European Environment Agency



Second European Climate Risk Assessment (EUCRA-2)
Methodology report

European Environment Agency

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Luxembourg: Publications Office of the European Union, 2026

EEA report 11/2026

ISBN: 978-92-9480-796-0
ISSN: 1977-8449
doi: 10.2800/1489878
TH-01-26-044-EN-N

Cover design: © EEA
Cover image: © Roxana Robescu, Resilient by Nature/EEA

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Acknowledgements

This EEA Technical Paper was authored by a team of experts from the European Environment Agency (EEA).

The EEA team was supported by a consortium of organisations that the EEA contracted to deliver key elements of the second European Climate Risk Assessment (EUCRA-2), led by Ramboll Management Consulting.

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Further contributions to this document were provided by experts from the European Commission's Joint Research Centre (JRC) and the Copernicus Climate Change Service (C3S), implemented by the European Centre for Medium-Range Weather Forecasts (ECMWF).

The EEA acknowledges the valuable input to earlier drafts of this Technical Paper from a wide range of experts and stakeholders during workshops and written consultations. These consultations comprised the Interservice Working Group of the Commission on the European Climate Risk Assessment (coordinated by the Directorate-General for Climate Action), the Group on Climate change impacts, vulnerability and adaptation of the European Environment Information and Observation Network (Eionet), and independent experts.

Executive summary

The second European Climate Risk Assessment (EUCRA-2), led by the European Environment Agency (EEA), will assess major climate risks facing Europe and identify priorities for strengthening resilience. Building on the first EUCRA published in 2024, it introduces a stronger focus on systemic risks, adaptation solutions, policy readiness and risk ownership.

The methodology follows an integrated, systems-based approach comprising five main stages:

- Systems mapping and risk identification: Identify systems at risk, their interdependencies and major climate risks.
- Risk analysis: Assess climatic and non-climatic risk drivers, including selected drivers from outside Europe, risk severity and confidence, including regional and social differences, and cascading impacts.
- Adaptation analysis: Examine adaptation options, risk-reduction potential, enabling conditions, implementation barriers and systemic solutions for climate resilience.
- Policy analysis: Assess risk ownership, policy readiness, interlinkages and gaps in EU-level policies.
- Risk evaluation and priorities for action: Determine the urgency to act and identify potential actions to strengthen climate resilience.

Cross-cutting considerations include macroeconomic impacts, regional vulnerabilities and just resilience, risks triggered by climate change impacts outside Europe, and security considerations. The assessment draws primarily on existing scientific evidence, modelling and expert judgement.

Stakeholder engagement is embedded throughout the process, involving Commission services, Eionet, EU-funded research projects, Thematic Expert Groups and an independent Risk Review Panel to inform, review and validate findings. Improved knowledge management and traceability will support analytical consistency.

Outputs: A concise main assessment report, executive summary and supporting technical papers, planned for publication in 2028.

The methodology report establishes the overall approach, with some elements requiring further refinement during implementation. It will be superseded by the final version of the methodology, for publication in 2028.

1 Introduction

1.1 EUCRA-1 and uptake by European policymakers

The European Environment Agency (EEA) published in 2024 the first European Climate Risk Assessment (EUCRA-1)[1], which identified and assessed 36 major climate risks for Europe. The findings of the first EUCRA were taken up widely in EU and national policy documents. In particular, EUCRA-1 was the knowledge foundation of the Communication of the European Commission (EC) *Managing climate risks – protecting people and prosperity*[2]

Further key documents by EU institutions and bodies referencing EUCRA include the *EU Preparedness Union Strategy*[3], the recently adopted *European Water resilience strategy*[4], the Special Report *Climate adaptation in the EU: Action not keeping up with ambition*[5] of the European Court of Auditors, the Niinistö Report *Safer together: A path towards a fully prepared Union*[6], the Opinion *The future of EU climate policy: aligning mitigation targets and adaptation challenges*[7] of the European Committee of the Regions, and the Report *Strengthening Resilience to Climate Change Recommendations for an effective EU adaptation policy framework*[8] of the European Scientific Advisory Board on Climate Change.

Notably, both the Council of the EU and the European Parliament (EP) have called the Commission to ensure regular science-based climate risk assessments for Europe, in the *Council conclusions on the 8th Environmental Action Programme Mid-term Review*[9] and the EP *Resolution of 19 September 2024 on the devastating floods in central and eastern Europe, the loss of lives and the EU's preparedness to act on such disasters exacerbated by climate change*[10], respectively.

In addition to its impact on EU policymaking, the EUCRA approach has also provided inspiration to several national climate risk assessments (CRA) that were being prepared and published since completion of the first EUCRA (e.g. in Belgium, Ireland, Slovenia, Spain and Sweden).

1.2 Purpose of this document and audience

This methodology report of the second European Climate Risk Assessment (EUCRA-2):

- Outlines the policy context, mandate, scope and objectives of EUCRA-2.
- Explains the key assessment steps, methods and information sources to be used for identifying and assessing major climate risks for Europe.
- Outlines the governance of EUCRA-2 and how input and feedback from various stakeholders will be elicited.

This methodological report serves as a common reference for the following audiences:

- All experts contributing to EUCRA-2.

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[1] https://climate-adapt.eea.europa.eu/en/eu-adaptation-policy/key-eu-actions/european-climate-risk-assessment
[2] COM (2024) 91 final, https://climate.ec.europa.eu/eu-action/adaptation-climate-change/managing-climate-risks-protecting-people-and-prosperity_en
[3] JOIN (2025) 130 final, https://ec.europa.eu/commission/presscorner/detail/en/ip_25_856
[4] COM/2025/280 final, https://commission.europa.eu/topics/environment/water-resilience-strategy_en
[5] ECA Special Report 15/2024, https://www.eca.europa.eu/en/publications/SR-2024-15
[6] https://commission.europa.eu/topics/defence/safer-together-path-towards-fully-prepared-union_en
[7] ENVE-VII/050, CDR-1474-2024, https://cor.europa.eu/en/our-work/opinions/cdr-1474-2024
[8] https://climate-advisory-board.europa.eu/reports-and-publications/strengthening-resilience-to-climate-change-recommendations-for-an-effective-eu-adaptation-policy-framework
[9] Council 11326/24, https://data.consilium.europa.eu/doc/document/ST-11326-2024-INIT/en/pdf
[10] 2024/2817(RSP), P10_TA (2024)0014, https://www.europarl.europa.eu/doceo/document/TA-10-2024-0014_EN.html

- Policymakers in the European Commission and its Member States that will be using the findings of EUCRA-2.
- Climate risk assessment experts in the European Commission, in EEA member countries, in European regions, and beyond that are interested in conducting sectoral, national or subnational climate risk assessments.

The final EUCRA-2 methodology report, including any modifications to the approach presented in this document, will be published jointly with the full EUCRA-2 report in 2028.

1.3 Mandate, objectives, and scope

In response to calls from the Council and the EP for regular climate risk assessments for Europe, the EEA was tasked by the European Commission to prepare a second EUCRA. The core of EUCRA-2 will be an EEA report, including an Executive Summary, that assesses climate risks in Europe and potential solutions. This report will be underpinned by a series of technical papers. Further information on the outline of the EEA report and the foreseen technical papers is available in Annex 1.

EUCRA-2 aims to inform policymakers who are responsible for EU-level decisions on the management and reduction of climate risks in specific policy areas. A secondary objective is to support Member States' national adaptation policies by complementing national climate risk assessments and supporting common methodologies. In addition, EUCRA-2 is intended to provide accessible information to transnational bodies, regulators, academia, sector organisations, businesses, other risk owners, and the interested public for understanding physical and societal climate risks, the distribution of responsibilities for action, and potential solutions. Strengthening climate resilience directly supports EU priorities by reducing systemic risks to economic stability, enhancing the competitiveness of key sectors, and contributing to long-term security through improved preparedness and adaptive capacity.

EUCRA-2 is a standalone project conducted in parallel to the development of the European Integrated Framework for Climate Resilience (EIFCR). Once the EIFCR has been adopted EUCRA-2 will align with key elements of the EIFCR where relevant and feasible.

EUCRA-2 will link risk information to relevant decision-making processes and include new quantitative and qualitative evidence. The policy analysis, which includes an assessment of policy readiness at the EU level for identified major climate risks, will be deepened, building *inter alia* on the progress assessments under the Climate Law. The identification and implementation of risk-reducing adaptation options and enabling policies are emphasised in EUCRA-2, with a focus on the EU level.

The key design parameters for EUCRA-2 include:

- **Geographical scope:** focus on the EU and its Member States; coverage of other EEA member and cooperating countries based on available data (see Section 2.6).
- **Risks in and out of scope**: comprehensive coverage of systems at risk and relevant policy areas; inclusion of climate risks originating outside Europe with cascading effects on the EU, in addition to climate risks originating in Europe; focus on adverse climate-related impacts requiring precautionary action; potential climate-related opportunities and risks related to the transition to a low-carbon economy ('transition risks') are out of scope.
- **Interaction of climatic and non-climatic risk drivers**: while the focus is on climatic impact drivers, their interaction with non-climatic risk drivers and their contribution to climate risks should be clearly identified.
- **Risk framework**: better support to decision making under uncertain, extreme conditions: while the scenario outcomes associated with high confidence are the baseline, structured information on high impact low probability (HILP) hazard events should be offered (see Section 5.2).

- **Solution space**: go beyond typical climate risk assessments by providing critical insights into risk-reducing actions and their enabling policies (solutions space), to facilitate adaptation planning and implementation

Note on the geographical scope: EUCRA-2 is tasked to support policymaking on climate risks at the EU level, with direct implications for the **27 EU Member States**. This includes the EU Outermost Regions that are a part of the EU but excludes the Overseas Countries and Territories that are associated with the EU. As an EEA report, EUCRA-2 further aims to support the knowledge needs of the **32 EEA member countries and 8 cooperating countries**, to the degree feasible. As a compromise, the risk analysis aims to cover all EEA member and cooperating countries[11] and provide information on regional hotspots, depending on data availability whereas the policy analysis will be restricted to instruments at the EU level**, affecting** the 27 EU Member States. The adaptation analysis will primarily be conducted at the pan-European level, but evidence from EEA member and cooperating countries may be used to inform the analysis and illustrate adaptation practice. However, in line with the policy analysis, the assessment of enabling conditions for adaptation, governance arrangements and policy levers will focus on EU-level instruments and therefore primarily on the EU-27 context. In line with EUCRA-1, EUCRA-2 will not analyse country-level risks, policies, and solutions, but illustrative country-specific insight can be included when relevant.

1.4 Guiding principles

The development of this methodology report and the overall EUCRA-2 is guided by the following principles[12]:

- **User-focused:** The development of this report started by asking key users of EUCRA-2 at EU and national level what information they need to inform their climate change preparedness and adaptation planning, decision-making and investment.
- **Collaborative design:** EUCRA-2, including this document, is developed with considerable input from key stakeholders, including representatives from EU institutions and national governments as well as practitioners, academic experts, potential risk owners, and domain specialists.
- **Drawing on best practice:** This document draws on international leading practices as exemplified in climate risk assessments in EEA member countries and beyond as well as relevant international guidance from the Intergovernmental Panel on Climate Change (IPCC), International Organization for Standardization (ISO), United Nations Office for Disaster Risk Reduction (UNDRR) and Organisation for Economic Co-operation and Development (OECD).
- **Building on existing knowledge:** EUCRA-2 makes full use of available knowledge and experience, such as: EUCRA-1; national climate risk assessments; relevant reports by EU institutions, including the forthcoming EU comprehensive risks and threats assessment; relevant reports of the IPCC[13]; knowledge from EU-funded research projects, including those related to the EU Mission Adaptation to climate change; and reports of the Copernicus Climate Change Service (C3S).

[11] Moldova and Ukraine became EEA cooperating countries in March and June 2026, respectively. Hence, information availability for these countries is expected to be limited.

[12] These principles have been inspired by the set of principles in the methodology report of the first Australian National Climate Risk Assessment, https://www.dcceew.gov.au/climate-change/publications/national-climate-risk-assessment.

[13] The IPCC Sixth Assessment Report (AR6) was already used as an input to EUCRA-1. The publication timeline for the IPCC Seventh Assessment Report (AR7) has not been agreed at the date of publishing this report (October 2026). Our working assumption is that the Working Group II contribution to the IPCC AR7 will *not* be available as an input to EUCRA-2. Informal contacts with relevant lead authors of the IPCC AR7 have been established to ensure coherence of key concepts and approaches between EUCRA-2 and IPCC AR7 where feasible. However, EUCRA-2 cannot rely on or cite preliminary findings from confidential drafts of the IPCC AR7.

- **Holistic:** EUCRA-2's holistic approach considers systemic interdependencies and accounts for complex, cascading, and compounding risks, as far as possible.
- **Solution-oriented:** EUCRA-2 complements the risk analysis with an assessment of the solution space, focusing on adaptation options, enabling conditions and policy levers.
- **Policy relevant:** EUCRA-2 is aligned with EU policy priorities, policy frameworks, competences, and governance responsibilities, recognising the different roles of EU, national, regional and local actors in managing climate risks.
- **Actionable:** EUCRA-2 communicates findings effectively to inform the further development of EU and national adaptation policies and support improved climate risk decision-making.
- **Transparency:** EUCRA-2 shares new knowledge, methods and data publicly for others to draw on, learn from and use.
- **Adaptive:** EUCRA-2 facilitates the identification of methodological challenges, data and knowledge gaps with a view to improving future climate risk assessments and informing potential future EU-funded research programmes.

Conceptual and methodological framework

2 Overall assessment approach

A climate (change) risk assessment (CRA) is a scientific estimation of climate-related risks to socio-ecological systems, and ultimately society, which is aimed at supporting improved risk management and risk governance. EUCRA-2 goes beyond a traditional CRA by linking climate risks to policies, decision-making processes, governance responsibilities and adaptation solutions, thereby supporting climate risk management and policy action at EU level.

This chapter outlines the overall EUCRA-2 assessment approach and explains key concepts, it introduces key policy lenses (such as social justice and macro-economic dimensions), and it gives an overview of the key steps of the assessment (that are described further in Chapters 3 to 10).

2.1 Key concepts and terms

EUCRA-2 aligns its terminology to common practice in climate risk assessments, based on their use by the Intergovernmental Panel on Climate Change (IPCC), standards of the International Organization for Standardization (ISO), and other relevant international sources. A brief overview with working definitions of key terms used in this chapter and throughout this report is provided in Text box 1 below. Further terms may be introduced in subsequent chapters.

Considering that EUCRA-2 has a strong focus on the solutions space, this box includes various terms that are not commonly used in 'classic' climate risk assessments. Furthermore, some of these terms are used in different ways by different scholarly communities or for different types of risk assessment. Their use in EUCRA-2 will be further explained in Section 2.3 or other sections as appropriate.

Text box 1: Key terms used in this methodology report

Adaptation option: A possible response to reduce climate risks.

Adaptation solution: The selected best-fit adaptation option or bundle of options for a specific context and objective.

Bundles of adaptation options: A coordinated combination of complementary adaptation options, considering their interactions and sequencing, that is targeting a systemic intervention point and.

Cascading risk: Risk that propagates across sectors or systems.

Climate resilience: The capacity of a system to maintain its essential functions, structures, and identity in the presence of climate-related shocks and stresses through coping, adapting, recovering, and where necessary transformation.

Climate risk: Potential adverse consequences resulting from the interaction of climate hazards with exposure and vulnerability.

Climatic impact driver (CID): Physical climate conditions (e.g. temperature, precipitation extremes) influencing risks. They can become risk drivers and hazards when they are detrimental to a specific system.

