc.).
Transversal knowledge needs	Involves the interplay between EU policies (e.g. Renewable Energy Directives, Nature Restoration Law) and activities by national agencies (e.g. EPAs often as monitors of national land use changes and trends).
Actionable knowledge needs	Outputs include pilot-tested data tools, use cases, policy guidance.

³⁰ Nature, Environmentally & Socially Friendly Energy Transition

Significance of topic and CASRI added values

Discussions and insights from CASRI have highlighted the limitations of relying solely on technological solutions to address societal and environmental challenges. Instead, integrated approaches to societal transformation are more of relevance, which requires asking different questions and fostering collaboration across disciplines and institutions. Key for the provision of urban green spaces is the importance of understanding co-benefits for both people and ecosystems, while also examining trade-offs and identifying who gains and who may be disadvantaged by particular interventions. It is here that a stronger role for the social sciences alongside technical and scientific expertise can be argued for. Communication on co-benefits should go beyond climate-related outcomes in order to resonate better with communities being provided with green space. Beyond communication, meaningful citizen involvement and co-creation are essential. Funding initiatives are encouraged to directly engage with communities to not only increase potential acceptance but also to generate more nuanced insights and design ideas. Innovative research on the topic would encompass interdisciplinary research that integrates arts, humanities, and environmental sciences, environmental alongside science-oriented approaches. Overall, methodological innovation and stronger interdisciplinary collaboration are needed to better demonstrate societal benefits, increase public support, and advance transformative environmental action.

3.3.2 C.2 Land Use and Sustainable Mobility

Subtitle: Synergies offered by transport (primarily transport of people, and in some cases freight) with other land use concepts (land use efficiency, reduction of land take, sponge city implementation)

Priority level: Low (P4)

Keywords: *land-use planning; sustainable mobility; compact urban form; accessibility*

Impacts

Land use and sustainable mobility are deeply interconnected within sustainable urbanisation because transport systems shape how cities expand, how land is consumed, and how efficiently urban space is used. When mobility planning is integrated with land use planning, cities can shift away from car-dependent sprawl toward compact, mixed-use development supported by high-quality public and active transport. This integration reduces inefficient land take, limits urban expansion into natural areas, and enables more efficient use of existing public infrastructure. At the same time, transport corridors and mobility infrastructure can be designed to support multifunctional land use, including green corridors and blue-green infrastructure, contributing to broader resilience strategies such as sponge city concepts that enhance water retention and flood mitigation.

Socially integrated land use and sustainable mobility increase the opportunities for mixed land uses, thus increasing accessibility to jobs, education, and services. It supports service provision by reducing travel times and reducing travel barriers. Better connectivity and accessibility have economic impacts as well, and it considerably contributes to the reduction in infrastructure maintenance cost. The integration of land use planning and sustainable mobility contributes to habitat preservation and a reduction of greenhouse gas emissions from transport. Often this integration requires the involvement and activation of multiple sectors of municipal planning. Such inter-sectoral cooperation strengthens policy coherence and enables more strategic, evidence-based decisions on urban planning.

Background & Rationale

The topic of C2 “Land Use and Sustainable Mobility” is included in existing R&I initiatives (see Annex 10) encompassing:

- TEN-T policy- EU's trans-European transport network policy³¹
- JPI Urban Europe SRIA³²
- Strategic Transport Research and Innovation Agenda (STRIA)³³
- CCAM SRIA³⁴ (Connected Cooperative Automated Mobility). Connected Cooperative Automated Mobility partnership is a public private partnership, which aligns all stakeholders' R&I efforts to accelerate the implementation of innovative CCAM technologies and services in Europe.
- CIVITAS³⁵, network of cities, for cities, dedicated to sustainable urban mobility
- Conference of European Directors of Roads CEDR Action Plan 2026-2028³⁶

Topic Description

Sustainability-oriented spatial urban development calls for integrative thinking between established sectors. This was made clear in CASRI with focus being set on the interlinkages of land use and mobility sectors (Table 11). The expected impacts on social, environmental and economic criteria play an important role as well. The development and understanding of scenarios can help coordinate sustainable development, from the building site level all the way to the regional, national and European level.

³¹ https://transport.ec.europa.eu/transport-themes/infrastructure-and-investment/trans-european-transport-network-ten-t_en

³² https://research-and-innovation.ec.europa.eu/research-area/transport/stria_en <https://jpi-urbaneurope.eu/about/sria/sria-2-0/>

³³ https://research-and-innovation.ec.europa.eu/research-area/transport/stria_en

³⁴ <https://www.connectedautomateddriving.eu/wp-content/uploads/2024/07/CCAM-SRIA-Update-2023.pdf>

³⁵ <https://civitas.eu/>

³⁶ www.CEDR.eu

TABLE 11 – LAND USE AND SUSTAINABLE MOBILITY (SOURCE CASRI D3.2)

Proposed topic	Land use and sustainable mobility
Description	For the regional spatial impact of transport decisions, a focus was placed on the synergies offered by transport (primarily the transport of people, and in some cases freight) with other land use concepts, such as land use efficiency, reduction of land take, and the implementation of “sponge city” principles. There was explicit recognition of the need to understand the impact of permitting processes, such as zoning, on issues of land take, and how to balance transport with land use.
Contribution to E&S challenges	This knowledge demand aims to contribute to understanding the broader societal impact of land use decisions on settlement structures. For example, the impact of transport choices on public health and the achievement of climate neutrality.
Transnational societal and policy relevance	Climate neutrality goals are of high priority for society. Some CASRI insights highlighted the need to progress towards this objective, while also recognising that physical infrastructure must support climate-neutral living. This requires a greater integration of mobility and land use fields, and widespread acceptance. CASRI data point towards promising methods of co-design and participation of civil society in developing feasible solutions due to the central role of the general population when it comes to influencing transportation patterns.
Systemic knowledge needs	Knowledge demands focus on the interplay between land use and mobility, and a need for innovative concepts to address evolving conditions, such as democracy crisis (e.g. populism) and climate change. A central question is how to integrate emerging land use needs, related to renewable energies and climate adaptation, into settlement structures that also support sustainability.
Transversal knowledge needs	Understanding the impact of local actions while adapting or creating supportive inter-/national frameworks is crucial, essentially mainstreaming effective solutions.
Actionable knowledge needs	Developing demonstrator sites for improved quality of life, building coalitions, and engaging communities are essential steps forward.

Significance of the topic and CASRI added values

The topic C2 is quite actionable in its description in CASRI. This indicates the importance of the topic to influence spatial structures and the environmental and societal impacts these have. The innovative use of data was stressed by stakeholders to better coordinate and plan land use and mobility infrastructures together so that proactive strategies can be created and monitored for their effectiveness. Data would not only feed into demands regarding emissions reduction but also the synergies with specific land uses (housing, green space allocation, etc.). The significance is thus established for a wide range of sectoral and planning related disciplines. Further, the topic touches upon the important interplay between urban and rural communities as a key lever for influencing sustainable planning practices, as the two spatial levels are heavily dependent upon each other. This requires coordination between various spatial and governmental scales on topics. Coordination can take place topically but also include questions of effective governance and institutional arrangements. Regarding institutional arrangements, systems for zoning and permitting have to be re-evaluated for their impact on land use and mobility patterns. This is one important example of how existing governance duties continue to contribute to land take, often in a detrimental manner.

3.3.3 C.3 Achieving social inclusion and assessing social impact

Subtitle: Better integrate social preconditions and needs when pursuing sustainable urbanisation projects.

Priority level: Low (P4)

Keywords: *social inclusion; social impact assessment; co-design; urban justice*

Impacts

Often actions for social inclusion in urban planning projects are considered beneficial where possible, yet not always feasible given time and financial constraints. It is generally accepted, however, that social cohesion provides many benefits worth pursuing. Social inclusion and systematically assessing social impact in sustainable urbanisation means embedding equity, accessibility, and lived social needs into the design, implementation, and evaluation of urban development projects. It involves actively identifying who benefits and who is excluded from urban interventions, and ensuring that lived spaces respond to diverse social conditions. This shifts sustainable urbanisation from a primarily technical or environmental agenda toward a socially grounded transformation of cities that prioritises people and their needs. Dimensions related to fairness, participation, and distributive justice are often considered. Innovation and research on social inclusion as well as social impacts of urban projects impacts governance structures. It can lead to the strengthening of legitimacy, transparency, and accountability in urban decision-making. Community trust can be fostered, thus enabling better cooperation between governmental and non-governmental parties.

Background & Rationale

The topic of C3 is included in existing R&I initiatives, SRIA or initiatives (see Annex 11) such as:

- JPI Urban Europe SRIA
- ESF SI+³⁷ initiative - European Competence Centre for Social Innovation
- The New European Bauhaus initiative, with its explicit focus on the inclusion of communities to help realize the goals of the European Green Deal in the construction sphere.

Knowledge demands for the theme of sustainable urbanisation stress the need for direct engagement with society through innovative means. Sustainable lifestyle choices can be supported by the contextual and regulatory setting as well as be a product of individual choices. On the one hand, there is a call for the comparison and operationalization of social innovation methods (co-design, co-management) for improved objective achievement. On the other hand, potential is seen in addressing consumption patterns of societal groups to help support sustainable lifestyle choices e.g. reducing car dependency and inefficient land use decisions. EPAs and alike organisations are vital to addressing the various points of this topic in their function as multipliers to various national, regional and local target groups (e.g. through consortium projects but also through strategic initiatives) as well as being general informer and supporter of sustainability initiatives (e.g. through general information campaigns and publications).

³⁷ <https://socialinnovationplus.eu/about/?gpwid=gpw-container>

Topic Description

TABLE 12 – ACHIEVING SOCIAL INCLUSION AND ASSESSING SOCIAL IMPACT (SOURCE CASRI D3.2)

Proposed topic	Achieving social inclusion and assessing social impact
Description	This topic aims to better integrate social preconditions and needs when pursuing projects relevant to sustainable urbanisation. This can include adapting co-design and co-management methods when carrying out projects, and highlighting social perspectives within dedicated research fields.
Contribution to E&S challenges	The focus is on engaging communities to establish them as active participants in sustainability research, thereby addressing existing disengagement and opposition. It looks to address both the contextual and regulatory setting in which initiatives are carried out to better address social needs as well as provide support in the form of knowledge or solutions for sustainable lifestyle changes.
Transnational societal and policy relevance	Social aspects, such as inclusion and co-design, are increasingly emphasised by the New European Bauhaus initiative (NEB) of the EU and the related EU Mission/NEB Facility. Further relevance is given to the objectives of cohesion between EU regions, as defined by Cohesion Policy and the related funding schemes (e.g., European Social Fund+).
Systemic knowledge needs	This topic calls for the integration of various disciplines to better understand community interests and impacts. It prioritises social equity, integrative thinking, and action, involving society in concepts such as climate adaptation and sponge cities. It also addresses the digitalisation of urban services and the creation of better data governance, alongside the essential social preconditions for successful inclusion.
Transversal knowledge needs	Knowledge exchange between different levels is crucial. Understanding the role of engagement, co-design, and co-management as means to achieve desired transformational impacts is paramount, as is aligning interests across various levels. European cohesion remains a key objective.
Actionable knowledge needs	Empowering communities, developing co-creation processes, and reaching consensus are essential. Encouraging interdisciplinary discussions—such as incorporating “Do No Significant Harm” perspectives into urban decision-making—will be vital.

Significance of the topic and CASRI added values

By focusing on the social dimension to the CASRI Theme of sustainable urbanisation, it opens up a more engaged methods for performing government duties. The added value lies in the knowledge generated by engaging diverse community stakeholders throughout the project lifecycle – prior to, during and following urban planning – as well as by implementing systematic methods to assess and monitor social outcomes and impacts. The impacts of urban development projects can vary considerably, and the needs, priorities, and lived experiences of different communities are rarely uniform. Effective research therefore requires a close alignment between research questions, methodological approaches, and the specific social, cultural, and institutional contexts in which urban planning takes place. Such context-sensitive and community-informed approaches increase the

relevance and legitimacy of research outcomes. When successfully implemented, the research can generate transferable knowledge for other communities facing similar challenges and contribute to the development of more inclusive, equitable, and resilient urban planning practices across Europe. Furthermore, they strengthen the potential for scaling up and validating research findings across diverse urban settings.

3.4 D. Nature, environmentally and socially friendly energy transition

Background

While the European Green Deal³⁸ established the long-term vision of climate neutrality and environmental sustainability, the theme is also closely linked to the Biodiversity Strategy³⁹ and the Nature Restoration Regulation⁴⁰. These initiatives highlight the need to ensure that the deployment of renewable energy systems contributes to climate and energy objectives without undermining biodiversity conservation, ecosystem integrity and nature restoration goals. Recent European policy developments increasingly frame the energy transition as a driver of competitiveness, resilience, strategic autonomy and security of supply. This shift is reflected in the Competitiveness Compass⁴¹, the Clean Industrial Deal⁴², the Affordable Energy Action Plan⁴³, FP10⁴⁴ discussions and the European Competitiveness Fund⁴⁵. It is also closely linked to wider European objectives under the European Economic Security Strategy⁴⁶, REPowerEU⁴⁷, the Net-Zero Industry Act⁴⁸ and the Critical Raw Materials Act⁴⁹. The transition is expected to contribute simultaneously to environmental sustainability, industrial competitiveness, affordable energy, energy sovereignty, social cohesion and long-term resilience. The challenge is not to choose between these objectives, but to identify synergies and manage trade-offs between them.

While the benefits of the energy transition are widely recognised, implementation remains challenging. It is characterised by competing societal interests, distributional impacts, and differing priorities across stakeholder groups. The large-scale deployment of renewable energy infrastructure may create tensions regarding land use, biodiversity conservation, landscape protection, water management, affordability and local acceptance. Ensuring transparency, participation and evidence-based decision-making is therefore crucial. Strengthened governance, stakeholder engagement and the systematic assessment of alternative transition pathways can support a just, inclusive and nature-compatible energy transition.

Drivers and enablers

The transition is driven by interconnected challenges and opportunities including climate change mitigation, biodiversity protection, energy security, economic resilience, competitiveness and technological innovation. Increasing recognition of the links between sustainability, industrial decarbonisation and strategic autonomy is creating new momentum for accelerating the transition. A key challenge is ensuring that expanding renewable energy systems do not undermine ecological and societal well-being.

³⁸ https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en

³⁹ https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030_en

⁴⁰ https://environment.ec.europa.eu/topics/nature-and-biodiversity/nature-restoration-regulation_en

⁴¹ https://commission.europa.eu/topics/competitiveness/competitiveness-compass_en

⁴² https://commission.europa.eu/topics/competitiveness/clean-industrial-deal_en

⁴³ https://energy.ec.europa.eu/strategy/affordable-energy_en

⁴⁴ <https://www.era-learn.eu/partnerships-in-a-nutshell/european-partnerships/next-framework-programme-fp10;>
<https://era.gv.at/fp10/position-papers/>

⁴⁵ https://single-market-economy.ec.europa.eu/access-finance/european-competitiveness-fund_en

⁴⁶ <https://www.consilium.europa.eu/en/policies/european-economic-security/>

⁴⁷ https://commission.europa.eu/topics/energy/repowerEU_en

⁴⁸ https://single-market-economy.ec.europa.eu/industry/sustainability/net-zero-industry-act_en

⁴⁹ https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials/critical-raw-materials-act_en

Important enablers include effective multi-level governance, policy coherence, stakeholder participation, cross-border cooperation, energy communities, territorial planning and improved science-policy-practice interfaces. EPAs and related organisations can play a key role by providing environmental evidence, monitoring data and implementation experience that help reconcile environmental, economic, political and social objectives. The systematic comparison of transition pathways can support evidence-based policymaking by identifying synergies, trade-offs, and key leverage points for change, enabling more coherent decisions that balance environmental protection, energy security, competitiveness and social justice.

Impacts

A nature-, environmentally- and socially friendly energy transition supports climate mitigation, reduces environmental pressures and contributes to biodiversity conservation and nature restoration. It also generates economic and societal benefits by supporting industrial decarbonisation, reducing dependence on imported fossil fuels, fostering innovation and creating employment opportunities. In parallel, it can contribute to social inclusion, reduced energy poverty, improved affordability, and greater public trust in decision-making processes.

R&I in this field contributes to reaching the objectives of the European Green Deal, the Competitiveness Compass, as well as National Energy and Climate Plans. It is relevant for the implementation of two major European Competitiveness Fund policy windows: “Clean Transition and Industrial Decarbonisation” and “Health, Biotech, Agriculture and Bioeconomy”. Both policy windows explicitly recognise the role of sustainable energy systems, industrial decarbonisation, renewable energy deployment, circular resource use, bioeconomy solutions and environmental resilience as foundations of future European competitiveness.

SDG relevance

Nature-, environmentally- and socially friendly energy transition contributes to **SDG 7** (Affordable and Clean Energy), to **SDG 13** (Climate Action), and to **SDG 15** (Life on Land). It also supports **SDG 9** (Industry, Innovation and Infrastructure) through innovation, industrial decarbonisation, resilient infrastructure and resilient infrastructure, and **SDG 11** (Sustainable Cities and Communities) through more sustainable and energy-efficient urban and rural areas.

By supporting a just transition, reducing energy poverty and promoting inclusive governance, the theme also contributes to **SDG 10** (Reduced Inequalities) and **SDG 16** (Peace, Justice and Strong Institutions). Cross-border cooperation, knowledge exchange and coordinated policy development further support **SDG 17** (Partnerships for the Goals).

Overall, the theme integrates environmental protection and social inclusion, contributing to a systemic approach for achieving the SDGs while contributing to emerging European priorities related to competitiveness, resilience, strategic autonomy and security of supply.

3.4.1 D.1 Governance of nature-, environmentally and socially friendly energy transition

Subtitle: Frameworks, policies, and collaborative mechanisms needed to coordinate stakeholders, create effective regulatory and incentive systems and ensure transparency & participation.

Priority level: Medium (P3)

Keywords: *energy-transition governance; renewable deployment; biodiversity safeguards; policy coherence*

Impacts

Effective governance is a critical prerequisite for achieving the energy transition. While technological solutions for renewable energy generation and energy efficiency continue to advance rapidly, their successful deployment ultimately depends on governance systems capable of balancing different policy frameworks, societal interests and stakeholders. Additional research and innovation on governance can generate substantial benefits by improving policy coherence, accelerating implementation, reducing administrative barriers and strengthening public trust.

Recent initiatives including the Clean Industrial Deal, the Affordable Energy Action Plan and the European Competitiveness Fund increasingly recognise governance, regulatory efficiency, stakeholder engagement and multi-level coordination as critical conditions for delivering the energy transition.

Better coordination and cross-border cooperation among public authorities, regulators, funding bodies, Environmental Protection Agencies (EPAs), businesses and civil society can increase implementation efficiency, and reduce delays caused by fragmented responsibilities and conflicting objectives.

Background & Rationale

Governance is increasingly recognised as a critical dimension of the energy transition in European research and innovation initiatives. Existing initiatives such as the European Energy Research Alliance (EERA) Joint Programme “e3s – clean Energy TranSition for Sustainable Society”⁵⁰, the Clean Energy Transition Partnership (CETP)⁵¹, and the Covenant of Mayors⁵² acknowledge that successful energy transitions require more than technological innovation alone. They highlight the need for integrated governance approaches, multi-level coordination, effective regulatory frameworks, stakeholder participation and stronger links between policy objectives and implementation capacities.

The governance of energy transition must respond to a broader global context characterised by climate change, biodiversity loss, resource constraints, geopolitical uncertainty and growing concerns regarding energy security, resilience and strategic autonomy. While the necessity of a nature friendly energy transition is well established in scientific and political discourse, its societal dimension requires greater attention. It must move beyond a narrow focus on CO₂ reduction and instead adopt integrated and transdisciplinary system approaches capable of managing complex

⁵⁰ [EERA Joint Programme e3s - Home](#)

⁵¹ [CETPartnership – Clean Energy Research & Innovation Funding](#)

⁵² <https://eu-mayors.ec.europa.eu/en/Why-the-Covenant-of-Mayors>

interactions between environmental protection, industrial competitiveness, energy security and social justice.

Topic Description

TABLE 13 – GOVERNANCE OF NATURE-, ENVIRONMENTALLY AND SOCIALLY FRIENDLY ENERGY TRANSITION (ADAPTED FROM CASRI D3.2)

Proposed topic	Governance of nature-, environmentally and socially friendly energy transition
Description	Governance of nature-, environmentally and socially friendly energy transition refers to the frameworks, policies, and collaborative mechanisms needed to steer the transition towards sustainable, competitive, resilient and socially just energy systems. It includes regulatory and incentive systems, stakeholder participation, territorial planning, cross-border cooperation and multi-level governance arrangements that ensure transparent and democratic decision-making, balancing ecological, social, economic and political dimensions in guiding the energy transition.
Contribution to E&S challenges	Governance of nature-, environmentally, and socially friendly energy transition contributes to addressing challenges by providing transparent and inclusive frameworks that balance ecological protection, social justice, and economic resilience. It supports the integration of renewable systems, fosters cross-border cooperation, and ensures that the transition is both just and sustainable for present and future generations.
Transnational societal and policy relevance	The topic is highly relevant across Europe because energy systems, infrastructure networks, environmental impacts and security-of-supply challenges increasingly transcend national borders. By providing effective regulatory frameworks and coordinated policies, governance of nature-, environmentally, and socially friendly energy transition enables a fair distribution of benefits and burdens, addresses energy poverty, and aligns national and regional strategies with broader sustainability goals. It thus strengthens democratic legitimacy, public trust, policy coherence and implementation capacity, while supporting European priorities related to competitiveness, industrial decarbonisation, resilience, preparedness and strategic autonomy.
Systemic knowledge needs	How can objectives related to climate neutrality, energy transition and biodiversity protection be reconciled with societal aspects?
Transversal knowledge needs	How can European policy frameworks, funding instruments and regulations be effectively connected to national authorities, EPAs, municipalities, businesses, energy communities and citizens through multi-level governance arrangements?
Actionable knowledge needs	Pathways for combining social aspects and targeted support for implementation at the local level, including regulatory simplification, incentive structures, stakeholder engagement mechanisms and territorial planning approaches.

Significance of the topic and CASRI added values

The relevance of governance for energy transition is increasingly recognised across European research, innovation and policy initiatives. The topic is closely aligned with the European Competitiveness Fund policy window "Clean Transition and Industrial Decarbonisation", which highlights governance capacities, regulatory frameworks and implementation mechanisms for accelerating renewable energy deployment. (Marelli, 2026) Similar priorities and synergies exist with the Clean Energy Transition Partnership (CETP)⁵³, the EERA e3s Strategic Research and Innovation Agenda⁵⁴, Horizon Europe Missions, the City Research and Innovation Agenda (CRIA)⁵⁵, all of which emphasise policy coordination, stakeholder engagement, just transition and socio-technical approaches (see Annex 12). The topic is also consistent with recommendations from the EEA Scientific Committee (EEA, 2026a) for research on innovative governance and policy effectiveness, which call for integrated and adaptive governance approaches capable of addressing complexity, uncertainty and cross-sectoral interdependencies.

CASRI reinforces this perspective addressing the research and innovation needs of organisations that operate at the interface between science, policy and implementation. Environmental Protection Agencies (EPAs) and related organisations play a key role in supporting implementation and facilitating dialogue among different stakeholders. A central contribution of CASRI is therefore to strengthen the knowledge base for governance processes and governance innovations that are transparent, inclusive and socially legitimate and enable the reconciliation of multiple policy objectives.

CASRI contributes to addressing current knowledge gaps through questions such as:

- How can governance frameworks support the implementation and valorisation of energy-transition pathways and roadmaps?
- How can governance frameworks balance renewable energy deployment with biodiversity conservation, ecosystem restoration and landscape protection?
- How can EPAs and related organisations strengthen science–policy–practice interfaces and implementation-oriented decision-making?
- Which governance mechanisms foster societal acceptance, stakeholder participation and energy communities?
- How can authorities, funding instruments and policy domains be better aligned across governance levels?
- Which regulatory innovations and simplification measures can accelerate renewable energy deployment while maintaining environmental safeguards and public trust?
- What are the long-term impacts of different incentive and subsidy structures on renewable energy adoption, societal acceptance and environmental outcomes?

How can cross-border governance arrangements strengthen renewable energy integration, regional cooperation and energy security?

⁵³ CETP SRIA: [CETP SRIA v1.0-endorsed](#)

⁵⁴ Strategic Research & Innovation Agenda 2023 – 2030: eera-e3s.eu/component/attachments/?task=download&id=1093

⁵⁵ [GCoM Innovate4Cities 2022 Booklet.pdf](#)

3.4.2 D.2 Societal engagement

Subtitle: Active involvement of citizens, communities, and stakeholders in shaping the energy transition process.

Priority level: Low (P4)

Keywords: *citizen participation; social acceptance; energy communities; behavioural change*

Impacts

A successful energy transition must not only be technically feasible but also broadly supported by society. Research on societal engagement can strengthen public participation, social acceptance and societal ownership of the energy transition. As Europe seeks to simultaneously achieve climate neutrality, biodiversity protection, energy security, competitiveness and resilience, societal engagement becomes a key prerequisite for successful implementation. The transition raises fundamental questions about sufficiency (how much energy do we really need?) and efficiency (how to best use energy), affecting individuals, households, communities and businesses alike. It also generates debates and conflicts around land use, biodiversity conservation, renewable energy deployment and the distribution of costs and benefits across different social groups and regions.

Research can help bridge the knowledge-action gap by improving understanding of behavioural change, incentives, social norms, public engagement and mechanisms for participation. It can further support the development of energy communities, citizen science initiatives and participatory governance approaches that contribute to socially accepted, nature-positive and just transition pathways. Strengthened societal engagement can ultimately improve implementation, reduce conflicts, increase trust in institutions and support more inclusive and resilient energy systems, thus contributing to the objectives of the European Green Deal⁵⁶, the Competitiveness Compass⁵⁷, the Clean Industrial Deal⁵⁸ and the Affordable Energy Action Plan⁵⁹.

Background & Rationale

Societal engagement is increasingly recognised as a critical dimension of successful energy transitions within European research and innovation initiatives. Programmes such as the Driving Urban Transitions partnership (DUT)⁶⁰, Clean Energy Transition partnership (CETP)⁶¹, the Built4People partnership⁶², the European Institute of Innovation and Technology (EIT)⁶³, the EERA e3s Joint Programme⁶⁴ and initiatives supporting energy communities all emphasise societal engagement (see Annex 13). These initiatives address this topic through concepts such as citizen participation, co-creation, and participatory governance, including approaches such as living labs, innovation communities, and local energy projects with strong citizen engagement.

⁵⁶ https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en

⁵⁷ https://commission.europa.eu/topics/competitiveness/competitiveness-compass_en

⁵⁸ https://commission.europa.eu/topics/competitiveness/clean-industrial-deal_en

⁵⁹ https://energy.ec.europa.eu/strategy/affordable-energy_en

⁶⁰ [Driving Urban Transition to a sustainable future. | dut](#)

⁶¹ [CETPartnership – Clean Energy Research & Innovation Funding](#)

⁶² [Built4People – European partnership under Horizon Europe](#)

⁶³ [European Institute of Innovation & Technology \(EIT\) | EIT](#)

⁶⁴ [EERA Joint Programme e3s - Home](#)

Societal engagement is key to building support within society, encouraging behavioural change, and ensuring a fair and equitable transition, particularly for vulnerable groups. By strengthening governance and stakeholder coordination at the regional level, the transition can be better aligned with broader goals such as reducing energy poverty and promoting social justice. Achieving this requires effective governance frameworks that ensure coordination, regulatory efficiency, and cross-border cooperation.

Topic Description

TABLE 14 – SOCIETAL ENGAGEMENT (ADAPTED FROM CASRI D3.2)

Proposed topic	Societal engagement
Description	Societal engagement refers to the active involvement of citizens, communities, and stakeholders in shaping the energy transition process. It encompasses fostering public awareness, encouraging behavioural change, and creating inclusive spaces for dialogue and co-design. By strengthening participation and democratic practices, societal engagement helps to build trust, ensure social acceptance, and promote equitable and sustainable energy solutions. Examples such as renewable energy communities demonstrate how collective action can strengthen local participation, as energy communities go beyond electricity sharing by promoting democratic participation, social inclusion, and environmental responsibility.
Contribution to E&S challenges	Key challenges include public disengagement, disinformation, insufficient public involvement in the energy transition and conflicts associated with renewable energy deployment, biodiversity conservation and land use. Strengthening societal engagement can help address these challenges by supporting social acceptance, social and procedural justice, and nature-positive transition pathways.
Transnational societal and policy relevance	Understanding the drivers and political implications of social acceptance and behavioural change is highly relevant across Europe. Equally important is understanding how public support and participation can contribute to more sustainable energy systems and exploring ways to foster new eco-social energy solutions, thereby strengthening the overall energy transition.
Systemic knowledge needs	How can energy transition, climate neutrality, biodiversity protection, climate adaptation, circular economy objectives and social justice be addressed simultaneously through societal engagement? This requires attention to systemic factors shaping engagement, including societal structures, dynamics, and barriers that influence participation across regions.
Transversal knowledge needs	How can EU policy, national agencies (e.g. EPAs), regions, cities and municipalities be engaged in ways that strengthen societal participation and mutual learning on how social engagement contributes to energy, climate and environmental objectives?
Actionable knowledge needs	Practical knowledge is needed at all levels of governance, including roadmaps, participation frameworks, citizen engagement tools, educational approaches, policy guidelines, territorial planning models and community-based solutions that strengthen participation, support behavioural change and contribute to socially accepted energy transitions.

