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Biodiversity and climate



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

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Biodiversity and climate – *Theme B*

Abstract

Climate change and biodiversity loss are deeply interconnected crises that reinforce ecosystem degradation, threaten livelihoods, and undermine environmental resilience. Both challenges must be addressed jointly through integrated policies and coordinated transnational strategies that maximise synergies between climate mitigation, biodiversity conservation, and nature restoration while managing trade-offs related to resource extraction and bioenergy. 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. A nature-centred approach integrating climate and biodiversity objectives into policy and economic decision-making can strengthen ecosystem resilience, support sustainable development, and prevent the externalisation of environmental impacts across borders and value chains. This integrated approach contributes directly to SDGs 13, 14, and 15, while supporting broader goals related to food security, clean water, energy, sustainable cities, and responsible consumption (SDGs 2, 6, 7, 11, 12).

Keywords

Climate change and biodiversity interdependence; Ecosystem resilience and restoration; Nature-based solutions; Integrated climate and biodiversity policies; Transnational environmental governance; Nature-centred sustainable development

Expected Impacts

Integrated data-driven climate and biodiversity policies (Topic B1)

Establish integrated Research and Innovation 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.

Effectiveness of climate policy (Topic B2)

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.

Comprehensive and timely biodiversity monitoring (Topic B3)

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.

Further Information

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

Topic B1 - Integrated data-driven climate and biodiversity policies

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

Description: Generation and utilisation of climate and biodiversity data to identify and manage interconnected policy opportunities and risks.

Impacts: CASRI stakeholders emphasise the need to better understand the interconnectedness of climate change and biodiversity loss through integrated, data-driven research, governance, and cross-sectoral policy frameworks. Key Research and Innovation opportunities lie in connecting ecological monitoring with socio-economic policymaking through comprehensive datasets and foresight, enabling the identification of synergies and risks in ecosystem restoration and the resilience of soil, water, and forest ecosystems.

Contribution to Environmental and Sustainability 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.

Research and Innovation (R&I) Questions 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).

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.

Topic B2 - Effectiveness of climate policy

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

Description*:* Regulatory frameworks and policy implementation for effective climate action.

Impacts*:* Effective climate action requires coherent, long-term policy pathways that address societal contexts, cross-sectoral synergies and trade-offs, and justice and resilience across different scales and actor groups, while strengthening the role of social sciences and humanities in policy implementation. Key research gaps concern mitigation–adaptation links, ecosystem-based solutions, and climate governance, with Environmental Protection Agencies (EPAs) acting as bridges between international climate objectives and national and local implementation.

Contribution to Environmental and Sustainability 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 Research and Innovation to design and implement more effective national climate adaptation and mitigation plans and policies.

Research and Innovation (R&I) Questions Include at Least*:*

- 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.

Topic B3 - Comprehensive and timely biodiversity monitoring

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

Description: Comprehensive, up-to-date, and policy-relevant ecosystem monitoring to create a better understanding of biodiversity change.

Impacts: Biodiversity monitoring remains fragmented, inconsistent, and limited by gaps in long-term data, habitat and species coverage, and established biodiversity thresholds, hindering evidence-based policy, risk assessment, and decision-making. Strengthening coordinated, transboundary monitoring methods, shared benchmarks, biodiversity indicators, and sustained funding is essential to generate timely, policy-relevant knowledge across ecosystem, species, and genetic levels and improve conservation outcomes.

Contribution to Environmental and Sustainability 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:

- 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.

Research and Innovation (R&I) Questions 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 e. g. validation of Earth Observation-derived indicators
- Monitoring and management plans for invasive species
- Utilisation of citizen science and participatory community-based approaches.

Background on CASRI SRIA

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

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

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

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

Further information

Within the EPA Network, the Interest Group on Sustainability Research and Solutions (EPAS) serves as a collaborative platform to support the implementation of the SRIA and advance this thematic priority through knowledge exchange, cooperation and joint action. In case of interest, please contact **Jari Lyytimäki - SYKE Finnish Environment Institute (Jari.Lyytimaki@syke.fi)**.

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

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