Outside-in climate-related risk driver (OCRD): A climate-related development or impact occurring outside Europe that can trigger or amplify risks in Europe through transboundary transmission pathways.

Impact chain: Conceptual model that maps the causal pathways through which climate hazards interact with exposure and vulnerability factors to generate risks and impacts on human, natural or socio-ecological systems. It represents the cascade of consequences associated with one or more climate hazards.

Just resilience: Addressing the inequalities in climate risks and adaptive capacities across geographical regions, social groups and generations, and ensuring fairness in the development and implementation of adaptation responses. It encompasses distributional justice, procedural justice, recognitional justice, and intergenerational justice.

Non-climatic risk driver (NCRD): Socio-economic, environmental, technical, or policy factors shaping exposure and vulnerability to climatic impact drivers.

Policy domain (or policy area): Area of public policy action through which governments and other actors design and implement interventions to influence risks in one or several (sub)systems (e.g. agriculture policies).

Risk ownership: The allocation of responsibility and authority among public, private and civil society actors for managing, reducing or responding to climate risks.

Sector: A distinct area of economic or societal activity grouped according to a common function or purpose (e.g. banking).

System at risk: A human, natural or socio-ecological system whose structure, functions, or performance may be impaired by climate change impacts (e.g. food system).

Solutions space: The range of adaptation and policy responses that are available to respond to climate risks. The solutions space is dynamic and can expand or contract over time, including in response to policies.

Systemic intervention point: a component or relationship within or across climate impact chains where intervention can modify the generation or propagation of climate risk, with potential effects on multiple risk pathways, risks or interconnected systems.

Urgency to act: Summary assessment of how urgently additional policy action is needed, considering the findings of the risk analysis, adaptation analysis and policy analysis.

2.2 Main innovations over EUCRA-1

Following the publication of EUCRA-1, EEA identified several areas for improvement related to the scope, structure, and presentation of EUCRA-2 in interactions with European and national stakeholders. Key experts from the European Topic Centre on Climate Change Adaptation and LULUCF involved in EUCRA-1 provided suggestions on how to address these in a EUCRA-2 reflection paper[14]. As a result, EUCRA-2 includes the following key innovations over EUCRA-1.

Expanded thematic scope: EUCRA-2 addresses a wider range of systems at risk and policy areas, compared to EUCRA-1. For a full list of systems to be assessed in EUCRA-2 and indicative links to policy areas, see Annex 2. **Stronger focus on solutions and enabling policies:** EUCRA-2 has a much stronger focus on the solutions space. This includes a structured analysis of adaptation, with a selected overview of adaptation options and a focus on real-world delivery and enabling conditions for adaptation, as well as an enhanced assessments of policy readiness and risk ownership. Further information is available in Section 2.4 as well as Chapters 7 and 8.

Enhanced stakeholder involvement: EUCRA-1 was developed primarily by scientific experts and climate risk assessment practitioners whereas stakeholders were involved mostly during the scoping phase and during the review of draft versions of the report. EUCRA-2 involves stakeholders throughout the project, including through Thematic Expert Groups. Further information is available in Chapter 12.

Improved traceability of the climate risk assessment: EUCRA-2 introduces a structured knowledge management framework that connects key information sources with standardised analytical templates for risk analysis, adaptation analysis and policy analysis, supported by a navigable impact chain tool that links evidence explicitly to risk components. Further information is available in Chapter 13.

New report structure: EUCRA-1 comprised two layers of reports: an Executive Summary and an extended main report. Information about climate risks for Europe was presented in two different chapter formats: thematic factsheets and risk storylines. Based on stakeholder feedback, the EUCRA-2 report package will be structured in three layers: the **executive summary**; the **main report**, but in a considerably shorter format than in EUCRA-1; and a series of **technical reports/papers** offering an additional and in-depth product layer dedicated to the readers interested in more details about specific systems or topics. Further information is available in Annex 1.

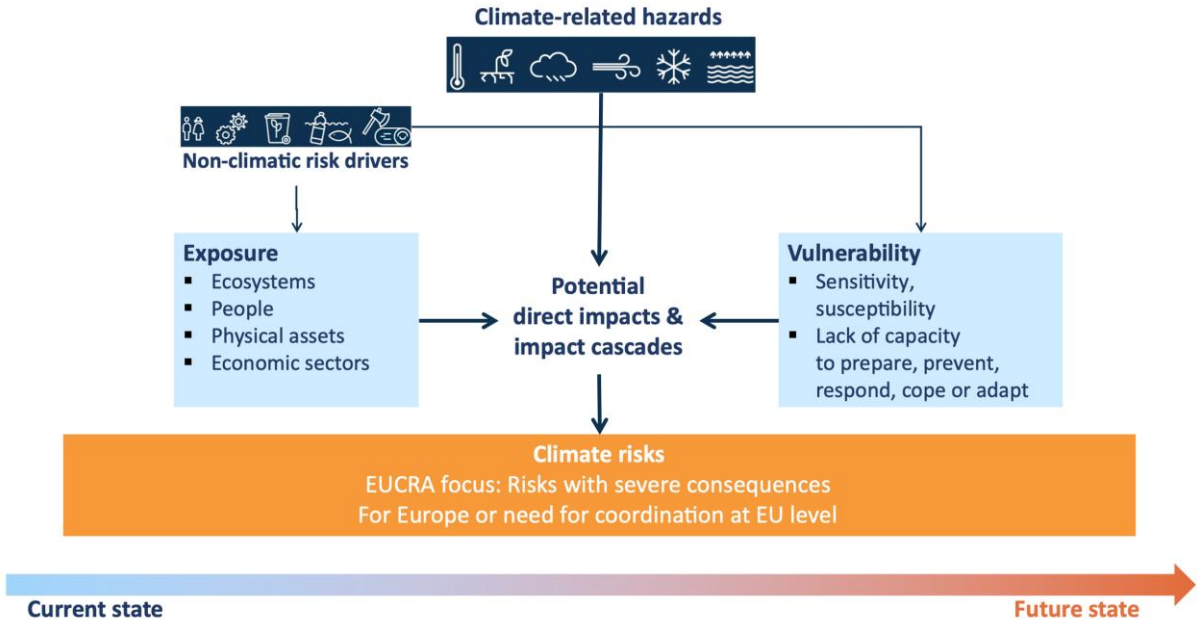
2.3 Risk concept and overall assessment approach

As in EUCRA-1, EUCRA-2 uses an extended risk assessment framework based on contributions by UNDRR (United Nations Office for Disaster Risk Reduction) and GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit)[15]. This framework explicitly reflects the nature of risks including climatic and non-climatic risk drivers that are affecting multiple exposed systems with various, and partly interconnected vulnerabilities. Potential impacts of these drivers are cascading through systems leading to interconnected risks (see Figure 1).

[14] Zebisch et al., Reflection paper for EUCRA-2, ETC-CA Report 2025/1, https://www.eionet.europa.eu/etcs/etc-ca/products/reflection-paper-for-eucra-2

[15] UNDRR, *Technical Guidance on Comprehensive Risk Assessment and Planning in the Context of Climate Change*. Zebisch et al., *Climate Risk Sourcebook*, GIZ.

Figure 1: EUCRA risk assessment framework (adapted from EUCRA-1)



The definition of (climate) risk in EUCRA-2 is based on the IPCC Sixth Assessment Report (AR6)[16], with its core features:

- Risk is the potential for adverse consequences for human, natural or socio-ecological systems.
- Relevant adverse consequences include those on lives, livelihoods, health and well-being, economic, social and cultural assets and investments, infrastructure, services (including ecosystem services), ecosystems and species.
- In the context of climate change impacts, risks result from dynamic interactions between climate-related hazards with the exposure and vulnerability of the affected human, natural or socio-ecological system to the hazards.
- Climate hazards as well as exposure and vulnerability to them may each be subject to uncertainty. Each of these factors may change over time and space due to drivers including socio-economic changes and human decision-making.

Within this broad framing, EUCRA-2 will address several connected types of climate risks, as shown in Table 1. This pragmatic categorisation distinguishes three categories of 'complex' climate risks from the 'direct' climate risks often assessed to inform planning for disaster risk reduction. All these categories are fully compatible with the IPCC AR6 definition and consider non-climatic risk drivers as appropriate. Further risk types and combinations of these categories are possible. For example, aggregation and cascading can refer to direct risks as well as more complex risks.

The distinction of different risk types is helpful for conceptual clarity, it has direct implications for the analytical approaches and underlying information that are most suitable for assessing a particular risk, and for the robustness of the risk analysis; it can also inform targeted communication about climate risks and possible solutions

Table 1: Broad categories of climate risk relevant for EUCRA-2

Risk type	**Definition**	**Defining feature**	**Illustration** (examples related to human health)

[16] IPCC, *Climate Change 2022 – Impacts, Adaptation and Vulnerability*. https://www.ipcc.ch/report/ar6/wg2/

Direct climate risk	Risk arising from a **single climate hazard** directly affecting a system through exposure and vulnerability	**First-order causality** from hazard to impact	**Increased risk of vibrio infections** due to higher water temperatures in coastal areas with brackish waters
Compounding climate risk	Risk arising when **multiple climate hazards interact** to amplify impacts beyond additive effects	Amplifying hazard interaction within a system	A combination of heat and heavy rainfall creating favourable conditions for mosquito breeding and pathogen development, **increasing transmission intensity of vector-borne diseases**
Cascading climate risk	Risk that **propagates across systems or sectors**, where an initial climate impact triggers a chain of further risks or impacts	System propagation and indirect effects	An extreme heat wave puts a strain on health systems, which have a reduced capacity to manage other health risks
Aggregate climate risk	Risk emerging from the combination and interaction of multiple direct, compounding and/or cascading risks across a system	**Aggregating** information on constituent risks for specific policy actors or other risk owners	**The overall health burden** arising from heatwaves, droughts and wildfire smoke, through excess mortality, worsening air quality, respiratory illness, healthcare pressures, and reduced population wellbeing

EUCRA-1 did not include an explicit distinction of risk types. Most **'major climate risks'** assessed there were aggregates of various constituting risks, many of which were themselves cascading risks or compound risks with complex risk transmission pathways. EUCRA-2 is expected to keep a strong focus on complex, cascading and aggregate risks in response to stakeholder demands.

The **complexity and aggregation level** of the climate risks in focus in EUCRA-2 will often prevent a fully quantitative analysis using composite indices or process-based climate impact models. Hence, the risk assessment of the (aggregate) climate risks in EUCRA-2 will eventually be based on **expert judgement that considers multiple lines of evidence**. This evidence includes a mix of targeted quantitative information on climate indices and some first order impacts, results from literature review of scientific papers and official reports, input from external experts and stakeholders, and a synthesis by the authors.

Most of this evidence will be based on **existing information sources**, including scientific publications, climate impact modelling studies, national CRAs, and other information from recent or ongoing research projects. This existing evidence will be complemented by a limited set of **activities conducted specifically for EUCRA-2**, in particular by the European Centre for Medium-Range Weather Forecasts, ECMWF (under the DestinE programme) and by the Joint Research Centre (JRC).

2.4 Framing the solutions space in EUCRA-2

A key innovation of EUCRA-2 is its explicit focus on a "solutions space". Going beyond a traditional climate risk assessment, EUCRA-2 seeks not only to identify and assess major climate risks, but also to strengthen the knowledge base for reducing those risks and advancing climate resilience in Europe.

The EUCRA-2 solutions space comprises the range of adaptation and policy options available in Europe to respond to major climate risks. This solutions space is dynamic and can expand or contract over

time because of policy choices, governance arrangements, investments, technological developments, and societal conditions as well as from major changes in the biophysical system – for instance higher global warming levels.

Within EUCRA-2, the solutions space is operationalised through two complementary analytical components: adaptation analysis and policy analysis. While closely linked, the two analyses serve also distinct purposes: the adaptation analysis focuses on the identification and assessment of types of implementable adaptation options, their risk-reduction potential, co-benefits, trade-offs, and the enabling conditions; whereas the policy analysis focuses on the broader governance and policy context that enables and constrains which adaptation options are available, at which time, and for whom.

Given the EU-wide scope of EUCRA-2 and the reliance on existing evidence, the adaptation analysis cannot assess highly context-specific options at a high level of granularity. The focus is therefore on clusters of adaptation options, their risk-reduction potential, enabling conditions, limits and implementation challenges, while drawing on case studies and practical experience to illustrate context-specific considerations where relevant. The adaptation analysis covers all Key Types of Measures (KTM) used in the reporting under the Regulation on the Governance of the Energy Union and Climate Action[17], except KTM A (Governance and institutional measures) and KTM B (Economic and financial measures – specifically B1 financing and incentive instruments). These two types are recognised as critical elements for strengthening the enabling conditions for the implementation of all other KTMs. Accordingly, KTM A and selected KTM B measures are assessed as part of the policy analysis. They will be considered in the identification of priorities for action and in informing ways forward at EU level to support effective adaptation implementation on the ground.

Building on the analysis of adaptation options, the policy analysis responds to the specific need for a stronger assessment of policy readiness and action levers at EU level to address climate risks. It will aim to identify the existing EU policy levers that support adaptation implementation on the ground, while also identifying gaps that would require action. The policy analysis will also look into risk ownership and clarity of responsibilities for responding to climate risks across sectors and levels of governance. Together, the adaptation and policy analyses provide insight not only into what can reduce climate risks, but also into what enables or constrains implementation in practice.

This integrated approach supports a stronger link between climate risk evidence and decision-making and enables EUCRA-2 to provide more actionable insights for policymakers. Together, risk, adaptation and policy analysis inform the assessment of urgency to act and the identification of priorities for action at the EU level (see Chapter 9).

2.5 Assessment workflow and timeline

EUCRA-1 followed the key steps of established climate risk assessment frameworks, drawing on relevant ISO standards[18]. The process began with the identification of key risk drivers, leading to the identification of major climate risks for Europe. This was followed by an in-depth risk analysis, including the assessment of risk severity and associated confidence levels over time. An indicative policy analysis complemented these core steps by examining broad policy characteristics and identifying initial aspects of risk ownership. Risk evaluation then determined the urgency to act, and a light assessment of priorities for action was undertaken.

EUCRA-2 builds on and extends this approach by fully implementing and strengthening each step of the CRA process. Prior to risk identification, EUCRA-2 introduces a system-mapping step to define the systems at risk, their boundaries, essential elements and functions, and key interdependencies,

[17] https://www.eionet.europa.eu/etcs/etc-cca/products/etc-cca-reports/using-key-type-measures-to-report-climate-adaptation-action-in-the-eea-member-countries

[18] ISO 31000:2018, Risk management — Guidelines, https://www.iso.org/standard/31000; ISO 14091:2021, Adaptation to climate change — Guidelines on vulnerability, impacts and risk assessment, https://www.iso.org/standard/68508.html

thereby establishing the analytical framework for subsequent risk identification and analysis. In addition to the core risk identification and selection, analysis, and evaluation stages, the EUCRA-2 workflow introduces a dedicated analysis of the 'solutions space', including a structured analysis of adaptation options, a focus on real-world delivery and enabling conditions for adaptation, and an enhanced assessments of policy readiness and risk ownership. These elements jointly inform risk evaluation and the priorities for action, alongside the outcomes of the risk analysis (see Figure 1). Furthermore, EUCRA-2 places stronger emphasis on stakeholder involvement throughout the process and is supported by improved data integration and knowledge management to ensure consistency and robustness across the assessment.

Figure 1: Development of the assessment approach from EUCRA-1 to EUCRA-2.