Significance of the topic and CASRI added values

Synergies with other relevant initiatives

The topic of societal engagement is a central component of several ongoing R&I initiatives, including CETP, DUT, Built4People, EIT initiatives, energy community programmes and the EERA e3s Strategic Research and Innovation Agenda. These initiatives recognise citizen participation, co-creation, behavioural change and inclusive governance as important enabling factors for successful energy transitions. The topic is also closely aligned with recommendations from the EEA Scientific Committee on Sustainability R&I (EEA, 2026a), which emphasise meaningful participation, capacity building, citizen science and stronger integration of practical knowledge into sustainability research and policymaking.

Added values

CASRI positions societal engagement as a practical governance mechanism for implementing socially accepted, nature-positive and just energy transitions and reconciling competing objectives such as climate neutrality, biodiversity conservation, territorial development, social justice and economic resilience. Added value of the CASRI approach lies in the coordination, scaling, and institutional learning processes across regions and governance levels. Research within this topic should help identify ways to permanently embed societal engagement within institutions and decision-making, and in particular how this can be supported by EPAs and related organisations as intermediaries between science, policy and society.

Key R&I questions include:

- How can societal engagement support socially accepted and nature-positive renewable energy deployment?
- How can energy communities contribute to just transitions, local resilience, and energy democracy?
- How can public participation improve territorial planning, management of land-use conflicts?
- Which approaches are most effective for reducing energy poverty and addressing distributional impacts?
- How can public engagement, education strengthen support for energy transitions?
- How can different stakeholder groups contribute to decisions on sustainable energy mixes?
- How can participation processes distinguish between tokenistic and genuinely empowered forms of engagement?
- How can local capacity gaps for participation and co-creation be identified and addressed?
- Which mechanisms are most effective for integrating practical knowledge into research, policymaking and implementation processes, for example through citizen science, multi-stakeholder advisory bodies and participatory policy impact assessments?
- How can EPAs support inclusive dialogue, citizen engagement and participatory decision-making?
- Which participation models are most effective in fostering trust, legitimacy and long-term societal acceptance of transition pathways?
- Which cultural, behavioural and psychological factors enable or hinder sustainability transitions in organisations and communities, and how can they be addressed?

3.4.3 D.3 Comparing scenarios

Subtitle: Identification of key levers for change in the energy transition. It explores how scenario analysis can inform strategic decisions by highlighting ecological risks, trade-offs, and long-term sustainability pathways beyond 2030.

Priority level: Low (P4)

Keywords: *transition scenarios; foresight; trade-off assessment; decision support*

Impacts

Scenario analysis is essential for supporting evidence-based decision-making in a nature-, environmentally- and socially friendly energy transition. By comparing alternative development pathways, it can help identify key levers for change, improve understanding of long-term consequences and support strategic choices under conditions of uncertainty.

The energy transition is characterised by rapid technological change, large-scale investments and increasing interactions between climate objectives, biodiversity protection, resource use, competitiveness, resilience and energy security. Scenario analysis can help assess environmental, social, economic and technological impacts simultaneously, enabling decision-makers to identify synergies, understand trade-offs and evaluate the consequences of action, delayed action and non-action.

Scenario analysis is increasingly relevant for informing European policy initiatives such as the European Green Deal, the Competitiveness Compass, the Clean Industrial Deal, FP10, National Energy and Climate Plans and the European Competitiveness Fund. These frameworks require evidence on how different transition pathways affect competitiveness, resilience, biodiversity, energy security and societal well-being. By improving the comparability, transparency, and inclusiveness of scenario development, research can strengthen stakeholder engagement, facilitate dialogue among different actors and support more robust policy and investment decisions.

Background & Rationale

The energy transition is taking place in a context of rapid technological change, large-scale investments, geopolitical uncertainty and increasing pressure to simultaneously achieve climate neutrality, biodiversity protection, competitiveness, resilience and energy security. Recent European policy developments such as the European Green Deal, the Competitiveness Compass, the Clean Industrial Deal, FP10 discussions, National Energy and Climate Plans (NECPs) and the European Competitiveness Fund increasingly require evidence on the long-term implications of alternative transition pathways and the trade-offs between sustainability, competitiveness and security objectives.

Comparing scenarios provides a structured approach for exploring alternative futures beyond 2030 and assessing the consequences of action, delayed action and non-action. By integrating environmental, social, economic and technological dimensions, scenario analysis can identify key levers for change and support transparent, evidence-based decision-making regarding biodiversity, resource use, competitiveness, social justice and energy security.

Topic Description

TABLE 15 – COMPARING SCENARIOS (ADAPTED FROM CASRI D3.2)

Proposed topic	Comparing scenarios
Description	Comparing scenarios focuses on foresight and the identification of key levers for change in the energy transition. It explores how scenario analysis can inform strategic decisions by highlighting ecological risks, trade-offs, and long-term sustainability pathways beyond 2030. Central research needs include developing effective methodologies to evaluate the environmental and social costs and benefits of different transition options and understanding the implications of action versus inaction. Robust scenario planning is therefore essential to ensure ecological resilience and to guide policy and investment choices towards a more sustainable energy future.
Contribution to E&S challenges	Scenario comparison enables policymakers and stakeholders to anticipate risks, identify synergies, assess ecological and social trade-offs, and evaluate alternative transition pathways. It supports informed decisions that balance environmental integrity, social acceptance, and long-term resilience of the energy infrastructure beyond 2030.
Transnational societal and policy relevance	Comparing scenarios enhances transparency in decision-making, builds public trust, and helps to navigate conflicting interests in the energy transition. By providing evidence-based insights into future risks, opportunities, and trade-offs, it enables policymakers to design strategies that ensure cross-border energy security and are both socially and ecologically acceptable.
Systemic knowledge needs	How can integrated methodologies combine environmental, social, economic, technological and governance dimensions when comparing transition scenarios? There is a need for interdisciplinary approaches that connect foresight tools, risk assessments, and policy analysis to identify leverage points for sustainable change and improve understanding of the long-term resilience and stability of renewable energy systems. Furthermore, advancing knowledge on how different scenarios interact across scales—local, regional, and global—will be crucial to ensure resilience and coherence in long-term energy strategies.
Transversal knowledge needs	How can collaboration across disciplines, sectors, and governance levels help scenario comparisons in capturing the full complexity of the energy transition? This includes fostering data sharing and harmonised methodologies across countries, integrating social and environmental dimensions into scenario models, and linking foresight exercises to democratic participation and stakeholder engagement.
Actionable knowledge needs	Concrete outputs are needed, including transition pathways that integrate sustainability, competitiveness, resilience and energy security objectives. Also, practical tools and guidelines are needed that enable policymakers to use scenarios effectively. This includes creating accessible decision-support systems, translating complex foresight results into clear policy options, and designing mechanisms for monitoring and adapting strategies over time. Pilot projects and case studies are also required to demonstrate how scenario comparisons can directly inform governance, investment choices, and societal engagement in the energy transition.

Significance of the topic and CASRI added values

Scenario development and foresight are central components of several European initiatives (see Annex 14), including the Clean Energy Transition Partnership (CETP)⁶⁵, the EERA e3s Strategic Research and Innovation Agenda⁶⁶, JRC foresight activities, the European Strategy and Policy Analysis System (ESPAS)⁶⁷ and Horizon Europe Missions. These initiatives emphasise long-term transition pathways, integrated assessment approaches and evidence-based decision-making under uncertainty. Similar priorities are reflected in FP10 discussions and the European Competitiveness Fund, particularly within the policy window "Clean Transition and Industrial Decarbonisation". Common priorities shared with CASRI include foresight beyond current policy cycles, integrated assessment of environmental and societal impacts, and strengthened support for strategic decision-making.

CASRI adds value by promoting scenario approaches that integrate environmental, social, economic and governance dimensions while maintaining a strong implementation perspective. Drawing on the role of EPAs as providers of environmental evidence, monitoring data and implementation experience, CASRI can improve the comparability, transparency and policy relevance of scenarios across countries and regions. Particular emphasis is placed on strengthening the links between foresight, implementation and decision-making, while ensuring that biodiversity, societal expectations, territorial impacts and long-term sustainability considerations are adequately reflected in future pathways. CASRI also supports interdisciplinary and participatory approaches to scenario development, enabling mutual learning across countries and governance contexts.

Key R&I questions include:

- Which energy-transition pathways best balance climate neutrality, biodiversity protection, competitiveness, resilience and energy security?
- How can scenario methodologies better integrate environmental, social, economic and governance dimensions?
- What are the environmental effects of rapid technological change and large-scale transition investments?
- What are the costs, benefits and long-term consequences of action, delayed action and non-action?
- Which pathways are most likely to deliver nature-positive and socially accepted energy systems?
- How can scenario analysis strengthen the translation of research into policy, implementation and investment decisions?
- How can stakeholder perspectives and local knowledge be integrated into scenario development and foresight processes?
- How can EPAs and related organisations use scenario analysis to strengthen evidence-based policymaking and implementation?

⁶⁵ CETP SRIA: [CETP SRIA v1.0-endorsed](#)

⁶⁶ Strategic Research & Innovation Agenda 2023 – 2030: eera-e3s.eu/component/attachments/?task=download&id=1093

⁶⁷ [About | ESPAS](#)

3.5 E. Security

Background

Security has emerged as a cross-cutting priority throughout the CASRI process, reflecting growing recognition that reliable, secure and fair environmental knowledge systems are essential for effective sustainability governance. Two interconnected challenges define this theme: the security and integrity of environmental data (E1) and the social vulnerabilities associated with climate adaptation actions (E2). Both topics highlight a common concern: without robust governance frameworks, reliable data infrastructures and socially inclusive approaches, environmental and climate policies may fail to achieve their intended outcomes. Across participating countries and organisations, these issues were consistently identified as increasingly important, even where national frameworks remain fragmented or under development.

Drivers and enablers

Several major forces are driving the need for research and innovation on security. The rapid expansion of digital technologies, AI systems and distributed sensor networks is generating growing volumes of environmental data while introducing new vulnerabilities. At the same time, climate change is increasing social risks, disproportionately affecting vulnerable populations and exposing weaknesses in adaptation governance across scales. Progress is supported by the emergence of European and international frameworks promoting both secure environmental data governance and socially just climate adaptation, as well as growing recognition that environmental security depends on reliable data ecosystems and socially resilient adaptation pathways. This is reflected in developments such as the European Data Governance Act⁶⁸, the EU Adaptation Strategy⁶⁹ and recent EEA Scientific Committee recommendations (EEA, 2026a).

Impacts

Research and innovation under Theme E would strengthen sustainable environmental governance by improving both the security of environmental information systems and the social resilience of climate adaptation pathways. Advances in environmental data security would enhance the reliability and interoperability of environmental monitoring systems, support trusted cross-border cooperation, and strengthen the evidence base for environmental and climate policies. At the same time, a better understanding of social vulnerabilities would enable more equitable adaptation measures, reducing maladaptation risks, improving the protection of vulnerable populations, and strengthening public trust in climate action. Together, these advances would support more resilient institutions, more informed decision-making, and a more inclusive sustainability transition. By addressing both technological and societal dimensions of environmental security, Theme E contributes to the implementation of the European Green Deal⁷⁰, the European Data Governance Act, the EU Adaptation Strategy, and broader international commitments related to climate resilience and sustainable development.

SDG relevance

Theme E contributes primarily to **SDG 16** (Peace, Justice and Strong Institutions) and **SDG 13** (Climate Action), which are shared across both topics and reflect the core ambition of the theme:

⁶⁸ [European Data Governance Act | Shaping Europe's digital future](#)

⁶⁹ [EU Adaptation Strategy - Climate Action - European Commission](#)

⁷⁰ [The European Green Deal - European Commission](#)

building trustworthy, equitable and effective environmental governance systems. **SDG 10** (Reduced Inequalities) and **SDG 11** (Sustainable Cities and Communities) are central to E.2, while **SDG 9** (Industry, Innovation and Infrastructure) anchors the data security and interoperability dimensions of E1.

3.5.1 E.1 Comprehensive data security and environmental data

Priority level: Medium (P3)

Keywords: *environmental data security; cybersecurity; interoperability; trusted data*

Impacts

Investing in research and innovation on the security and integrity of environmental data offers a powerful lever to strengthen the collective capacity to make informed decisions and respond effectively to environmental crises. Reliable, secure and interoperable data improve the accuracy and continuity of environmental monitoring, strengthen cross-border cooperation between agencies, and provide a robust evidence base for public policies, which is essential for both their effectiveness and legitimacy.

Without such progress, compromised or inaccessible data may lead to poorly designed or even counterproductive policies. Research and innovation can also help address risks related to the generation and use of environmental data, including cyber threats, data manipulation, interoperability failures, disinformation, and biases introduced by increasingly complex digital and artificial intelligence systems.

From an **environmental perspective**, advances in data governance and security would improve the responsiveness of ecological monitoring systems covering air quality, biodiversity, water resources and other environmental domains in the face of rapidly evolving environmental challenges. **From a social perspective**, securing environmental data infrastructures strengthens trust among citizens and scientific communities, creating opportunities for greater participation through citizen science and the co-production of knowledge. **From an economic perspective**, a shared framework of trust reduces the costs associated with regulatory inaction and creates favourable conditions for stronger public-private cooperation around the data assets managed by environmental agencies.

By developing robust technical, legal and organisational frameworks, research and innovation in this field actively contributes to the objectives of the European Green Deal and the European Data Governance Act, strengthens the capacity of Member States to fulfil their international commitments, and supports national strategies for ecological planning. Environmental data security is not merely a technical prerequisite for action; it is a structural enabler of effective and credible sustainability policies.

Background & Rationale

Several existing R&I initiatives and international frameworks (see [Annex 15](#)) already address questions related to environmental data security, governance and interoperability, such as

- The **Water4All SRIA**⁷¹ (Horizon Europe partnership)
- The **UNEP Global Environmental Data Strategy (GEDS)**⁷²

⁷¹ [Strategic Research and Innovation Agenda | European Partnership Water4All](#)

⁷² [Global Environmental Data Strategy \(GEDS\) | UNEP - UN Environment Programme](#)

- **UNEA Resolution 4/23**⁷³ mandated by UNEP

The concept of Transnational Environmental Data Security⁷⁴ highlights the need for cross-border environmental data protection, addressing security of geospatial, biodiversity, climate, and pollution data, and risks such as cyberattacks on monitoring systems and manipulation of biodiversity, climate and pollution datasets.

The Data & Policy benchmarking of global data governance frameworks (Marcucci et al, 2023) provides a comparative analysis of transnational models emphasising responsible data reuse, global harmonisation, and the integration of human rights principles applicable to cross-border environmental data.

These programmes share with CASRI topic E1 a common focus on (1) strengthening data governance frameworks across borders, (2) ensuring data integrity, reliability and security throughout the generation, sharing and use of environmental data, and (3) building institutional capacities to manage environmental data risks responsibly.

Beyond these existing initiatives, environmental data security concerns cut across all sustainability themes identified in the CASRI process. Security issues related to the generation and use of environmental data were consistently raised across participating countries and regions, reflecting a broadly shared recognition that data security extends well beyond the protection of information. It is a fundamental enabler of effective environmental risk management and policy action. Without robust data security frameworks, data-driven environmental policies risk being inaccurate, ineffective or even counterproductive. Key considerations include ensuring data integrity and reliability for accurate monitoring, protecting sensitive data, building trust among stakeholders to facilitate collaboration, for example through citizen science, and preventing data misuse.

Topics Description

The security concerns relate to environmental and sustainability issues in several ways. In CASRI results, security issues related to generation and use of environmental data were present across the themes. Widely understood data security isn't just about protecting information; it's a fundamental enabler of effective risk management and environmental action (Table 16).

⁷³ <https://www.unep.org/resources/resolutions-treaties-and-decisions/UN-Environment-Assembly-4>

⁷⁴ Transnational Environmental Data Security → Term

TABLE 16 – COMPREHENSIVE DATA SECURITY AND ENVIRONMENTAL (ADAPTED FROM CASRI D3.2)

Proposed topic	Comprehensive data security and environmental
Description	Comprehensive data security addresses risks related to the generation and use of environmental data.
Contribution to E&S challenges	Safeguarding the accuracy and reliability of environmental data is fundamental for responding to E&S challenges. Security concerns stem from rapid technological developments, challenges related to open data, a lack of clear legal frameworks, inconsistencies of data governance, and inadequate data infrastructures and processes for sharing environmental data across international borders. Addressing security and privacy concerns builds trust among stakeholders (governments, researchers, NGOs, local communities) and increased trust fosters greater collaboration in sharing data and prevents misuse.
Transnational societal and policy relevance	Security considerations are a prerequisite for effective international environmental data sharing and cooperation – without robust data security and governance, trust erodes, collaboration stalls, and the potential for data-driven solutions remains unrealized. Collaboration requires an understanding of transnational data governance and knowledge regarding how geopolitical tensions and varying national security interests influence data sharing willingness.
Systemic knowledge needs	Comprehensive security requires a deeper, more systemic understanding of the legal, technical, and societal factors that underpin data sharing and how these factors interact to create vulnerabilities. Systemic knowledge needs relate to an understanding of legal and governance issues related to national laws and practices, optimal technical design models of complex environmental data systems across different sectors and security protocols by EPAs and other organisations, the ethical implications of data use and privacy concerns related to environmental data sharing, and liability and fair use.
Transversal knowledge needs	Transversal knowledge needs highlight a need to move beyond siloed approaches to data security. It requires fostering communication, collaboration, and adaptability across disciplines and organisational boundaries to create more resilient and responsible data-sharing practices. Recognising and communicating links between robust data security and broader goals of environmental sustainability is essential. Rigid and siloed frameworks hinder innovation and responsiveness, highlighting the need for governance structures that are flexible and adaptable to changing threats and emerging technologies.
Actionable knowledge needs	There is a gap between high-level recommendations and practical guidance needed to implement effective security measures. Addressing them requires creating concrete resources, tools, and training programmes that empower individuals and organisations to take proactive steps to ensure the intended use of secured data. Knowledge needs include specific technical guidance on designing and implementing secure environmental data systems, learning from best practices, and skill-building and training programmes (e.g. cybersecurity for environmental professionals).

Significance of the topic and CASRI added values

CASRI topic E1 gains relevance through strong synergies with existing European and international initiatives on environmental data governance, which can be grouped into two complementary levels. **At the operational level**, initiatives such as the European Biodiversity Observation Network (EuropaBON)⁷⁵, the EU Soil Observatory (EUSO)⁷⁶ and Water4All⁷⁷ already coordinate data availability, transparency and cross-border consistency. **At the strategic level**, frameworks such as the UNEP GEDS and UNEA Resolution 4/23 establish shared standards for data quality, governance and interoperability. CASRI builds on these efforts by addressing persistent implementation gaps, particularly at local level and in multi-actor contexts. Its relevance is further reinforced by the 2026 opinion of the EEA Scientific Committee (EEA, 2026a), which identifies interoperable, FAIR and federated data infrastructures as essential for reducing fragmentation and improving access to environmental information and underlines the importance of accountable digital systems aligned with sustainability objectives. Together, these initiatives confirm that data security, governance and integrity are critical prerequisites for evidence-based environmental policymaking, positioning CASRI topic E1 as a timely and complementary contribution to ongoing European efforts.

CASRI adds value by identifying knowledge gaps that remain insufficiently addressed by existing environmental data governance and security initiatives. Discussions conducted through the CASRI process highlighted persistent challenges related to the implementation of data security frameworks across governance levels, the protection of distributed environmental monitoring infrastructures, the long-term integrity of environmental data, and the balance between openness, transparency and security. While numerous directives, standards and governance mechanisms already exist, participants consistently stressed the need for stronger coordination, practical implementation guidance and enhanced institutional capacities. CASRI contributes by translating these challenges into concrete research and innovation priorities that support secure, trusted and interoperable environmental data ecosystems.

To address these gaps, CASRI proposes the following research and innovation questions:

- How can environmental data governance frameworks be effectively coordinated across European, national, regional and local levels while maintaining interoperability, trust and regulatory coherence?
- How can existing European and national data security frameworks be translated into practical guidance, operational tools and governance models for environmental data producers and users?
- Which technical and organisational approaches are most effective in ensuring the long-term integrity, traceability and resilience of environmental data across distributed monitoring systems?
- How can environmental monitoring infrastructures, including sensors, smart-city systems and private measurement networks, be protected against cyber threats, data manipulation and system failures?
- How can environmental data remain open, accessible and reusable while ensuring appropriate levels of security, privacy and protection of sensitive information?

⁷⁵ [EuropaBON – Europa Biodiversity Observation Network: integrating data streams to support policy](#)

⁷⁶ [EU Soil Observatory \(EUSO\) - Joint Research Centre - European Commission](#)

⁷⁷ [Water Security for the Planet](#)

- Which capacity-building, training and institutional support mechanisms are most effective in strengthening environmental data security practices across public authorities, research organisations and private actors?

Addressing these questions would support the development of secure, trusted and interoperable environmental data ecosystems capable of underpinning evidence-based environmental governance across Europe.

3.5.2 E.2 Social vulnerabilities of multi-scaled climate adaptation

Priority level: Very high (P1)

Keywords: *climate adaptation; social vulnerability; maladaptation; climate justice*

Impacts

Investing in research and innovation on the social vulnerabilities of multi-scaled climate adaptation offers a powerful lever to strengthen the fairness, inclusiveness and long-term effectiveness of climate action across Europe. Climate change does not affect all communities equally: the most vulnerable populations face disproportionate exposure to climate risks while having the least capacity to adapt. Advancing R&I in this field directly supports the development of adaptation policies that are socially just, evidence-based and responsive to the diversity of lived experiences across territories and communities.

From a social perspective, improved knowledge on social vulnerabilities would enable policymakers to design adaptation measures that reduce rather than reinforce existing inequalities, ensuring that the costs and benefits of climate adaptation are distributed fairly across social groups and generations. **From an environmental perspective**, socially inclusive adaptation strategies are more likely to be implemented effectively and sustainably, as they build legitimacy and community engagement. **From an economic perspective**, addressing social vulnerabilities proactively reduces the long-term costs of maladaptation, social disruption and health impacts associated with climate-related hazards.

By producing knowledge on vulnerability mapping, participatory adaptation processes and equity-sensitive policy evaluation, R&I in this domain actively contributes to the EU Adaptation Strategy, the Just Transition Mechanism⁷⁸ and the objectives of the European Green Deal. It supports Member States in fulfilling their commitments under the Paris Agreement⁷⁹ and the Sendai Framework for Disaster Risk Reduction⁸⁰, while informing national and local adaptation planning. Reducing social vulnerabilities to climate change is not merely a matter of social justice: it is a prerequisite for resilient, effective and democratically legitimate climate adaptation.

⁷⁸ [The Just Transition Mechanism - European Commission](#)

⁷⁹ [The Paris Agreement | UNFCCC](#)

⁸⁰ [Sendai Framework for Disaster Risk Reduction 2015-2030 | UNDRR](#)

Background & Rationale

Several existing R&I initiatives and international frameworks already address the social dimensions of climate adaptation and vulnerability assessment (see Annex 16).

The European Commission's Strategic Research and Innovation Agenda on Health and Climate Change (2024)⁸¹ explicitly focuses on the societal and equity dimensions of climate impacts, integrating social determinants of vulnerability, emphasising equitable adaptation measures, and identifying research priorities across adaptation of people, communities and societal systems.

The Regions Adapt Initiative⁸² is a global commitment enabling regional governments to track adaptation progress, address adaptation challenges across scales, and strengthen the visibility and coordination of subnational adaptation action.

The Social Vulnerability Index (SVI) for Cities⁸³, co-developed through the REACHOUT project⁸⁴ with European cities including Cork, Logroño, Milan, Rimini and Belfast, operationalizes climate justice by identifying socially vulnerable populations and supporting tailored, equitable and community-centered adaptation.

These programmes share with CASRI topic E2 a common focus on (1) integrating social justice and equity into climate adaptation frameworks, (2) developing better tools and metrics for assessing social vulnerability across scales, and (3) strengthening cross-sectoral and multi-level governance for coordinated adaptation planning.

Beyond these existing initiatives, the social vulnerabilities associated with climate adaptation actions remain insufficiently understood and systematically addressed. While climate adaptation aims to reduce environmental and societal risks, adaptation measures themselves can generate or exacerbate social vulnerabilities if their impacts on different socioeconomic groups are not adequately considered. Interactions between economic systems, social structures and adaptation interventions often remain fragmented across sectors and governance levels, limiting the ability of decision-makers to anticipate unintended consequences. Developing a more holistic understanding of how climate adaptation actions influence social vulnerability across buildings, districts, cities and regions is therefore essential for designing equitable, socially accepted and effective adaptation pathways.

⁸¹ [Strategic research and innovation agenda on health and climate change - Publications Office of the EU](#)

⁸² [RegionsAdapt – Regions4](#)

⁸³ [Social Vulnerability Index \(SVI\) | Tools Database | EU Mission on Adaptation to Climate Change Portal Climate-ADAPT](#)

⁸⁴ [REACH-OUT PROJECT](#)

Topic Description

TABLE 17 – SOCIAL VULNERABILITIES OF MULTI-SCALED CLIMATE ADAPTATION (ADAPTED FROM CASRI D3.2)

Proposed topic	Social vulnerabilities of multi-scaled climate adaptation
Description	Systematically addressing social risks and vulnerabilities related to climate adaptation actions. A broad understanding exists of how economic and social systems contribute to social vulnerabilities, often by exacerbating them. The interlinkage of these systems to actions of climate adaptation in (urban) planning are often piecemeal, leaving considerable gaps to be addressed if one were to create a larger roadmap for decision-makers to follow. A more holistic and systematic understanding of the impact of urban climate adaptation on social vulnerability would create a clearer picture for decision-makers.
Contribution to E&S challenges	Sufficiency concepts and just transition frame the desired impact of climate adaptation in urban areas. However, the desired transition must also explicitly address social dimensions, which are essential for ensuring broad societal acceptance. This includes deeper insights into processes of societal engagement, as well as aspects of socio-ecological justice. From the building level regarding urban renovation and energy retrofits, to the district level with the creation of urban green spaces and the potential for district-wide gentrification, to city-level impacts of policy goals: the problem being tackled here is to coherently understand the impact and interaction of these actions for equitable and just development for heterogeneous socioeconomic groups. Only by having a full view of social vulnerabilities caused or exacerbated by urban processes can just transition be achieved.
Transnational societal and policy relevance	Climate change poses a common challenge, but local adaptation needs are highly variable and dependent on socio-ecological context. Comprehensive strategies that are both practical and just need to be developed through cross-disciplinary and cross-country collaboration.
Systemic knowledge needs	Addresses Green Deal goals (renovation wave, climate adaptation) with social dimension.
Transversal knowledge needs	Collaboration between various levels of government and involvement of civil society and private sectors is crucial for tailored and effective climate adaptation strategies. Involved EU policy (New European Bauhaus, climate neutrality, Nature Restoration Law), national agencies (looking for general societal impact), cities, and communities.
Actionable knowledge needs	Outputs include roadmaps for social acceptance for climate adaptation measures

Significance of the topic and CASRI added values

CASRI topic E2 aligns closely with a growing ecosystem of European and international initiatives addressing the social dimensions of climate adaptation. At the operational level, tools such as the Social Vulnerability Index co-developed through REACHOUT with European cities, and the Regions Adapt Initiative, provide frameworks for vulnerability assessment and subnational coordination.

At the strategic level, the EU SRIA on Health and Climate Change and the 2030 Agenda's⁸⁵ core commitment to "leave no one behind" establish equity and social justice as central priorities for climate adaptation policy. The relevance of CASRI topic E2 is further reinforced by the 2026 EEA Scientific Committee opinion (EEA, 2026a), which calls for research on just transitions, distributional justice and the development of indicators to track how costs and benefits of adaptation are distributed across social groups. Together, these initiatives confirm that social vulnerability is a recognised and urgent research priority, positioning CASRI topic E2 as a timely contribution to filling persistent implementation gaps.