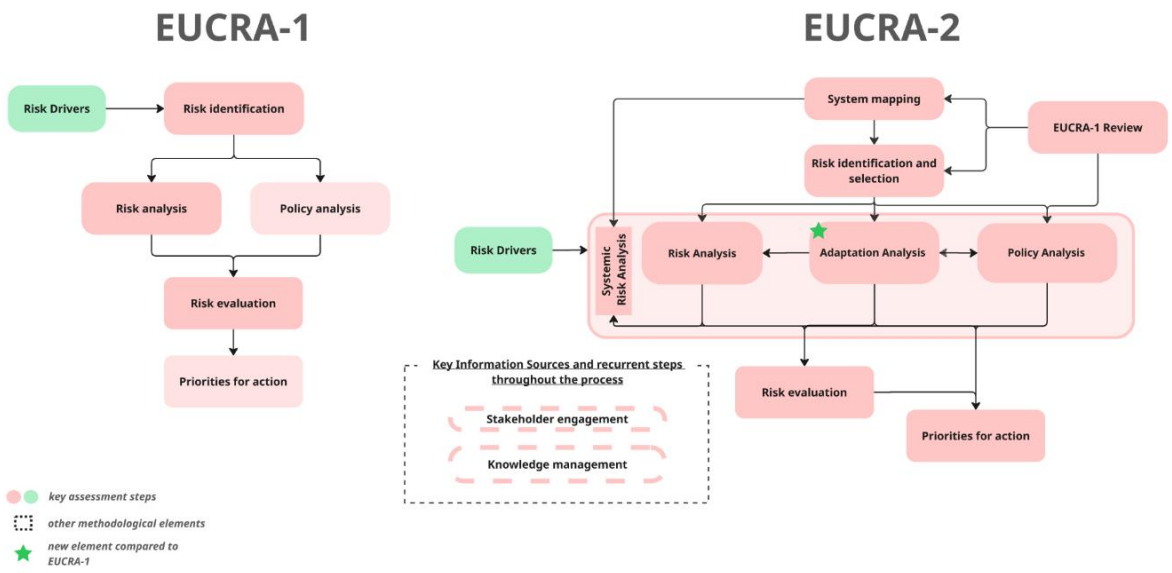
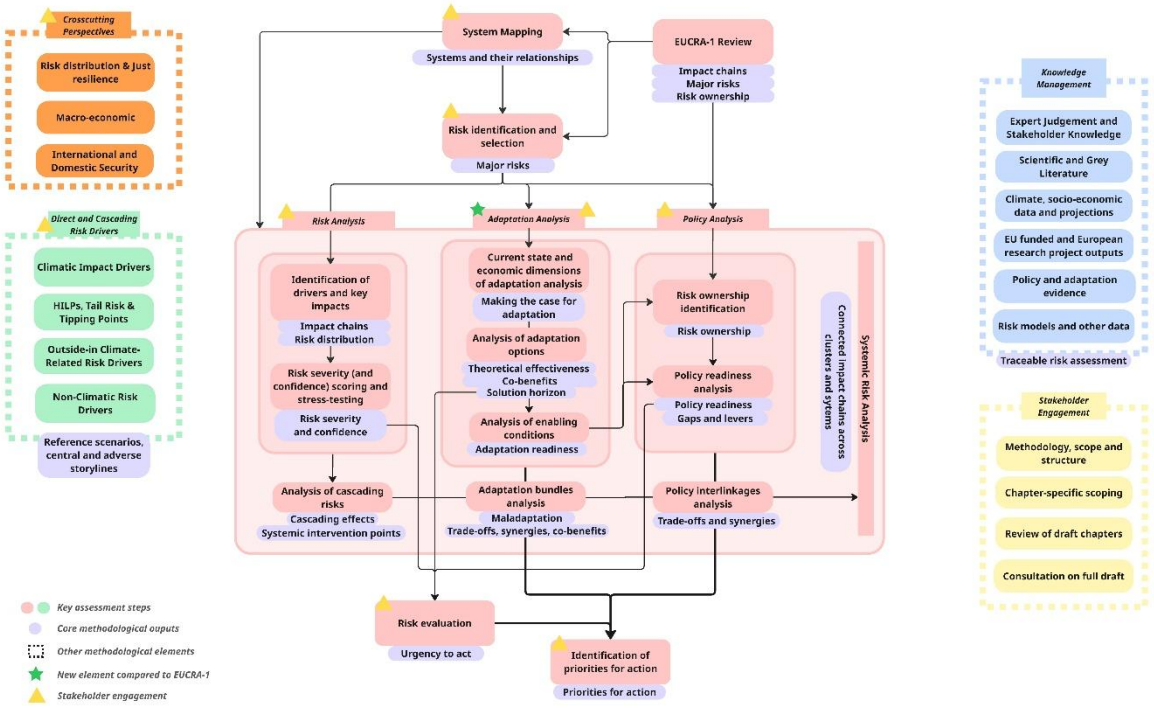


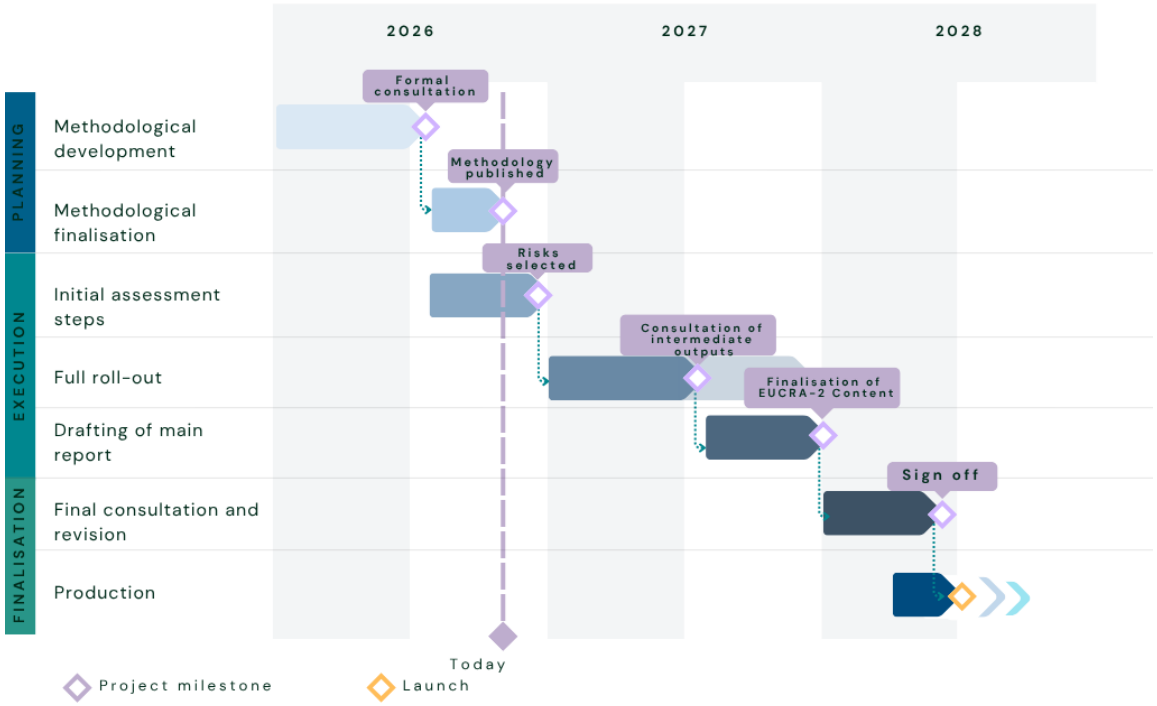
Figure 2 presents the EUCRA-2 workflow in more detail. This workflow comprises three closely interconnected workstreams on risk analysis, adaptation analysis and policy analysis that inform each other throughout the assessment. These workstreams jointly inform the risk evaluation, which combines information on the severity of a risk now and in the future, the robustness of the assessment, the solution horizon, and the policy readiness. They also provide the evidence base for identifying priorities for action, which shift the focus from prioritising risks to prioritising feasible and policy-relevant solutions. A detailed presentation of each step of the climate risk assessment and element in this figure is outlined in the following chapters.

Figure 2: EUCRA-2 workflow



Publication of this interim methodology report constitutes an important milestone in the EUCRA-2 development. The overall project timeline is presented in Figure 3.

Figure 3: EUCRA-2 timeline



2.6 Regional dimension of the risk assessment

The nature and severity of **climate risks differ across European regions** owing to differences in climatic, environmental and socioeconomic conditions. EUCRA-1 geographical scope were the 32 EEA member countries and 6 cooperating countries (in 2024), which were divided into four **subcontinental macro-regions:** Northern Europe, Western Europe, Central-Eastern Europe, and Southern Europe. The regionalisation was based primarily on the four geographical subregions for Europe identified in the United Nations M49 Geoscheme[19], considering also the geographical subdivision of Europe in the IPCC AR6[20] and the geographic scope of EUCRA. The resulting regions were considered broadly relevant to differences in climatic and socioeconomic conditions. Most risks in EUCRA-1 were assessed primarily at the pan-European level, while regions with substantially higher risk severity were identified as regional hotspots.

The macro-regional analysis was complemented by a dedicated assessment of the EU Outermost Regions, which face distinctive climate risks owing to their geographic location, socioeconomic characteristics and exposure to climate hazards. EUCRA-1 further distinguished three broad subgroups: small islands in the tropical regions, coastal regions of the Amazon, and the Macaronesian region.

EUCRA-2 strengthens the regional dimensions of the assessment through the following specific changes:

- EUCRA-2 **replaces the former Southern Europe EUCRA-1 macro-region with two macro-regions** that broadly cover its western and eastern parts, respectively. This distinction allows major differences in climatic hazards and socioeconomic conditions within the former Southern Europe macro-region to be represented more explicitly. The introduction of the fifth macro-region also involved adjustments to some boundaries (i.e. reassignment of Bulgaria and Romania) and region names, informed by climatic and socioeconomic considerations and stakeholder feedback.
- The assessment of **risk severity** will be conducted **explicitly for each of the five EUCRA-2 macro-regions** rather than implicitly as in EUCRA-1.
- The **EU Outermost Regions** remain a dedicated territorial focal area of the risk analysis. The findings from EUCRA-1 will be updated in light of recent evidence.
- EUCRA-2 introduces several **cross-cutting focal areas: mountain regions, floodplains, coastal regions and islands**. These geographical or topographic categories that will be considered across relevant risks but will not receive separate risk-severity assessments.
- Relevant **Overseas Countries and Territories** associated with the EU will be considered in the analysis of the security implications of climate change, with a focus on Greenland and its links to the wider **European Arctic**.

Table 2 presents the geographical coverage, macro-regions and focal areas used in EUCRA-2. The division of Europe into five macro-regions along national borders is a pragmatic analytical framework that cannot fully represent the complex pattern of climatic, environmental and socioeconomic and factors that shape climate risks in Europe, both across and within countries. Several countries stretch across different climatic and biogeographical zones, including France, Italy, Romania and Türkiye, while others, including Bulgaria, Croatia, Romania and Slovenia, lie in the transition zone between macro-regions. Assignment of such countries reflects expert judgement that was guided primarily by similarities in current climatic and socioeconomic characteristics rather than by historical or conventional regional groupings.

[19] Standard country or area codes for statistical use (M49), https://unstats.un.org/unsd/methodology/m49/#ftn13

[20] See Figure 13.1 in the IPCC AR6 Working Group II report, https://www.ipcc.ch/report/ar6/wg2/figures/chapter-13/figure-13-001

Table 2: Composition of EUCRA-2 macro-regions and focal areas

EUCRA-2 macro-regions[1]				
For each pan-European risk, risk severity will be assessed for each of these regions in addition to the European-level assessment.				
Northern Europe (NEU)	**Western Central Europe (WCE)**	**Eastern Central Europe (ECE)**	**Western Mediterranean Europe (WME)[2]**	**South-eastern Europe and the Eastern Mediterranean (SEEM)[3]**
Denmark Estonia Finland Iceland Ireland Latvia Lithuania Norway Sweden	Austria Belgium France Germany Liechtenstein Luxembourg Netherlands Switzerland	Czechia Hungary Poland Slovakia	Italy Malta Portugal Spain	**EEA member countries:** Bulgaria Croatia Cyprus Greece Romania Slovenia Türkiye **EEA cooperating countries** (as of 2025)[4]: Albania Bosnia and Herzegovina Kosovo (under UNSCR 1244/99) Montenegro North Macedonia Serbia

Other geographical units considered in EUCRA-2		
Cross-cutting focal areas	**Dedicated territorial focal area**	**Additional geographical coverage in selected analyses**
For each pan-European risk, it is assessed whether any of these areas is particularly affected, but without assessing risk severity separately.	*These regions are not considered in the assessment of pan-European risks; instead, a small set of specific climate risks for this area is identified and assessed separately (as in EUCRA-1)*	*These regions will be considered in specific thematic analyses, despite being outside the general scope of EUCRA-2.*
Mountain regions Floodplains Coastal regions Islands	EU Outermost Regions	For international security: European Arctic (including Greenland)[5]

Note 1: Macro-regions are defined for analytical purposes based on broad climatic and socioeconomic similarities. They do not imply homogeneity within or between countries in a region, and do not correspond to official Eurostat or UN regional classifications.

Note 2: In the name WME, the term 'Mediterranean' refers to broad Mediterranean-type climatic characteristics; it does not imply that every country has a Mediterranean coastline.

Note 3: The macro-region SEEM includes the largest number of EEA member and cooperating countries that are not EU Member States. Türkiye alone accounts for a large share of the region's population, land area and economy. Regionally aggregated results may therefore be strongly influenced by conditions in Türkiye. Results will be interpreted considering country-level contributions and, where relevant and feasible, presented separately for relevant parts of the region.

Note 4: Moldova and Ukraine became EEA cooperating countries during 2026. They are not included in the formal EUCRA-2 macro-regions because the available evidence is currently considered insufficient for systematic inclusion in EUCRA-2. Relevant information for these countries may nevertheless be covered on a case-by-case basis.

Note 5: The European Arctic comprises land and sea areas of EEA member countries as well as Greenland, one of the Overseas Countries and Territories associated with the EU through its constitutional links with Denmark.

2.7 Just resilience dimensions

EUCRA-2 applies a **just resilience lens** across all stages of the EUCRA-2 assessment. Such a lens aims to examine the uneven burdens of climate risks across social groups and regions, risks of maladaptation, and the importance of inclusive and participatory adaptation processes, to ensure that adaptation responses leave no one behind. Justice dimensions are used as cross-cutting analytical criteria embedded in each step of the assessment process.

The assessment of the regional distribution of climate risks (see Section 2.6) is an important input to informing just resilience. Further dimensions, focussing on social justice, are described below.

Particularly affected population groups

Climate risks are affecting different population groups within the same country or region differently, reflecting their exposure to climate hazards, cascading climate risks, and vulnerability. EUCRA-2 will assess whether certain population groups are systematically more affected by specific climate risks than others as part of its distributional justice lens.

Table 3 presents the vulnerability dimensions addressed in EUCRA-2. Note that membership of a listed group does not in itself imply elevated vulnerability to every climate risk. Furthermore, EUCRA-2 recognises that vulnerability is multidimensional and shaped by the interaction of multiple and overlapping social, economic and demographic characteristics, which can compound disadvantage and influence both exposure to risks and access to adaptation.

Table 3: Vulnerability dimensions intended to be targeted in EUCRA-2[21]

Vulnerability dimension	Demographic	Socio-economic	Health-related	Cultural and linguistic	Occupational	Housing and neighbourhood
Populations that may experience elevated vulnerability or exposure	Children and youth Older people Women and girls	Low-income households Single-parent households People with limited social networks	People with disabilities People with chronic health conditions People with mental health conditions Pregnant women	People facing language barriers Migrants and displaced people Indigenous peoples and ethnic minorities	Healthcare and emergency workers Agricultural and forestry workers Other seasonal and outdoor workers	Homeless people People living in sub-standard housing People living in rented accommodation People living in densely built areas

[21] Adapted from the Belgian Climate Risk Assessment (BCRA), https://www.cerac.be/en/bcra

Distributional dimensions of adaptation

Taking a forward-looking perspective, EUCRA-2 will examine how adaptation options, adaptation bundles and enabling conditions may affect different social groups, including the distribution of adaptation benefits and costs. The analysis will place a strong emphasis on co-benefits, ripple effects and maladaptation risks, both for individual adaptation options and for adaptation bundles, including the potential for adaptation responses to unintentionally reinforce inequalities, increase vulnerability, or shift risks onto already disadvantaged populations.

Procedural and recognitional justice

Considerations of procedural justice and recognitional justice will be embedded in the analysis of adaptation options and policies. Procedural and recognitional justice are distinct but closely related dimensions: procedural justice concerns inclusive and transparent decision-making, while recognitional justice concerns the acknowledgement of diverse identities, needs and vulnerabilities. The policy analysis will examine how such considerations are reflected in existing governance arrangements and policy instruments. The forward-looking adaptation analysis will draw on good practices and evidence from the literature to highlight the importance of inclusive and participatory approaches as enabling conditions for effective adaptation and for avoiding maladaptation. The broader stakeholder engagement process supporting EUCRA-2 seeks to capture a diversity of perspectives and knowledge types, including scientific evidence, practitioner experience, and local knowledge relevant to climate risks and adaptation.

Intergenerational justice

Intergenerational justice involves considering both (i) emerging or future climate risks that may not yet be critical but are expected to intensify over time, and (ii) the potential for today's adaptation decisions to create long-term lock-ins that increase future vulnerability or constrain adaptation options for future generations. EUCRA-1 has addressed intergenerational justice by making the time dimension of risk evolution and adaptation planning explicit. As a result, a climate risk could be classified as requiring 'more action' even if risks are not at critical levels now, but such levels are expected in the future, and the lead time or lock-in time is long. EUCRA-2 will continue and strengthen this approach by systematically considering the timing of adaptation options, their time to effectiveness, and their potential to create or avoid long-term lock-in effects that may increase risks or constrain adaptation options for future generations.

2.8 Macroeconomic implications of climate change

Many climate risks are associated with costs to citizens, businesses, economic sectors or governments. Cost estimates often distinguish **direct losses** (e.g. damaged infrastructure or declining crop yields) from **indirect losses**, which can occur at different, interconnected scales: at the **microeconomic level** (e.g., revenue declines owing to business interruption), at the **mesoeconomic level** (e.g., impacts on sectors caused by interruptions to supply chains or temporary unemployment), and at the **macroeconomic level** (e.g. price increases, declining tax revenues, impacts on financial markets or gross domestic product). Impacts at one level can propagate to and contribute to impacts at higher levels.

EUCRA-2 will collect evidence of the macroeconomic consequences of climate change impacts in Europe. This collection will ensure a proper categorisation (e.g. direct costs vs. indirect costs, sector-specific costs vs whole society costs, costs for the households vs. costs for the firms vs. costs for the public sector).

Macroeconomic consequences are mainly (but not only) measured by impacts on gross domestic product (GDP); some studies also consider welfare impacts. Cost estimates should account for these

'higher order' or 'systemic' economic effects triggered by climate change impacts. Ideally, macroeconomic costs associated with single hazards, combinations of hazards, and determined using different methodologies (model-based vs. econometric assessments) will be presented.

This assessment will consider available information on economic impacts related to specific climate risks identified in EUCRA-2 (bottom-up perspective); this information will be complemented by information based on whole-society assessments (top-down perspective). The end goal is to offer an overview of the potential macroeconomic consequences of climate change in Europe together with some interpretation keys to orientate oneself within the huge variability of existing estimates. In addition, EUCRA-2 will critically review available information on adaptation economics.

2.9 Security implications of climate change

The climate-security nexus has received considerable attention since the publication of the first EUCRA, against the background of increasing geopolitical tensions and a stronger policy focus on European security and preparedness.

Climate change may cause or aggravate security-related risks for Europe through different pathways, including:

- **Disruption of vital resources, services and societal functions.** Climate change can affect food and water supply, energy, transport, critical infrastructure and other economic and societal functions on which European security and preparedness depend.
- **Erosion of societal resilience and crisis-response capacity.** Repeated, prolonged or concurrent climate impacts can deplete the buffers and reserve capacities needed to manage additional climatic or non-climatic crises, including infrastructure redundancy, institutional response capacity and financial buffers.
- **Security repercussions of climate impacts outside Europe.** Climate change can undermine livelihoods and disrupt essential resources, services and infrastructure in other world regions. In interaction with socioeconomic, political and governance factors, these impacts may contribute to political instability and geopolitical tensions, with potential repercussions for Europe.
- **Changes in strategic access and geopolitical competition.** Climate change can alter access to strategically important regions, resources and transport routes, potentially intensifying geopolitical competition. One example is the increasing accessibility of Arctic shipping routes and mineral resources associated with declining sea ice.
- **Impacts on preparedness and security actors.** Climate change can directly affect the operations, infrastructure, personnel and capabilities of actors responsible for preparedness, crisis response and security, including civil protection and emergency services as well as defence actors.

The potential implications of climate change on national security have so far received limited explicit attention in national CRAs in Europe. They were also out of scope of the first EUCRA. Some countries, such as Germany, have assessed the climate-security nexus through a separate, security-focussed CRA. Relevant studies have also been conducted by and for EU institutions (e.g. the Joint Research Centre of the EC and the EU External Action Service) and international organisations, such as NATO and its Climate Change and Security Centre of Excellence.

EUCRA-2 will consider the security implications of climate change through a **targeted, cross-cutting perspective**. The analysis will examine how selected climate risks and changing environmental conditions may affect Europe's ability to maintain vital societal functions, manage concurrent crises and respond to a changing international security environment. Security will thus provide one lens for interpreting the systemic consequences of climate risks assessed elsewhere in EUCRA-2.

The analysis will focus on a **limited number of well-evidenced examples and interactions** that illustrate how security implications can emerge from interactions across systems. These may include cascading and compound effects across food, water, health, energy, transport, digital infrastructure and other essential systems; interactions between domestic and climate risks triggered by climate change impacts occurring outside Europe ('outside-in climate-related risk drivers, OCRD); the coincidence of climate pressures with non-climatic threats; and the erosion of the capacities and buffers that enable societies and institutions to manage disruption. Selected evidence may also illustrate context-dependent pathways through which climate change can contribute to wider international security challenges, such as instability, resource pressures or geopolitical competition. Selected examples could also illustrate how concurrent climate impacts across Member States may create pressures on shared resources, mutual assistance and European solidarity arrangements.

The EUCRA-2 system-specific assessments will be an important information base, particularly concerning climate impacts on vital resources, services and societal functions within Europe. This information base will be complemented by the planned **analyses of cascading risks and risks triggered by outside-in climate-related risk drivers**. These assessments will remain the principal basis for identifying and evaluating climate risks.

Targeted supplementary evidence will be used where important security dimensions are not adequately captured by this evidence, particularly concerning climate-sensitive developments outside Europe with implications for European security, changes in strategic access and geopolitical competition, and impacts on civil protection, emergency management, security and defence actors.

The security perspective will involve only limited supplementary evidence collection. It will therefore not constitute a comprehensive assessment of climate-security risks, geopolitical developments, defence capabilities or all possible interactions between climatic and non-climatic threats. Supplementary security-related factors will not be independently scored or added to the formal EUCRA-2 climate-risk inventory, and the analysis will focus on EU-level relevance rather than Member State defence posture or capability planning. Its principal added value will be to connect evidence that might otherwise remain dispersed across individual risk and system assessments, highlighting where shared dependencies, cascading effects, pressures on response capacity and climate change impacts outside Europe create broader implications for European security, preparedness and resilience.

Steps of the climate risk assessment

3 Systems mapping

EUCRA-2 adopts a **systems perspective** to support scoping and structuring of the assessment.

The systems at risk considered in EUCRA-2 refer to socio-ecological systems defined by their elements, their interactions, and their purpose. They are interlinked and embedded in their wider environment. Elements might be grouped into subsystems (e.g. an agricultural subsystem as part of the food system). Outcomes of the systems arise nonlinearly at different levels, including the element, subsystems. Systems are usefully described by systems maps if they cover structure and relationships (e.g. functional dependencies) of the elements, embedded in their environment and highlighting functions at the subsystem and system levels.

System maps are developed to support the identification of boundaries, elements, and functional dependencies, within and across systems (see Table 3). They do not constitute climate-risk assessments in themselves. Climate hazards, exposure, vulnerability, adaptive capacity, consequences and adaptation limits are introduced in subsequent stages of the risk assessment. The system maps provide a common reference structure to which impact chains, risks, adaptation options and policy information can subsequently be linked. In the context of EUCRA-2, focus is given to climate-sensitive systems that deliver relevant societal functions (e.g. food security and affordability, energy security). EUCRA-2 is not attempting a comprehensive network map at cluster, system, and element level simultaneously. It rather aims at identifying key interconnections within and across systems which inform risk analysis.

The approach to system mapping developed in EUCRA-2 combines literature review, analysis of policy documents, and expert knowledge. Its steps are outlined below.

Table 4: System mapping definitions and examples

Components	Definition	Food system example
Societal function	A high-level capability or service whose continuity matters for society, and which helps define the scope of the assessment.	Provision of sufficient, safe and accessible food.
System cluster	A pragmatic grouping of related systems used to organise EUCRA-2 analysis, stakeholder engagement and communication.	Food system and bioeconomy.
System	A bounded set of interacting biophysical, technical, social and institutional components that jointly perform one or more functions relevant to EUCRA-2.	Food system.
Subsystem	A coherent part of a system used where additional analytical detail is necessary.	Primary production; processing and storage; distribution and retail.
Element	A concrete biophysical, technical, organisational or socio-economic component of a system or subsystem.	Crops, farms, irrigation infrastructure, storage facilities, processors, ports, retailers.
Specific function	A process or capability performed by a system, subsystem or element that contributes to a societal function.	Production, storage, processing, transport, distribution.
Functional dependency	A relationship through which a system/component relies on, receives from or affects another component; it may involve material, energy, water, information, financial or ecosystem-service flows.	Dependence of crop production on water, energy and agricultural inputs.

Step 1 – Definition of systems and systems clusters

This step establishes the systems in scope for EUCRA-2, the societal functions they provide, and their relationship to relevant policy domains. It is based on a structured review of EUCRA-1, national climate risk assessments and adaptation plans, relevant EU thematic policy frameworks (e.g. Critical Entities Resilience Directive, Preparedness Union Strategy, Common Agricultural Policy), and expert judgement.

The analysis identifies climate-sensitive systems and specifies their societal functions, with the aim of defining the substantive coverage of the assessment. Systems and functions are identified by means of:

- a review of national CRAs and EUCRA-1 to identify the breadth of climate-sensitive systems identified in the field of climate risk assessment;
- a review of national CRAs and EU policy documents to identify what societal functions are provided by each of the systems potentially considered.

The systems identified are subsequently mapped against relevant EU policy areas to assess policy coverage, identify potential gaps, and provide a basis for subsequent policy analysis in Chapter 8.

The final selection of the systems considered in the assessment and their clustering is performed iteratively by considering functional similarity, policy relevance, comprehensiveness and feasibility

within the scope of EUCRA-2. It is reviewed through consultation with the European Commission and Eionet, and it provides the organising framework for subsequent analytical and stakeholder-engagement activities. The outcome of the selection of systems and their clusters is presented in Annex 2.

Step 2 – Systems characterisation

This step supports the characterisation of the systems identified in Step 1. Each of the systems in scope is further characterised by identifying and mapping subcomponents, elements, specific functions and system boundaries which compose it and enable its provision of societal functions.

The sources considered and reviewed for this step are EUCRA-1 and EU policy documents, which are combined with expert judgement.

Step 3 – Map functional dependencies within and across systems

In this step, each system is further characterised in terms of the dependencies that exist across its elements and functions, as well as across elements and functions within other systems. Such dependencies describe how systems' parts interconnect and depend on each other. Dependencies are mapped by indicating which elements and specific functions are involved and the direction of dependency.

The identification of functional dependencies is informed by literature review and expert knowledge. Dependencies are mapped at the lowest level of detail required to understand a dependency (e.g. subsystems, elements and specific functions). System-level relationships may be used where additional disaggregation would not materially improve subsequent risk analysis.

The outcomes of this step are relevant for systemic risk analysis, as they support the identification of cross-system interconnections that are necessary to identify cascading, compounding, and systemic risks through risk analysis.

Example within the food system. Functional dependencies can be mapped across elements of the supply chain such as agricultural land, crops, agricultural inputs (e.g. fertilisers, machinery), livestock, irrigation infrastructure, storage facilities, processing capacity, transport, retail networks and consumers.

Example across ecosystems, food, and the economy. Loss of ecosystem functions such as water retention, soil protection or coastal buffering can reduce agricultural productivity, and generate economic and financial losses.

Step 4 – Validation and refinement of the maps

The systems maps are validated through expert workshop. The purpose of this step is to ensure completeness, consistency, and common interpretation of the systems maps.

4 Risk identification and selection

The aim of risk identification and selection is to produce a shortlist of major climate risks for Europe that will be analysed in detail in the risk analysis and provide entry points for adaptation and policy analyses. This will be done in three steps: identifying an 'initial longlist' of climate-sensitive risks based on multiple data sources (see Section 4.1); clustering and merging these risks into a 'consolidated longlist' of risks according to common criteria (see Section 4.2); and screening the remaining risks as to their potential severity to create a shortlist of the most significant risks for Europe ('major climate risks') (see Section 4.3).

4.1 Risk identification

This step identifies an initial long list of (up to 100) potential climate-sensitive risks. The starting point is the list of 36 major climate risks for Europe identified in EUCRA-1. This list will be extended based on the following information sources:

- National climate risk assessments in Europe;
- National risk assessments under the Union Civil Protection Mechanism;
- IPCC Sixth Assessment Report (AR6);
- JRC risk and strategic foresight reports;
- EEA Horizon Scanning outputs;
- Selected EU-funded research projects on climate impacts and risks

The inclusion of new risks to the longlist is guided by the following criteria:

- **Consistent risk definition:** Each risk should specify at least one hazard, one exposed element or subsystem, and one or several impacts. This implies that risk definitions that refer only to a specific hazard or a system are not sufficient.
- **Significance:** Each risk should be considered as significant in the underlying source or assessment, at least at the scale of the original assessment.
- **Geographical scope:** A risk should be relevant for the whole of Europe or a substantial part of it, such as a European macro-region (see Section 2.6).
- **Complementarity to EUCRA-1 risks:** Newly added risks should be complementary to the major climate risks covered in EUCRA-1.

4.2 Risk consolidation

The initial longlist identified in the previous step will be reviewed, and similar risks will be merged, to create a consolidated longlist of about 50 risks, leading to a consolidated longlist for final risk selection (see next section).

This aggregation and consolidation process considers the following criteria:

- **Overlap between risks:** Risks are clustered, and ultimately merged according to common risk drivers, exposed subsystems, causal pathways, and impacts, to limit overlap between different risks.
- **Specificity and breadth:** Clustered risks need to be sufficiently specific for meaningful assessment as well as sufficiently broad to warrant a detailed risk assessment. As a result, narrower risks may be absorbed into broader ones where appropriate.
- **Solutions space characteristics:** Initial considerations of policy and adaptation aspects (including policy instruments coverage, availability and uptake of adaptation options, and clarity of risk ownership) will be considered in the aggregation of risks.