Despite this growing recognition, significant knowledge gaps remain. Discussions conducted through the CASRI process consistently highlighted that social vulnerabilities receive insufficient weight in political debates on climate change, where economic impacts tend to dominate. Participants stressed the need for better tools to monitor social vulnerability and its dynamics over time, stronger coordination across governance levels and more effective mechanisms to prevent vulnerable groups from bearing disproportionate adaptation burdens. A particular concern was raised regarding the risk of unintended consequences of adaptation measures, such as green gentrification, displacement and unequal access to new amenities. Existing instruments, including insurance systems and planning tools, were identified as requiring substantial revision to remain fit for purpose under accelerating climate change. CASRI contributes by translating these shared challenges into concrete research and innovation priorities.

To address these gaps, CASRI proposes the following research and innovation questions:

- Which indicators and evidence thresholds are most effective for evaluating socially just adaptation outcomes across spatial scales and across short/medium/long-term timeframes?
- What frameworks and decision gates are needed to translate justice principles into permitting, procurement and monitoring procedures at multiple spatial levels?
- How can adaptation planning incorporate early-warning systems for social side-effects such as green gentrification, displacement or unequal access to new amenities, and which predictive socio-spatial modelling tools can anticipate such unintended impacts?
- How can adaptation strategies be reframed to treat climate resilience as a sociopolitical challenge rather than a purely technical one, integrating decision-making inequalities and power dynamics into adaptation planning?
- What policy mechanisms can prevent vulnerable groups from bearing disproportionate adaptation costs and ensure that benefits are equitably distributed across social groups?
- How can adaptation policies anticipate and respond to climate-induced migration and demographic change while ensuring social cohesion and equitable access to resources, services?
- How can monitoring systems capture evolving social vulnerabilities over time, including cumulative climate risks, demographic change and adaptive capacity?
- How to strengthen integration of climate adaptation with water management, health, tourism, spatial planning and ecosystem resilience?

Addressing these questions would support the development of socially just, multi-scalar and evidence-based climate adaptation frameworks capable of leaving no one behind across Europe.

⁸⁵ [United Nations Sustainable Development Goals \(SDGs\)](#)

3.6 F. Democracy and participation

Background

Sustainability transformation is not only a technological and economic challenge but also a societal and democratic one. Transformative policies affect places, sectors and social groups differently and involve decisions about priorities, distributional effects, acceptable risks and trade-offs. Scientific knowledge is essential for these decisions, but knowledge alone does not lead to effective action. Its relevance and uptake depend on how knowledge needs are defined, whose perspectives are considered and how scientific, practical and societal knowledge and actionability interact.

The CASRI process identified persistent barriers at these interfaces. Research, policymaking and implementation are often organised in disciplinary and institutional silos; participation may take place only after problems or solutions have already been framed; and knowledge generated by research is not always aligned with the needs of those responsible for implementation. Particularly important are transdisciplinary problem framing, locally adapted approaches, inclusion of experiential and societal knowledge and stronger links between international challenges and local action.

Theme F therefore addresses two complementary knowledge needs. F.1 focuses on the institutional conditions for inclusive science-policy-practice interaction, while F.2 explores how environmental, health and socio-economic knowledge can be integrated and used to support socially just urban transformation. Both topics address how knowledge can become more systemic, transversal and actionable while strengthening transparency, participation and societal legitimacy.

Drivers and enablers

The need for such research is driven by increasingly interconnected environmental, health, economic and social challenges, while institutional responsibilities and knowledge systems often remain fragmented. Sustainability measures may generate substantial co-benefits but also distributional effects and local conflicts that cannot be understood through environmental or technological evidence alone. At the same time, misinformation, contested expertise and unequal opportunities to participate increase the importance of transparent and credible knowledge processes.

Important enablers include the growing European science-for-policy ecosystem, new forms of transdisciplinary and participatory research, citizen science and knowledge brokerage, and rapidly improving possibilities for integrating environmental, health, socio-economic and geospatial information. EPAs can play a particular role because many operate at the interface between environmental monitoring, scientific assessment, regulation, policy advice and implementation.

Impacts

Research and innovation under Theme F can strengthen the capacity of European institutions and societies to develop sustainability solutions that are not only scientifically robust but also practically feasible and socially legitimate. Better science-policy-practice interaction can improve problem definition, reveal implementation barriers and trade-offs earlier and support learning between research, policy and practice.

Improved integration and participatory interpretation of environmental, health and social evidence can make inequalities and multiple burdens more visible and support better targeted interventions. Together, the two topics can contribute to more transparent decision-making, improved policy effectiveness, stronger institutional learning and greater capacity to adapt sustainability policies in light of implementation experience and societal needs.

SDG relevance

Theme F contributes particularly to SDG 3 (Good Health and Well-being), SDG 10 (Reduced Inequalities), SDG 11 (Sustainable Cities and Communities), SDG 16 (Peace, Justice and Strong Institutions) and SDG 17 (Partnerships for the Goals). Through improved participation, governance and knowledge use, it also supports implementation of the environmental SDGs more broadly.

3.6.1 F.1 Inclusive science-policy-practice interface

Subtitle: Developing institutional arrangements that enable science, policy, practice and society to jointly generate and use knowledge for viable and legitimate sustainability transformations.

Priority level: Very high (P1)

Keywords: SPPI; co-creation; knowledge brokerage; institutional learning

Impacts

Additional R&I on inclusive science-policy-practice interfaces (SPPI) can improve how sustainability knowledge is generated, interpreted and used. Rather than relying primarily on linear transfer of scientific results into policy and practice, effective interfaces allow research questions, policy needs and implementation experience to inform each other throughout the process.

Research can provide tested governance models, co-creation methods, knowledge-brokerage approaches and evaluation frameworks and clarify the institutional capacities and resources required to sustain them. This can lead to research that responds more closely to real implementation needs, earlier recognition of conflicting objectives and unintended effects, and stronger involvement of citizens, local communities, SMEs and under-represented groups. In the longer term, inclusive and transparent interfaces can strengthen both the practical effectiveness and legitimacy of sustainability transformation and contribute to conditions for trust in science and public institutions.

Background & Rationale

Science-policy-practice interfaces comprise the institutions, processes and roles connecting scientific research, political decision-making and practical implementation. They include scientific advisory bodies and assessments, but also knowledge brokerage, stakeholder engagement, co-design, citizen science and collaborative learning.

CASRI findings indicate considerable variation across Europe in the organisation and effectiveness of these interfaces. Existing structures often connect scientific experts and policymakers, while interaction with implementation actors and local communities is less systematically embedded. Persistent challenges include institutional and disciplinary silos, insufficient resources for knowledge co-creation, unequal participation and limited long-term support for interface activities. The CASRI community nevertheless showed considerable interest in F.1: organisations from several countries considered the topic a national or European priority, while the Paris workshop particularly highlighted the need for locally adapted approaches and stronger integration of social, cultural, ethical and experiential knowledge.

This suggests that R&I should not search for one universally applicable SPPI model. Rather, comparative research and experimentation are required to understand which combinations of institutions, methods and professional roles work under different political, administrative, cultural and socio-economic conditions.

Topic Description

TABLE 18 – INCLUSIVE SCIENCE-POLICY-PRACTICE INTERFACE (ADAPTED FROM CASRI D3.2)

Proposed topic	Inclusive science-policy-practice interface
Description	The development of broad and inclusive science-policy-practice interfaces is essential for finding viable solutions and supporting trust in science. Different perspectives and forms of knowledge need to be considered in order to avoid deepening societal divisions during rapid transformation processes. Research should investigate how interfaces and exchange processes between scientific research, political decision-makers, implementing actors and society can be structured so that 1. interaction begins with joint problem framing and knowledge co-creation (stakeholders involved early enough to influence which problems and research questions are addressed. R&I combining scientific evidence with implementation experience, local knowledge, socio-cultural insights and societal values) via 2. knowledge brokerage and translation (dedicated capacities to translate between professional languages, evidence standards and decision contexts; investigate roles such as knowledge brokers, boundary organisations and science-policy fellows, including their competencies, institutional positioning and incentives), via 3. deliberation and management of trade-offs (help actors make conflicting objectives explicit and provide transparent processes for evaluating alternatives) to 4. continuous learning and feedback (beyond agenda setting; evidence from regulation, implementation, monitoring and local experimentation should feed back into research agendas and policy adaptation).
Contribution to E&S challenges	Implementing policies addressing socio-ecological challenges requires a shared understanding of problems, transparent consideration of trade-offs and solutions that are feasible. More effective SPPI can connect environmental evidence with economic, social, cultural and implementation knowledge, improving the capacity to address interconnected challenges rather than treating them in isolation.
Transnational societal and policy relevance	Environmental and climate challenges cross sectors and borders, while the institutional contexts in which decisions are made differ substantially across Europe. Research should therefore combine transnational learning with sensitivity to local and national contexts. Comparative testing can identify common principles while avoiding the assumption that participation or advisory structures can simply be transferred unchanged between countries.
Systemic knowledge needs	Environmental, social and economic interdependencies, feedback loops and cascading effects need to be reflected within SPPI. Research should investigate methods that allow different actors to explore such complexity and associated trade-offs without making the resulting knowledge unusable for decision-making. This includes stronger integration of natural sciences, social sciences and humanities and of scientific, practical and experiential knowledge.
Transversal knowledge needs	Effective interfaces require collaboration between research organisations, government agencies, policymakers, businesses, civil society and communities and across local, regional, national and European levels. Particular attention is needed to vertical knowledge flows and to professional roles that connect institutional and disciplinary communities, including knowledge brokers, facilitators and translators.

Actionable knowledge needs	Research should develop and test practical models for co-design, participation, knowledge brokerage and collaborative learning, including mechanisms for involving local businesses, communities and vulnerable or marginalised groups. It should also identify governance, financing and capacity-building models that allow effective SPPI to persist beyond individual projects and funding cycles and enable implementation experience to feed back into future research and policy.
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Significance of the topic and CASRI added values

The CASRI added value lies in treating science-policy-practice interaction not primarily as a question of communicating research results, but as an institutional component of sustainability R&I and governance. The CASRI process brings together countries with different administrative and research cultures and therefore provides a basis for comparative learning on why specific approaches succeed in some settings and not in others.

This has concrete value for different actors. Policymakers and administrations can gain earlier insight into implementation barriers, conflicting interests and societal effects. Research funders and research organisations can better connect research questions and expected outcomes to real knowledge needs. Businesses and implementation actors can contribute practical knowledge about feasibility and constraints. Citizens and civil society can introduce local experience, values and concerns before pathways are fixed. EPAs are particularly relevant as potential boundary organisations because their functions frequently connect science, monitoring, regulation, policy advice and implementation.

Key R&I questions emerging from CASRI concern the governance conditions determining successful SPPI in different contexts; meaningful co-creation with communities, SMEs and under-represented groups; methods for incorporating systemic interdependencies and trade-offs; institutionalisation and financing of interface structures and boundary-spanning roles; vertical knowledge flows across governance levels; and approaches that strengthen trust and resilience against misinformation while recognising uncertainty and legitimate disagreement.

Key R&I questions include

- Which institutional arrangements make science-policy-practice interfaces effective, credible and legitimate under different administrative, political and socio-cultural conditions? What factors explain success or failure?
- How can research questions and transformation pathways be co-designed with policymakers, implementing authorities, businesses, citizens and affected communities without compromising scientific independence?
- Which methods enable local communities, SMEs, young people and marginalised or under-represented groups to exercise meaningful influence rather than being consulted only after key decisions have been taken?
- How can SPPI represent systemic interdependencies and trade-offs across climate, biodiversity, pollution, health, economic development and social justice in formats that remain usable for decision-makers?
- Which institutional roles, competencies, incentives and career structures are needed for knowledge brokers, facilitators and other boundary-spanning professionals?
- Which funding and governance models can sustain SPPI beyond individual projects, political mandates and short funding cycles?

- How can evidence from implementation, monitoring and evaluation systematically feed back from local and national practice into European R&I agendas and policymaking?
- Which approaches strengthen conditions for trust and resilience against misinformation while recognising uncertainty, legitimate disagreement and different forms of knowledge?

3.6.2 F.2 Integrating environmental and health data for socially just urban transformation

Sub-title: Development of integrated tools and governance models that combine environmental and health data to guide holistic, just urban transformation strategies

Priority level: Medium (P3)

Keywords: *environmental health; data integration; environmental justice; urban decision support*

Impacts

Growing urban populations are exposed simultaneously to environmental pressures such as air pollution, noise, heat, climate risks, poor housing conditions or insufficient access to green space, while both exposure and capacity to respond are socially uneven. Additional R&I can improve the capacity of cities and public authorities to identify where environmental burdens, health effects and social vulnerability overlap and where interventions can produce the greatest combined benefits.

Research can deliver integrated indicators, multiple-burden and vulnerability assessments, spatial decision-support systems and urban health or environmental-justice dashboards. These can improve the targeting of measures such as greening, mobility redesign, climate adaptation, building renovation or brownfield redevelopment and help assess their environmental, health and distributional effects. If monitoring is maintained after implementation, the same evidence base can also show whether measures and regulations achieve their intended outcomes and where adaptation is necessary. This creates a feedback loop of data, intervention, evaluation and policy improvement.

Background & Rationale

Urban areas face interconnected challenges related to climate risks, air and noise pollution, mobility, land use, health and social inequalities. Yet environmental, health, planning and socio-economic data are frequently collected and used within separate institutional structures. This limits the capacity to identify cumulative burdens, evaluate co-benefits or understand how benefits and costs are distributed between population groups.

The original CASRI topic therefore proposed combining environmental quality data with health and socio-economic data and using co-development methods to guide just urban transformation. The co-design process reinforced this approach through discussions on brownfield redevelopment, One Health, urban greening, nature-based solutions and urban agriculture. Participants particularly emphasised accessible data, comparable monitoring approaches and the persistent gap between evidence on environmental-health benefits and practical implementation. Further approaches connect urban planning, active mobility, climate adaptation, environmental justice and biodiversity with health and participatory governance. Work on population studies and biomonitoring highlights an additional function of health-related evidence: determining whether regulation produces intended real-world effects and where adjustment may be necessary.

Topic Description

TABLE 19 – INTEGRATING ENVIRONMENTAL AND HEALTH DATA FOR SOCIALLY JUST URBAN TRANSFORMATION (ADAPTED FROM CASRI D3.2)

Proposed topic	Integrating environmental and health data for socially just urban transformation
Description	This topic focuses on developing integrated tools and governance models that combine environmental, health and socio-economic data to guide holistic and socially just urban transformation. Links between characteristics of the urban environment and health outcomes need to be better understood and translated into practical guidance for urban action. Co-development and participatory approaches should ensure that data interpretation and resulting interventions reflect local conditions and societal needs.
Contribution to E&S challenges	Research should co-develop and pilot urban planning and decision-support systems combining environmental quality data, for example on air pollution, noise, microclimate, biodiversity and soil quality, with health and socio-economic information. Such systems can help identify and prioritise interventions such as greening, mobility redesign, building renovation or brownfield redevelopment where environmental and health co-benefits are high and where vulnerable groups face multiple burdens.
Transnational societal and policy relevance	Environmental-health inequalities differ according to urban form, socio-economic conditions, governance systems and available data. Place-specific research is therefore essential, while transnational collaboration can improve comparability of indicators, monitoring approaches and interventions and support transfer of methods between cities and agencies.
Systemic knowledge needs	Research needs to analyse environmental conditions, human health, social vulnerability, urban infrastructure and governance as interconnected systems. This includes identifying cumulative exposures, environmental-health co-benefits and possible trade-offs or unintended effects, such as interventions that improve average environmental quality while increasing inequalities or displacement pressures.
Transversal knowledge needs	Effective integration requires collaboration between EU policymaking, EPAs, health authorities, municipalities, planning authorities, research organisations and affected communities. It also requires interoperability across environmental, health, socio-economic and spatial datasets and governance arrangements that enable evidence to move between disciplines, institutions and governance levels while respecting data protection, quality and accountability.
Actionable knowledge needs	Research should deliver pilot-tested data integration methods, indicators, visualisation and decision-support tools, use cases, policy guidance and training. These tools should enable authorities to identify multiple burdens, compare interventions, target resources and monitor whether policies actually reduce exposure, improve health and narrow inequalities. Participatory approaches should complement quantitative evidence with the knowledge and lived experience of affected communities.

Significance of the topic and CASRI added values

CASRI's added value is to move beyond data integration as a technical objective and connect it explicitly with decision-making, environmental justice and policy learning. This distinguishes F.2 from Topic C.3: while C.3 concentrates on social inclusion and social impact in sustainable urbanisation projects, F.2 addresses the evidence and governance infrastructure required to identify unequal environmental-health burdens, prioritise action and subsequently assess whether transformation actually delivers socially just outcomes.

The potential benefits are tangible for several actor groups. Cities and regional authorities gain a stronger basis for targeting investments and comparing alternatives; environmental and health authorities gain a common evidence base across institutional boundaries; and policymakers can evaluate not only whether measures have been implemented, but whether environmental and health outcomes improve in practice. Communities benefit from greater visibility of cumulative burdens and from opportunities to contribute local knowledge to priority-setting. For businesses, clearer urban transformation priorities and evidence on environmental-health co-benefits can support innovation in areas such as sustainable buildings, mobility, environmental technologies and nature-based solutions. For EPAs, the topic builds on their environmental monitoring and assessment capacities while extending their potential role towards integrating, assuring and translating evidence for policy and implementation.

The resulting key R&I questions are

- How can environmental, climate, health, socio-economic, behavioural and spatial data be interoperably combined to identify cumulative environmental-health burdens and vulnerable population groups?
- Which indicators can capture not only average environmental improvement but also distributional effects, health co-benefits and changes in environmental inequality?
- How can integrated decision-support tools compare alternative urban interventions—including greening, mobility, building renovation, brownfield redevelopment and pollution reduction—and make synergies and trade-offs transparent?
- How can population studies, human biomonitoring and other longitudinal evidence be used to assess whether environmental regulation and urban transformation actually improve real-world health outcomes?
- Which governance models allow environmental agencies, health authorities, municipalities, planning bodies and research institutions to jointly manage and use integrated evidence while safeguarding privacy, data quality and accountability?
- How can citizens and affected communities participate in defining indicators, interpreting evidence and setting priorities, particularly where quantitative data do not fully represent lived environmental conditions?

3.7 G. Regulatory efficiency and competitiveness

Background

Europe's regulatory and competitiveness agenda is being reshaped at speed. Against a backdrop of polycrisis, geopolitical pressure and a renewed political emphasis on competitiveness and simplification (the Draghi Report⁸⁶, the Competitiveness Compass⁸⁷ and the Omnibus simplification packages⁸⁸), there is a real risk that environmental ambition is treated as a cost to be cut rather than a goal to be delivered more efficiently. This is set out in the European Green Deal⁸⁹ and European Climate Law⁹⁰, amongst others. Even since the Draghi Report of 2024, the geopolitical context continues to change and present further challenges to international trade and security of supply. At the time of finalising this document, this could be seen in the conflict between the United States and Iran and obstructions in the Strait of Hormuz, which had negative impacts on European economies. These external pressures, added to Europe's commitment to significantly increase defense spending, could make it attractive to relieve the regulatory burden to promote economic growth; however, as detailed in the OECD's Better Regulation Practices across the European Union (OECD, 2025), better regulations can be designed that meet complex challenges whilst "seeking to drive forward the green transition towards a carbon neutral economy".

Across the CASRI process, national key stakeholders identified two linked needs: regulation that is smarter, more integrated and adaptive (G1), and a deeper rethinking of what "competitiveness" means once growth, sufficiency and justice are taken seriously (G2). The theme treats these not as opposing forces but as two sides of governing the sustainability transition well.

Drivers and enablers

Drivers: the speed and fragmentation of policy change; geopolitical and economic pressure to deregulate; the administrative burden carried by businesses and public bodies; overconsumption and rebound effects; and growing volumes of environmental data awaiting use.

Enablers: better ex-ante and ex-post impact assessment; digital tools and Artificial Intelligence (AI) for regulatory simplification and learning; multi-level, multi-actor governance grounded in subsidiarity and proportionality; genuine stakeholder participation; real-world experimentation through learning labs; sustainable-finance instruments and the EU taxonomy; and the convening role of environmental protection agencies, which can build internal capacity to wield these tools while safeguarding environmental integrity.

Impacts

Research and innovation across the Regulatory efficiency and competitiveness theme would help Europe resolve a tension that sits at the heart of the sustainability transition: how to reduce regulatory burden and strengthen competitiveness while simultaneously raising environmental ambition and delivering it in practice. Treated as a system rather than a trade-off, the two topics reinforce one another — smarter, more coherent and adaptive regulation (G1) lowers the cost and uncertainty of acting sustainably, while a redefinition of competitiveness around long-term resilience, sufficiency

⁸⁶ [The Draghi report on EU competitiveness](#)

⁸⁷ [Competitiveness compass - European Commission](#)

⁸⁸ [Omnibus package - European Commission](#)

⁸⁹ [The European Green Deal - European Commission](#)

⁹⁰ [European Climate Law - Climate Action - European Commission](#)

and justice (G2) ensures that regulatory effort is pointed at the right goal. The economic impact is a more certain, less fragmented operating environment that channels investment towards sustainable innovation; the environmental impact is the closing of persistent implementation and enforcement gaps so that European Green Deal and European Climate Law objectives are realised; and the social and political impact is greater institutional capacity, trust and legitimacy in multi-level governance. Together this supports the EU's Competitiveness and Better Regulation⁹¹ agendas and the Clean Industrial Deal⁹², positioning environmental protection agencies as enablers of a transition that is both competitive and ecologically sound.

Sustainable Development Goals (SDG) relevance

SDG 3 (Good health), **SDG 8** (Decent work and economic growth), **SDG 9** (Industry, innovation and infrastructure), **SDG 12** (Responsible consumption and production), **SDG 13** (Climate action), **SDG 14** (Life below Water), **SDG 15** (Life on land), **SDG 16** (Peace, justice and strong institutions) and **SDG 17** (Partnerships for the goals) needed to achieve the previous goals.

3.7.1 G.1 Smart, adaptive and effective regulation

Priority level: Medium (P3)

Keywords: *adaptive regulation; regulatory simplification; impact assessment; regulatory innovation*

Impacts

Additional Research & innovation (R&I) on smart, adaptive and effective regulation would generate significant and mutually reinforcing benefits, working less as a set of separate gains than as a system of reinforcing feedback loops. Economically, better ex-ante and ex-post impact assessment, regulatory simplification and the removal of outdated, redundant or contradictory rules reduce administrative burden and compliance costs; the resulting regulatory certainty unlocks long-term investment in sustainable innovation, which in turn generates the evidence and capability that sharpen the next round of regulation — directly supporting the EU's competitiveness and Better Regulation agendas. Environmentally, more coherent, data-driven and better-enforced regulation closes the persistent implementation gap, ensuring that objectives set out in the European Green Deal and European Climate Law are delivered in practice rather than only on paper, while feedback from monitoring allows unintended or harmful effects to be detected and corrected early. Crucially, simplification is understood as a route to higher levels of environmental protection, not a lowering of ambition. Socially and politically, transparent, participatory and adaptive rule-making strengthens the trust, legitimacy and institutional learning capacity needed to navigate fragmented, multi-level and rapidly changing policy landscapes. The R&I would deliver new impact-assessment methods, digital and AI-enabled regulatory tools and real-world “living labs” (outputs); these would be embedded by EPAs and similar organisations, and regulators (outcomes); ultimately enabling a faster, fairer and more durable sustainability transition that reconciles competitiveness with environmental integrity (impacts).

Whilst identifying unintended and harmful effects, smarter regulation would also foreground, and quantify through evaluation using open data and replicable methodology, the many co-benefits to society. In June of 2026 Europe recorded over 10,000 additional deaths due to heatwaves, and this

⁹¹ [Better regulation - European Commission](#)

⁹² [Clean Industrial Deal - European Commission](#)

is only one of the risks to human health associated with climate change, in a limited period of time (Europe recorded 10,000 excess deaths during late-June heatwave, data show | Reuters).

From health to housing, and flooding and food security, it's important to be clear that regulations which address the climate and nature emergencies and enable a transition to net-zero, are also, at their heart, the key to improve the wellbeing and health outcomes of people across Europe and the globe.

Background & Rationale

The topic of G1 is included in existing R&I initiatives (see Annex 17) encompassing:

- Water4All SRIA⁹³
- Mission Soil Platform ⁹⁴.
- The Clean Industrial Deal⁹⁵
- Earth Observation / Copernicus SRIA⁹⁶
- DUT Partnership (Driving Urban Transitions)⁹⁷
- Climate change and public health SRIA⁹⁸
- EU Global Health Strategy with the One Health Approach (existing task force at EU level, created in 2023, include 5 agencies (ECDC⁹⁹, ECHA¹⁰⁰, EEA¹⁰¹, EFSA¹⁰², EMA¹⁰³) to prevent & respond to health threats, including those driven by climate change.
- European research infrastructures and data spaces: European Open Science Cloud (EOSC), European Health data space, European Green Deal Data Space, ICOS¹⁰⁴ on climate change, ISIDORE¹⁰⁵ on health, EIRENE¹⁰⁶ on human exposome research.
- Copernicus Health hub¹⁰⁷

These initiatives commonly support data-driven, science-based and participatory approaches to regulation and policy. Common features and shared needs with CASRI topic G1 include: 1) data-driven, evidence-based policymaking; 2) integration of science into regulation and policy uptake; 3) multi-level governance and cross-sector coordination; 4) genuine stakeholder participation and co-creation; 5) digital tools, AI and data infrastructures for decision support; and 6) real-world experimentation through living labs. Some implementation challenges still emerged such as (i) Instruments are often fragmented and insufficiently integrated, (ii) Policy mixes need more flexibility

⁹³ https://www.water4all-partnership.eu/sites/default/files/2023-02/Water4All_SRIA-2022-2025_A4_2311_bd.pdf

⁹⁴ [Clusters | Mission Soil Platform](#)

⁹⁵ [Clean Industrial Deal - European Commission](#)

⁹⁶ <https://publications.jrc.ec.europa.eu/repository/handle/JRC136730>

⁹⁷ <https://dutpartnership.eu/about>

⁹⁸ <https://op.europa.eu/en/publication-detail/-/publication/616cce9c-39e5-11f0-8a44-01aa75ed71a1>

⁹⁹ European Centre for Disease Prevention and Control : [Homepage | European Centre for Disease Prevention and Control](#)

¹⁰⁰ European Chemicals Agency [Homepage - ECHA](#)

¹⁰¹ European Environment Agency [European Environment Agency \(EEA\)](#)

¹⁰² European Food Safety Authority [EFSA | Science, safe food, sustainability](#)

¹⁰³ European Medicines Agency [European Medicines Agency \(EMA\)](#)

¹⁰⁴ Integrated Carbon Observation System ICOS

¹⁰⁵ Integrated Services for Infectious Disease Outbreak Research ISIDORE on health

¹⁰⁶ European InfrastructurE for humaN Exposome [ABOUT | EIRENE](#)

¹⁰⁷ <https://health.hub.copernicus.eu/>

and adaptiveness, (iii) Supply–demand mismatches persist and (iv) Agencies require new capabilities (e.g. blended finance, equity tools, strategic procurement).

At CASRI, these discussions directly connect to our work on a sustainable European future:

- Measuring effectiveness of policy instruments
- Improving flexibility and adaptiveness
- Strengthening cross-agency cooperation

Europe’s competitiveness will depend not only on ambition — but on how well we design, integrate and implement the instruments that drive transformation.

At the core is the need for smart, adaptive regulation that supports innovation while reducing unnecessary administrative burdens. The importance of consistency, simplification and clarity was emphasised. Regulations should be designed with actionable and transparent rules, especially for funding instruments, to reduce uncertainty and encourage long-term innovation. This includes conducting better ex-ante and ex-post impact assessments and ensuring their effective utilisation, as well as identifying outdated – or even redundant or harmful – regulations. Thoughtful use of digital tools and AI offers potential for regulatory innovation, streamlining bureaucracy and enhancing information processing.

Topic Description

The CASRI results highlighted that enhancing regulatory efficiency and fostering competitiveness within a sustainability transformation requires a strategic rethinking of governance structures, tools, and incentives (Table 20).