During this process, major climate risks identified in EUCRA-1 may be merged, split up, renamed, or categorised to the systems at risk considered in EUCRA-2 (see Annex 2).

4.3 Risk selection

Risk selection consists of a filtering phase where the ‘consolidated longlist’ from the previous step is reduced to create a shortlist of major risks (most significant risks with the potential to lead to severe consequences) that will be assessed in detail in subsequent steps of the climate risk assessment. Risk selection relies on a small set of screening criteria which consists of a sub-set of dimensions analysed in the risk analysis step, however applied in a more simplified and rapid way, including:

- **Coarse assessment of risk severity:** This criterion considers the potential magnitude and irreversibility of impacts, tipping points, and disturbance of system functionality.
- **Cascading and systemic risks:** This criterion considers the potential for cascading effects that create further risks beyond the initially affected system.
- **Cross-cutting perspectives:** Information on distributional impacts, macroeconomic impacts and broader security significance can be considered where readily available.

4.4 Stakeholder engagement

Risk identification and risk consolidation are based on a desk review of existing knowledge sources.

For the risk selection, EEA and consortium experts undertake the initial risk selection, using coherent analytical templates to ensure consistency of the information. Following an internal EEA review, the draft shortlist of major climate risks will be presented for validation to the Interservice Working Group (ISWG; see Section 12.1) through a written review and an online workshop. The final shortlist compiled by the EEA will consider the comments received by the ISWG.

More information on the full stakeholder engagement is available under Section 12, including the definition of stakeholder groups such as the Thematic Expert Groups (TEGs) and the Eionet Group on Climate Change and Adaptation (CCA).

EUCRA-2 step	ISWG	TEGs	Eionet CCA group	EU research projects	Sounding board	Risk review panel
Risk selection	◇ ✓					
Legend	● Inform	◇ Review	✓ Validate			

5 Risk drivers

5.1 Framing and role of scenarios in EUCRA-2

EUCRA-2 considers three categories of drivers that jointly shape climate risks in Europe:

- **Climatic impact drivers (CIDs**) refer to changes in climate conditions in Europe that affect systems at risk (e.g. increasing frequency of heatwaves in Europe).
- **Non-climatic risk drivers (NCRDs**) refer to changes in environmental, socioeconomic, and other conditions that shape the exposure and vulnerability to these CIDs (e.g. expanding settlements in flood plains, ageing population),
- **Outside-in climate-related risk drivers (OCRDs)** refer to climate-related developments or impacts occurring outside Europe that can trigger or amplify risks in Europe through transboundary transmission pathways (e.g. harvest failures outside Europe affecting livestock production in Europe).

EUCRA-2 will extract information on CIDs, NCRDs and OCRDs primarily from existing data sources, scenarios and storylines, complemented by targeted activities to enrich the coverage of these information sources. Information on these risk drivers then provides a cross-cutting evidence base that informs risk identification, risk analysis, confidence assessment, stress-testing and the evaluation of future priorities.

In a model-driven or other high-resolution CRA, consistent scenarios of CIDs – and possibly NCRDs – are the essential starting point of the analysis. In a review-based CRA such as EUCRA-2, in contrast, the main source of information about future climate risks are existing studies that already consider

scenarios for CIDs, and possibly NCRDs, which may differ across studies. Therefore, consistent scenarios and storylines of CIDs and NCRDs play a somewhat different role in EUCRA-2, compared to model-driven assessments. This information will be used mainly as a framework to categorise existing knowledge sources and as the starting point to identify important knowledge gaps. It also helps understanding the nature of risks and their spatial patterns, serves as important background information for expert and stakeholder involvement and as a framing of the risk assessment for readers of the EUCRA-2 report. Furthermore, this information can serve as a complementary line of evidence for the risk analysis and evaluation. Information on NCRDs can also inform the identification of risk-reducing adaptation options and policies.

CIDs are described in EUCRA-2 through a central and a high-warming scenario (see Section 5.2) that constitute the core of the analysis. More extreme climate conditions including High-Impact and Low-Probability (HILP) events, tail risks, and Earth System Tipping Points (ESTPs), are used in the risk, adaptation and policy analysis for stress-testing (see Sections 5.3 and 6.4).

Information on relevant NCRDs will be compiled into a central and an adverse NCRD storyline for each system at risk (see Section 5.4). NCRDs storylines are designed to describe potential future states of the EUCRA-2 systems, with the aim to contextualise risk analysis through the identification of key drivers and impacts, as well as to inform and test the robustness of the risk severity scoring through stress-testing. Therefore, these configurations represent plausible futures rather than fully consistent scenarios.

EUCRA-2 will also combine CID scenarios and NCRDs storylines (including JRC foresight reference scenarios) to test the robustness of priorities for action across multiple futures (see Chapter 10).

The final section of this chapter (Section 5.5) addresses the coverage of OCRDs from outside Europe affecting Europe.

5.2 Climatic impact drivers

In EUCRA-2, the term ‘climatic impact driver (CID)’ is used to refer to climatic conditions that affect or lead to climate risks (see text box below). The classification of CIDs follows the IPCC CID framework and is complemented by selected compound risk drivers. To ensure coherence with broader policy and operational contexts, the classification is also aligned with the terminologies of other global and European initiatives, such as the UN Office for Disaster Risk Reduction (UNDRR) and the Union Civil Protection Mechanism (UCPM).

Text box 2: Terminology around climatic factors influencing climate risks

Several related terms are being used to describe the climatic factors that shape climate risks and their evolution over time.

Climatic impact drivers (CIDs), as introduced by the IPCC AR6, are *'physical climate system conditions (e.g., means, events, extremes) that affect an element of society or ecosystems"* whereas **climate hazards** are potentially damaging physical events or trends.

Some conceptual models define climate hazards narrowly as acute events linked to a single climate variable (such as an extreme precipitation event). In contrast, IPCC AR6 recognises that both acute events and long-term changes or trends as relevant to CIDs and climate hazards. Moreover, relevant climatic conditions can involve a single climate variable (such as temperature) or multi-variate climate conditions (such as fire weather).

A key distinction is that CIDs and their changes may be **detrimental, beneficial, neutral, or a mixture**, depending on the affected system and its tolerance whereas climate hazards are defined by their potential for adverse consequences. For example, decreasing winter frost is a CID that can contribute to a climate hazard for winter tourism, while potentially providing opportunities for road transport.

EUCRA-2 uses the broadest term, climatic impact driver (CID), as the primary descriptor of future climate conditions. In the context of a specific climate risk, the two terms often refer to closely related climatic phenomena. The term (climate) hazard may be used for brevity or when referring the hazard–exposure–vulnerability framework of risk.

Finally, **climate storylines** describe plausible climate scenarios, including low-probability, high-impact events, and earth system tipping points (see Section 5.3); they may be based on recent observed extreme events.

5.2.1 Role of climate information throughout the assessment

Climate risks are affected by changes in many different CIDs. EUCRA-2 will be based on studies using a variety of CIDs, depending on the system being considered.

In addition to these studies, EUCRA-2 will provide climate projections for a limited number of CIDs and selected climate storylines. This information will be used to inform expert and stakeholder consultations, to contextualise information from existing climate impact and risk assessments, and eventually to provide a framing of climate change for readers of the EUCRA-2 report. These scenarios will not be used to drive quantitative climate impact or risk modelling studies.

Key roles of CID scenarios and projections during the risk analysis are as follows:

- Broad projections of changes in global or regional temperature for different radiative forcing scenarios and time horizons helps **relating information from relevant evidence sources** to the pre-defined time periods and/or global warming levels of the EUCRA-2 reference scenario (see Section 5.2.2);
- Quantitative or semi-quantitative information about variations in relevant CIDs across regions can inform the assessment of regional risk distribution;
- Quantitative or semi-quantitative information about differences in relevant CIDs between a reference scenario and a stress-testing scenarios can inform stress-testing if quantitative risk estimates are available only for the reference scenario.
- Quantitative or semi-quantitative information on changes in relevant CIDs may be combined with expert knowledge about the sensitivity of a given system to **review the plausibility of science-based or expert-based assessments of the severity of a given climate risk**.

Importantly, information from any forward-looking studies activities can be considered in EUCRA-2, even if this information is based on other climate scenarios or time horizons than the EUCRA-2 reference scenarios.

5.2.2 Time horizons, reference scenarios and adverse scenarios

EUCRA-2 assesses risks for the following timeframes, which are identical to those used in the IPCC AR6 and EUCRA-1:

- **current/near-term future** (2021-2040, centred around 2030),
- **mid-term future** (2041-2060, centred around 2050),
- **long-term future** (2081-2100, centred around 2090).

The same time frames will be used for CID projections. Where available, past trends of CIDs and/or changes since the climate reference period (1961-1990) will also be presented to illustrate observed climate change.

EUCRA-2 will provide information on projected changes in selected **CID indicators** relevant for Europe for these time horizons under two global warming scenarios that are consistent with **recommendations by the European Scientific Advisory Board on Climate Change**[22].:

- A **central warming scenario** (compatible with the SSP2-RCP4.5 forcing scenario) involves global warming of about 2 °C over preindustrial levels for the mid-term future **and 3 °C for the long-term future**
- A high-warming scenario (compatible with the SSP3-7.0 forcing scenario) involves global warming of about 2 °C over preindustrial levels for the mid-term future and 3.5-4 °C for the **long-term future**

The central warming scenario is aligned with the **common climate reference scenario** (or reference global climate trajectory) for Europe expected to be included in the forthcoming European Integrated Framework for Climate Resilience.[23] Therefore, it will be used as reference scenario for the risk evaluation in EUCRA-2.

EUCRA-1 used two ranges of global warming scenarios rather than specific scenarios: a low-warming range (1.5-2 °C global warming by the end of the century) and a high-warming range (3-4 °C global warming by the end of the century). Note that both the common climate reference scenarios and the high-warming scenario in EUCRA-2 fall within the high-warming range in EUCRA-1, and the difference between the two warming scenarios in EUCRA-2 is smaller than the difference between the two scenario ranges in EUCRA-1.

EUCRA-2 will use **various approaches for** identifying more adverse changes in CIDs than the average changes under the central warming scenarios that can inform **selective stress testing** (see also Section 5.4 on scenarios for NCRDs):

- Consideration of the high-warming scenario
- Focus on 'tail risks', i.e. the upper range of plausible climate projections under the central or high-warming scenarios
- Developing climate risk storylines for selected high-impact low-probability events (HILPs) (see Section 5.3).

In this context, it is important to note that the uncertainty in projections of climate hazards relevant at European, national and subnational levels is generally dominated by uncertainties across climate

[22] Strengthening resilience to climate change - Recommendations for an effective EU adaptation policy framework. https://climate-advisory-board.europa.eu/reports-and-publications/strengthening-resilience-to-climate-change-recommendations-for-an-effective-eu-adaptation-policy-framework

[23] See https://www.europarl.europa.eu/legislative-train/theme-a-new-plan-for-europe-s-sustainable-prosperity-and-competitiveness/file-european-framework-for-climate-resilience-(1)

models (No. 2 above) and systematic limitations of these models (partially addressed in No. 3 above) rather than differences between global warming (or the underlying radiative forcing) scenarios (No. 1 above)[24].

5.2.3 Key Information sources

Key source for observed climate trends and future projections of CIDs in EUCRA-2 will be the Climate Data Store (CDS) of the Copernicus Climate Change Service (C3S), which gives access to climate data from a wide range of underlying sources, including observations, reanalyses, and projections. This information will be complemented by climate storylines that may incorporate findings from statistical attribution studies relevant to Europe and results from high-resolution modelling experiments, including DestinE and convection-permitting simulations.

Relevant CIDs to be covered explicitly through projections in EUCRA-2 are identified through a risk-oriented perspective that explicitly links hazards and impacts. The **selection of relevant CIDs** for standardised CID input relies on expert judgement of the sensitivity of major climate risks as indicated e.g. in impact chains. For pragmatic reasons, the list of CIDs operationalised through standardised reference and 'high hazard' projections is expected to be in the range of 10-15 CIDs. These CIDs will be initially drawn from the impact chains in EUCRA-1, complemented by CIDs covered in the *European Climate Data Explorer*[25] or the EEA web report *Europe's changing climate hazards*[26]. ECMWF is invited to advise on priority CIDs and related indices based on technical feasibility and its own work with sectoral stakeholders.

For each selected CID, climate indicators are clearly defined, along with criteria for spatial and temporal aggregation.

5.3 High-impact low-probability events, tail risks and earth system tipping points

5.3.1 Definitions

In a climate risk assessment context, **high-impact, low-probability (HILP) events** are understood as plausible climate events with potentially severe consequences and either low, uncertain, or poorly constrained likelihood[27]. HILPs include **tail risks**, for which the probability is known to be low, as well as events characterised by deep uncertainty where probabilities cannot be robustly quantified. One category of HILPs associated with deep uncertainty are **Earth System Tipping Points (ESTPs)**, which are critical thresholds that may lead to rapid or irreversible change at global or regional scale in Europe. All these events are characterised by uncertainty about their occurrence, potentially severe cascading impacts, and the possibility of exceeding response capacities or adaptation limits.

HILPs focus on events and processes that are not already adequately covered by standard central climate scenarios. Long-term climate trends with high impacts or regional tipping points that are well represented in scenario-based assessments, such as progressive aridification in parts of southern Europe or glacier retreat, are therefore not the primary focus unless they interact with HILP dynamics.

[24] See e.g., Bevacqua et al., 2026: Moderate global warming does not rule out extreme global climate outcomes. *Nature* **651**, 946–953 (2026). https://doi.org/10.1038/s41586-026-10237-9

[25] https://climate-adapt.eea.europa.eu/en/knowledge/european-climate-data-explorer

[26] https://www.eea.europa.eu/en/analysis/publications/europes-changing-climate-hazards-an-index-based-interactive-eea-report

[27] See e.g. Definitions and taxonomy for High Impact Low Probability (HILP) and outlier events, https://doi.org/10.1016/j.ijdrr.2025.105504

5.3.2 Selection of HILPs and ESTPs

To support a **transparent and consistent selection,** a clear identification procedure for HILPs and ESTPs based on defined criteria will be used. The approach builds on criteria applied to large-scale disaster events and combines them with low or unknown probability. The identification focuses not only on physical hazard, but also on system response limits. Events are considered **HILPs** when they meet the following criteria:

- very large impacts, potentially affecting multiple sectors simultaneously
- cascading effects across interconnected systems
- exhaustion of response capacity, with further resources either unavailable or ineffective
- spatial extent beyond local or national scales

To determine the European relevance for including these events in EUCRA-2, the following criteria will be considered:

- events affecting several countries or regions at the same time
- cascading cross-border impacts
- situations in which the Union Civil Protection Mechanism is insufficient to cope
- strong interdependencies between key systems such as energy, food, water, transport and health

Only a **limited number of ESTPs** are currently assessed to be of high relevance for Europe until the end of the century. Among the global ESTPs, a potential slowdown or even collapse of the Atlantic Meridional Overturning Circulation (AMOC) has received the largest scientific and political attention recently, including by a dedicated JRC-led project on the governance of AMOC and the JPI Joint JPI Climate & JPI Oceans Initiative on the Atlantic Meridional Overturning Circulation. Relevant regional ESTPs, such as the European megadrought or climate conditions facilitating cataclysmic forest fires, will be identified by ECMWF.

5.3.3 Role of HILPs and ESTPs throughout the assessment

Building on EUCRA-1 storylines for selected compound risks, EUCRA-2 will address HILPs, including selected ESTPs, more systematically through dedicated climate and risk storylines.

EUCRA-2 will develop dedicated **factsheets**, **impact chains** and **risk storylines** for selected HILPs and ESTPs. Each storyline describes the event or processes itself (e.g. an extreme meteorological event or trend, or changes in atmospheric and ocean circulation) together with its potential high-level impacts on European systems.

Storylines represent a physically self-consistent unfolding of past observed events (for HILPs only) and of plausible future events and pathways, following a storyline approach. They cover both the climatic and non-climatic risk drivers and the resulting cascading impacts across systems, including multiple and compounding risks that may exceed adaptation limits. For **ESTPs**, storylines draw on the latest research on tipping points and their potential impacts on Europe, such as the Global Tipping Points Report[28].

Within the risk analysis, risk storylines are used primarily to stress-test systems under conditions beyond the central scenarios (see Section 6.4).

5.4 Non-climatic risk drivers

5.4.1 Definition and classification

Definition

[28] https://global-tipping-points.org/

Non-climatic risk drivers (NCRDs) comprise the processes and conditions that affect the **exposure** and **vulnerability** of human or ecological systems. They include environmental stressors, infrastructure standards, socio-economic conditions, institutional capacity, policy design and behavioural factors.

Identifying and characterising relevant NCRDs aims at supporting the characterisation of climate-sensitive systems, exposure and vulnerability factors, related impact chains and risks, thus informing the risk analysis, as well as at facilitating the identification of levers for adaptation and policy-responsive drivers, therefore informing adaptation and policy analysis.

Driver typology classification

EUCRA-2 classifies NCRDs in two complementary ways. First, NCRDs are classified by driver typology according to scale, impact, uncertainty and policy responsiveness. These categories identify the shared background conditions for analysis, the uncertainties that distinguish central from adverse vulnerability trajectories, the system-specific variables that calibrate severity and the policy-responsive levers that can reduce risk.

Megatrends are broad, high-impact drivers with relatively low uncertainty and low climate-resilience policy responsiveness, such as ageing, electrification and digitalisation. **Structural uncertainties** are broad, high-impact drivers with uncertain direction, such as economic development, European integration, institutional trust and trade barriers. **System-specific drivers** affect one or a few systems, such as the role of hydrogen or sectoral employment patterns. **Climate resilience policy-responsive drivers** can be shaped by European, national or subnational policy, such as coastal protection standards, flood-plain development, water-allocation rules or health preparedness.

Second, NCRDs are classified according to the STEEPV categories for strategic environmental analysis[29] to ensure coverage of social, technological, economic, environmental, policy and values-related drivers. Examples include ageing, increasing inequality, digitalisation, land use changes, ecosystem degradation, and degrading trust in governments.

NCRDs may be represented through numerical, ordinal or directional ranges. Quantitative projections are used where available, but qualitative variables such as trust, institutional capacity and ecosystem connectivity remain necessary to avoid blind spots in severity stress-testing.

5.4.2 Identification and selection of NCRDs

Relevance criteria

NCRDs are selected for their relevance to understand the past and potential future development of climate-related risks in Europe, including the role of EU policies; improving estimates of severity through alternative evolutions of exposure and vulnerability; understanding regional and distributional differences; and identifying risk-management entry points, including policy levers.

Identification and selection process

- **Selection of common NCRDs variables.** A common set of cross-cutting drivers, megatrends, structural uncertainties, informed by a bounded scan of authoritative sources (see Section 5.4.4), is identified to provide a shared context across all systems.
- **Selection of priority NCRDs per system.** For each climate-sensitive system, expert judgement is used to select variables according to expected relevance for exposure and vulnerability, systemic role, interdependencies, relevance to adaptation and policy responsiveness, as well as evidence availability. A two-tier structure is recommended: up to five or six core NCRDs. Identification starts from NCRDs already highlighted in EUCRA-1 impact-chain and risk analysis, complemented by a bounded scan of authoritative sources (see Section 5.4.4).

[29] Ian Miles, Ozcan Saritas, Alexander Sokolov, 2016: *Foresight for Science, Technology and Innovation*. https://doi.org/10.1007/978-3-319-32574-3

- **Characterisation of priority NCRDs.** Priority variables are characterised by expected values and plausible ranges over time, for example 2030 and 2060. Historical trends, projections, scenarios and qualitative developments are combined and used as input for system-level future storylines. Recurring demographic and economic macro-variables should be labelled as cross-cutting and used consistently across systems.

5.4.3 Development and operationalisation of 'future storylines'

Note: *The 'storylines' for NCRDs described here are different from the 'climate storylines' described earlier in this chapter. The terminology may still be adjusted to avoid confusion.*

NCRD storylines are developed through a two-layer approach combining macro-level storylines with system-specific storylines. A common set of macro-drivers, informed by megatrends, structural uncertainties, SSPs and European foresight reports, provides a shared context across all systems. This is complemented by system-specific NCRDs that influence exposure and vulnerability. Two future configurations are developed for both macro-drivers and system-specific drivers: a **central storyline** based on mainstream projections and current-policy assumptions, and an **adverse storyline** describing plausible conditions that make exposure and vulnerability materially worse than in the central trajectory. The storylines are severity-conditioning storylines, not full scenarios, which combine information on NCRDs to support severity assessment, scoring and stress-testing in risk analysis. They describe whether future exposure, vulnerability, coping capacity and cascading potential could make a climate hazard translate into moderate, severe or catastrophic consequences. Their purpose is to support the integration of NCRDs transparently into climate risk assessment, improve traceability and comparability, and broaden the range of futures considered. The formal severity assessment in the risk analysis (see Section 6.3.6) will be conducted for the central trajectory only, whereas the adverse storylines will inform stress-testing of risk severity.

NCRDs support multiple stages of the assessment. Each of the storylines will be underpinned by a list of priority NCRDs, related ranges and specifications, selected through expert judgement and desk-based evidence. The list of priority NCRDs informs initial identification of adaptation options and policy landscape analysis for the identification of concrete entry points for solutions to lower vulnerability and exposure and to reduce adverse effects of NCRDs. Subsequently, more detailed information, including indicators, trends, future states and storylines, supports risk analysis and the identification of priorities for action. The resulting system-level storylines provide a consistent basis for exploring how changes in socio-economic, environmental, technological, governance and geopolitical conditions may influence climate risks and their management.

5.4.4 Knowledge sources for NCRDs

NCRD identification and selection use a bounded and traceable evidence base. Many of these drivers are captured by the shared socioeconomic pathways (SSPs) used by the IPCC, combined with EUCRA impact chains and EUCRA-1 NCRDs; national climate impact, vulnerability and risk assessments; European statistics; European and global scenario studies; sectoral projections from Commission DGs, EU agencies, research projects and networks; peer-reviewed literature; and foresight and horizon-scanning outputs. The latter include dedicated EEA's horizon scanning on social vulnerability, alongside other established foresight scenarios and trends analyses (e.g. by EEA, JRC, European Strategy and Policy Analysis System (ESPAS)).

Sources are selected according to authority, relevance to severity, spatial and temporal coverage, update cycle, transparency of assumptions, uncertainty treatment and suitability for distinguishing robust trends from contested uncertainties. Priority is given to sources used in EU policymaking, followed by intergovernmental publications, national authorities and scientific literature.

5.5 Outside-in climate-related risk drivers

Outside-in climate-related risk drivers (OCRD) refer to climate-related developments or impacts occurring outside Europe that can trigger or amplify risks in Europe through transboundary transmission pathways.

OCRD and related risks can:

- involve specific source and recipient regions that can be far away (e.g. along specific supply chains), or
- refer to climate-enhanced geopolitical risks (e.g. Arctic geopolitical competition) where source or recipient region may not be well defined.

Compared with EUCRA-1, OCRDs are more systematically integrated throughout the broader analysis in the following ways.

- **OCRD identification**: Relevant OCRDs are identified jointly with European CIDs and NCRDs.
- **Impact chain analysis:** OCRDs are embedded within system-level impact chains, explicitly showing how external hazards and stressors interact with, amplify, trigger, or cascade into internal European risks.
- **Risk analysis:** The relevance of OCRDs is systematically considered in the risk analysis.
- **Policy analysis and risk ownership:** OCRDs and related risks are linked to specific EU policy areas, and risk ownership gaps are identified to support more coherent and targeted policy responses.

The focus is generally not on assessing risks affected by OCRDs as standalone risks, but on understanding how climate change impacts occurring outside Europe are transmitted to the EU and how they interact with existing impacts, exposures, and vulnerabilities identified in the climate risk assessment. Emphasis is placed on understanding the pathways through which externally originating drivers influence European systems and modify the severity, dynamics, and urgency of internally identified risks.

5.5.1 Selection of OCRDs

OCRDs will be identified focusing on broad categories of impact transmission pathways:

- Trade and finance
- Mobility of people
- Geopolitical dynamics
- Biophysical processes
- Infrastructure dependencies

The geographical scope of the OCRD assessment focuses on regions with strong climatic, economic, political, or social linkages to the EU, including:

- Western Balkan countries (which are within the scope of EUCRA-2 as EEA cooperating countries);
- The EU's Southern Neighbourhood countries in the Mediterranean;
- The EU's Eastern Neighbourhood countries;
- Globally relevant regions for EU supply chains, finance, or security.

The final scope is refined through expert judgement and stakeholder consultation, ensuring relevance to European systems and alignment with EU policy priorities, while avoiding exhaustive global coverage.

Relevant knowledge sources include the IPCC AR6, published and ongoing national CRAs (e.g. in Finland, Germany and the United Kingdom), peer-reviewed literature and relevant EU research projects. Stakeholder involvement (for example expertise through the Thematic Expert Groups, see

Section 12.1) for the identification of potential impacts in each policy area due to the presence of transmission linkages such as trade agreement, geographical proximity, and political cooperation agreements. The identification of OCRDs and related cross-border impacts is also informed by an analysis of past events that generated impacts in the EU despite originating outside EU borders. Examining previous events allows the identification of recurrent linkages, cascading effects, and common patterns of interaction between external drivers and European systems.

Final selection is guided by relevance to European systems and policy areas and validated through expert and stakeholder engagement. Each OCRD is explicitly flagged as amplifying, triggering, or cascading into internally identified European risks, ensuring transparency and consistency with the impact-chain framework.

5.5.2 Consideration of OCRDs

Selected OCRDs are considered, following established transboundary risk transmission concepts.

The most relevant OCRDs are presented in a narrative way using storylines to provide a consolidated overview and to frame their relevance for the EU. These risks are then systematically addressed across all systems at risk by explicitly representing them as external drivers, jointly with European CIDs and NCRDs, by highlighting their point of entrance in the impact chains that may exacerbate impacts within each policy area.

This enables the risk analysis to highlight how a single external risk may contribute simultaneously to impacts within a system and across different systems, supporting a more integrated and systemic assessment of risk interdependencies.

6 Risk analysis

6.1 Framing

Risk analysis aims to understand the nature, severity and distribution of the major climate risks determined through the risk identification and selection process (Chapter 4), and to provide a traceable evidence base for adaptation analysis, policy analysis and risk evaluation.

The risk analysis will be structured in three connected parts:

- **System-level analysis** describes how climate change affects a system (e.g. food system), its subsystems and societal functions, building on the system mapping in Chapter 3. It examines how impacts cascade within the system leading to major risks, as well as how impacts and risks propagate to and from interconnected systems. Impact chains represent these mechanisms, while examples of past cascading events illustrate key pathways and consequences for the system and across systems. After the assessment of single risk, a stress test will be applied on the system level to identify critical system behaviour under adverse conditions beyond the central scenarios
- **Single-risk analysis** examines each selected major risk in detail, beginning with a concise summary of its mechanisms and evolution over time. It describes the relevant climatic, non-climatic and outside-in climate-related risk drivers based on the impact chains from the system-level analysis and assesses for each time slice (near, mid-term, far future) potential direct and cascading impacts. It also examines the role and trends of exposure and vulnerability, regional and social risk distribution, and macroeconomic implications. The analysis then evaluates confidence and evidence gaps and assigns risk-severity scores.
- **Analysis of cascading risks across systems** synthesises evidence and interconnected impact chains across individual risks and systems to identify major cascade pathways, shared drivers

and feedback loops. It also identifies systemic intervention points where adaptation could mitigate cascading processes and reduce risks across several systems.

The analysis will systematically consider just resilience dimensions by examining regional and social risk distribution as well as macro-economic effects (see Sections 2.6, 2.7 and 2.8).

6.2 Impact chains as backbone for the risk analysis

Impact chains are conceptual models to structure, visualize, and prioritize risk drivers by illustrating cause-effect relationships within socio-ecological systems and highlighting key connections between risk components. A growing body of methodological guidance, such as the UNDRR technical guidance[30], the Climate Risk Sourcebook[31], and Eurac Research Guidelines[32], provides step-by-step frameworks for developing and implementing impact chains across diverse contexts.

In EUCRA-2, one impact chain is developed for each system at risk identified in the system mapping (see Chapter 3 and Annex 2). For each system and for each risk, CIDs, and NCRDs and OCRDs, including their effects on exposure and vulnerability will be identified. These dynamics are mapped and described in an impact chain tool through a descriptive analysis of evidence claims for each element of the impact chain, including references to each evidence claim. More information about this tool is available in Chapter 13. Impact chains are also central for the analysis of cascading risks, including the identification of systemic intervention points (see Section 6.5).

6.3 Single-risk analysis

Analytical templates for each selected risk will be used by the authors to map risk-specific drivers and impacts to inform the risk analysis of single risks.

6.3.1 Risk drivers

The risk analysis is conducted following the impact chain logic. This implies reporting CIDs, NCRDs, OCRDs, exposed elements, vulnerability factors, and direct and cascading impacts across these elements (e.g., direct hazard impacts on the environment and indirectly on human systems), which constitute entry points for policy and adaptation analyses that can reduce/interrupt exposure and vulnerability elements and therefore related impacts. Heterogeneous evidence is sourced from literature, climate impact modelling studies, and integrated with experts' data and information provision to collect the most comprehensive information possible for all risk drivers and dynamics leading to impacts and risks.

6.3.2 Assessment of potential impacts and consequences

Potential impacts will be assessed for the present/near term, mid-term and long term. The analysis will describe how risk drivers and cascading impacts may adversely affect exposed systems and subsystems, and evaluate the magnitude, extent and pervasiveness of these consequences.

It will also examine whether impacts remain within the affected system or propagate to other risks and systems, and whether they amplify, or are amplified by, other climatic or non-climatic factors.

Furthermore, it will identify whether ecological, social, economic, infrastructure or governance functions named in the system maps are disrupted or impaired, and whether such disruptions are temporary, long-lasting or potentially irreversible. Any evidence on critical thresholds or tipping points that may be exceeded and lead to hard limits to adaptation will also be reviewed.

[30] https://www.undrr.org/media/79566/download?startDownload=20261020
[31] https://www.adaptationcommunity.net/climate-risk-assessment-management/climate-risk-sourcebook/
[32] https://works.eurac.edu/Impact-Chains-guidelines.pdf

In addition, the direct and indirect macroeconomic consequences of each risk (e.g. on GDP, employment, trade, public finances and supply chains) will be estimated, using quantified figures for past and projected losses where available, to judge whether these effects are localised or systemic enough to influence overall risk severity.

6.3.3 Regional and social risk distribution

The risk analysis will be conducted at the pan-European level as well as for pre-defined subcontinental regions and specific focal areas (see Section 2.6). The regional distribution of impacts is analysed with particular attention to the identification of hotspot regions where the climate hazards, exposure or vulnerability to it are significantly elevated. In this context, the assessment evaluates whether risks are disproportionately concentrated in specific regions to an extent that would influence the overall severity scoring.