TABLE 20 – SMART, ADAPTIVE AND EFFECTIVE REGULATION (SOURCE CASRI D3.2)

Proposed topic	Smart, adaptive and effective regulation
Description	Smart, adaptive, more integrated and effective regulation aims to successfully navigate fragmented, incoherent and rapidly changing policy landscapes with a data-driven, flexible and participatory approach.
Contribution to E&S challenges	Comprehensively responding to all key E&S challenges. Ensuring effective use of available data and knowledge. Guiding regulative attention and action to the most pressing questions in a just and efficient manner and ensuring that non-intended effects of regulation are effectively avoided.
Transnational societal and policy relevance	Reducing regulatory burden while at the same time improving the capacities of regulatory frameworks to respond to changing environmental conditions, economic realities, public concerns, and technological advancements.
Systemic knowledge needs	Addressing the systemic mismatch between formal, top-down regulation and informal social norms and cultural practices. Ensuring that the best practices are adopted across different sectors and policy domains.
Transversal knowledge needs	Managing complex, polycentric regulative contexts and equipping policymakers with tools to navigate multi-level and multi-actor systems.
Actionable knowledge needs	Addressing weak enforcement and implementation gaps of environmental and sustainability policies and regulations. Improved implementation and utilisation of ex-ante and ex-post assessments, cross-sectoral impact evaluations. Development of digital tools for regulatory simplification and learning labs for testing new governance models in real-world settings. EPAs should build internal capacity to harness these tools effectively, while also ensuring precaution and testing and refining new approaches through controlled experiments

Significance of the topic and CASRI added values

Synergies with other relevant R&I initiatives

The relevance of smart, adaptive and effective regulation is reinforced by its strong alignment with current European priorities. The EU's Better Regulation agenda and the simplification drive both depend on exactly the improved impact-assessment methods and evidence base that CASRI identifies, while the Earth Observation / Copernicus SRIA and the European data spaces supply the data-driven foundations for adaptive, responsive regulation. The recent EEA assessment (EEA, 2025a), Europe's environment and climate: knowledge for resilience and sustainable prosperity, similarly stresses the need for coherent, well-implemented policy and for evidence that informs decision-making under uncertainty. CASRI's distinctive contribution is to insist that simplification and burden reduction are pursued as a route to higher — not lower — environmental protection, addressing the concern raised by community members (e.g. ISPRA, Italy) that “better regulation” can become a vehicle for weakening environmental safeguards.

CASRI added values

CASRI proposes to address the topic through a set of R&I questions that target current knowledge gaps:

- How can ex-ante and ex-post impact assessments be improved, and actually used, to identify outdated, redundant or harmful regulations while raising rather than lowering levels of environmental protection?
- How can digital tools and AI be responsibly deployed for regulatory simplification, monitoring and “living labs”, without eroding environmental safeguards or transparency?
- How can regulatory frameworks be made genuinely adaptive across fragmented, multi-level and polycentric governance, and how can the systemic mismatch between formal regulation and informal social norms be addressed?
- What role do “intermediaries” (public procurement bodies, energy and innovation agencies, civil-society actors) play in governing transformation, and how can fragmented funds and authorities be aligned into a coherent framework?
- How can evaluation strategies and futures modelling be used to quantify, predict and communicate co-benefits and unintended consequences to human health and wellbeing across temporal and spatial scales?

3.7.2 G.2 Governance for sustainable competitiveness

Priority level: Low (P4)

Keywords: *sustainable competitiveness; wellbeing; sufficiency; long-term resilience*

Impacts

Additional R&I on governance for sustainable competitiveness would shift the foundations on which European economies compete. Economically: reframing competitiveness around long-term resilience, value retention and wellbeing — rather than short-term cost reduction and throughput — opens the way to circular and regenerative business models, while sustainable-finance instruments and the EU taxonomy realign capital with sustainability goals.

- **Environmentally:** governing for sufficiency and tackling overconsumption and rebound effects allows economies to operate within the resilience of ecosystems, reducing Europe's global material and environmental footprint.
- **Socially:** an explicit focus on justice and on who benefits from regulation ensures the transition does not deepen inequality, addressing entrenched norms and structures that perpetuate unsustainable consumption. Politically, mission-oriented industrial policy and multi-level governance grounded in subsidiarity and proportionality give policymakers the means to act coherently across scales (both time and space, especially at a local scale).

Wales offers a concrete worked example: under the Well-being of Future Generations (Wales) Act 2015, it has legislated for a regenerative economy that uses “no more than its fair share of global resources” and operates within ecological limits (SoNaRR 2025, Aim 4¹⁰⁸) — demonstrating that this governance reframing is implementable at national scale. In line with the European Commission’s

¹⁰⁸ <https://naturalresources.wales/evidence-and-data/research-and-reports/state-of-natural-resources-report-2025/aim-4-a-regenerative-economy-with-sustainable-levels-of-production-and-consumption/?lang=en>

Better Regulation Agenda, it is worth noting that Italy, through Law No. 167 of 10 November 2025, introduced the Generational Impact Assessment (Youth Check) as an analytical tool for the *ex ante* assessment of Government regulatory measures, with a view to examining their environmental and social impacts on young people and future generations, with particular attention to intergenerational equity.

This instrument has subsequently also been adopted in the regulatory frameworks of certain subnational authorities.

The R&I would deliver wellbeing indicators and sufficiency benchmarks (outputs), embedded in policy targets and finance (outcomes), ultimately enabling an economy that competes on sustainability while staying within planetary boundaries (impacts) and avoiding higher footprint elsewhere.

Background & Rationale

The topic of G2 is included in existing R&I initiatives encompassing (trans)national network and projects presented in Annex 18.

These initiatives commonly support a regenerative, sufficiency-oriented rethinking of the economy. Common features and shared needs with CASRI topic G2 include: 1) a regenerative economic paradigm; 2) sufficiency and demand-side governance; 3) wellbeing as a measure of success beyond growth; 4) social-norm and lifestyle transformation; 5) circular economy and local resilience; and 6) multi-actor collaboration across government, business, academia and civil society.

In addition to the concrete need to improve regulatory efficiency, the CASRI results highlight the necessity to reconsider fundamental assumptions related to efficiency and competitiveness from the perspective of environmental sustainability and sufficiency (Table 21). The vision behind regulatory efficiency must be clear: governance for sustainability should aim for long-term transformative change rather than merely reducing short-term costs or enhancing efficiency. This requires aligning regulation with long-term sustainability goals while ensuring co-benefits for society, industry, and the environment. Multi-level governance is essential in this process. Principles such as subsidiarity and proportionality are key considerations when addressing the European level of integration for specific issues. A balanced approach that combines EU-wide frameworks with local knowledge can enhance both efficiency and legitimacy keeping in mind that there is a gap between the long-term sustainability goals and the short-term (operational) activities. Societal learning and cross-disciplinary collaboration, involving legal, environmental, social, and economic expertise, are needed. The regulatory paradox—where overly streamlined regulation becomes more costly over time—underscores the need for proactive, forward-looking policy design. Notably, individual behaviour change is essential but insufficient on its own. Policy interventions are required to create enabling environments since existing societal norms and structures often perpetuate unsustainable consumption patterns. Understanding who benefits from regulation and how is key to ensuring that policies are efficient, just, and inclusive.

Topic Description

TABLE 21 – GOVERNANCE FOR SUSTAINABLE COMPETITIVENESS (SOURCE CASRI D3.2)

Proposed topic	Governance for sustainable competitiveness
Description	Ensuring a regulatory environment that fully supports action towards sustainability involves considerations of growth, sufficiency, and justice. Reconfiguring the economy towards sustainable competitiveness requires a redefinition of competitiveness and the establishment of regulatory frameworks for sustainable production and consumption.
Contribution to E&S challenges	The traditional paradigm of competitiveness in terms of economic growth is challenged in the context of polycrisis. Overconsumption and rebound effects require a fundamental re-thinking of the economic system's capacity to achieve ecological sustainability in a socially just manner.
Transnational societal and policy relevance	Sufficiency and justness as key questions for competitive economies. The relevance extends to finance, marketing, regulations including EU taxonomy Focus areas include sustainable consumption, (dis)incentives for overconsumption, sustainable finance, inequalities and social science approach on just transition.
Systemic knowledge needs	Focus is on regenerative economic paradigms across all sectors of society. This involves identifying the long-term impacts of economic activity and developing transitional strategies to address potential economic and social disruption associated with a sufficiency-based transition. Clear definitions and benchmarks for sufficiency are needed in different sectors (housing, mobility, goods).
Transversal knowledge needs	Implications span all societal sectors and levels of governance, from international trade to local economies. Development of corporate governance and public-private collaborations through mission-oriented industrial policies for sustainability.
Actionable knowledge needs	Developing wellbeing indicators and policy targets that emphasise social and environmental well-being over economic growth. Addressing the psychological drivers of consumerism and attachment to unsustainable lifestyles requires collective action and social innovation to overcome deeply ingrained norms and barriers to sufficiency.

Significance of the topic and CASRI added values

Synergies with other relevant R&I initiatives

Governance for sustainable competitiveness aligns closely with a shift now visible at European level. The EEA's 2025 assessment is framed explicitly around “resilience and sustainable prosperity” rather than growth alone, while regenerative-economy initiatives (EuroREGEN¹⁰⁹, Regenerative

¹⁰⁹ <https://ces.uc.pt/en/investigacao/projetos-de-investigacao/projetos-financiados/euroregen>

Europe¹¹⁰, re:gen-u¹¹¹) and sufficiency-focused research (the Shift Project¹¹², SUSCON¹¹³) are converging on the same questions CASRI raises about competitiveness, consumption and wellbeing. The topic is also strongly reinforced by national practice: under the Well-being of Future Generations (Wales) Act 2015, Wales has legislated for a regenerative economy that uses no more than its fair share of global resources and operates within ecological limits (SoNaRR 2025, Aim 4) — evidence that the governance reframing CASRI calls for is not only theoretically desirable but practically implementable.

CASRI added values

CASRI's added value lies in turning this agenda into researchable questions:

- How can competitiveness be redefined and measured so that wellbeing and ecological limits — not throughput or short-term cost — become the benchmark, and which indicators and policy targets operationalise this?
- What clear definitions and benchmarks for sufficiency can guide different sectors (housing, mobility, goods), and which policy instruments (incentives, subsidy and taxation reform, sustainable finance, the EU taxonomy, green public procurement) enable a sufficiency-based transition while managing the associated economic and social disruption?
- How can the psychological and social drivers of overconsumption be addressed through collective action and social innovation, given that individual behaviour change is necessary but insufficient on its own?
- How can mission-oriented industrial policy and corporate governance be designed to reconfigure value chains towards regenerative production and consumption?
- How to bridge the gap between the long-term sustainability goals and the short-term (operational) activities?

¹¹⁰ <https://www.regenerative-europe.org/#digitaltt>

¹¹¹ <https://regenu.eu/>

¹¹² <https://theshiftproject.org/>

¹¹³ <https://cordis.europa.eu/project/id/101199131>

3.8 H. Digitalisation

Background

Digitalisation is emerging in the CASRI evidence base as a cross-cutting condition for sustainability transitions rather than as a narrowly technical or sector-specific research theme. Digitalisation-related needs appear across all four main CASRI sustainability themes: resilient, net-zero, circular production systems; nature and environmentally friendly energy transition; biodiversity and climate; and sustainable urbanisation.

Digitalisation should not be framed simply as a collection of technologies, but as a set of research and innovation needs around how digital capacities can support sustainability knowledge, while also ensuring that the digital transformation itself remains environmentally sustainable.

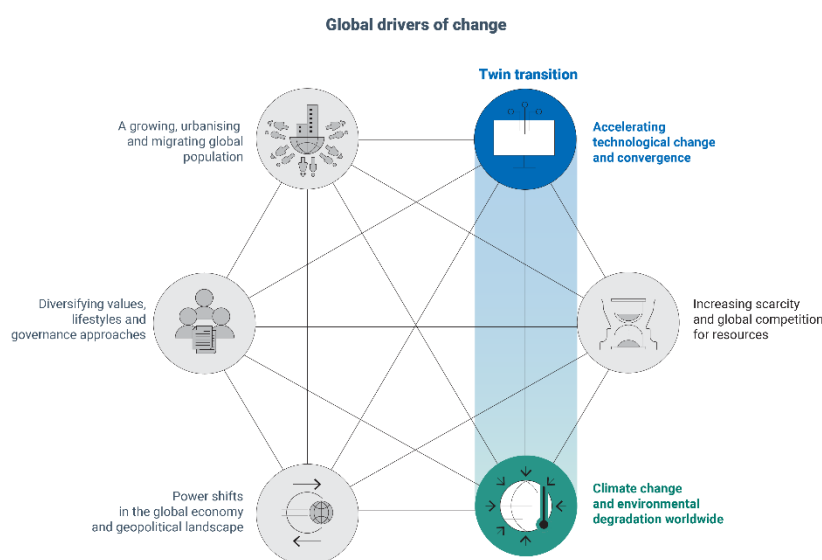


FIGURE 6 - OPPORTUNITIES AND CHALLENGES OF DIGITALIZATION IN THE GREEN TRANSITION (EEA, 2026B)

Drivers and enablers

There are four main functional roles of digitalisation.

First, digitalisation supports **modelling, simulation and anticipatory governance**, including digital twins, AI-supported scenario modelling, territorial modelling and integrated models combining economic, environmental and social information. Previous CASRI outcomes include smart economic environmental flows data systems using AI-supported scenarios, territorial digital twins for existing territorial information, comprehensive economic-environmental-social models for climate adaptation, and AI-supported early warning based on territorial data.

Second, digitalisation supports **value-chain transparency and circularity**. Previous CASRI outcomes include digital tools for automatic information acquisition, material traceability upstream and downstream in value chains, alignment with the EU Digital Product Passport, blockchain-based information management between value-chain actors, and digital solutions for new circular economy business models.

Third, digitalisation supports **energy-system management**. Previous CASRI outcomes contain digitalisation and AI needs linked to decentralised and flexible energy systems, data availability

versus data protection, smart grids, energy-storage solutions, real-time energy-use information, smart energy solutions, and advanced control mechanisms for variable renewable energy systems.

Fourth, digitalisation supports **data-driven territorial and urban governance**. Previous CASRI outcomes include continuous urban analysis, long-term observation devices, smart city technologies, digitalisation of urban services, AI-supported dynamic urban-regeneration scenarios, and digital governance for urban sustainability.

These drivers are consistent with the EEA briefing Navigating Europe's twin transition — opportunities and challenges of digitalisation in the green transition (EEA, 2026b), which states that digitalisation can support environmental action by improving data generation and interpretation for evidence-informed decision-making, while also creating new environmental pressures, risks and trade-offs (Figure 1). They are also consistent with Europe's environment and climate (EEA, 2025b), which frames sustainability challenges in relation to resilience, prosperity, resource use and the transformation of production and consumption systems.

Impacts

Theme H is expected to contribute to sustainability transitions in two complementary ways.

First, digitalisation can **strengthen the capacity of environmental agencies, research organisations and policymakers to generate, integrate and use knowledge**. This includes improved monitoring, better data integration, AI-assisted analysis, user-oriented decision support, digital twins, early-warning systems and tools for assessing trade-offs between different policy options. This applies to circular economy, energy systems, climate adaptation, territorial planning and sustainable urbanisation.

Second, the **environmental consequences of digital transformation** itself need to be understood and governed. The EEA briefing (EEA, 2026b) states that digitalisation creates environmental pressures, risks and trade-offs, and that its growing footprint and rebound effects mean that efficiency gains alone are unlikely to deliver absolute reductions in resource use and emissions. The EEA Scientific Committee opinion SC opinion knowledge and research needs for sustainability (EEA SC, 2026a) calls for research on the potential negative impacts of digitalisation and AI, including energy demand, water use for cooling, energy-efficient data centres, low-power computing, green AI algorithms and circular design principles for electronic hardware.

Artificial Intelligence (AI) offers vast new potential for modelling, analysis and real-time decision support but raises concerns around bias, reliability, transparency and energy use.

The United Nations Environment Assembly on its seventh session (8-12 December 2025) approved a resolution on “Environmental sustainability of artificial intelligence systems” recognising the importance of reducing the environmental impacts of AI while enhancing its benefits and sustainability (cfr. UNEP/EA.7/L.14¹¹⁴).

Theme H supports the overall CASRI ambition to develop systemic, transversal and actionable R&I priorities. It does so by distinguishing between digitalisation for sustainability knowledge and action (H1) and the sustainability of digitalisation itself (H2).

At global level UNEP has developed a Global Environmental Data Strategy (GEDS) to support Member States to improve their data ecosystems. reducing data fragmentation and strengthening

¹¹⁴ [Outcomes of UNEA-7](#)

environmental data globally. Effective environmental data governance is crucial for achieving sustainable development goals and ensuring that data resources are standardized and accessible to all, creating frameworks that support interoperability and data accuracy on a global scale.

SDG relevance of digitalisation

Theme H is relevant to several SDG-related policy objectives because digitalisation can improve monitoring, transparency and decision support for sustainability transitions. In particular, H1 can support better knowledge systems for environmental action, circular economy, climate adaptation (**SDG 13**), sustainable urbanisation (**SDG 11**), energy transition (**SDG 7**), resource management (**SDG 12**) and decent work and economic growth (**SDG 8**). H2 adds a safeguard dimension by ensuring that the digital systems used for these purposes do not create unmanaged environmental pressures through clean water & sanitation (**SDG 6**), energy use (SDG 7), material demand (SDG 12), water use, electronic waste or rebound effects (**SDG 9**). This interpretation is consistent with the WP4 aim to translate transnational knowledge needs into selected topics for the CASRI SRIA and subsequent matchmaking with potential funders.

3.8.1 H.1 Capacities for advanced data generation and responsible utilization

Subtitle: Developing digital capacities for streamlined and systematic environmental and sustainability monitoring, data integration and tailored decision-support tools

Priority level: High (P2)

Keywords: *digital environmental knowledge; artificial intelligence; digital twins; interoperable data*

Impacts

Additional R&I on H1 can significantly strengthen Europe's capacity to generate, integrate and use environmental and sustainability knowledge. The expected positive impact is not simply the production of more data, but the creation of more policy-relevant, timely, interoperable and trusted knowledge systems. This directly supports the CASRI objective of developing systemic, transversal and actionable R&I priorities. The WP4 proposal states that WP4 will develop a SRIA for systemic, actionable and transversal environmental and sustainability R&I, match it with existing opportunities, and identify gaps that could be bridged by national funders.

The WP3 digitalisation outcomes provide strong evidence for this topic. They show digitalisation needs linked to AI-supported policy scenarios, digital twins, territorial modelling, smart energy systems, smart grids, real-time energy-use information, digital traceability tools, Digital Product Passport alignment, blockchain coordination, continuous urban observation and smart city technologies. These examples show that digitalisation is already being used to improve monitoring, modelling, coordination and decision-making across several sustainability domains.

H1 can therefore contribute to environmental, social, economic and political impacts. Environmentally, it can improve detection of pressures, risks and changes in climate, biodiversity, energy, resource use and urban systems. Socially and politically, it can improve transparency, trust and usability of knowledge if tools are designed around users and governed responsibly. Economically, it can improve the efficiency of monitoring investments and help target policy and funding where need and impact are greatest. These impacts are aligned with the EEA twin transition

briefing, which states that digitalisation can support environmental action by improving data generation and interpretation for evidence-informed decision-making.

At the same time, the benefits of H1 depend on responsible use. CASRI D3.2 notes that digitalisation creates challenges related to big data, information overflow, disinformation, privacy and transparency. For H1, this means that R&I should focus not only on technical capabilities but also on validation, data quality, policy relevance, governance, institutional capacity, transparency and usability.

Background & Rationale

H1 is connected to several existing European R&I and data initiatives (see [Annex 19](#)), including Earth observation (EO)¹¹⁵, Copernicus¹¹⁶, the European Open Science Cloud (EOSC)¹¹⁷, digital twins, Geological Service for Europe, EuroGeoSurveys/GSEU, FAIR data infrastructures and environmental data analytics¹¹⁸.

Shared needs between existing SRIAs and CASRI R&I are identified around advanced environmental monitoring, interoperable digital infrastructures, responsible and transparent use of digital technologies, user-centred decision-support tools, capacity building and harmonised standards.

The EEA (2026b) Scientific Committee opinion strengthens this rationale. The EEA SC recommends FAIR, interoperable, open-access data spaces and AI-native solutions that enable the use of global data for local decision-making. They also recommend large-scale digital twins of Earth systems, powered by AI and real-time data from sources such as Copernicus, to simulate complex interactions between environmental and societal systems and support foresight, risk assessment and policy stress-testing.

Topic H1 is a genuine transnational R&I topic. Digitalisation entries are not confined to one country, sector or theme. They appear across circular economy and production systems, energy transition, biodiversity and climate, and sustainable urbanisation. For example, entries include digital tools for material traceability and Digital Product Passport alignment in circular value chains, AI-supported climate-risk early warning, smart grids, energy-use data, and digital governance of urban services.

The background rationale is therefore clear: existing digital infrastructures and initiatives are important, but they do not automatically translate into policy-ready environmental knowledge. H1 fills this gap by focusing on the capacities, governance arrangements and user-centred tools needed to transform data and models into actionable sustainability knowledge.

¹¹⁵ [What is Earth Observation? | EU Agency for the Space Programme](#)

¹¹⁶ [Homepage | Copernicus](#)

¹¹⁷ [Home | European Open Science Cloud - EU Node](#)

¹¹⁸ [Environmental Data Initiative](#)

Topic description

TABLE 22 – CAPACITIES FOR ADVANCED DATA GENERATION AND RESPONSIBLE UTILISATION (ADAPTED FROM CASRI D3.2)

Proposed topic	Capacities for advanced data generation and responsible utilisation
Description of topic	H1 develops digital capacities for streamlined systematic and responsible environmental and sustainability monitoring, data integration and tailored decision-support tools. This includes the integration of Earth observation, in-situ monitoring, administrative datasets, statistical information, territorial data, citizen-generated data, AI-enabled analytics and digital twins.
Contribution to environmental and sustainability challenges	H1 contributes to climate action, biodiversity protection, pollution reduction, circular economy, resource management, sustainable energy systems and sustainable urbanisation by improving monitoring, modelling, early warning, scenario assessment and decision support. The WP3 outcomes show relevant examples across all these domains, including territorial digital twins, AI-supported climate-risk warning, digital traceability systems, smart grids and smart city technologies.
Transnational societal and policy relevance	H1 has strong transnational relevance because environmental data, policy frameworks, supply chains, energy systems and climate risks cross national borders. WP4 is intended to develop the CASRI SRIA, match topics with opportunities and identify gaps that could be bridged by funders, which makes H1 directly relevant as a transnational capacity-building topic.
Systemic knowledge needs	Systemic knowledge needs include data fusion, model integration, AI validation, uncertainty assessment, reproducibility, digital twins, interoperability between environmental and socio-economic datasets, and methods for linking global data to local decision-making. The EEA Scientific Committee opinion explicitly recommends AI-native solutions that enable global data to support local decision-making.
Transversal knowledge needs	Transversal knowledge needs include standards, FAIR data, licensing, data sovereignty, privacy, cybersecurity, institutional roles, capacity building and collaboration between public authorities, research communities, technology providers and civil society. There are common needs around interoperability, ethical use, transparency, capacity building, cross-border coordination and harmonised standards.
Actionable knowledge needs	Actionable outputs include demonstrators, dashboards, data governance templates, quality-assurance protocols, AI-use cases, digital twin pilots, training modules and policy guidance for embedding digital tools into policy cycles. D3.2 states that tools, monitoring and data must be designed with users in mind and that digital capacities are needed to tackle information overload and misinformation.

Significance of the topic and CASRI added values

H1 has strong synergies with European digital and environmental knowledge infrastructures, including Copernicus, Earth observation SRIAs, EOSC, environmental data spaces, digital twins, FAIR data initiatives and AI-enabled environmental analytics. There are shared needs around advanced monitoring, interoperability, ethical use, user-centred decision support, capacity building and harmonised standards. EEA SC (2026a) reinforces these synergies by recommending interoperable governed environmental data spaces and AI-native solutions for decision-making. EEA (2026b), provides the broader policy justification: digitalisation can support environmental action through better data generation and interpretation, but requires proactive governance and systemic oversight.

CASRI added value

CASRI adds value by translating fragmented digital applications into a structured transnational R&I agenda for EPAs and environmental knowledge organisations. The WP3 outcomes show many practical digitalisation applications, but they are spread across themes and countries rather than organised as a coherent digitalisation agenda. H1 consolidates these applications into a clear priority: trusted, interoperable and policy-relevant digital capacities for sustainability knowledge and action. This directly supports the WP4 objective to develop a SRIA, match topics with opportunities and identify gaps.

Relevant R&I questions for H1 include:

- How can Earth observation, in-situ monitoring, administrative, statistical, territorial and citizen-generated data be integrated into trusted environmental knowledge systems?
- How can AI and digital twins be validated, documented and made transparent enough to support public decision-making?
- How can digital tools be embedded in real policy cycles rather than remaining isolated dashboards or technical prototypes?
- What role should EPAs and similar organisations play as trusted intermediaries in digital environmental knowledge systems?
- Which governance, interoperability and quality-assurance arrangements are needed to make digital environmental decision-support tools reliable, usable and legitimate?

3.8.2 H.2 Environmental sustainability of digital transformation

Subtitle: Ensuring environmentally friendly digital transformation of societies

Priority level: Low (P4)

Keywords: *green digitalisation; digital footprint; green AI; circular hardware*

Impacts

H2 addresses the environmental sustainability of digital transformation itself. Its main expected impact is to ensure that digital infrastructures, data systems, AI applications and connected devices contribute to sustainability rather than creating unmanaged environmental burdens. EEA (2026b) states that digitalisation creates new environmental pressures, risks and trade-offs, while its growing footprint and rebound effects mean that efficiency gains alone are unlikely to deliver absolute reductions in resource use and emissions.

The EEA Scientific Committee opinion (EEA SC, 2026a) provides a clear research rationale for H2. The SC calls for research on the potential negative impacts of digitalisation and AI, including energy demand, water use for cooling, energy-efficient data centres, cooling systems, low-power computing architectures, green AI algorithms and circular design principles for electronic hardware. It also calls for research into the ecological impacts of digital infrastructure and best-practice guidance for siting, designing and operating digital infrastructure in ways that minimise harm to biodiversity and ecosystems.

Previous CASRI outcomes provide strong evidence that digitalisation is increasingly embedded in sustainability transitions, but they contain fewer explicit entries on the environmental footprint of digitalisation itself. The entries focus primarily on what digitalisation enables: digital twins, AI-supported modelling, traceability, smart grids, smart cities, territorial modelling and digital governance. This means that H2 plays an important balancing role in the SRIA. It ensures that CASRI does not only promote digital tools for sustainability but also asks whether the digital transformation required to run those tools is itself sustainable.

The intended impacts of H2 include better understanding of lifecycle impacts, reduced energy and resource demand from digital systems, improved circularity of digital hardware, reduced rebound effects, more sustainable data infrastructures, and stronger governance alignment between digital policy and environmental policy.

Background & Rationale

The rationale for H2 is that digitalisation has a dual role: it can **support sustainability transitions**, but it can also **create new environmental pressures**. CASRI D3.2 (Lyytimäki, 2025) explicitly states that there is a tension between using digital tools for sustainability and ensuring the sustainability of digital systems themselves. It notes that digitalisation directly affects production chains and consumption patterns and indirectly affects knowledge generation and use across environmental and sustainability issues.

Relevant initiatives and frameworks for H2 (see [Annex 20](#)), including EOSC¹¹⁹, Processes4Planet¹²⁰, the Raw Materials SRIA¹²¹, the EU twin transition framing¹²², the Digital Decade¹²³, green digital policy frameworks¹²⁴, the Digital Europe Programme¹²⁵ and energy-system digitalisation projects. These initiatives support the relevance of H2 but also demonstrate that CASRI must define its specific added value carefully. CASRI's contribution is not to duplicate technology programmes, but to identify R&I needs for understanding and governing the environmental sustainability effects of digital transformation.

Digitalisation is increasingly being applied across value chains, circular economy, energy systems, climate-risk management, urban services and territorial planning. Each of these applications may generate environmental benefits, but each also depends on digital infrastructure, data processing,

¹¹⁹ The Strategic Research & Innovation Agenda and its Multi-Annual Roadmap - EOSC Association

¹²⁰ [Processes4Planet SRIA 2050 | A.SPIRE](#)

¹²¹ [R&I Agenda | ERA.MIN](#)

¹²² [The twin green & digital transition: How sustainable digital technologies could enable a carbon-neutral EU by 2050 - Joint Research Centre](#)

¹²³ [Europe's Digital Decade | Shaping Europe's digital future](#)

¹²⁴ <https://digital-strategy.ec.europa.eu/en/policies/green-digital>

¹²⁵ [Digital Europe Programme - European Commission](#)

hardware, connectivity and energy. H2 therefore addresses the environmental costs, system effects and rebound risks associated with the digitalisation agenda itself.