Complementary to the regional distribution of risks, the analysis identifies particularly affected population groups, recognising that certain segments of society may face heightened vulnerability due to socio-economic, demographic, occupational, or geographic factors (see Section 2.7).

6.3.4 Exposure and vulnerability

Exposure and vulnerability will be assessed separately for each major risk, with explicit attention to how they evolve over time. For exposure, authors will identify and, where possible, quantify the exposed elements (e.g. population, land area, assets, species or system functions) and report whether exposure is growing or shrinking, explaining how relevant non-climatic risk drivers amplify or buffer these trends. Vulnerability will be split into two components: (i) sensitivity and susceptibility, describing the mechanisms that make exposed elements sensitive to the specific hazard, including biophysical, socioeconomic and institutional characteristics and the particular sensitivity of certain population groups; and (ii) adaptive capacity, covering existing adaptation measures, governance, financial and technical capacities, and, where relevant, limits to adaptation. For both components, the influence of non-climatic risk drivers will be made explicit, and differences across the EUCRA-2 macro-regions, focal areas and population groups will be documented as far as possible.

6.3.5 Confidence and robustness of evidence

Confidence will be assessed based on the amount, quality, robustness and representativeness of the available evidence as well as the level of agreement across sources. The assessment will distinguish, where relevant, evidence on observed impacts from evidence on future risk levels and will explain the role of expert judgement. Evidence transferred from another geographical area or time period will be explicitly identified and its applicability justified. Important evidence gaps, including missing information on exposure, vulnerability, adaptation and cascading impacts, will also be highlighted.

6.3.6 Risk severity

The risk severity assessment and scoring are the result of the analysis of the magnitude of consequences, extent and pervasiveness, and confidence for each risk within each system, as well as their potential to lead to loss of functionality, irreversibility, and to trigger cascades and tipping point effects. Risk severity considers the extent to which impacts are distributed across the system, both geographically and in terms of the population and specific groups affected. Risk severity does not simply state a score but is supported by a transparent assessment and justification of the scoring and confidence level grounded in evidence and structured reasoning.

Risk severity can be related to different types of impacts with a potential to address them by quantitative benchmarks. Relevant adverse consequences include those on lives, livelihoods, health and well-being, economic, social and cultural assets and investments, infrastructure, services (including ecosystem services), ecosystems and species.

Overall, the severity assessment is informed by all available quantitative (when available) and qualitative evidence. Benchmarks are intended to support consistency, transparency and comparability across risks. Severity scoring is guided by expert judgement considering the levels of hazard, exposure, vulnerability (sensitivity and current state of adaptation) determining the potential impacts. The final severity category should therefore reflect the overall weight of evidence across all assessment dimensions and be supported by a transparent narrative explaining the rationale for expert judgement.

Sources of uncertainty such as missing data, lack of process understanding, and low confidence are reported (see Section 6.3.5). A confidence level (Low/Medium/High) is based on the quality, quantity, and direct relevance of the evidence used, as well as the uncertainty and the level of agreement within the evidence for this risk. Where evidence is strong, directly applicable, and consistent, confidence can be high. When the assessment relies heavily on transposed evidence or assumptions, confidence is reduced accordingly.

Risk severity will be classified as Limited, Substantial, Critical, Catastrophic (Table 5), guided by qualitative and quantitative benchmarks aimed at increasing the comparability across risks (Table 6).

Table 5: Risk severity classes

Risk severity	Description
Catastrophic	Disastrous and frequent damage, very large extent or very high pervasiveness, irreversible loss of system functionality, systemic risk.
Critical	Large and frequent damage, large extent and high pervasiveness, long-term disturbance of system functionality, cascading effects beyond system boundaries.
Substantial	Substantial losses, moderate extent or pervasiveness, temporary or moderate disturbance of system functionality.
Limited	Limited or rare losses, no significant disturbance of system functionality.

Table 6: Risk severity qualitative and quantitative benchmarks

Risk severity	Magnitude of consequences, extent and pervasiveness	Cascading and systemic effects	Loss of functionality	Duration and reversibility; Thresholds and tipping points
Catastrophic	Disastrous and frequent losses or damage; very large geographical extent or very high pervasiveness across populations, assets, ecosystems or institutions.	Systemic effects propagate widely across multiple sectors and systems, including critical infrastructure, supply chains, societal or ecological systems; impacts may mutually amplify.	Irreversible or near-total loss of essential ecological, social, economic, infrastructure or governance functions; institutional failure may occur.	Impacts are permanent or effectively irreversible; critical thresholds or tipping points are crossed; hard limits to adaptation are reached.
	Quantitative benchmarks			
	Economic impact: At least 1% of GDP (EU: ca EUR 150 billion) **Social impact**: >100,000 deaths or >1,000,000 health impacts or >10,000,000 people affected **Environmental impact:** > 40 Mha of land lost or severely damaged (10% of land area)			

Critical	Large and frequent losses or damage; large geographical extent and high pervasiveness across substantial parts of the system.	Major cascading effects extend beyond system boundaries and disrupt several connected systems, infrastructures, supply chains or societal and ecological systems.	Long-term and extensive disruption of essential functions; recovery requires major repair, restoration or institutional reform and may remain incomplete.	Long-lasting impacts; critical thresholds may be exceeded, and adaptation capacity may be substantially exceeded.
	Quantitative benchmarks			
	Economic impact: 0.25-1% of GDP (EU: ca EUR 40-150 billion) **Social impact**: >10,000 deaths or >100,000 health impacts or >1,000,000 people affected **Environmental impact:** 4 million to 40 Mha of land lost or severely damaged; Major impact (10% or more) on valued habitat or landscape types; Major impacts on or loss of species groups; Major impact (10% or more) on an individual natural capital asset and associated goods and services			
Substantial	Substantial losses or damage; moderate geographical extent or pervasiveness, affecting multiple exposed elements or locations.	Cascading effects occur but are mostly limited to directly connected sectors or locations; amplification is material but does not become system wide.	Temporary or moderate disruption of functions; recovery is feasible through maintenance, repair, restoration or existing institutional arrangements.	Impacts are generally reversible over the short to medium term; thresholds may be approached locally, but widespread tipping points or hard adaptation limits are not expected.
	Quantitative benchmarks			
	Economic impact: 0.05-0.25% of GDP (EU: ca EUR 10-40 billion) **Social impact:** >1000 deaths or >10,000 health impacts or >100,000 people affected **Environmental impact:** 400,000 to 4 Mha of land lost or severely damaged; Intermediate impact (1-10%) on valued habitat or landscape types; Intermediate impacts or loss of species groups; Intermediate impact (1-10%) on individual natural capital assets and associated goods and services			
Limited	Limited or rare losses or damage; impacts are localized, affect few exposed elements and have low pervasiveness.	Impacts remain contained within the affected system or location; no significant cascading or systemic consequences are evident.	No significant disturbance of essential functions; minor interruptions are manageable within routine operations and existing capacity.	Impacts are short-lived and readily reversible; critical thresholds, tipping points and hard limits to adaptation are not approached.
	Quantitative benchmarks			
	Economic impact: <0.05% of GDP (EU: ca EUR 10 billion) **Social impact:** >100 deaths or >1,000 health impacts or >10,000 people affected **Environmental impact:** Less than 400,000ha of land lost or severely damaged; Minor impact (less than 1%) on valued habitat or landscape types; Minor impacts on loss of species groups; Minor impact (less than 1%) on an individual natural capital asset and associated goods and services			

6.4 Stress-testing with risk storylines

Stress-testing is carried out at the system level after the single risk analysis. Its objective is to explore how a system and its major risks would respond to adverse climatic and non-climatic developments beyond the central scenarios, and whether the individual risk-severity scores derived under the central

CID scenario and central NCRD storyline remain robust, are underestimated or are particularly sensitive to specific drivers.

The stress-test draws on three types of information: (i) adverse climate storylines, including HILP events, Earth system tipping points (e.g. AMOC, a Southern-European mega-drought) and tail risks (Section 5.3); (ii) the adverse NCRD storyline (Section 5.4); and (iii) evidence on tail risks reported in the underlying literature (e.g. from large model ensembles). Additional storylines are only considered where supported by referenced evidence. Expert input from the Thematic Expert Groups will help identify which storylines are most relevant for each system.

For each system, the stress test documents how the system would react differently from the central scenarios: changes in the magnitude or severity of its risks; potential loss of critical functions; new cascades within and across systems, system failures or irreversible changes; elements or system nodes that become critical by being overloaded or propagating failures; and relevant thresholds, tipping points or hard limits to adaptation.

The results inform the interpretation of risk severity in the risk evaluation and the identification of priorities for action and highlight gaps and biases in the evidence base.

6.5 Analysis of cascading risks

The analysis of cascading risks looks beyond individual risks to examine how risks interact, propagate and reinforce each other across systems. Once the system-level and single-risk analyses are complete, the connected impact chains and the evidence collected will be synthesised to trace the main transmission pathways across systems. Building on the functional dependencies identified in the system mapping (Chapter 3), the analysis will focus on a limited number of well-evidenced cascade pathways rather than a complete network analysis.

Connecting impact chains across systems helps to ensure that risk elements (climatic and non-climatic drivers, impacts, exposed elements and vulnerabilities) are described consistently across systems. It also helps to identify drivers and vulnerability factors that recur across several systems, and systems or elements that are affected by multiple impacts at the same time.

A particular aim is to identify systemic intervention points (SIPs). In EUCRA-2, SIPs are components or relationships within or across climate-risk impact chains where intervention can modify the generation or propagation of climate risk, with potential effects on multiple risk pathways, risks or interconnected systems. SIPs will be identified qualitatively, based on how many risks and systems they connect and on how strongly they transmit impacts.

The results will feed into the adaptation analysis (in particular Section 7.4), the policy analysis (in particular Section 8.4) and the identification of priorities for action (Section 10). The approach is exploratory and will be refined as the analysis progresses.

6.6 Stakeholder engagement

EUCRA-2 authors (EEA and consortium) identify risk drivers, impacts and cross-system interlinkages through desk-based research, supported by stakeholder input. They develop impact chains and analytical templates for each system and individual risks, with a dedicated team coordinating the analysis of connections between impact chains across systems. EEA experts, Thematic Expert Groups (TEGs) and the ISWG (see Section 12.1) inform the analysis by providing evidence and identifying interlinkages through targeted consultations and system-level or cross-system workshops.

Risk severity and confidence will be assessed originally by experts from the EEA and the consortium, based on published evidence and input from stakeholder workshops. The Risk Review Panel (see Section 12.1) with senior experts in climate impacts and risks will review and validate the risk severity

scoring to ensure comparability and reliability of the analysis through written review. To protect the independence of the risk assessment, the indictment of the risk review panel is final.

EUCRA-2 step	ISWG	TEGs	Eionet CCA group	EU research projects	Sounding board	Risk review panel
Impact chain development	●	●				
Call for evidence against selected risks	●	●	●	●	●	
Risk analysis	◇	● ◇		●		
Risk severity (jointly with solution horizon and policy readiness)	●					◇✓
Legend	● Inform	◇ Review	✓ Validate			

7 The Solutions Space: Adaptation analysis

The solutions space looks at the range of adaptation and policy options available in Europe to address major climate risks, and how this may evolve over time. Within EUCRA-2, the solutions space is operationalised through two complementary components: adaptation analysis, focusing on implementable adaptation options, their risk-reduction potential, co-benefits, trade-offs and enabling conditions; and policy analysis, focusing on the broader governance and policy context that enables or constrains which options are available, when and for whom.

7.1 Objectives

The adaptation analysis in EUCRA-2 is framed through the lens of the solutions space by assessing how risks can be reduced and managed through adaptation. It plays an integrative role within the overall assessment and is closely linked to the risk and policy analyses: adaptation-related evidence can inform the risk selection and analysis, while insights on enabling conditions and implementation gaps contribute to the policy analysis, including policy readiness and ownership. Its scope, structure and level of detail are shaped by the granularity of key inputs generated elsewhere in the assessment.

Rather than providing a comprehensive catalogue of measures or developing adaptation plans for specific contexts, the adaptation analysis focuses on generating insights that can inform adaptation and EU-level action across Europe, while recognising the inherently context-specific nature of adaptation and the EU-wide scope of EUCRA-2. Taking an implementation-focused approach, it provides a targeted overview of adaptation options and their potential contribution to reducing major risks, alongside an assessment of the conditions that enable or constrain their implementation and how EU-level policies and instruments can support adaptation, in light of the rising costs of inaction and growing investment needs for adaptation across Europe.

The analysis aims to contribute to the following key objectives:

- To make the case for adaptation in Europe (i.e., why to invest in adaptation);

- To provide an overview of adaptation options related to major climate risks, with insights on systemic interventions (i.e. bundle of options to tackle systemic intervention points);
- To support the policy analysis with insights on real world implementation barriers and gaps (see Chapter 8);
- To support the risk evaluation by providing information on the time needed to plan and implement solutions (see Chapter 9);
- To support the determination of priorities for action by identifying the enabling conditions that the EU could put in place for the effective implementation of national adaptation plans (see Chapter 10).

To achieve those objectives, the adaptation analysis is structured around three complementary pillars, reflecting its main intended outputs:

- **Providing summary evidence on adaptation needs and benefits** (see Section 7.2)**:** this pillar provides an overarching perspective on why adaptation needs to be accelerated, drawing on available and relevant evidence on adaptation gaps, the costs of inaction, adaptation investment needs, and the wider economic and societal value of adaptation. It will also draw on relevant findings generated through the risk analysis, including, where available, information about the effects of current adaptation and, where relevant, hard limits to adaptation. Where possible, it will also bring together selected cross-cutting insights emerging from the adaptation analysis, such as recurring implementation challenges or enabling conditions, to highlight potential areas where persistent adaptation bottlenecks could be addressed. Together, these elements will help strengthen the evidence base for the case for adaptation in Europe.
- **Providing a forward-looking overview and critical analysis of selected adaptation options and enabling conditions** (see Section 7.3): this pillar will examine a targeted set of adaptation options within the EU context, including their solution horizon, risk-reduction potential, relevant co-benefits and maladaptation risk, as well as the enabling and constraining conditions that shape their implementation. Closely integrated with the policy analysis (see Chapter 8), this component also highlights how existing policy instruments can support or hinder their implementation.
- **Providing a more systemic perspective on adaptation** (see Section 7.4): this pillar complements the assessment of individual adaptation options by exploring how interventions may interact within and across systems, through illustrative bundles of adaptation options around a limited number of critical systemic intervention points (see Section 6.5). The analysis will consider potential synergies and trade-offs, maladaptation risks, and relevant timing and sequencing considerations.

Overall, the adaptation analysis complements the assessment of why and when action is needed with a more implementation-focused perspective on how to act. Its contribution to the risk evaluation is primarily through the solution horizon, while its broader contribution to EUCRA-2 is to help ground priorities for action in evidence on adaptation options, enabling conditions and implementation gaps.

7.2 Evidence on adaptation needs and benefits

This component provides an overarching perspective on why adaptation needs to be accelerated in Europe, drawing together available and relevant evidence on adaptation gaps, the costs of inaction, adaptation investment needs, and the wider economic and societal value of adaptation. Rather than undertaking a comprehensive assessment of each of these dimensions, it will synthesise key findings from relevant existing evidence to strengthen the overall case for adaptation.

The analysis will draw on available information on the effects of current adaptation and preparedness measures, recognising that assessments of climate risks and climate-related impacts already reflect adaptation actions undertaken to date, and, where relevant, hard limits to adaptation.