Topic Description

TABLE 23 – ENVIRONMENTAL SUSTAINABILITY OF DIGITAL TRANSFORMATION (ADAPTED CASRI D3.2)

Proposed topic	Environmental sustainability of digital transformation
Description of topic	H2 focuses on ensuring that digital transformation is environmentally sustainable across its lifecycle and systemic effects. It addresses energy use, water use, material demand, data-centre impacts, electronic waste, hardware circularity, rebound effects, AI-related resource demand and ecological impacts of digital infrastructure.
Contribution to environmental and sustainability challenges	H2 contributes by identifying and managing the positive and negative environmental effects of digitalisation, including energy and resource efficiency, circularity, sustainable infrastructure, and prevention of rebound effects. D3.2 states that environmental sustainability of digital transformation concerns both direct energy and material consumption and indirect effects on production and consumption patterns.
Transnational societal and policy relevance	Digital infrastructures, AI systems, data centres, electronic hardware, material supply chains and digital services are transnational by nature. EEA (2026) transition briefing frames the digital and green transitions as linked to competitiveness, resilience and strategic autonomy, while also requiring governance of environmental risks and rebound effects.
Systemic knowledge needs	Systemic knowledge needs include lifecycle assessment of digital infrastructures, material and energy flows linked to digitalisation, rebound effects, indirect effects on consumption and production systems, and the role of digitalisation in restructuring energy, mobility, housing, food and industrial systems. D3.2 states that digitalisation can either support environmentally friendly production and consumption patterns or contribute to increased consumption and material use.
Transversal knowledge needs	Transversal knowledge needs include governance frameworks linking digital policy and environmental policy, cooperation between environmental agencies and digital/technology actors, sustainability criteria for data infrastructures, and coordination across EU, national, regional and local levels. WP4 aims to match the SRIA with existing opportunities and identify gaps, which is directly relevant to such transversal governance needs.
Actionable knowledge needs	Actionable outputs include indicators for digital footprints, methods for assessing rebound effects, guidelines for sustainable data centres and digital infrastructure, criteria for green AI, circular hardware design principles, public procurement criteria and guidance for EPAs on assessing the environmental impacts of digital transformation. The EEA Scientific Committee opinion explicitly calls for research on energy-efficient data centres, low-power computing, green AI and circular electronic hardware

Significance of the topic and CASRI added values

H2 has synergies with European initiatives on digital infrastructures, green digital policy, raw materials, circular economy, data centres, AI and the twin transition. Existing R&I initiatives include EOSC, Processes4Planet, the Raw Materials SRIA, the EU twin transition framing, the Digital Decade, green digital policy frameworks and the Digital Europe Programme (see Annex 22). EEA SC (2026a) adds a strong research-policy rationale by identifying the environmental impacts of digitalisation and AI as a topic requiring research, including energy demand, water use, low-power computing, green AI and circular hardware design.

EEA (2026b) is especially important for H2 because it does not treat digitalisation as automatically beneficial. It states that digitalisation can support environmental action but also creates risks, trade-offs and rebound effects requiring proactive governance, clear sustainability objectives, policy coherence and systemic oversight.

CASRI added value

CASRI adds value by giving H2 a clear place in the SRIA alongside H1. H2 strengthens the completeness and credibility of the CASRI digitalisation agenda by addressing environmental costs and sustainability limits of digitalisation itself and ensuring that digital transformation is treated as both an enabler and a sustainability challenge.

Relevant R&I questions for H2 include:

- What are the lifecycle environmental impacts of digital infrastructures, data centres, AI systems, connected devices and digital public services?
- How can the energy, water and material footprint of digital transformation be reduced?
- How can rebound effects from digital efficiency gains be identified, monitored and mitigated?
- What criteria should define environmentally sustainable digital services, digital infrastructures and AI systems?
- How can circular economy principles be applied to digital hardware and data infrastructures?
- What role should EPAs and similar organisations play in assessing, communicating and governing the environmental impacts of digital transformation?

Together, H1 and H2 reflect the dual role of digitalisation in sustainability transitions: digital technologies can strengthen environmental knowledge and decision-making, while their own environmental footprint and rebound effects must be actively governed. This complementary framing ensures that digitalisation is treated both as an enabler of and a potential pressure on sustainability transformation.

4. Towards SRIA implementation and conclusions

4.1 CASRI SRIA added values and impacts summary

The CASRI SRIA is broadly aligned with existing European and national R&I initiatives. Its particular added value therefore does not lie in claiming that each individual research field is new. Rather, it lies in the bottom-up perspective of EPAs and implementation-oriented stakeholders, the combination of knowledge needs across countries, and the systematic application of the CASRI principles of systemic, transversal and actionable R&I.

Systemic R&I means moving beyond isolated environmental or technological solutions towards understanding interactions, feedback loops, co-benefits and trade-offs across environmental, social and economic systems. Across the SRIA this is reflected, for example, in connecting climate and biodiversity evidence (B1), land use and mobility (C2), environmental, health and socio-economic inequalities (F2), and the benefits of digitalisation with its own environmental footprint (H1/H2). The systemic perspective also highlights distributional effects and asks who benefits, who carries risks and how interventions in one domain affect others.

Transversal R&I connects disciplines, sectors, actors and governance levels. CASRI therefore places particular emphasis on transnational coordination of resource and environmental challenges (A1), governance across policy domains (D1), inclusive science-policy-practice interfaces (F1), and interoperable environmental knowledge systems (H1). EPAs and EPA-like organisations can contribute as boundary organisations because they combine scientific assessment and monitoring with policy advice, regulation and implementation experience. Their role can help connect European strategic priorities with national, regional and local implementation and provide feedback from practice to future R&I agendas.

Actionable R&I focuses attention on the implementation gap between available knowledge, policy ambition and measurable outcomes. This includes understanding why climate policies do or do not deliver their intended effects (B2), strengthening the use of foresight and scenarios in decision-making (D3), turning environmental data and security frameworks into operational guidance (E1), and developing smarter regulation that reduces unnecessary burden while maintaining environmental ambition (G1). Across the SRIA, actionable R&I means developing knowledge, methods and tools together with those expected to use them and creating mechanisms for learning from their implementation.

These three dimensions reinforce one another. Systemic analysis without implementation can remain abstract; actionable solutions without systemic understanding risk unintended effects; and neither can be sustained without transversal cooperation between knowledge producers, funders, decision-makers and implementers. The CASRI SRIA therefore seeks to contribute to greater policy coherence and implementation capacity, fairer sustainability transitions, stronger multi-level and multi-actor governance, better identification of synergies and trade-offs, and more effective use of environmental and digital knowledge.

Table 24 summarises the expected contribution to impact across the eight themes and 20 topics. These impacts depend on subsequent R&I, programming and implementation and should therefore be understood as areas to which the SRIA can contribute, rather than impacts attributable to the document itself.

TABLE 24 – CASRI SRIA EXPECTED IMPACTS

THEME	Expected impacts
THEME A 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 (A1).
	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 (A2).
	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. (A3).
THEME B Biodiversity & Climate	Establish integrated R&I initiatives and data frameworks that bridge the gap between siloed ecological observation and socio-economic policy — enabling the identification of complex policy opportunities and critical risks through comprehensive, interconnected climate-biodiversity datasets (B1).
	Close the persistent implementation gaps in climate policy by developing R&I tools and models that translate regulatory frameworks into actionable, real-world implementation pathways — enabling effective coordination of multi-level governance, identification of trade-offs and synergies, and improved policy coherence (B2).
	Achieve better coherence and strengthened monitoring capacity, with clearly defined benchmark references for groups of species — significantly improving policy relevance, creating indicators and supporting conservation outcomes on national and transnational levels. (B3)
THEME C Sustainable urbanisation	Reshape cities to function more like adaptive socio-ecological systems rather than purely engineered spaces — shifting urban development away from grey, resource-intensive models toward hybrid green–blue infrastructures that regulate climate, manage water, support biodiversity, and improve human well-being. (C1)
	Shift cities away from car-dependent sprawl toward compact, mixed-use development supported by high-quality public and active transport — reducing inefficient land take, limiting urban expansion into natural areas, and enabling more efficient use of existing public infrastructure through integrated land use and mobility planning. (C2)
	Shift sustainable urbanisation from a primarily technical or environmental agenda toward a socially grounded transformation of cities that prioritises people and their needs — embedding equity, accessibility, and lived social needs into the design, implementation, and evaluation of urban development projects. (C3)
THEME D Nature, environmentally and socially	Improve policy coherence, accelerate implementation, reduce administrative barriers and strengthen public trust in the energy transition — by developing governance systems capable of balancing different policy frameworks, societal interests and stakeholders, thereby increasing implementation efficiency and reducing delays caused by fragmented responsibilities and conflicting objectives (D1).

friendly energy transition	Strengthen public participation, social acceptance and societal ownership of the energy transition — making it not only technically feasible but broadly supported by society, thereby improving implementation, reducing conflicts, increasing trust in institutions and supporting more inclusive and resilient energy systems (D2).
	Support evidence-based decision-making in a nature-, environmentally- and socially friendly energy transition by enabling decision-makers to identify synergies, understand trade-offs, and evaluate the consequences of action, delayed action and non-action — through comparing alternative development pathways that assess environmental, social, economic and technological impacts simultaneously (D3).
THEME E Security	Position environmental data security as a structural enabler of effective and credible sustainability policies — strengthening the collective capacity to make informed decisions and respond effectively to environmental crises through reliable, secure and interoperable data that improve monitoring accuracy, cross-border cooperation, and provide a robust evidence base essential for policy effectiveness and legitimacy (E1).
	Strengthen the fairness, inclusiveness and long-term effectiveness of climate action across Europe by enabling policymakers to design adaptation measures that reduce rather than reinforce existing inequalities — ensuring that the costs and benefits of climate adaptation are distributed fairly across social groups, generations, and territories (E2).
THEME F Democracy and participation	Strengthen the effectiveness and legitimacy of sustainability transformation by developing inclusive and iterative science-policy-practice interfaces that connect scientific, practical and societal knowledge, improve implementation-oriented R&I and enable continuous learning across governance levels (F1).
	Enable healthier and more socially just urban transformation by integrating environmental, health and socio-economic evidence to identify cumulative burdens, target interventions and assess whether policies reduce environmental-health inequalities in practice (F2).
THEME G Regulatory efficiency and competitiveness	Enable a faster, fairer and more durable sustainability transition that reconciles competitiveness with environmental integrity through a system of mutually reinforcing environmental, societal and economic feedback loops (G1).
	Shift the foundations on which European economies compete — reframing competitiveness around long-term resilience, value retention and wellbeing rather than short-term cost reduction and throughput (G2).
THEME H Digitalisation	Besides the production of more data, ensure the creation of more policy-relevant, cost-efficient, timely, interoperable and trusted knowledge systems that significantly strengthen Europe's capacity to generate, integrate and use environmental and sustainability knowledge (H1).
	Ensure that digital infrastructures, data systems, AI applications and connected devices contribute to sustainability rather than creating unmanaged environmental burdens (H2).

4.2 SRIA next steps

4.2.1 From agenda to implementation

The publication of the SRIA is not an end point. Its value depends on how the identified knowledge needs are further developed, connected to research and funding agendas, translated into collaborative R&I activities and tested in implementation. In line with the CASRI impact cycle presented in Section 1.2, implementation should therefore be understood as an iterative process in which experience from policy, regulation, monitoring and practice continuously informs future research priorities.

The preparation of the next Multiannual Financial Framework (MFF), including the European Competitiveness Fund and Horizon Europe framework (FP10), creates a timely opportunity to embed these priorities in future European investment. Under the Commission proposal, the next Horizon Europe Framework Programme would run from 2028 to 2034; negotiations on Horizon Europe and the proposed European Competitiveness Fund are ongoing. This creates an important window of opportunities. CASRI provides an evidence-base and a collaboration model for connecting sustainability knowledge needs with current priorities for competitiveness, resilience, strategic autonomy, democracy, health and environmental quality.

Secure and sustained access to materials and resources, resilient production systems and supply chains, climate-resilient infrastructure, healthy populations, functioning ecosystems, effective regulation and societal capacity to manage transformation are foundations of Europe's long-term competitiveness and resilience. CASRI goals and proposals are consistent with the competitiveness agenda and reinforce it in identifying knowledge to make Europe's competitiveness and resilience strategies durable, effective and sustainable.

The SRIA provides a common reference point rather than a fixed implementation programme. Different topics may require different combinations of European, national, regional and local action, and their relevance will evolve with changing environmental, societal and policy contexts. Continued dialogue with funders, policymakers, research organisations, businesses, public authorities and civil society will therefore be needed to refine the topics and identify suitable implementation pathways.

4.2.2 Role of EPAs and continued collaboration

EPAs and EPA-like organisations can make a particular contribution to this process because they connect environmental knowledge with policy advice, regulation and implementation. Building on the collaboration developed through CASRI, they can contribute as knowledge providers, boundary organisations, conveners and implementation partners. Their monitoring data, regulatory experience, stakeholder networks and understanding of implementation barriers can help ensure that R&I priorities remain connected to practical needs.

The CASRI co-design process has also created relationships and shared understanding among EPAs, National Key Stakeholders and other participating actors. These networks provide a basis for continued cooperation, but future participation should remain open and adapted to the specific topic and implementation context. Targeted multi-stakeholder dialogue can bring together those identifying knowledge needs, those funding and generating research and those responsible for implementation, thereby supporting joint priority-setting, collaborative activities and learning across governance levels.

4.2.3 Connecting the SRIA with R&I programming and funding

Implementation requires stronger links between the SRIA knowledge needs and existing or future R&I programmes, funding mechanisms and collaborative initiatives. CASRI Deliverable 4.2 provides a mapping of relevant funding opportunities, while further matchmaking and dialogue are part of the CASRI implementation activities.

The SRIA can support funders and programme owners in identifying opportunities for coordinated programming, complementary investments and joint initiatives. At the same time, implementation should not be limited to new funding calls. Existing programmes, partnerships, research infrastructures, policy processes and implementation activities can also provide opportunities to address the identified knowledge needs. The appropriate pathway will differ between topics and should be developed together with the relevant actors.

4.2.4 Priority topics as a starting point

The four P1 topics underwent the complete CASRI co-design process:

- Security of resource supply (A1)
- Effectiveness of climate policy (B2)
- Social vulnerabilities of multi-scaled adaptation (E2)
- Inclusive science-policy-practice interface (F1)

Two further topics received P2 status: Comprehensive and Timely Biodiversity Monitoring (B3) and Capacities for Advanced Generation and Responsible Utilization (H1).

For the remaining CASRI pre-implementation activities, these six topics provide a pragmatic starting set for testing implementation and collaboration approaches. They should not be interpreted as a permanent hierarchy of SRIA topics. The other topics remain relevant and can be taken forward where policy needs, partnerships, capacities and funding opportunities provide suitable conditions.

Implementation should also exploit connections between topics rather than address them in isolation. The priority topics illustrate several recurring needs across the SRIA: reliable and interoperable knowledge infrastructures; stronger links between research, policy and implementation; attention to equity and social impacts; and capacities to understand systemic interactions and trade-offs. These common needs offer opportunities for integrated R&I portfolios and collaborative activities that combine environmental evidence, digital capacities, governance innovation and societal participation.

4.2.5 First implementation steps through CASRI WP5

CASRI WP5 provides the first opportunity to test this implementation approach. Its activities will:

- develop an implementation plan for the SRIA, including opportunities to better coordinate R&I priorities and funding;
- develop building blocks for sustained collaboration among EPAs and with relevant European Research Area actors, particularly funders, beyond the duration of CASRI; and
- promote implementation-oriented activities, knowledge transfer, capacity building and uptake of CASRI results.

These activities will help translate the SRIA from a shared agenda into practical collaboration while generating lessons for its further development beyond CASRI.

Implementation also needs to recognise the diversity of European research and administrative systems. Capacities, institutional mandates and available resources vary across countries and regions. Continued cooperation should therefore combine common European ambitions with approaches that can be adapted to different national and local circumstances.

The longer-term ambition is not to establish another fixed institutional layer, but to strengthen an iterative European collaboration in which sustainability knowledge needs, research agendas, funding, implementation and learning are better connected.

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Annex 1 – SRIA co-design steps

The steps of the co-design SRIA process, including the topics selection, are presented in Figure 7 and are further described below:

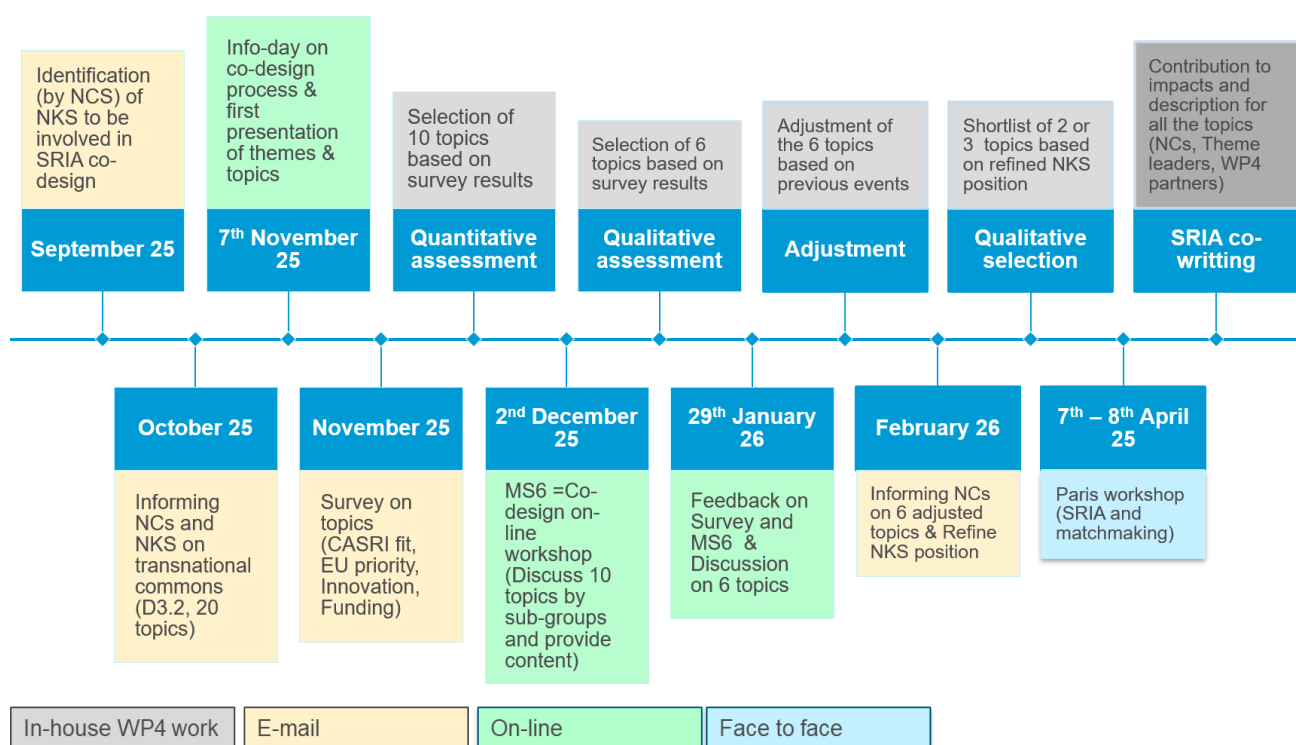


FIGURE 7 : STEPS FOR THE CO-DESIGN SRIA PROCESS

The different steps are as follows:

- 1) **Identification of actors of the co-design process.** The first step of the co-design SRIA process consisted in identifying **who shall be involved in the co-design**. **National Contact (NC) were solicited to identify the National Key Stakeholders (NKS)** (focusing on potential funders and R&D program managers) which would be willing to take part in the process. In October 2025, 40 participants were identified covering 11 countries involved in CASRI (out of the 14, Bulgaria, The Basque Country and Ireland were missing). Over the course of the process, Bulgarian NKS was identified and the NC from the Basque country and Ireland played an active role. Actors involved in the co-design SRIA process include **NKS and NCs**.
- 2) **Informing NKS and NC about the 20 CASRI topics / transnational commons:** This was carried out in two steps. The deliverable on “Selected topics for the matchmaking process for environmental and sustainability research and innovation” was first diffused to NKS and NC and followed by an info-day which gathered 14 NKS and 10 NC representing 11 countries (Bulgaria, Montenegro and The Basques country could not be present).
- 3) **Collecting opinions on the 20 CASRI topics from NKS and NC:** A survey was launched to get opinions from NCs on each of the CASRI topics. Questions on a) CASRI and existing R&D national program fit, 2) EU priority, 3) Innovation, 4) current coverage by existing R&D

and 5) funding opportunities were raised for each topic. Twenty-four participants (16 NKS, 7 NCs and 1 International Advisory Board (IAB) member) responded to the survey covering 13 countries present in CASRI (Ireland was missing).

- **4) Selection of 10 CASRI topics:** Running the on-line meeting (MS6) on the 20 topics of CASRI was not considered manageable nor auspicious to get quality input. A selection of 10 CASRI topics was proposed to carry out the co-design online CASRI workshop (MS6 see step 5). The selection was based on the survey results (step 3). A quantitative assessment of the survey results was carried out in pondering the results (e.g. High-3, Medium-2, Low-1, None 0) and calculating a total score for each of the topics and questions dealing with innovation, EU priority and funding. The topics having the highest score were selected.
- **5) Discussing the 10 topics and specifying topic content:** The overall aims of the one-line workshop (MS6) were to confirm / infirm interest from participants on the 10 selected topics and if appropriate, to formulate Research and Innovation questions for each selected topic. An online co-design workshop gathered 22 participants (9 NKS and 12 NC) and enabled to discuss 9 of the 10 topics in small groups of 3 to 4 participants. There has been strong alignment (strong common interests) on 4 topics, no interest for one topic and a fair interest on 4 topics. R&I questions were raised for some of the topics.
- **6) Selection of 6 CASRI topics:** Working on 10 topics was quite challenging in the previous step. It was deemed necessary to work on an even smaller number of topics for further steps and it was decided to select 6 CASRI topics. This selection was made based on first qualitative analysis of the survey (step 3) and secondly on MS6 outcomes (step 5). The qualitative analysis consisted in considering if the CASRI topics fit with existing R&D programmes and the funding opportunities. A topic was considered of upmost importance if it was gathering the largest number of organisations rating high for willingness to fund and having the topic already part of their R&D programme.
- **7) Informing on SRIA progress and expression of interests for 6 CASRI topics:** An on-line meeting was organized to give feedback to the NC and NKS on the survey results and online workshop outcomes. This meeting aimed to give an overview of the results collected so far to the widest audience of NKS. It gathered 20 people (10 NC and 10 NKS), showing the same level of participation as the previous events. Participants were asked to express their interest on the 6 selected topics in a plenary setting. Three of the topics, one theme and a transversal topic generated much discussion and consensus.
- **8) Adjustment and description of the 6 topics:** This step aimed to give a description of the 6 topics which were proposed for the Paris workshop. The choice and the description of the topic are based on all the previous steps of the co-design, especially including the more recent expressions of interests collected at the feedback on-line meeting in January 2026.
- **9) Informing NCS and NKS on the 6 topics and refining NKS position:** The description of the 6 selected topics was sent to NCs (and NKS). In addition, NCs asked the NKS their raised interests on the topic to better understand the position of the NKS regarding the topic (short-term, medium-term, long-term interest and / or funding opportunities) through a quick survey.
- **10) Selection of 4 topics to be discussed at the Paris workshop:** Four topics were selected based on refined positions of the NKS and NC. The topics selected are the ones for which higher motivation is perceived and the largest number of NKS and NCs. For each of these four topics a comparison with existing R&I initiatives and CASRI topics was performed. Moreover, R&I questions were generated.

- **11) Promoting exchange between partners, formulating main interests and identifying matchmaking options for funding for the 4 selected topics and:** The objectives of the Paris workshop were to further develop 4 topics content according to the CASRI framework (actionable, transversal and systemic aspects) and to start discussing matchmaking of CASRI topics and funding opportunities. Present participants were NCs, NKS, and especially funders who have specific interests in the 4 selected topics.
- **12) Co-writing of the SRIA:** Based on the input collected throughout the previous steps, themes and topics expert (NCs and NKS) contributed in the redaction of impacts and added values of the topics.

Annex 2 – Theme A – Existing R&I initiatives and gaps analysis

Relevant SRIA and initiatives	Description
A.SPIRE, 2021. Process4Planet Strategic Research and Innovation Agenda ¹²⁶	Process4Planet partnership is about transforming the European process industries to make a circular and achieve overall climate neutrality at EU level by 20250, while enhancing their global competitiveness
BEPA, 2024. BATT4EU Strategic Research & Innovation Agenda ¹²⁷	The BATT4EU SRIA focuses on securing European battery value chains, including access to critical raw materials, manufacturing resilience, and recycling. It explicitly addresses reducing reliance on non-EU suppliers, strengthening cross-border industrial ecosystems, and safeguarding industrial productivity. And it is strongly linked to the Single Market and mobility/energy industries.
CBE-JU, 2022. Circular Bio-based Europe (CBE) Joint Undertaking: Strategic Research and Innovation Agenda , ¹²⁸	The Strategic Research and Innovation Agenda (SRIA) identifies the strategic priorities and the essential research and innovation actions required to achieve the objectives of the Circular Bio-based Europe Joint Undertaking (aiming to 1) accelerate the innovation process and development of bio-based innovative solutions; 2) accelerate market deployment of existing mature and innovative bio-based solutions; 3) ensure a high level of environmental performance of bio-based industrial systems
CH-JU, 2022. Clean Hydrogen Joint Undertaking: Strategic Research and Innovation Agenda 2021-2027 ¹²⁹	The overall goal of the Clean Hydrogen JU is to support research and innovation (R&I) activities in the EU, in the field of clean hydrogen solutions and technologies
CICERONE, EU Circular Cooperation Hub, 2020. Strategic Research and Innovation Agenda on Circular Economy ¹³⁰	The SRIA was developed based on eight priority themes (biomass and biotechnologies, chemicals, construction and demolition, food, plastic, raw materials, waste and water) and builds on four societal areas that face sustainability challenges (urban areas, industrial systems, value chains and territory and sea) to identify priority areas to tackle EU region-wide issues and facilitate the circular economy transition.
DLR-PT, 2026. Preliminary draft strategic research & Innovation agenda for the STR-partnership. Towards a strategic research & Innovation Agenda for the new	A new European Partnership is to be established as part of the European Framework Programme for Research and Innovation, 'Horizon Europe': the 'European Partnership on Social Transformations and Resilience' (STR). To define this partnership's specific research and innovation priorities, the DLR Project Management Agency conducted four strategic foresight cycles on Supporting the modernisation of social protection

¹²⁶ https://www.aspire2050.eu/sites/default/files/users/user85/p4planet_07.06.2022._final.pdf

¹²⁷ <https://bepassociation.eu/our-work/sria/>

¹²⁸ <https://www.cbe.europa.eu/system/files/2022-06/cbeju-sria.pdf>

¹²⁹ <https://www.clean-hydrogen.europa.eu/system/files/2022-02/Clean%20Hydrogen%20JU%20SRIA%20-%20approved%20by%20GB%20-%20clean%20for%20publication%20%28ID%2013246486%29.pdf>

¹³⁰ <https://circulareconomy.europa.eu/platform/en/knowledge/strategic-research-innovation-agenda-sria-circular-economy>

European Partnership on Social Transformations and Resilience¹³¹	systems; Shaping the future of work; Fostering education and skills development; Contributing to a fair transition towards climate neutrality. On this basis, the DLR-PT team elaborated a first draft of the Partnership's strategy for 2027-2033
ECTP, 2022. Built4People Partnership Strategic Research & Innovation Agenda 2021-2027¹³²	Strategic Research and Innovation Agenda for the built environment sets out the objectives, outputs and outcomes that provide the framework for value for money, relevant, replicable Built4People Partnership SRIA – V7 5 / 80 and people-centric research, aligned with the priority EU policy objectives, including of course research policy. The SRIA will ultimately transform the built environment into what we need for our economic prosperity, environmental protection and sustainable and fairly distributed health and well-being of all citizens in the EU.
EIT Manufacturing, 2024. EIT Manufacturing revised strategic agenda 2021-2027¹³³	Key areas of the EIT's new strategy: strengthening the EIT Community's impact, increasing the entrepreneurial and innovation capacity of higher education institutions, strengthening the EIT's regional development efforts, through the Regional Innovation Scheme, and setting up two innovation communities dedicated to the cultural and creative sectors and industries (2022) and to water, marine and maritime sectors and ecosystems (2026).
EIT Raw Materials, 2023. EIT Raw Materials Strategic Agenda 2021-2027¹³⁴	EIT RawMaterials is a key European enabler of a green, circular economy. The Strategic Agenda 2021-2027 is fully aligned with the strategic priorities of Horizon Europe. EIT RawMaterials will prioritise and focus on activities that are mutually beneficial for the Community and the organisation as well as strive for a financially sustainable, professional service organisation.
ERA.MIN, 2024. Strategic Research & Innovation Agenda (SRIA) on Raw Materials¹³⁵.	Co-funded European Partnership on Sustainable Supply and Use of Raw Materials (ERA-MIN / Raw Materials SRIA) explicitly addresses resilient primary and secondary raw material supply, circularity, and strategic autonomy. It covers the entire value chain, from extraction and processing to recycling, and aims to reduce critical dependencies for European industries. A strong focus on cross-border coordination of national funding programmes and alignment with industrial needs.
ETP, 2024. Textiles of the Future Strategic Research & Innovation Agenda¹³⁶	Developed by Textile ETP with input from its members, the SRIA addresses the major challenges of the ongoing green and digital transition in the textile sector. It focuses on upcoming regulatory requirements and global market trends while leveraging key enabling technologies.

¹³¹ <https://www.futures4europe.eu/post/towards-a-strategic-research-innovation-agenda-for-the-str-partnership-jizyw>

¹³² https://research-and-innovation.ec.europa.eu/document/download/9218d132-78c8-4461-82e6-0d3ab044fbba_en?filename=ec_rtd_he-partnerships-built4people-agenda.pdf

¹³³ https://www.eitmanufacturing.eu/wp-content/uploads/2024/07/eit-manufacturing_revised-agenda_21-27.pdf

¹³⁴ https://eitrawmaterials.eu/sites/default/files/2024-11/EIT_RM_Strategic_Agenda_2021-2027.pdf

¹³⁵ https://www.era-min.eu/sites/default/files/docs/eramin_sria.pdf

¹³⁶ <https://www.textile-platform.eu/textiles-of-the-future/#sria>

EUFORE, 2025. Strategic Research and Innovation Agenda (SRIA) for the European forest-based sector¹³⁷	EUFORE SRIA sets out a long-term framework for research and innovation to strengthen the resilience, sustainability and multifunctionality of Europe's forests and forest-based sector. Developed through an inclusive, multistakeholder co-creation process, this SRIA reflects the collective intelligence and shared ambitions of policymakers, industry, researchers, forest owners, and civil society.
EUPI-PV, 2025. European Partnership for Innovation in Photovoltaics Strategic Research and Innovation Agenda¹³⁸	The core mission of the EUPI-PV is to define a strategic approach to the allocation of research and innovation funding in the perspective of key policy and industrial objectives reflected in policies including the Net-Zero Industry Act and REPowerEU, and as part of the implementation of the Horizon Europe 2025-2027 work programmes.
IAM4EU, 2024. Innovative Advanced Materials for Europe (IAM4EU) Strategic Research and Innovation Agenda (SRIA)¹³⁹	The aim of IAM4EU is to align the European world-leading Innovative Advanced Materials (IAM) research conducted in universities and RTOs with industrial needs, to bridge gaps, introduce feedback loops, accelerate design, development, uptake and reduce time-to-market. There is an overarching need for safety and sustainability, circularity, reduced carbon footprints, and for resilience and strategic autonomy, while considering natural resources' scarcity.
SBEP, 2024. Sustainable Blue Economy Partnership Strategic Research and Innovation Agenda 2024¹⁴⁰	SRIA has a stronger emphasis on the impact of the partnership activities, and reflects relevant changes of the past years, a situation where the EU countries operate in a transformed global environment and in where key sectors are still recovering from the disruptions caused by the Covid-19 pandemic. This situation gives more urgency to the need for impactful R&I that can support transitions and innovative solutions for the blue economy sectors
The Clean Steel Partnership (CSP), 2021. Clean steel partnership Strategic Research and Innovation Agenda (SRIA)¹⁴¹	The Clean Steel Partnership SRIA addresses industrial value chains, resource efficiency, and secure access to inputs for one of Europe's most strategic industrial sectors. While climate-driven, it clearly links resource availability, industrial productivity, and competitiveness of European steelmaking. Supports a coordinated R&I agenda across Member States.
Water4All, 2022. Water4All's Strategic Research and Innovation Agenda (SRIA) 2022-2025¹⁴²	Water4All Partnership SRIA on the specific topic as resource security as a systemic enabler, and although primarily focused on water, the Water4All SRIA addresses resource security as a prerequisite for economic activity and value chains. Water

¹³⁷ <https://doi.org/10.36333/rs12>

¹³⁸ <https://etip-pv.eu/publications/etip-pv-publications/download/eupi-pv-sria-2025-2027>

¹³⁹ <https://www.iam-i.eu/wp-content/uploads/2025/02/SRIA-Innovative-Advanced-Materials-for-Europe.pdf>

¹⁴⁰ https://www.bluepartnership.eu/sites/bluepartnership.eu/files/documents/2024-12/sustainable_blue_economy_partnership_strategic_research_and_innovation_agenda_2024.pdf

¹⁴¹ <https://www.estep.eu/assets/Publications/CSP-SRIA-Oct2021-clean.pdf>

¹⁴² https://www.water4all-partnership.eu/sites/default/files/2023-02/Water4All_SRIA-2022-2025_A4_2311_bd.pdf

	availability is considered a strategic resource affecting transnational industries and territorial resilience.
The Critical Raw Materials Act¹⁴³ and the RESourceEU Action Plan (2025)¹⁴⁴	The Critical Raw Materials Act and the RESourceEU Action Plan (2025) form the EU's key policy instruments to secure resource supply, reduce dependencies, and protect European value chains. It includes joint purchasing, stockpiling, diversification of supply, and coordination across Member States and is strongly complements R&I-focused SRIAs and transnational funding actions, the creation of the European Critical Raw Materials Centre (2026)
European Raw Materials Alliance (ERMA)¹⁴⁵	European Raw Materials Alliance (ERMA) supports the development of resilient raw material value chains for strategic industrial ecosystems (batteries, renewables, defence) and it operates as a pan-European coordination platform between industry, finance, and public authorities.

Gap analysis

CASRI aligns closely with multiple European Strategic Research and Innovation Agendas (SRIAs) in supporting the EU's core objectives of **competitiveness, security, and strategic autonomy**. Across agenda setting, policy formulation, implementation, and assessment, CASRI and SRIAs such as ERA MIN, BATT4EU, IAM4EU, Processes4Planet, and Water4All converge on strengthening Europe's resilience by improving **resource efficiency, circularity, and technological leadership**. Shared priorities include securing access to critical raw materials, reducing external dependencies through innovation, and addressing systemic risks such as geopolitical instability and water scarcity within the water energy food ecosystem nexus.

Competitiveness and autonomy are operationalised through common investments in **strategic technologies** (hydrogen, CCUS, bio based materials), **digital and regulatory infrastructures** (circularity metrics, Digital Product Passports, industrial data spaces), and **value retention strategies** (repair, re manufacturing, and circular value chains). CASRI's emphasis on lifecycle assessment, material flow analysis, regional diagnostics, skills development, and inclusive governance aligns with SRIAs including CICERONE, the STR Partnership, Made in Europe (EFFRA), and EUFORE. Together, these agendas reinforce Europe's capacity to build resilient, competitive, and socially legitimate industrial ecosystems across key value chains such as raw materials, energy, mobility, chemicals, construction, textiles, and electronics.

A gap analysis between the **CASRI** priorities and the broader Strategic Research and Innovation Agendas (SRIAs) reveals several underexplored areas (see Table 1). These gaps often relate to the "messy" human, institutional, and regional realities of implementation that are frequently overshadowed by the technical and macro-economic focus of many SRIAs.

¹⁴³ https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials/critical-raw-materials-act_en

¹⁴⁴ https://single-market-economy.ec.europa.eu/document/download/01c448d6-dc93-40d7-9afe-4c2af448d00c_en

¹⁴⁵ <https://erma.eu/>

The following table categorizes these gaps (CASRI PRIORITIES VS. SRIA COVERAGE (AI GENERATED VIA NOTEBOOKLM)) and identifies the role of public organizations involved in (trans)national knowledge brokering for policy.

Research Gap addressed in CASRI	Why it is missing or under-addressed in SRIAs	Role for Public Policy Knowledge Brokers	Type of Gap
"Exnovation" of Legacy Systems	SRIAs focus heavily on innovation and the deployment of new technologies. There is little focus on the structured phase-out of non-resilient systems.	High. Requires cross-border policy frameworks to manage the social and economic costs of de-commissioning old industries.	Transversal (Implementation)
Sub-national Economic Diagnostics	Most SRIAs focus on the EU or broad sectoral levels. CASRI specifically targets value chains strategic for regional ecosystems, like the Basque economy.	High. Brokership is needed to translate regional industrial strengths into national and EU-level specialization strategies.	Actionable (Execution)
True Pricing Mechanisms	While mentioned by Processes4Planet, most SRIAs focus on technical costs/LCA. CASRI views "true pricing" as a tool to overcome institutional resistance.	High. Essential for policy integration to ensure sustainable products are not disadvantaged by market distortions.	Transversal (Implementation)
Virgin-to-Secondary Carbon Transition	Most Material Flow Analysis (MFA) focuses on minerals. CASRI highlights foreseeing gaps in the transition specifically from fossil carbon to secondary sustainable carbon.	Moderate. Requires coordinating data across energy, waste, and chemical policy silos to ensure carbon feedstock security.	Systemic (Understanding)
Resilience to Systemic Shocks & Uncertainty (incl. Geopolitical Shocks, Unknown-Unknowns)	IAM4EU, eramin, and BATT4EU treat geopolitics primarily as a material supply chain risk. There is a landscape-wide gap in researching the behavioral and institutional adaptation required for policy stability when transformation pathways are disrupted by strategic shocks.	High. Strengthen competencies in crisis preparedness and use strategic foresight to identify "weak signals" and orientation knowledge across borders.	Systemic (Understanding)
Institutional Resistance and Normalization (incl. Permitting Efficiency, Admin Normalization)	Most SRIAs assume institutional support. CASRI emphasizes research into political resistance and how to "normalize" sustainability in government.	Very High. Crucial for understanding how to break down bureaucratic silos and update administrative mindsets.	Systemic (Understanding)

Component-Level Repair Specialization	Broad "remanufacturing" is common, but CASRI identifies a specific need for optimized logistics for high-alloy steel repair.	Low. This is primarily a technical/industrial gap best addressed by sector-specific clusters.	Actionable (Execution)
Non-linear Environmental & Health Spillovers (incl. Cumulative/Cocktail Effects, Telecoupling)	Technical SRIAs often lack tools to predict the synergistic toxicity of emerging contaminants in real-world cycles (PARC, Water4All). Models for telecoupling (where an EU circular solution triggers a crisis in a distant region) are identified as a major landscape gap by Biodiversa+.	High. Coordinate data across chemical, health, and environmental silos to foster a "One Substance, One Assessment" regulatory approach.	Systemic (Understanding)

Annex 3 – Topic A1 – Existing R&I initiatives, share needs & gaps analysis

Relevant SRIA and initiatives	Description
BEPA, 2024. BATT4EU Strategic Research & Innovation Agenda ¹⁴⁶	The BATT4EU SRIA focuses on securing European battery value chains, including access to critical raw materials, manufacturing resilience, and recycling. It explicitly addresses reducing reliance on non-EU suppliers, strengthening cross-border industrial ecosystems, and safeguarding industrial productivity. And it is strongly linked to the Single Market and mobility/energy industries.
ERA.MIN, 2024. Strategic Research & Innovation Agenda (SRIA) on Raw Materials ¹⁴⁷	Co-funded European Partnership on Sustainable Supply and Use of Raw Materials (ERA-MIN / Raw Materials SRIA) explicitly addresses resilient primary and secondary raw material supply, circularity, and strategic autonomy. It covers the entire value chain, from extraction and processing to recycling, and aims to reduce critical dependencies for European industries. A strong focus on cross-border coordination of national funding programmes and alignment with industrial needs.
The Clean Steel Partnership (CSP), 2021. Clean steel partnership Strategic Research and Innovation Agenda (SRIA) ¹⁴⁸	The Clean Steel Partnership SRIA addresses industrial value chains, resource efficiency, and secure access to inputs for one of Europe's most strategic industrial sectors. While climate-driven, it clearly links resource availability, industrial productivity, and competitiveness of European steelmaking. Supports a coordinated R&I agenda across Member States.
Water4All, 2022. Water4All's Strategic Research and Innovation Agenda (SRIA) 2022-2025 ¹⁴⁹	Water4All Partnership SRIA on the specific topic as resource security as a systemic enabler, and although primarily focused on water, the Water4All SRIA addresses resource security as a prerequisite for economic activity and value chains. Water availability is considered a strategic resource affecting transnational industries and territorial resilience.
The Critical Raw Materials Act ¹⁵⁰ and the RESourceEU Action Plan (2025) ¹⁵¹	The Critical Raw Materials Act and the RESourceEU Action Plan (2025) form the EU's key policy instruments to secure resource supply, reduce dependencies, and protect European value chains. It includes joint purchasing, stockpiling, diversification of supply, and coordination across Member States and is strongly complements R&I-focused SRIAs and transnational funding actions, the creation of the European Critical Raw Materials Centre (2026)
European Raw Materials Alliance (ERMA) ¹⁵²	European Raw Materials Alliance (ERMA) supports the development of resilient raw material value chains for strategic industrial ecosystems (batteries, renewables, defence) and it operates as a pan-European coordination platform between industry, finance, and public authorities.

Shared needs between CASRI topic and existing SRIAs – Topic A1

- **Circular Economy & Resource Efficiency**
 - Regenerative and circular material systems. Increased material efficiency across value chains. Substitution and reuse to reduce dependency
- **Critical Raw Materials and Supply Risk Monitoring**

¹⁴⁶ <https://bepassociation.eu/our-work/sria/>

¹⁴⁷ https://www.era-min.eu/sites/default/files/docs/eramin_sria.pdf

¹⁴⁸ <https://www.estep.eu/assets/Publications/CSP-SRIA-Oct2021-clean.pdf>

¹⁴⁹ https://www.water4all-partnership.eu/sites/default/files/2023-02/Water4All_SRIA-2022-2025_A4_2311_bd.pdf

¹⁵⁰ https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials/critical-raw-materials-act_en

¹⁵¹ https://single-market-economy.ec.europa.eu/document/download/01c448d6-dc93-40d7-9afe-4c2af448d00c_en

¹⁵² <https://erma.eu/>

- Identification of critical raw materials and supply risks. Methods to evaluate maturity, potentials, and vulnerabilities. Monitoring tools for disruptions, dependencies, and geopolitical risks;
- **Diversification of Supply, Feedstock and Sourcing**
 - Alternative materials, regenerative feedstocks, substitutes. Increasing domestic and secondary sourcing. Reducing import concentration from single non-EU suppliers
- **Industrial Resilience, Shock Prevention, and Sovereignty**
 - Resilience methods for shocks (geopolitical, economic, environmental). Technological options enabling sovereignty in key sectors. Strengthening cross-border and domestic industrial value chains
- **Policy, Governance, and Agenda-setting**
 - Policy frameworks enabling circular industrial transitions. Governance tools to support resilient supply chains. Research on the political impact of resource security concerns
- **Sector-specific Applications and Tools**
 - Sector-level energy and resource efficiency measures. Tools to manage fluctuating renewable energy supply. Application-driven circular and substitution innovations

Gaps in R&I needs from existing SRIA and transnational initiatives – Topic A1

- **Insufficient attention to territorial and place-based resource security**
 - Local and regional territorial resource vulnerabilities (urban–rural divide, peripheral regions).
 - Place-based dependencies affecting regional industrial clusters.
 - Integration of resource security into territorial planning
- **Lack of integrated approaches combining climate neutrality, circularity, and security**
 - Integrated frameworks balancing decarbonisation, resource security, economic competitiveness, and territorial cohesion.
 - Research on trade-offs between climate neutrality pathways and resource sovereignty (materials needed for renewable energy, batteries, hydrogen).
- **Insufficient focus on regenerative materials and bio-based substitutes**
 - R&I on regenerative materials beyond biomass (e.g., regenerative polymers, mineral substitutes).
 - Scalable bio-based industrial feedstocks for energy-intensive sectors (steel, chemicals).
 - Assessment of sustainability limits of bio-based options (land use, biodiversity impact).
- **Underspecified research on cross-border value chain interdependencies**
 - R&I on cross-border (transnational) value chain vulnerabilities, not only in raw materials but also in: industrial components, digital infrastructure, energy systems
 - Methods to assess cascade risks across interconnected sectors.
- **Limited integration of political science, geopolitics, and governance research**
 - Research on how resource scarcity shapes political agendas, decision-making, and societal perceptions.

- Analysis of geopolitical strategies for resource alliances beyond the EU.
- Tools to evaluate political risks of resource dependencies (e.g., foreign export controls).
- **Lack of operational tools for real-time monitoring and forecasting**
 - Real-time data platforms for supply chain monitoring at high resolution.
 - Early-warning models combining: climate risks, geopolitical shocks, industrial demand forecasting
 - Decision-support systems for regional and sectoral stakeholders.
- **Insufficient actionable R&I for specific industrial sectors**
 - Sector-specific tools for energy and material demand reduction in: heavy industries, manufacturing SMEs, logistics and mobility systems
 - Tools for balancing renewable energy fluctuations in energy-intensive industrial processes (beyond generic RE power balancing).
- **Limited attention to social dimensions and societal resilience**
 - Research on social acceptance of new extraction, recycling, and circular systems.
 - Societal resilience to resource disruptions (e.g. employment, regional inequality).
 - Behavioural aspects of material demand, substitution, and reuse.

Annex 4 – Topic A2– Existing R&I initiatives

Relevant SRIA and initiatives	Description
EUFORE, 2025. Strategic Research and Innovation Agenda (SRIA) for the European forest-based sector¹⁵³	EUFORE SRIA sets out a long-term framework for research and innovation to strengthen the resilience, sustainability and multifunctionality of Europe's forests and forest-based sector. Developed through an inclusive, multistakeholder co-creation process, this SRIA reflects the collective intelligence and shared ambitions of policymakers, industry, researchers, forest owners, and civil society.
SBEP, 2024. Sustainable Blue Economy Partnership Strategic Research and Innovation Agenda 2024¹⁵⁴	SRIA has a stronger emphasis on the impact of the partnership activities, and reflects relevant changes of the past years, a situation where the EU countries operate in a transformed global environment and in where key sectors are still recovering from the disruptions caused by the Covid-19 pandemic. This situation gives more urgency to the need for impactful R&I that can support transitions and innovative solutions for the blue economy sectors
Water4All, 2022. Water4All's Strategic Research and Innovation Agenda (SRIA) 2022-2025¹⁵⁵	Water4All Partnership SRIA on the specific topic as resource security as a systemic enabler, and although primarily focused on water, the Water4All SRIA addresses resource security as a prerequisite for economic activity and value chains. Water availability is considered a strategic resource affecting transnational industries and territorial resilience.
CICERONE, EU Circular Cooperation Hub, 2020. Strategic Research and Innovation Agenda on Circular Economy¹⁵⁶	The SRIA was developed based on eight priority themes (biomass and biotechnologies, chemicals, construction and demolition, food, plastic, raw materials, waste and water) and builds on four societal areas that face sustainability challenges (urban areas, industrial systems, value chains and territory and sea) to identify priority areas to tackle EU region-wide issues and facilitate the circular economy transition.
DLR-PT, 2026. Preliminary draft strategic research & Innovation agenda for the STR-partnership. Towards a strategic research & Innovation Agenda for the new European Partnership on Social Transformations and Resilience¹⁵⁷	A new European Partnership is to be established as part of the European Framework Programme for Research and Innovation, 'Horizon Europe': the 'European Partnership on Social Transformations and Resilience' (STR). To define this partnership's specific research and innovation priorities, the DLR Project Management Agency conducted four strategic foresight cycles on Supporting the modernisation of social protection systems; Shaping the future of work; Fostering education and skills development; Contributing to a fair transition towards

¹⁵³ <https://doi.org/10.36333/rs12>

¹⁵⁴ https://www.bluepartnership.eu/sites/bluepartnership.eu/files/documents/2024-12/sustainable_blue_economy_partnership_strategic_research_and_innovation_agenda_2024.pdf

¹⁵⁵ https://www.water4all-partnership.eu/sites/default/files/2023-02/Water4All_SRIA-2022-2025_A4_2311_bd.pdf

¹⁵⁶ <https://circulareconomy.europa.eu/platform/en/knowledge/strategic-research-innovation-agenda-sria-circular-economy>

¹⁵⁷ <https://www.futures4europe.eu/post/towards-a-strategic-research-innovation-agenda-for-the-str-partnership-jizyw>

	climate neutrality. On this basis, the DLR-PT team elaborated a first draft of the Partnership's strategy for 2027-2033
The Just Transition Initiative ¹⁵⁸ .	The Just Transition Initiative is a new partnership project developed by the CSIS Energy Security & Climate Change Program and the Climate Investment Funds (CIF) to investigate how to achieve a just transition through the transformational change necessary to address climate change.

¹⁵⁸ <https://www.csis.org/programs/energy-security-and-climate-change-program/projects/just-transition-initiative>

Annex 5 – Topic A3 – Existing R&I initiatives

Existing SRIA and initiatives	Description and relevance
A.SPIRE, 2021. Process4Planet Strategic Research and Innovation Agenda ¹⁵⁹	Process4Planet partnership is about transforming the European process industries to make a circular and achieve overall climate neutrality at EU level by 20250, while enhancing their global competitiveness
The Clean Steel Partnership (CSP), 2021. Clean steel partnership Strategic Research and Innovation Agenda (SRIA) ¹⁶⁰	The Clean Steel Partnership SRIA addresses industrial value chains, resource efficiency, and secure access to inputs for one of Europe's most strategic industrial sectors. While climate-driven, it clearly links resource availability, industrial productivity, and competitiveness of European steelmaking. Supports a coordinated R&I agenda across Member States.
IAM4EU, 2024. Innovative Advanced Materials for Europe (IAM4EU) Strategic Research and Innovation Agenda (SRIA) ¹⁶¹	The aim of IAM4EU is to align the European world-leading Innovative Advanced Materials (IAM) research conducted in universities and RTOs with industrial needs, to bridge gaps, introduce feedback loops, accelerate design, development, uptake and reduce time-to-market. There is an overarching need for safety and sustainability, circularity, reduced carbon footprints, and for resilience and strategic autonomy, while considering natural resources' scarcity.
Made in Europe Partnership – SRIA (Manufacturing) ¹⁶²	The Made in Europe Partnership is the central Horizon Europe manufacturing partnership. This SRIA focuses on: climate-neutral and resource-efficient manufacturing, digitalised and human-centric production, resilient and globally connected European manufacturing ecosystems, scaling cross-border production technologies for net-zero industries. There is a strong alignment with the Net-Zero Industry Act, Critical Raw Materials Act, and the Green Deal Industrial Plan. It brings together EFFRA, representing the private side (industry, academia, and research centres), the European Commission in particular DG Research & Innovation (DG RTD) and DG CONNECT and the EU Member States

¹⁵⁹ https://www.aspire2050.eu/sites/default/files/users/user85/p4planet_07.06.2022._final.pdf

¹⁶⁰ <https://www.estep.eu/assets/Publications/CSP-SRIA-Oct2021-clean.pdf>

¹⁶¹ <https://www.iam-i.eu/wp-content/uploads/2025/02/SRIA-Innovative-Advanced-Materials-for-Europe.pdf>

¹⁶² <https://www.effra.eu/made-in-europe-state-play/>

Annex 6 – Topic B1 – Existing R&I initiatives

Existing SRIAs & initiatives	Description & relevance
Biodiversa+ – Strategic Biodiversity Monitoring Priorities (2025–2028) ¹⁶³	Outlines shared goals and priorities for biodiversity monitoring, covering intraspecific genetical variety (diversity), species populations, different habitats, and ecosystems across terrestrial, freshwater, and marine environments. It emphasises Essential Biodiversity Variables (EBVs) and the DPSIR framework for harmonised monitoring. It defines Europe's coordinated monitoring priorities; supports policy relevant, up to date biodiversity information and application.
European co-funded Partnership on Biodiversity, Biodiversa+ ¹⁶⁴	Biodiversa+ is the European Biodiversity Partnership that supports excellent research on biodiversity with an impact on policy and society. Co-developed and launched in 2021 by BiodivERsA and the European Commission as part of the EU Biodiversity Strategy for 2030, it contributes to the ambition that by 2030, nature in Europe is on a path to recovery, and by 2050, people are living in harmony with nature.
Earth Observation Strategic Research and Innovation Agenda ¹⁶⁵	This first Strategic Research and Innovation Agenda (SRIA) for Earth Observation sets out a comprehensive framework for Copernicus' research and technological development. It outlines key priorities for the Horizon Europe Work Programmes for 2025-2027 and beyond into the next Multi-annual Financial Framework, ensuring that Copernicus and its products and services remain state-of-the-art.

¹⁶³ <https://www.biodiversa.eu/2025/04/24/updated-biodiversity-monitoring-priorities-for-2025-2028/>

¹⁶⁴ <https://www.biodiversa.eu/>

¹⁶⁵ <https://publications.jrc.ec.europa.eu/repository/handle/JRC136730>

Annex 7 – Topic B2 – Existing R&I initiatives, shared needs and gaps

Existing SRIA & Initiatives	Description & relevance
JPI Climate Strategic Research & Innovation Agenda¹⁶⁶	The three overarching challenges are: Understanding the processes and consequences of climate change, improving knowledge on climate-related decision-making processes and measures, Researching sustainable societal transformation in the context of climate change (2016 – 2025)
Equinox Workshops (on Societal transformation in the face of Climate change¹⁶⁷	3 keys questions: How should governance and policy be designed to drive effective and legitimate societal transformations for climate action? How can wider public engagement and change of practices be enabled among citizens, businesses and political institutions to advance climate action? What are trade-offs and co-benefits between climate policy and other policies? (Environnemental, Competitiveness, Security, Agricultural etc.) December 2025, Brussels). A strong focus on improving climate related decision making, societal transformations, and connecting research to implementation & Helps address policy gaps, transdisciplinary governance, and climate neutral societal pathways.
JPI Magica¹⁶⁸	MAXimising the synergy of European research Governance and Innovation for Climate Action”, is a 4-year Coordination and Support Action funded under the Horizon Europe programme within the call “HORIZON-CL5-2021-D1-01-03” and share the main objectives of the Joint Programming Initiative Connecting Climate Knowledge for Europe.
EU Mission: Adaptation to Climate Change¹⁶⁹	Support at least 150 European regions and communities towards climate resilience by 2030. It focuses on helping these regions and local authorities to (i) Understand climate risks: Identify current and future climate-related challenges specific to their areas, (ii) Develop adaptation pathways: Create strategic plans to prepare for and manage the impacts of a changing climate, (iii) Implement innovative solutions: Deploy practical measures and technologies to enhance resilience on the ground.
EU Strategic R&I Agenda on Health & Climate Change¹⁷⁰(2025)	Although framed around health, this SRIA includes substantial content on policy implementation, adaptation, and mitigation governance. It emphasises research uptake into policy implementation—a key issue you highlighted (closing implementation gaps); Addresses climate driven inequalities, cross sectoral resilience, and links to global and national governance; Implemented under Horizon Europe and intended to guide multiple funders.
EU Adaptation Strategy (2021+)¹⁷¹	EU Adaptation Strategy functions like a strategic agenda for climate policy implementation. It provides a framework for smarter, faster, and more systemic climate adaptation, an integration of adaptation across all policies & strengthened international climate policy action. This strategy is central to evaluating climate policy

¹⁶⁶ https://jpi-climate.eu/wp-content/uploads/2022/11/JPI-CLIMATE_SRIA.pdf

¹⁶⁷ <https://jpi-climate.eu/event/workshop-societal-transformation-in-the-face-of-climate-change/>

¹⁶⁸ <https://www.magica-project.eu/>

¹⁶⁹ https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/adaptation-climate-change_en

¹⁷⁰ <https://op.europa.eu/en/publication-detail/-/publication/616cce9c-39e5-11f0-8a44-01aa75ed71a1>

¹⁷¹ https://climate.ec.europa.eu/eu-action/adaptation-and-resilience-climate-change/eu-adaptation-strategy_en

	effectiveness because it focuses on tools, governance, and multilevel implementation required for climate resilience.
European Climate Law (2021–2025 updates) ¹⁷²	This law explicitly structures regulatory frameworks for climate targets, including: Binding net zero by 2050 target, legally binding 2030 (55%) and proposed 2040 (90%) climate targets, Implementation, monitoring, and correction mechanisms for EU and Member States. The law acts as a governance backbone ensuring policy coherence, accountability, and long-term regulatory stability.
European Committee of the Regions (CoR) Opinion on the Future of EU Climate Policy (2024) ¹⁷³	Strategic governance document evaluating policy effectiveness. It highlights: the need for Europe wide systemic transformation to achieve climate neutrality, the critical role of local and regional authorities (responsible for 70% of mitigation and 90% of adaptation actions), the importance of clear governance frameworks, capacity, and monitoring. This document identifies governance and regulatory gaps relevant to climate policy effectiveness
EEA Report: From adaptation planning to action (2025) ¹⁷⁴	This EU wide assessment covers: the progress in climate policy implementation across Member States, persistent gaps in monitoring, evaluation, local capacity, funding, and clarity of roles, weak evidence on effectiveness of implemented actions. [eea.europa.eu]. Functionally, this offers a systemwide review of climate policy implementation effectiveness.
EU Special Report on Climate Adaptation (2024) ¹⁷⁵	The European Court of Auditors confirms: A sound EU adaptation framework exists, but ineffective reporting, low local awareness of tools and plans, Inference for short-term, insufficiently evaluated solutions. This connects directly to regulatory effectiveness and implementation shortcomings
Transnational Climate Adaptation Initiatives (40initiative dataset) ¹⁷⁶	Research shows that two thirds of initiatives produce outputs, BUT only one-third achieve actual behavioural change, showing a gap between delivery and impact & effectiveness depends on strong leadership, binding rules, process management, and coordination with international governance. This is directly relevant to assessing climate policy effectiveness across borders.
Regions Adapt Initiative ¹⁷⁷	A global transnational initiative enabling regional governments to: Coordinate adaptation policies, improve tracking, visibility, and aggregation of adaptation measures, Strengthen multilevel governance of climate adaptation. Important because regional implementation significantly affects policy effectiveness
European Climate Resilience and Risk Management –	The Commission is developing a new integrated framework for European climate resilience and risk management to help Member States prevent and prepare for the growing impacts of climate change. It will consist of a balanced policy package which,

¹⁷² https://climate.ec.europa.eu/eu-action/european-climate-law_en

¹⁷³ <https://www.cor.europa.eu/en/our-work/opinions/cdr-1474-2024>

¹⁷⁴ <https://www.eea.europa.eu/en/analysis/publications/from-adaptation-planning-to-action>

¹⁷⁵ https://www.eca.europa.eu/ECAPublications/SR-2024-15/SR-2024-15_EN.pdf

¹⁷⁶ <https://www.c40.org/>

¹⁷⁷ <https://regions4.org/regionsadapt/>

Integrated Framework (2026) ¹⁷⁸	following a thorough impact assessment process, is expected to be adopted during the second half of 2026.
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Shared needs between CASRI topic and existing SRIAs

- Need for Better Policy Implementation & Science–Policy Uptake

EU SRIA on Health & Climate Change explicitly calls for more effective measures to implement scientific evidence into policy and improved uptake mechanisms & The European Scientific Advisory Board stresses that adaptation efforts remain insufficient and require coherent, coordinated action across governance levels.

Common need: Research on how to operationalize climate policy: institutions, governance models, evidence-uptake processes, monitoring systems.

- Recognition of Systemic, Cross-Sectoral Climate Risks

The **EU Adaptation Strategy** promotes systemic adaptation and integrating climate resilience across all sectors. The **Scientific Advisory Board** highlights systemic and transboundary climate risks affecting infrastructure, supply chains, and ecosystems. **JPI Climate SRIA** focuses on connecting people, problems, and solutions in a systemic approach.

Common need: Understanding and managing climate change as a systemic, cross-sectoral challenge requiring integrated governance and research across domains.

- Strong Emphasis on Mitigation–Adaptation Linkages

The **EU Adaptation Strategy** foregrounds the need for nature-based solutions and integrated, cross-sectoral approaches. The **Scientific Advisory Board** stresses that intensifying risks require better coordinated mitigation and adaptation strategies.

Common need: Integrated research on how mitigation and adaptation reinforce or conflict with one another, especially through nature-based approaches.

- Central Role of Social Sciences & Societal Transformation

JPI Climate SRIA prioritizes understanding climate-related decision-making and societal transformation processes. The **Health & Climate SRIA** emphasizes climate-driven inequalities, social impacts, and interdisciplinary research.

Common need: Research on social drivers, societal resilience, behavioural change, and equitable transformations toward climate neutrality.

- Need for Multilevel Governance: Global → National → Local

¹⁷⁸ https://climate.ec.europa.eu/eu-action/adaptation-and-resilience-climate-change/european-climate-resilience-and-risk-management-integrated-framework_en

The Health & Climate Change SRIA includes research on bridging global and local levels and improving multi-level governance. **Climate-ADAPT** acts as a transnational platform supporting national and local implementation. **The EU Adaptation Strategy** stresses local action supported by EU-level frameworks.

Common need: Research on how to coordinate climate governance across scales, ensuring consistency from UNFCCC goals to municipal action.

- Attention to Climate Justice, Inequalities, and Fairness

The Health & Climate SRIA focuses on climate-driven health inequalities and the centrality of equity. **The Scientific Advisory Board** links inadequate adaptation to threats against lives, livelihoods, and economic foundations.

Common need: Research on distributional outcomes, fair adaptation, and justice in climate transitions, especially for vulnerable and marginalized groups.

- Need for Actionable Knowledge Supporting National Adaptation & Mitigation Plans

The Scientific Advisory Board calls for strengthening national adaptation planning and financial coherence. **The EU Adaptation Strategy** focuses on developing smarter, swifter, more systemic adaptation solutions.

Common need: Applied research that directly supports policy design, planning, investment decisions and implementation at the national level.

Gaps in R&I needs from existing SRIA and transnational initiatives

- **Bridging Policy Design and Real-world Implementation-World Implementation**

Resulting gap: SRIAs do not sufficiently address implementation of bottlenecks or provide guidance for ensuring that regulatory frameworks translate into effective, measurable outcomes.

- **Governance and Coordination Gap Across Levels and Borders**

Resulting gap: SRIAs lack concrete strategies for synchronizing governance across jurisdictions, resulting in fragmented implementation and limited cross-border policy coherence.

- **Institutional Capacity, Resources, and Skills**

Resulting gap: SRIAs under-address the practical capacity needed for policy implementation, making it difficult for transnational initiatives to operationalize ambitious climate agendas.

- **Monitoring, Evaluation, and Policy Outcome Gap**

Resulting gap: SRIAs do not provide the methodological depth required for consistent, cross-border evaluation frameworks, leaving transnational initiatives without clear measurement tools.

- **Regulatory Coherence and Stringency Gap**

Resulting gap: SRIAs often assume regulatory environments are capable of absorbing advanced policy mixes, while reality shows strong political economy and institutional constraints.

- **Gap Between Research-Oriented SRIAs and Practice-Oriented Transnational Needs**

Resulting gap: SRIAs are often too research-oriented, while transnational initiatives require practical, enforceable, and scalable tools.

Annex 8 – Topic B3 – Existing R&I initiatives, shared needs and gaps

Existing SRIAs & initiatives	Description & relevance
Biodiversa+ – Strategic Biodiversity Monitoring Priorities (2025–2028) ¹⁷⁹	Outlines shared goals and priorities for biodiversity monitoring, covering intraspecific genetic variety (diversity), species populations, different habitats, and ecosystems across terrestrial, freshwater, and marine environments. It emphasises Essential Biodiversity Variables (EBVs) and the DPSIR framework for harmonised monitoring. It defines Europe's coordinated monitoring priorities; supports policy relevant, up to date biodiversity information and application.
European co-funded Partnership on Biodiversity, Biodiversa+ ¹⁸⁰	cited as a relevant document (Strategy & flagships – Biodiversa +)
European Biodiversity Strategy for 2030 ¹⁸¹	The Biodiversity Strategy aims to put Europe's biodiversity on the road to rejuvenation by 2030 for the benefit of people, climate and the planet. The strategy aims to build our societies' resilience to future threats, such as: The impacts of climate change, Forest fires, Food insecurity and Disease outbreaks - including by protecting wildlife and fighting illegal wildlife trade.
Nature Restoration Regulation ¹⁸²	The Nature Restoration Regulation is the first continent-wide, comprehensive law of its kind. It is a key element of the EU Biodiversity Strategy, which sets binding targets to restore degraded ecosystems, in particular those with the most potential to capture and store carbon and to prevent and reduce the impact of natural disasters.
Kunming-Montreal Global Biodiversity Framework ¹⁸³	Amidst a dangerous decline in nature threatening the survival of 1 million species and impacting the lives of billions of people, the GBF aims to halt and reverse nature loss. The framework consists of global targets to be achieved by 2030 and beyond to safeguard and sustainably use biodiversity.
EuropaBON / Guides to Harmonising Biodiversity Monitoring (Biodiversa+) ¹⁸⁴	EuropaBON / Guides to Harmonising Biodiversity Monitoring is a formal guidance document used across Europe which provides harmonisation guidance for transnational biodiversity monitoring protocols and emphasises building interoperable monitoring systems
IUCN SSC – Guidelines and Tools for Monitoring Biodiversity (2025) ¹⁸⁵	This global initiative provides manuals, protocols, and methods for biodiversity monitoring across taxa and environments, including remote sensing, observer-based monitoring, and camera systems. It offers foundational tools for designing comprehensive and scientifically robust biodiversity monitoring systems.

¹⁷⁹ <https://www.biodiversa.eu/2025/04/24/updated-biodiversity-monitoring-priorities-for-2025-2028/>

¹⁸⁰ <https://www.biodiversa.eu/2021/11/18/release-of-the-biodiversa-strategic-research-and-innovation-agenda/>

¹⁸¹ https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030_en

¹⁸² https://environment.ec.europa.eu/topics/nature-and-biodiversity/nature-restoration-regulation_en

¹⁸³ <https://www.cbd.int/gbf/introduction>

¹⁸⁴ <https://europabon.org/>

¹⁸⁵ https://www.speciesmonitoring.org/uploads/8/4/9/7/84975128/iucn_smsg_2025._guidelines_and_tools_for_monitoring_biodiversity_v1.1.pdf

UNEP – Global Biodiversity Monitoring Frameworks¹⁸⁶	UNEP supports countries in implementing biodiversity monitoring systems aligned with the Global Biodiversity Framework (GBF). It provides tools, technical support, and capacity building to assess biodiversity status, threats, and progress toward global goals. Its relevance on Global framework for ecosystem and biodiversity monitoring, informing national and international policy
Earth Observation SRIA for Copernicus¹⁸⁷	This is relevant to spatial and remote-sensing-based ecosystem monitoring. It defines the strategic trajectory of EU Earth Observation systems for environmental monitoring and strongly supports biodiversity-relevant monitoring through EO (land, water, soil, species trends).

Shared needs between CASRI topic and existing SRIAs (assisted by AI)

- Need for Comprehensive, Coherent & Up-to-Date Biodiversity Monitoring Systems
 - Creation of coherent, integrated European biodiversity monitoring frameworks
- Harmonisation & Interoperability of Monitoring Systems Across Countries
 - Developing interoperable, harmonised pan-European biodiversity monitoring infrastructures.
- Use of Spatial Data & Earth Observation for Biodiversity Monitoring
 - Expanding the use of EO/spatial technologies to enhance biodiversity monitoring coverage and timeliness.
- Improved Monitoring of Aquatic Biodiversity & Water Ecosystems
 - Strengthening aquatic and freshwater biodiversity monitoring systems.
- Genetic Diversity Monitoring & Data Integration
 - Operationalising genetic diversity monitoring and integrating it into broader biodiversity indicators.
- Soil Biodiversity Monitoring in Natural & Managed Lands
 - Developing structured soil biodiversity monitoring frameworks
- Invasive Species Monitoring & Management
 - Strengthening EU-wide early detection and monitoring of invasive species
- Need for Actionable, Policy-Relevant Monitoring Outputs
 - Translating biodiversity monitoring into actionable, timely, evidence-based policy outputs
- Citizen Science as a Component of Monitoring Systems
 - Expanding and systematising citizen science contributions to biodiversity monitoring

Gaps in R&I needs from existing SRIA and transnational initiatives (Assisted by AI)

- Limited Integration Across All Biodiversity Dimensions
 - Gap: Monitoring systems still operate in silos; full integration across genetic, species, ecosystem, soil, aquatic, and invasive species layers is incomplete.

¹⁸⁶ <https://www.unep.org/interactives/biodiversity-sdgs-tool/global-biodiversity-framework.html>

¹⁸⁷ <https://publications.jrc.ec.europa.eu/repository/handle/JRC136730>

- What's missing: A unified, multi-layered monitoring framework that simultaneously captures genetic, functional, ecosystem and abiotic components; Standardised metrics linking soil biodiversity, genetic diversity, and ecosystem functioning across countries.
- Insufficient Real-Time or Near-Real-Time Monitoring Capability
 - *Gap: Copernicus enables timely spatial data, but most biodiversity monitoring programmes rely on periodic sampling, not continuous data flows*
 - *What's missing: Technologies and infrastructures for high-frequency in situ monitoring (eDNA stations, acoustic sensors, automated species detection); Direct integration of real-time EO data with field-based biodiversity metrics.*
- Weak Integration of Citizen Science into Formal Monitoring Frameworks
 - *Gap : Citizen science is recognised as an opportunity, but not structurally embedded in monitoring systems*
 - *What's missing: Protocols and QA/QC systems that allow citizen-generated data to feed directly into national and EU-level biodiversity indicators; Long-term funding*
- Interoperability Efforts Are Still Challenging in Practice
 - *Gaps: Despite protocols for harmonisation, national systems remain only partially connected*
 - *What's missing: A fully operational, EU-wide interoperability platform integrating all biodiversity monitoring datasets; Clear interoperability standards for soil, genetic, and aquatic monitoring data.*
- Policy Uptake Still Limited by Data Fragmentation & Delayed Reporting
 - *Gap: Monitoring initiatives produce high-quality data, but this does not consistently translate into timely policies*
 - *What's missing: Mechanisms ensuring fast translation of biodiversity monitoring results into regulatory frameworks; Policy-ready indicators systematically integrated across Member States.*
- Soil Biodiversity Remains Under-Monitored
 - *Gap: Soil biodiversity is mentioned but receives far less methodological and operational attention compared to terrestrial or aquatic species monitoring.*
 - *What's missing: A dedicated, standardised EU soil biodiversity monitoring programme; Methods linking soil biodiversity to ecosystem services in national reporting.*
- Genetic Diversity Monitoring Is Conceptually Recognised but Operationally Weak
 - *Gap: Although genetic diversity is included in EU strategies and Biodiversa+ themes, actual genetic monitoring schemes are limited.*
 - *What's missing: Baseline genetic datasets and long-term sampling protocols across species groups; Integration of genetic data into policy indicators or conservation assessments.*
- Invasive Species Monitoring Lacks Early-Warning System Coherence

- *Gap: IAS (Invasive Alien Species) monitoring is present but not coordinated through a unified EU early-warning system*
- *What's missing: A unified EU IAS detection, reporting, and response network integrating EO, citizen science, and national agencies; Rapid-alert integration with Copernicus services.*
- Limited Connection Between EQS (Environmental Quality Standards) and Biodiversity Monitoring
 - *Gap: Chemical, water, and air monitoring systems remain largely separate from biodiversity datasets;*
 - *What's missing: Integrated monitoring linking pollutants, climate pressures, and biodiversity response indicators. Shared platforms between EEA (e.g., water/air quality tools) and biodiversity datasets.*
- Sustainable Funding Models for Long-Term Monitoring Are Not Fully Established
 - *Gap: Initiatives highlight funding fragility as a major barrier*
 - *What's missing: Multi-decade funding commitments for biodiversity monitoring infrastructures. Dedicated EU budget lines for operational, not only research-based, monitoring;*

Annex 9 – Topic C1 – Existing R&I initiatives

Existing SRIAs & initiatives	Description & relevance
DUT (Driving Urban Transition)¹⁸⁸	DUT is an European-wide partnership platform to address sustainable issues and fund future-oriented projects in intergovernmental research and innovation setting. The program addresses key challenges of urban transitions such as mobility, digitalization and also green spaces
Copernicus Land monitoring Service¹⁸⁹	It is the Land Monitoring Service of the satellite observation platform Copernicus. It supports the use of open-source satellite imagery to support municipal and planning demands. By using the spectral information provided by certain Sentinel satellites, it is possible for users to monitor and manage urban green spaces more efficiently and with a stable time scale
Networking platform Eurocities¹⁹⁰	It brings stakeholders from about 200 cities together to network and exchange on topics of importance to city planning and politics. One working topic of the network is dedicated to green areas and biodiversity.
New European Bauhaus¹⁹¹	The New European Bauhaus looks to address the broader public as well as architects and designers to engage in the transformation of urban areas to support the goals of the European Green Deal. Inclusive, sustainable and aesthetic and qualitative urban planning projects are supported in the very hands-on EU initiative, resulting also in the creation of innovative and socially important green spaces in existing city structures.
European Biodiversity Strategy for 2030¹⁹²	The Biodiversity Strategy aims to put Europe's biodiversity on the road to rejuvenation by 2030 for the benefit of people, climate and the planet. The strategy aims to build our societies' resilience to future threats, such as: The impacts of climate change, Forest fires, Food insecurity and Disease outbreaks - including by protecting wildlife and fighting illegal wildlife trade.
Nature Restoration Regulation¹⁹³	The Nature Restoration Regulation is the first continent-wide, comprehensive law of its kind. It is a key element of the EU Biodiversity Strategy, which sets binding targets to restore degraded ecosystems, in particular those with the most potential to capture and store carbon and to prevent and reduce the impact of natural disasters.
Zero Pollution Action Plan¹⁹⁴	The zero pollution vision for 2050 is for air, water and soil pollution to be reduced to levels no longer considered harmful to health and natural ecosystems, that respect the boundaries with which our planet can cope, thereby creating a toxic-free environment.

¹⁸⁸ [About | dut](#)

¹⁸⁹ [Understanding and managing urban green spaces — Copernicus Land Monitoring Service](#)

¹⁹⁰ [Eurocities - Home](#)

¹⁹¹ https://new-european-bauhaus.europa.eu/index_en

¹⁹² https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030_en

¹⁹³ https://environment.ec.europa.eu/topics/nature-and-biodiversity/nature-restoration-regulation_en

¹⁹⁴ https://environment.ec.europa.eu/strategy/zero-pollution-action-plan_en

Soil Monitoring Law¹⁹⁵	The Soil Monitoring Law aims to address key soil threats in the EU, such as 1) Erosion, 2) Loss of soil organic matter, salinisation, contamination, compaction and sealing and 3) Loss of soil biodiversity.
LIFE¹⁹⁶	The European Climate, Infrastructure and Environment Executive Agency (CINEA) presented the LIFE 2026 including priority topics such as 1) nature and biodiversity; 2) Circular economy and quality of life; 3) Climate change mitigation and adaptation; and 4) Clean energy transition.
ERDF – European Regional Fund¹⁹⁷	The European Regional Development Fund (ERDF) is designed to strengthen economic, social and territorial cohesion in the European Union. It aims to do this by correcting imbalances between regions enabling investments in a smarter, greener, more connected and more social Europe that is closer to its citizens.
EGD – European Green Deal	The Green Deal invests in innovation, clean technology, and green infrastructure while ensuring a just transition for the communities most affected. Thanks to the European Green Deal, Europeans enjoy cleaner air and more energy efficient products and homes. They are also drawing on more renewable energy sources to power their lives.

¹⁹⁵ https://environment.ec.europa.eu/topics/soil-health/soil-monitoring-law_en

¹⁹⁶ https://cinea.ec.europa.eu/life-calls-proposals-2026_en

¹⁹⁷ https://ec.europa.eu/regional_policy/funding/erdf_en

Annex 10 – Topic C2 – Existing R&I initiatives

Existing SRIAs & initiatives	Description & relevance
TEN-T policy- EU's trans-European transport network policy¹⁹⁸	The EU's trans-European transport network policy, the TEN-T policy, is a key instrument for planning and developing a coherent, efficient, multimodal, and high-quality transport infrastructure across the EU. The network comprises railways, inland waterways, short sea shipping routes and roads linking urban nodes, maritime and inland ports, airports and terminals.
JPI Urban Europe SRIA¹⁹⁹	To enhance urban transformation capacities and expertise, JPI Urban Europe has taken a challenge-driven approach and identified a need to foreground dilemmas in four transition areas in their updated SRIA.
Strategic Transport Research and Innovation Agenda (STRIA)²⁰⁰	STRIA is the EU's Strategic Transport Research and Innovation Agenda. It sets out the areas where the EU needs to act in concertation with EU countries and stakeholders to radically change transport..
CCAM SRIA²⁰¹ (Connected Cooperative Automated Mobility)	Connected Cooperative Automated Mobility partnership is a public private partnership, which aligns all stakeholders' R&I efforts to accelerate the implementation of innovative CCAM technologies and services in Europe
CIVITAS²⁰²	Network of cities, for cities, dedicated to sustainable urban mobility.
CEDR Action Plan 2026-2028²⁰³	CEDR's activities are guided by a dynamic, three-year rolling Action Plan, which outlines the organisation's priorities and allocates the resources accordingly. The current Action Plan spans from 2026 to 2028 and is organised into nine core Working Groups, as shown below. These Working Groups may also include specialised expert groups, with support provided through the relevant CEDR Research Calls.

¹⁹⁸ https://transport.ec.europa.eu/transport-themes/infrastructure-and-investment/trans-european-transport-network-ten-t_en

¹⁹⁹ https://research-and-innovation.ec.europa.eu/research-area/transport/stria_en <https://jpi-urbaneurope.eu/about/sria/sria-2-0/>

²⁰⁰ https://research-and-innovation.ec.europa.eu/research-area/transport/stria_en

²⁰¹ <https://www.connectedautomateddriving.eu/wp-content/uploads/2024/07/CCAM-SRIA-Update-2023.pdf>

²⁰² <https://civitas.eu/>

²⁰³ www.CEDR.eu

Annex 11 – Topic C3 – Existing R&I initiatives

Existing SRIAs & initiatives	Description & relevance
JPI Urban Europe SRIA ²⁰⁴	To enhance urban transformation capacities and expertise, JPI Urban Europe has taken a challenge-driven approach and identified a need to foreground dilemmas in four transition areas in their updated SRIA.
New European Bauhaus ²⁰⁵	The New European Bauhaus looks to address the broader public as well as architects and designers to engage in the transformation of urban areas to support the goals of the European Green Deal. Inclusive, sustainable and aesthetic and qualitative urban planning projects are supported in the very hands-on EU initiative, resulting also in the creation of innovative and socially important green spaces in existing city structures.
European Competence Centre for Social Innovation ²⁰⁶	The European Competence Centre for Social Innovation, part of the European Social Fund Plus Social Innovation+ initiative, aims to speed up the adoption and expansion of proven innovative solutions in employment, education, and social inclusion.

²⁰⁴ <https://jpi-urbaneurope.eu/about/sria/sria-2-0/>

²⁰⁵ https://new-european-bauhaus.europa.eu/index_en

²⁰⁶ <https://socialinnovationplus.eu/about/?gpwid=gpw-container>

Annex 12 – Topic D1 – Existing R&I initiatives

Existing SRIAs & initiatives	Description & relevance
Joint Programme “e3s – clean Energy TranSition for Sustainable Society”²⁰⁷	The Joint Programme “clean Energy tranSition for Sustainable Society” (e3s) aims to advance research and provide evidence, knowledge and tools to address the socio-economic challenges of the clean energy transition.
Clean Energy Transition Partnership²⁰⁸	The Clean Energy Transition Partnership supports international research and innovation projects that help accelerate the transition to a climate-neutral energy system. Through its Joint Calls, organisations from across Europe and beyond can collaborate to develop solutions that address key energy and climate challenges.
Covenant of Mayors²⁰⁹	The EU Covenant of Mayors is the European Commission’s long-standing initiative uniting local governments in the fight against climate change. It is the largest movement of cities and towns working to secure a sustainable, resilient and inclusive future for their citizens.
City Research and Innovation Agenda (CRIA)²¹⁰,	The City Research and Innovation Agenda seeks to fill local-level knowledge, information, and technology gaps at every stage of the city climate action journey.

²⁰⁷ <https://www.eera-e3s.eu/>

²⁰⁸ <https://cetpartnership.eu/>

²⁰⁹ <https://eu-mayors.ec.europa.eu/en/Why-the-Covenant-of-Mayors>

²¹⁰ [GCoM Innovate4Cities 2022 Booklet.pdf](#)

Annex 13 – Topic D2 – Existing R&I initiatives

Existing SRIAs & initiatives	Description & relevance
European Green Deal ²¹¹	The Green Deal invests in innovation, clean technology, and green infrastructure while ensuring a just transition for the communities most affected. Thanks to the European Green Deal, Europeans enjoy cleaner air and more energy efficient products and homes. They are also drawing on more renewable energy sources to power their lives.
Competitiveness Compass ²¹² ,	The competitiveness compass is a new roadmap to restore Europe's dynamism and boost EU economic growth. The compass builds on the analysis of Mario Draghi's report on the future of European competitiveness. The Draghi report originally identified three necessities for the EU to boost its competitiveness: 1) Closing the innovation gap, 2) Decarbonising our economy and 3) Reducing dependencies.
Clean Industrial Deal ²¹³	It outlines concrete actions to turn decarbonisation into a driver of growth for European industries such as lowering energy prices, creating quality jobs and the right conditions for companies to thrive. It really reinforces that transformation requires clear directionality and integrated innovation & industrial policy.
Affordable Energy Action Plan ²¹⁴ .	The Affordable Energy Action Plan includes 8 actions, many of which were already delivered in 2025. These actions are based on 4 pillars: 1) lowering energy costs for all; 2) completing the Energy Union; 3) attracting investments and ensuring delivery and 4) being ready for potential energy crises
Driving Urban Transitions partnership (DUT) ²¹⁵ ,	DUT is an European-wide partnership platform to address sustainable issues and fund future-oriented projects in intergovernmental research and innovation setting. The program addresses key challenges of urban transitions such as mobility, digitalization and also green spaces
Clean Energy Transition partnership (CETP) ²¹⁶ ,	The Clean Energy Transition Partnership supports international research and innovation projects that help accelerate the transition to a climate-neutral energy system. Through its Joint Calls, organisations from across Europe and beyond can collaborate to develop solutions that address key energy and climate challenges.

²¹¹ https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en

²¹² https://commission.europa.eu/topics/competitiveness/competitiveness-compass_en

²¹³ https://commission.europa.eu/topics/competitiveness/clean-industrial-deal_en

²¹⁴ https://energy.ec.europa.eu/strategy/affordable-energy_en

²¹⁵ [Driving Urban Transition to a sustainable future. | dut](#)

²¹⁶ [CETPartnership – Clean Energy Research & Innovation Funding](#)

Built4People partnership ²¹⁷	Strategic Research and Innovation Agenda for the built environment sets out the objectives, outputs and outcomes that provide the framework for value for money, relevant, replicable Built4People Partnership SRIA – V7 5 / 80 and people-centric research, aligned with the priority EU policy objectives, including of course research policy. The SRIA will ultimately transform the built environment into what we need for our economic prosperity, environmental protection and sustainable and fairly distributed health and well-being of all citizens in the EU.
European Institute of Innovation and Technology (EIT) ²¹⁸ ,	Key areas of the EIT's new strategy: strengthening the EIT Community's impact, increasing the entrepreneurial and innovation capacity of higher education institutions, strengthening the EIT's regional development efforts, through the Regional Innovation Scheme, and setting up two innovation communities dedicated to the cultural and creative sectors and industries (2022) and to water, marine and maritime sectors and ecosystems (2026).
EERA e3s Joint Programme ²¹⁹	The Joint Programme “clean Energy tranSition for Sustainable Society” (e3s) aims to advance research and provide evidence, knowledge and tools to address the socio-economic challenges of the clean energy transition

²¹⁷ [Built4People – European partnership under Horizon Europe](#)

²¹⁸ [European Institute of Innovation & Technology \(EIT\) | EIT](#)

²¹⁹ [EERA Joint Programme e3s - Home](#)

Annex 14 – Topic D3 – Existing R&I initiatives

Existing SRIAs & initiatives	Description & relevance
European Green Deal ²²⁰	The Green Deal invests in innovation, clean technology, and green infrastructure while ensuring a just transition for the communities most affected. Thanks to the European Green Deal, Europeans enjoy cleaner air and more energy efficient products and homes. They are also drawing on more renewable energy sources to power their lives.
Competitiveness Compass ²²¹ ,	The competitiveness compass is a new roadmap to restore Europe's dynamism and boost EU economic growth. The compass builds on the analysis of Mario Draghi's report on the future of European competitiveness. The Draghi report originally identified three necessities for the EU to boost its competitiveness: 1) Closing the innovation gap, 2) Decarbonising our economy and 3) Reducing dependencies.
Clean Industrial Deal ²²²	It outlines concrete actions to turn decarbonisation into a driver of growth for European industries such as lowering energy prices, creating quality jobs and the right conditions for companies to thrive. It really reinforces that transformation requires clear directionality and integrated innovation & industrial policy.
European Competitiveness Fund ²²³	The European Competitiveness Fund as part of the EU's next long-term budget is composed of a budget of €234 billion, combined with Horizon Europe (€175 billion), it will bring together €409 billion (or 21% of the future EU budget) to accelerate strategic technologies in Europe.
National Energy and Climate Plans ²²⁴	The National Energy and Climate Plans (NECPs) are an essential strategic planning tool to deliver a fair, resilient, and climate-neutral Europe, and to steer the much-needed investments for the climate and energy transition, helping to mobilise private and public spending.
FP10 ²²⁵	The next Framework Programme for Research and Innovation is currently referred to as Horizon Europe 2028-34. Although it is not due to start until January 2028, discussions have already begun on how it should shape European funding for research, technology and innovation.
Clean Energy Transition partnership (CETP) ²²⁶	The Clean Energy Transition Partnership supports international research and innovation projects that help accelerate the transition to a climate-neutral energy system. Through its Joint Calls, organisations from across

²²⁰ https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en

²²¹ https://commission.europa.eu/topics/competitiveness/competitiveness-compass_en

²²² https://commission.europa.eu/topics/competitiveness/clean-industrial-deal_en

²²³ https://single-market-economy.ec.europa.eu/access-finance/european-competitiveness-fund_en

²²⁴ https://energy.ec.europa.eu/strategy/energy-union/national-energy-and-climate-plans_en

²²⁵ <https://www.era-learn.eu/partnerships-in-a-nutshell/european-partnerships/next-framework-programme-fp10>

²²⁶ [CETPartnership – Clean Energy Research & Innovation Funding](#)

	Europe and beyond can collaborate to develop solutions that address key energy and climate challenges.
EERA e3s Joint Programme²²⁷	The Joint Programme “clean Energy tranSition for Sustainable Society” (e3s) aims to advance research and provide evidence, knowledge and tools to address the socio-economic challenges of the clean energy transition
Strategy and Policy Analysis System (ESPAS)²²⁸	The European Strategy and Policy Analysis System (ESPAS) is an inter-institutional EU process promoting foresight and anticipatory governance. It brings together nine EU institutions and bodies including the European Parliament and the European Commission who are committed to thinking longer term about the challenges and opportunities facing Europe and, through foresight, to support policymakers in making their policy choices.

²²⁷ [EERA Joint Programme e3s - Home](#)

²²⁸ [About | ESPAS](#)

Annex 15 – Topic E1 – Existing R&I initiatives

Existing SRIAs & initiatives	Description & relevance
Water4All, 2022. Water4All's Strategic Research and Innovation Agenda (SRIA) 2022-2025 ²²⁹	It addresses water-related environmental data security, focusing on water security and supporting EU Green Deal goals. It includes (i) Coordinated water data collection, (ii) Data governance for hydrological and environmental monitoring and (iii) Alignment with EU programs for cross-border environmental data consistency
UNEP Global Environmental Data Strategy (GEDS) ²³⁰	It is a SRIA-type global strategic framework which defines global priorities for environmental data quality, governance, interoperability and inclusive access, providing a comprehensive framework for international cooperation on environmental data management.
UNEA Resolution 4/23 ²³¹	UNEA Resolution is mandated by UNEP to develop a long-term environmental data strategy in response to governments' shared difficulties in collecting, accessing, exchanging and managing environmental data. The resulting strategy is structured around five pillars: Data quality and provenance, Governance, Interoperability, Access and affordability, and Capacity building. It is supported by over 1,000 identified ISO standards from circular economy to water quality.
EuropaBON / Guides to Harmonising Biodiversity Monitoring (Biodiversa+) ²³²	EuropaBON / Guides to Harmonising Biodiversity Monitoring is a formal guidance document used across Europe which provides harmonisation guidance for transnational biodiversity monitoring protocols and emphasises building interoperable monitoring systems
EU Soil Observatory (EUSO) ²³³	The EU Soil Observatory (EUSO) aims to be the principal provider of reference data and knowledge at EU-level for all matters relating to soil.

²²⁹ https://www.water4all-partnership.eu/sites/default/files/2023-02/Water4All_SRIA-2022-2025_A4_2311_bd.pdf

²³⁰ [Global Environmental Data Strategy \(GEDS\) | UNEP - UN Environment Programme](#)

²³¹ <https://www.unep.org/resources/resolutions-treaties-and-decisions/UN-Environment-Assembly-4>

²³² <https://europabon.org/>

²³³ <https://esdac.jrc.ec.europa.eu/euso>

Annex 16 – Topic E2 – Existing R&I initiatives, shared needs and gaps

Existing SRIAs & initiatives	Description & relevance
EU Adaptation Strategy (2021+) ²³⁴	EU Adaptation Strategy functions like a strategic agenda for climate policy implementation. It provides a framework for smarter, faster, and more systemic climate adaptation, an integration of adaptation across all policies & strengthened international climate policy action. This strategy is central to evaluating climate policy effectiveness because it focuses on tools, governance, and multilevel implementation required for climate resilience.
EU Strategic R&I Agenda on Health & Climate Change ²³⁵ (2025)	Although framed around health, this SRIA includes substantial content on policy implementation, adaptation, and mitigation governance. It emphasises research uptake into policy implementation—a key issue you highlighted (closing implementation gaps); Addresses climate driven inequalities, cross sectoral resilience, and links to global and national governance; Implemented under Horizon Europe and intended to guide multiple funders.
Just Transition Mechanism ²³⁶	The Just Transition Mechanism (JTM) is a key tool to ensure that the transition towards a climate-neutral economy happens in a fair way, leaving no one behind. It provides targeted support to help mobilise around €55 billion over the period 2021-2027 in the most affected regions, to alleviate the socio-economic impact of the transition. The Just Transition Mechanism addresses the social and economic effects of the transition, focusing on the regions, industries and workers who will face the greatest challenges, through three pillars: 1) Just Transition Fund; 2) "Just Transition" scheme; 3) Public Sector Loan Facility
Sendai Framework for Disaster Risk Reduction ²³⁷ ,	The Sendai Framework for Disaster Risk Reduction 2015-2030 outlines seven clear targets and four priorities for action to prevent new and reduce existing disaster risks: (i) Understanding disaster risk; (ii) Strengthening disaster risk governance to manage disaster risk; (iii) Investing in disaster reduction for resilience and; (iv) Enhancing disaster preparedness for effective response, and to "Build Back Better" in recovery, rehabilitation and reconstruction.
Paris Agreement ²³⁸	The Paris Agreement is a legally binding international treaty on climate change . It was adopted by 195 Parties at the UN Climate Change Conference (COP21) in Paris, France, on 12 December 2015. It entered into force on 4 November 2016. Currently, as of 27 January 2026, there are 194 Parties to the Paris Agreement.
Social Vulnerability Index (SVI) for Cities ²³⁹	Including REACHOUT, TALX2, Directed Projects - Tools co-developed with European cities (Cork, Logroño, Milan, Rimini, Belfast), used to operationalise climate justice and identify socially vulnerable populations and supports adaptation that is tailored, equitable, and community-centered.

²³⁴ https://climate.ec.europa.eu/eu-action/adaptation-and-resilience-climate-change/eu-adaptation-strategy_en

²³⁵ <https://op.europa.eu/en/publication-detail/-/publication/616cce9c-39e5-11f0-8a44-01aa75ed71a1>

²³⁶ https://commission.europa.eu/topics/regional-and-urban-policy/just-transition-mechanism_en

²³⁷ [Sendai Framework for Disaster Risk Reduction 2015-2030 | UNDRR](#)

²³⁸ [The Paris Agreement | UNFCCC](#)

²³⁹ <https://climate-adapt.eea.europa.eu/en/mission-inactive/solutions/tools-inactive/social-vulnerability-index-svi>

Shared needs between CASRI topic and existing SRIAs

- Integrating Social Justice into Climate Adaptation
 - Embedding justice and equity into climate adaptation at all levels
- Systematic Identification & Assessment of Social Vulnerabilities
 - Better tools, definitions, metrics, and processes for assessing social vulnerability
- Multi-Scalar Adaptation (Building → District → City → Region → Transnational)
 - Multi-level adaptation frameworks that recognise social impacts at each scale
- Cross-Sectoral and Cross-Level Governance Collaboration
 - Strengthening governance interfaces and coordinated adaptation planning.
- Co-creation, Engagement & Inclusion of Vulnerable Groups
 - Improved engagement frameworks for meaningful participation of vulnerable and marginalised groups.
- Need for Roadmaps, Tools & Actionable Guidance for Just Adaptation
 - Accessible and practical tools for just, socially-informed adaptation implementation.
- Understanding Multi-Dimensional Climate Risks (Social, Economic, Health, Environmental)
 - Integrating social, economic, health and environmental dimensions of climate risk.
- Data Gaps, Weak Decision-Support Tools & Need for Systemic Knowledge
 - Stronger evidence base and improved data systems for decision-making.

Gaps in R&I needs from existing SRIA and transnational initiatives (Assisted by AI)

- **Missing Multi-Scalar Integration (Building → District → City → Regional Scales)**
 - Gap: Lack of a holistic framework linking social vulnerabilities across multiple spatial levels
 - What's missing: Practical implementation playbooks (roles, decision gates, indicators, evidence thresholds) that translate high-level justice principles into permitting, procurement, and monitoring procedures at the scales CASRI targets. EEA shows the need is recognised but also documents gaps in formalising inclusion and monitoring outcomes for vulnerable groups
- **Fragmented Social Vulnerability Approaches — No Unified Framework**
 - Gap: Absence of shared EU standards for assessing and integrating social vulnerabilities
 - What is missing: No unified EU-wide conceptual or operational framework for defining, assessing, or tracking social vulnerability in adaptation. No standardized indicators across regions, cities, or sectors. Insufficient guidance on integrating social vulnerability into formal adaptation planning processes.
- **Lack of Tools to Anticipate Social Side-Effects (e.g., Green Gentrification)**
 - Gap: Lack of predictive socio-spatial impact assessment tools for adaptation actions
 - What is missing: No predictive or anticipatory tools linking specific adaptation actions (urban greening, flood defences, heat mitigation) to potential negative socio-economic impacts such as: displacement, rent increases, exclusion from green

amenities; No EU-level guidance on managing adaptation-driven inequities (green gentrification).

- **Insufficient Integration of Socio-Economic and Political Structures**
 - Gap: Lack of socio-political systems analysis embedded in adaptation planning.
 - What is missing: No SRIA integrates economic systems (housing markets, employment precarity) and political systems (decision-making inequalities) into models of climate vulnerability.; Adaptation still treated mainly as a technical rather than socio-political challenge.
- **No “Just Transition for Adaptation” Framework**
 - Gap: Missing structured roadmap for fair distribution of adaptation costs and benefits.
 - What is missing: No operational just transition framework tailored to adaptation (as exists for climate mitigation); No tools for ensuring vulnerable groups do not bear the disproportionate cost of adaptation (e.g., retrofitting burdens, insurance gaps).
- **Weak Multi-Level Governance Integration (EU → National → Local → Community)**
 - Gap: Lack of governance architecture embedding social vulnerability across all levels.
 - What is missing: No governance model links social vulnerability metrics directly into national, regional, and local adaptation decision systems; No EU framework for integrating civil society as an equal governance actor in adaptation.
- **Limited Community Co-Creation & Social Acceptance Pathways**
 - Gap: Absence of participatory, justice-oriented co-creation methodologies.
 - What is missing: No SRIA or project provides structured co-creation processes enabling vulnerable populations to co-design adaptation measures; No social acceptance roadmaps for adaptation like energy-transition roadmaps
- **Persistent Data Gaps and Weak Decision-Support Tools**
 - Gap: Lack of robust, harmonised data and monitoring systems for social vulnerability.
 - What is missing: EU-wide harmonised datasets on socially differentiated impacts of adaptation; Longitudinal monitoring systems linking adaptation actions to social outcomes; Robust evaluation frameworks to assess effectiveness of adaptation on vulnerable groups.
- **No Integrated Socio-Ecological Modelling**
 - Gap: Missing socio-ecological modelling tools linking climate measures to social equity impacts.
 - What is missing: No SRIA combines ecological adaptation actions (NBS, heat reduction, flood protection) with social outcomes in a unified evaluation model; Missing cross-linkage between adaptation benefits and potential socio-economic trade-offs.

Annex 17 – Topic G1 – Existing R&I initiatives

Existing SRIAs & initiatives	Description & relevance
Water4All, 2022. Water4All's Strategic Research and Innovation Agenda (SRIA) 2022-2025²⁴⁰	European Partnership which covers governance, international cooperation, and policy integration in water systems & emphasises (i) multi-level governance and cross-sector coordination, (ii) integration of science into policymaking, (iii) Built through broad stakeholder consultation (multi-actor participation)
Mission Soil Platform²⁴¹	The EU Mission 'A Soil Deal for Europe' (Mission Soil) is one of five Missions funded under the EU Research and Innovation (R&I) Programme Horizon Europe. Its goal is to create 100 Living Labs and Lighthouses by 2030 to promote sustainable land and soil management in urban and rural areas with a mention to one of the clusters related to the theme. The cluster "Business models and investments" is setup, with the aim of elaborating the economic and financial dimensions of soil health
The Clean Industrial Deal²⁴²	It outlines concrete actions to turn decarbonisation into a driver of growth for European industries such as lowering energy prices, creating quality jobs and the right conditions for companies to thrive. It really reinforces that transformation requires clear directionality and integrated innovation & industrial policy.
Earth Observation Strategic Research and Innovation Agenda²⁴³	This first Strategic Research and Innovation Agenda (SRIA) for Earth Observation sets out a comprehensive framework for Copernicus' research and technological development. It outlines key priorities for the Horizon Europe Work Programmes for 2025-2027 and beyond into the next Multi-annual Financial Framework, ensuring that Copernicus and its products and services remain state-of-the-art.
EU Strategic R&I Agenda on Health & Climate Change²⁴⁴(2025)	Although framed around health, this SRIA includes substantial content on policy implementation, adaptation, and mitigation governance. It emphasises research uptake into policy implementation—a key issue you highlighted (closing implementation gaps); Addresses climate driven inequalities, cross sectoral resilience, and links to global and national governance; Implemented under Horizon Europe and intended to guide multiple funders.
DUT (Driving Urban Transition)²⁴⁵	DUT is an European-wide partnership platform to address sustainable issues and fund future-oriented projects in intergovernmental research and innovation setting. The program addresses key challenges of urban transitions such as mobility, digitalization and also green spaces

²⁴⁰ https://www.water4all-partnership.eu/sites/default/files/2023-02/Water4All_SRIA-2022-2025_A4_2311_bd.pdf

²⁴¹ [Clusters | Mission Soil Platform](#)

²⁴² [Clean Industrial Deal - European Commission](#)

²⁴³ <https://publications.jrc.ec.europa.eu/repository/handle/JRC136730>

²⁴⁴ <https://op.europa.eu/en/publication-detail/-/publication/616cce9c-39e5-11f0-8a44-01aa75ed71a1>

²⁴⁵ [About | dut](#)

EU Global Health Strategy – one health ²⁴⁶	with the One Health Approach (existing task force at EU level, created in 2023, include 5 agencies (ECDC ²⁴⁷ , ECHA ²⁴⁸ , EEA ²⁴⁹ , EFSA ²⁵⁰ , EMA ²⁵¹) to prevent & respond to health threats, including those driven by climate change.
Copernicus Health hub ²⁵² :	The Copernicus Health Hub is a collaborative platform where health and environmental science communities come together through the power of Copernicus Services, offering user-centred information on factors affecting citizens' physical and mental health and well-being.
Artificial Intelligence Act (2024) ²⁵³	The Artificial Intelligence Act is a European Union regulation concerning artificial intelligence. It establishes a common regulatory and legal framework for AI within the European Union.
National Energy and Climate Plans ²⁵⁴	The National Energy and Climate Plans (NECPs) are an essential strategic planning tool to deliver a fair, resilient, and climate-neutral Europe, and to steer the much-needed investments for the climate and energy transition, helping to mobilise private and public spending.
European Climate Law (2021–2025 updates) ²⁵⁵	This law explicitly structures regulatory frameworks for climate targets, including: Binding net zero by 2050 target, legally binding 2030 (55%) and proposed 2040 (90%) climate targets, Implementation, monitoring, and correction mechanisms for EU and Member States. The law acts as a governance backbone ensuring policy coherence, accountability, and long-term regulatory stability.
EGD – European Green Deal ²⁵⁶	The Green Deal invests in innovation, clean technology, and green infrastructure while ensuring a just transition for the communities most affected. Thanks to the European Green Deal, Europeans enjoy cleaner air and more energy efficient products and homes. They are also drawing on more renewable energy sources to power their lives.
EU mission: Climate and neutral smart cities ²⁵⁷	The EU Cities Mission will bring together local authorities, citizens, businesses, investors, and national and regional bodies to 1) Deliver 100 climate-neutral and smart cities by 2030 and 2) Ensure that these cities act as experimentation and innovation hubs to enable all European cities to follow suit by 2050.

²⁴⁶ https://health.ec.europa.eu/one-health_en

²⁴⁷ European Centre for Disease Prevention and Control : [Homepage | European Centre for Disease Prevention and Control](#)

²⁴⁸ European Chemicals Agency [Homepage - ECHA](#)

²⁴⁹ European Environment Agency [European Environment Agency \(EEA\)](#)

²⁵⁰ European Food Safety Authority [EFSA | Science, safe food, sustainability](#)

²⁵¹ European Medicines Agency [European Medicines Agency \(EMA\)](#)

²⁵² <https://health.hub.copernicus.eu/>

²⁵³ <https://artificialintelligenceact.eu/>

²⁵⁴ https://energy.ec.europa.eu/strategy/energy-union/national-energy-and-climate-plans_en

²⁵⁵ https://climate.ec.europa.eu/eu-action/european-climate-law_en

²⁵⁶ https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en

²⁵⁷ https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/climate-neutral-and-smart-cities_en

Annex 18 – Topic G2 – Existing R&I initiatives

Existing SRIAs & initiatives	Description & relevance
Mission Soil Platform ²⁵⁸	The EU Mission 'A Soil Deal for Europe' (Mission Soil) is one of five Missions funded under the EU Research and Innovation (R&I) Programme Horizon Europe. Its goal is to create 100 Living Labs and Lighthouses by 2030 to promote sustainable land and soil management in urban and rural areas with a mention to one of the clusters related to the theme. The cluster "Business models and investments" is setup, with the aim of elaborating the economic and financial dimensions of soil health
EuroREGEN Project (2021 – 2025) ²⁵⁹	Studies transnational grassroots networks promoting regenerative development and covers (i) Global Ecovillage Network (GEN), (ii) Transition Network (TN), (iii) RIPESS (solidarity economy). It deals with regenerative economic paradigm, governance from grassroots to policy level and challenges growth-centric models. Funded by Portuguese Foundation for Science and Technology (FTC).
Regenerative Europe – CORE project ²⁶⁰ (European cooperation project funded by Erasmus+)	It promotes (i) circular economy, (ii) regenerative entrepreneurship and (ii) local resilience. An interactive space designed to connect expert, policymakers, entrepreneurs and organizations across Europe is generated for open discussion on regenerative design, circular economy and social innovation (sharing of experiences, best practices and collaborative initiatives). <u>Start - Regenerative Europe.</u>
Regenerative Economy - "re:gen-u project" ²⁶¹	The project defines economy centred on (i) wellbeing, (ii) ecosystems and (iii) social equity. The support to regenerative economy and nature-based solutions, centring ecological, financial, and human resources is done through promoting entrepreneurial activities to foster greater collaboration between university, business, government and civil society
The Shift Project ²⁶²	French NGO Think Tank advocating the shift to a post-carbon economy. promotes demand-side governance and sufficiency metrics.
SUSCON (Horizon Europe / ERC, 2025 - 2030) ²⁶³	Suscon as "Shifting Mindsets for Sustainable Consumption" focuses on (i) revealing the limitations of current sustainability mindsets, (ii) Social norms and lifestyle transformation. It deals with psychological drivers of overconsumption & Social innovation for sufficiency.
Green Deal R&I projects ²⁶⁴	Projects on biodiversity integration into policy, circular economy, and sustainable food systems

²⁵⁸ [Clusters | Mission Soil Platform](#)

²⁵⁹ <https://ces.uc.pt/en/investigacao/projetos-de-investigacao/projetos-financiados/euroregen>

²⁶⁰ <https://www.regenerative-europe.org/#digitaltt>

²⁶¹ <https://regenu.eu/>

²⁶² <https://theshiftproject.org/>

²⁶³ <https://cordis.europa.eu/project/id/101199131>

²⁶⁴ https://research-and-innovation.ec.europa.eu/strategy/strategy-research-and-innovation/environment-and-climate/european-green-deal_en

Annex 19 – Topic H1 – Existing R&I initiatives, shared needs and gaps

Existing SRIA and initiatives	Description
SRIA for Earth Observation – Copernicus ²⁶⁵	Outlines research priorities for the evolution of Copernicus Earth Observation (EO), including i) Integration of AI, machine learning, and Digital Twins, (ii) Advanced data assimilation and modelling, (iii) Enhanced user-centric services for environmental monitoring, (iv) Strong emphasis on supporting EU environmental policies with systematic, high-quality data. It explicitly focuses on digital capacities, data integration, and decision-support mechanisms for environmental and sustainability monitoring.
EOSC (European Open Science Cloud) – Strategic Research & Innovation Agenda (SRIA 1.3, 2024) ²⁶⁶	Provides the digital backbone for: FAIR data sharing, federated cloud infrastructures, advanced data discovery and integration tools, multi-annual roadmaps for R&I digital infrastructures supporting science. EOSC is fundamental for connecting environmental datasets, enabling systematic data integration, and generating decision-support tools for sustainability monitoring across disciplines.
Geological Service for Europe (GSEU) SRIA (2025) ²⁶⁷	Focuses on Digital geological knowledge systems, Common data standards and interoperable geoscience datasets; Support for EU Green Deal monitoring needs. Relevance for environmental and sustainability monitoring strongly dependant on geoscientific data infrastructures.
Environmental Data Analytics Initiative ²⁶⁸	Rapid growth of data analytics for environmental monitoring, Need for standardisation, interoperability, ethics, and stakeholder inclusion in digital monitoring systems. It confirms the need for integrated analytical tools and responsible utilization approaches
Global Environmental Data Strategy (GEDS) ²⁶⁹	Focuses on the development and piloting of the Environmental Data Capacity (EDC) Toolkit to help governments translate GEDS principles into practical country-level action.
Global Digital Compact Initiative ²⁷⁰	Comprehensive global framework for digital cooperation and governance of artificial intelligence to harness the immense potential of digital technology and close digital divides.
Water4All, 2022. Water4All's Strategic Research and Innovation Agenda (SRIA) 2022-2025 ²⁷¹	It covers systemic, digitalised water monitoring, data sharing, and alignment of governance levels. It emphasises digital infrastructures, cross-sector data integration, and multi-level collaboration and

²⁶⁵ [Earth Observation: a new Strategic Agenda on R&I to enable Copernicus programme evolution - Joint Research Centre](#)

²⁶⁶ [The Strategic Research & Innovation Agenda and its Multi-Annual Roadmap - EOSC Association](#)

²⁶⁷ [The EuroGeoSurveys SRIA 2025-2034: Building a Sustainable Geological Service for Europe - EuroGeoSurveys](#)

²⁶⁸ [Environmental Data Initiative](#)

²⁶⁹ [Global Environmental Data Strategy \(GEDS\) | UNEP - UN Environment Programme](#)

²⁷⁰ [Global Digital Compact | Office for Digital and Emerging Technologies](#)

²⁷¹ https://www.water4all-partnership.eu/sites/default/files/2023-02/Water4All_SRIA-2022-2025_A4_2311_bd.pdf

	provides examples of transnational coordination, learning from frontrunners, and digital data tools.
EU Strategic R&I Agenda on Health & Climate Change (2025)²⁷²	It focuses on data-driven climate monitoring, cross-sector digital integration, and evidence-based policy. It tackles information overload, digital coordination, and responsible data use—mirroring CASRI concerns about misinformation and overload and serves as a cross-sector model for integrating digitalisation into environmental and societal monitoring frameworks.

Shared needs between CASRI topic and existing SRIAs

- **Need for Advanced, Integrated Environmental Monitoring**
 - High-quality, cross-sector, and cross-border monitoring using modern digital technologies.
- **Need for Robust, Interoperable Digital Infrastructures**
 - Stronger digital infrastructures, ensuring interoperability, standardisation, and seamless multi-level dataflows
- **Need for Ethical, Responsible, and Transparent Use of Digital Technologies**
 - A governance framework for ethical, transparent, and accountable digital technology use.
- **Need for User-Centred Decision-Support Tools**
 - Digital tools that deliver actionable insights and are designed for policymakers, practitioners, and other end users.
- **Need for Capacity Building & Digital Skills Across Institutions**
 - Strengthening institutional and human capacities to use and govern advanced digital tools.
- **Need for Cross-Border Coordination and Harmonised Standards**
 - Common data standards, transnational coordination, and aligned digitalisation strategies
- **Need to Address Information Overload, Misinformation & Data Quality**
 - Stronger mechanisms for data validation, bias mitigation, and combating misinformation.

Gaps in R&I needs from existing SRIA and transnational initiatives (Assisted by AI)

- Cross domain data fusion standards (EO ↔ in situ ↔ administrative/statistical data). -domain data fusion standards (EO ↔ in-situ ↔ administrative/statistical data).
- Near real time assimilation pipelines with guaranteed latency and reliability-real-time assimilation pipelines with guaranteed latency and reliability
- AI/ML and Digital Twins: validation, uncertainty, and reproducibility gaps
- retailored decision support remains fragmented and not sufficiently embedded in policy cycles-tailored decision-support remains fragmented and not sufficiently embedded in policy cycles

²⁷² <https://op.europa.eu/en/publication-detail/-/publication/616cce9c-39e5-11f0-8a44-01aa75ed71a1>

- FAIR by design with clear governance for licensing, sovereignty, and responsible reuse.-by-design with clear governance for licensing, sovereignty, and responsible reuse.
- Edge/IoT integration with EO: device to cloud security, calibration, and provenance.-to-cloud security, calibration, and provenance.
- Semantic harmonisation between domain standards (geoscience/soil/subsurface) and EO/EOSC
- Impact evaluation frameworks for digital services (benefits, costs, risks, uptake).

Annex 20 – Topic H2 – Existing R&I initiatives

Existing SRIA and initiatives	Description
EOSC SRIA (European Open Science Cloud)²⁷³	focuses on data infrastructures, interoperability, knowledge sharing & provides a framework for future R&I on data ecosystems supporting public authorities and science
Processes4Planet SRIA 2050²⁷⁴	co-programmed partnership which focuses on climate-neutral, circular, digitally enabled process industries & includes a dedicated R&I theme on “digitalisation and human-centric industry”. The previous public-private partnership was SPIRE (Sustainable Process Industry through Resource and Energy Efficiency). The document formulated three pathways towards an ecologically and economically sustainable European Process Industry in the year 2050: (i) Abating emissions for climate neutrality, (ii) Striving for circularity of materials, (iii) Enhancing global competitiveness and leadership.
Raw Materials SRIA (2024)²⁷⁵	to support the EU co-funded Partnership on Sustainable Supply and Use of Raw Materials for Green and Digital Transition. It focuses on sustainable raw materials for green & digital transition (Environmental footprint of digital infrastructure (materials extraction, processing) & explicitly links raw materials demand to digitalisation and environmental sustainability challenges.
EU “Twin Transition” (Green + Digital)²⁷⁶	Central EU paradigm integrating digitalisation with sustainability published by EEa en mai 2026. It addresses (i) systemic impacts across sectors, (ii) governance and policy alignment & (iii) trade-offs and lifecycle thinking.
Digital Decade / Digital Agenda for Europe²⁷⁷	Its objectives are (i) sustainable digital infrastructure digital public services, (ii) skills and governance capacity & (iii) Anchors human-centric and sustainable digital transformation at EU level.
EU Green Digital Strategy / Green Deal alignment²⁷⁸	Includes (i) climate-neutral data centres by 2030, (ii) measurement of ICT environmental impact.
Digital Europe Programme (DIGITAL)²⁷⁹	Focus on deployment of digital capacities & supports policy-relevant data tools and infrastructures. Its aim is to bridge the gap between digital technology research and market deployment, with a focus on benefiting Europe's citizens and businesses, particularly SMEs.
Horizon Europe projects	<i>TwinEU project</i> (2024 - 2026) aims to develop a digital twin of the EU electricity system.

²⁷³ [The Strategic Research & Innovation Agenda and its Multi-Annual Roadmap - EOSC Association](#)

²⁷⁴ [Processes4Planet SRIA 2050 | A.SPIRE](#)

²⁷⁵ [R&I Agenda | ERA.MIN](#)

²⁷⁶ [The twin green & digital transition: How sustainable digital technologies could enable a carbon-neutral EU by 2050 - Joint Research Centre](#)

²⁷⁷ [Europe's Digital Decade | Shaping Europe's digital future](#)

²⁷⁸ <https://digital-strategy.ec.europa.eu/en/policies/green-digital>

²⁷⁹ [Digital Europe Programme - European Commission](#)

	<p><i>ODEON project (2024 – 2027)</i> aims is to introduces the ODEON Cloud-Edge Data and Intelligence Service Platform, to facilitate data, intelligence, service, and market flows (demonstration sites in Denmark, France, Greece, Ireland and Spain).</p> <p><i>HEDGE-IoT project (2024-2027)</i> aims to exploit advantages of IoT technologies, deployed at different levels of power systems, through an interoperable and standardised digital framework.</p>
BRIDGE European Commission initiative²⁸⁰	Identify solutions to overcome obstacles to innovation, share knowledge, and deliver recommendations to facilitate the energy transition



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