The economic dimension will build on the wider EUCRA-2 assessment of the macroeconomic consequences of climate change and available evidence on adaptation economics, including costs of inaction and adaptation investment needs. Where available and relevant, evidence on the costs and wider benefits of adaptation will provide additional context for understanding the value of accelerating adaptation action. EUCRA-2 will not generate new economic estimates for this purpose, but will synthesise available evidence, drawing on targeted peer-reviewed literature, key outputs from EU-funded research (e.g. ACCREU project) and EEA reports. The scope and level of detail of the analysis will therefore depend on the availability, robustness and comparability of existing evidence, with priority given to estimates available at EU level or that allow for meaningful comparisons across European countries or regions.

Finally, the component will bring together selected cross-cutting insights emerging from the other pillars of the adaptation analysis. Where recurring implementation challenges, enabling conditions or other patterns emerge across adaptation options and systems, these will be synthesised to highlight potential areas where persistent adaptation bottlenecks could be addressed. This synthesis will build on the option-level analysis in the following sections rather than constitute a separate comprehensive assessment.

7.3 Analysis of adaptation options and enabling conditions

This component provides a structured and policy-relevant forward-looking assessment of adaptation options to reduce the major climate risks in Europe. It aims to provide critical insights into their implementation potential and to identify key levers for action that can accelerate implementation across policy areas and European contexts.

The list of adaptation options to be analysed will build primarily on the adaptation option clusters developed for the recent *Assessment of EU and Member States Adaptation Investment Needs – Study on the macro-economic impact of the climate transition*[33]. This study provides a practical starting point grounded in options identified in Member States' adaptation strategies and plans and other relevant European evidence, with the options being already mapped against EUCRA-1 risks. These clusters will be adapted and possibly expanded to the revised EUCRA-2 list of risks based on expert judgement. Given the EU-wide scope of EUCRA-2, the analysis will explore and synthesise the available evidence on the clustered adaptation options, rather than assessing their effectiveness in specific local contexts, while highlighting relevant contextual differences and uncertainties.

The analysis of the adaptation options is organised around two complementary components:

- Overall analysis of adaptation options, covering their solution horizon, the risk-reduction potential and key descriptive information, including the type of measure (using the KTM framework[34]), implementation status and, where available, information on costs, as well as relevant co-benefits, trade-offs and maladaptation risks.
- Specific analysis of their enabling conditions, examining the main factors that support or constrain their implementation.

A consistent level of granularity is applied across all options to ensure coherence and to support policy-relevant interpretation, while avoiding excessive detail that would limit comparability or usability. Where relevant, the presentation of adaptation options in the report will include references to external, recognised knowledge platforms (e.g. Climate-ADAPT) and other key information sources to provide access to case studies and further technical detail.

[33] https://data.europa.eu/doi/10.2834/2895769

[34] https://www.eionet.europa.eu/etcs/etc-cca/products/etc-cca-reports/using-key-type-measures-to-report-climate-adaptation-action-in-the-eea-member-countries

7.3.1 Overall analysis of adaptation options

The overall analysis will provide a structured description and qualitative analysis of the selected adaptation options, exploring the available evidence and drawing from expert judgement. For each option, it will bring together key characteristics, including the solution horizon, the type of measure, implementation status and, where available, information on costs. The analysis will then examine the option's risk-reduction potential, focusing on the risks and impacts it may help address and, where relevant, its contribution to addressing multiple or cascading risks. Relevant contextual and temporal dimensions will be considered where they materially influence the option's potential contribution to risk reduction. The analysis considers, in particular: (i) the range of risks addressed and risk mitigation potential, including the capacity to address multiple or cascading risks, and (ii) the broad conditions of applicability, i.e. the types of biophysical, climatic and territorial contexts in which they can be implemented (e.g., coastal, mountainous, urban or river basin contexts, as well as specific region when relevant), and (iii) key time-dependent dimensions, including lead time to effect, policy and planning horizons, and potential lock-in effects, which may constrain future adaptation pathways – including consideration of intergenerational justice. Where evidence allows, the analysis may also highlight conditions under which adaptation options could become less effective as the climate changes.

The notion of "effectiveness" in climate change adaptation is subject to an ongoing debate in the literature, reflecting different conceptual and normative framings. How effectiveness is defined shapes priorities and decision-making, and, conversely, policy priorities and decision contexts influence how effectiveness itself may be defined. EUCRA-2 acknowledges this plurality by considering different dimensions separately, including risk reduction, co-benefits and maladaptation. The primary and first use of effectiveness in the comparative analysis of adaptation options hence adopts a deliberately narrow and operational definition, focusing on the risk-reducing potential of options and their capacity to address multiple risks simultaneously.

The analysis will finally also consider wider implications, including relevant co-benefits and maladaptation risks. This will help identify potential interactions with other risks, systems or policy objectives, as well as circumstances in which an option may increase vulnerability, shift risks or undermine longer-term resilience. Recognising that options designed to reduce climate risks may also influence environmental and social systems in ways that generate spillovers if not appropriately designed or implemented, the analysis therefore provides essential background information to better understand where benefits or burdens may be unevenly distributed and potential maladaptation risks, conflicts and trade-offs with different adaptation options, and other important European policy goals (e.g. climate change mitigation, biodiversity, public health, preservation of cultural heritage). At the same time, this makes visible the co-benefits of adaptation options, including positive ripple effects across systems (e.g. for biodiversity, health, economic resilience or social outcomes), thereby contributing to a more comprehensive and evidence-based case for adaptation. The presentation of the co-benefits and ripple effects will draw inspiration from the Triple Dividend of Resilience framework[35] where relevant, to help structure the consideration of wider benefits associated with adaptation options. This primarily descriptive analysis also provides a basis for exploring interactions between adaptation options through the bundles considered in Section 7.4.

Importantly, the adaptation analysis will seek to define a solution horizon for each risk by aggregating information across all relevant adaptation options. The solution horizon is defined as the period between the decision to act and the point at which adaptation options can achieve a substantial reduction in risk. It encompasses both implementation lead time and lagged effectiveness and informs the urgency to act (Chapter 9).

[35] Tanner et al., 2015, *The Triple Dividend of Resilience*, https://www.uncclearn.org/wp-content/uploads/library/the_triple_dividend_of_resilience.pdf

7.3.2 Focus analysis on enabling conditions

The analysis of enabling conditions will examine the main factors that determine whether adaptation options can be implemented and sustained in practice. Rather than assessing feasibility in specific local contexts, it will provide a high-level diagnosis of key barriers, enabling factors and actionable levers for implementation and highlight soft limits to adaptation, where constraints may not be absolute but significantly reduce the effectiveness or implementation of options. The analysis will be based primarily on expert judgement, supported by relevant scientific, policy and practice-based evidence and complemented by targeted expert and stakeholder input to address evidence gaps and capture implementation experience.

Enabling conditions are understood as multi-dimensional and interacting. The analysis is structured around four main dimensions, providing a common analytical framework while remaining indicative and non-exhaustive. The proposed four dimensions are:

- knowledge and technology;
- economic and financial;
- policy and regulatory;
- governance and social (including acceptance).

These dimensions provide a common structure for the analysis, while their application and level of detail will depend on the relevance and availability of evidence for each adaptation option. Enabling conditions will also be examined through a just resilience lens, recognising that these conditions may shape the outcomes of adaptation implementation.

While considering the broader range of factors underpinning implementation, the analysis will focus particularly on how EU-level instruments can support or constrain the real-world development of adaptation options. Where relevant and feasible, selected cases may be used to illustrate enabling conditions in practice. In coordination with the policy analysis (Chapter 8), the analysis will build on evidence on policy readiness, risk ownership, and relevant policy instruments, while providing complementary insights on financial risk ownership and implementation constraints, gaps and levers that can be of practical use to improve policy readiness.

Attention will be paid to whether barriers are systemic, recurrent across systems, or context-specific. The resulting identification of barriers and levers will be used as a starting point to elaborate priorities for action (see Chapter 10).

7.4 Adaptation bundles: systemic interventions, synergies and maladaptation

Building on the analysis of individual adaptation options, EUCRA-2 will explore illustrative bundles of adaptation options to provide a more systemic perspective on adaptation. The analysis will focus on a limited number of critical systemic intervention points identified through the systemic risk analysis (Section 6.5), where combinations of adaptation options may help address interconnected or cascading risks.

The analysis will explore how adaptation options that were mainly designed to target specific risks can work together to target systemic risks. Depending on the available evidence and the characteristics of the intervention point, this may include consideration of complementarities and synergies, potential trade-offs and maladaptation risks, and relevant timing or sequencing considerations. This analysis may reveal effects across risks, systems or policy objectives that are less apparent when options are assessed individually and provide insights into the potential systemic added value of coordinated interventions, informing the identification of priorities for action.

The analysis will be primarily qualitative and based on expert judgement, supported by findings from the individual adaptation-option analysis, systemic risk analysis, relevant literature and, where useful, targeted expert and stakeholder input. The precise analytical approach will be further refined during

implementation, reflecting the nature of the systemic intervention points identified and the availability of evidence.

Where relevant, the analysis will identify enabling conditions or policy interlinkages that become particularly important when the adaptation options are considered together. The selected bundles will provide the focus for the policy interlinkages analysis (Section 8.4), which will examine interactions between the EU-level policy instruments linked to the adaptation options within each bundle. Findings from both analyses will also inform the identification of priorities for action (Chapter 10).

7.5 Stakeholder engagement

Stakeholders will inform the final list of adaptation options (Section 7.3.1) and the assessment of enabling conditions (Section 7.3.2), particularly barriers, implementation gaps and potential levers for action. Targeted consultations and/or workshops with TEGs and relevant Commission services will also inform and review the development of adaptation bundles (Section 7.4), including their potential to reduce risks across multiple systems. A targeted call for evidence will gather additional knowledge, particularly on adaptation economics.

EUCRA-2 step	ISWG	TEGs	Eionet CCA group	EU research projects	Sounding board	Risk review panel
Solutions shortlisting	✓			●		
Call for evidence on adaptation information for selected risks	●	●	●	●	●	
Solutions space: enabling conditions	● ✓	●	● ◇	●		
Solutions horizon (jointly with risk severity and policy readiness)	●					◇ ✓
Adaptation bundles and policy interlinkages	●	●				
Legend	● Inform	◇ Review	✓ Validate			

8 The Solutions Space: Policy analysis

An enhanced policy analysis is one of the main innovations in the second EUCRA, compared to its first version. Building on the risk and adaptation analyses, it provides a structured approach to examining how EU policies shape the management of climate risks in Europe. It focuses on assessing the extent to which relevant policies recognise and address selected risks, identifying strengths and weaknesses in policy design, implementation and coherence, and highlighting where gaps or inconsistencies may hinder effective risk management under current and future conditions.

8.1 Policy landscaping of relevant EU-level policies

Based on the major risks selected (Section 4.3), the policy landscaping will compile a database of EU-level policy instruments relevant to each major risk, maintained in a shared register across risks. This list will be the product of a mapping exercise capturing the range of policy instruments across different policy areas that can influence a given risk through vulnerability and exposure factors. The focus of the analysis will be on "hard" policies (binding regulations, directives, etc.) complemented - where relevant - by "soft" instruments such as standards, funding streams and financial mechanisms that play a significant role in managing the risk.

A subset of particularly relevant instruments is subsequently selected for more detailed characterisation. For each policy instrument in this subset, information is collected on the objectives, scope, legal status, implementation stage, governance arrangements, monitoring and reporting requirements, and planning horizon.

The analysis then examines how these policies relate to the specific EUCRA-2 risks. Using the risk descriptions and impact chains developed in the risk analysis, policies are analysed to determine whether they explicitly address the risk and help contribute to reducing exposure or vulnerability through support to adaptation or the provision of mechanisms for implementation and financing for instance. The assessment also considers whether policies address future climate conditions, cross-border dimensions, cascading risks, and adaptation options (as per analysis in Section 7.3), principles of just resilience, or broader resilience objectives.

This step combines (i) a structured document review with expert input and (ii) an analysis of policy texts using standardised data collection templates. The main information sources include EU legislation, non-legislative EU policy documents such as EU strategies, and expert consultations. The resulting database provides a comprehensive overview of the current policy framework and its relationship to each climate risk.

8.2 Risk ownership identification

Effective climate risk management requires a clear understanding of who is responsible for managing, coordinating, financing, and implementing responses to each climate risk. The objective of the risk ownership analysis is therefore to identify how relevant responsibilities are distributed across governance levels, policy areas, and actors, and whether these arrangements support effective risk management.

Building on stakeholder engagement and on the information collected through the policy landscaping (Section 8.1), risk ownership will be analysed at the level of individual risks, using a dedicated analytical template. Together with the policy readiness assessment (Section 8.3) and policy interlinkages mapping (Section 8.4), this analysis clarifies why some risks remain difficult to manage and where governance improvements may be needed. This work will build on the adaptation analysis, particularly its assessment of enabling conditions (Section 7.3.2) and provide information to understand existing implementation barriers.

The analysis distinguishes the different functions and roles involved in risk management, recognising that responsibility for strategy, coordination, regulation, financing, implementation and monitoring may lie with different actors. In fact, ownership can encompass legal and regulatory, policy, operational, financial, and coordination responsibilities.

8.2.1 Vertical and horizontal risk ownership

Vertical risk ownership examines how responsibility for managing a risk is distributed across governance levels – from the EU to Member States, and, where relevant, regional and local authorities - as well as among private entities (such as private operators of critical infrastructure and civil society

actors, when relevant). This includes responsibilities for developing legislation, setting objectives, coordinating action, monitoring progress, and implementing adaptation options. The analysis aims to identify whether responsibilities are clearly allocated across governance levels and whether any accountability or implementation gaps exist. It will showcase responsibility owned by the EU, Member States, subnational authorities, as well as supranational institutions, private operators and households.

Horizontal risk ownership focuses on the distribution of responsibilities across sectors and policy areas (i.e. different EU institutions, bodies or agencies, including different EU Commission services). Many climate risks affect multiple systems simultaneously and require coordinated responses involving several policy areas. The analysis identifies which actors have mandates to address a given risk, and where ownership is shared. It also helps highlight overlaps, ambiguities, coordination challenges, and areas where responsibilities may be unclear or insufficiently defined.

8.2.2 Financial risk ownership

Financial risk ownership is one of the dimensions of risk ownership. It examines who is responsible for financing adaptation and long-term resilience building. This could include public authorities at the different levels (EU, national, subnational), private actors, infrastructure operators, financial institutions, and other relevant stakeholders. The analysis considers whether funding responsibilities are clearly assigned and whether they are aligned with governance and implementation responsibilities. Attention is given to identifying mismatching between responsibilities and incentives as well as potential key funding gaps. Such analysis will substantially build on the work and stakeholder engagement developed as part of the adaptation analysis, under the identification of enabling conditions (Section 7.3.2). This financial dimension is assessed for a subset of risks identified by expert judgement.

8.3 Policy readiness and gap assessment

This analysis step is conducted at the level of individual climate risks. Rather than evaluating policies in isolation, it examines how the overall policy framework contributes to the management of each risk. Analytical templates complementing those for the adaptation and risk analyses will be used for this step, drawing from the data collected for individual policy instruments.

8.3.1 Readiness assessment

The readiness assessment evaluates how the existing policy framework (i.e. the mix of policy instruments identified for a specific climate risk within the policy landscape) responds to a specific climate risk. The assessment does not focus solely on the presence of policies, but also on whether the necessary governance structures, implementation mechanisms, knowledge, and resources are planned and/or delivered, at the EU level, to support effective risk management, in line with the analysis of adaptation options and their enabling conditions (Chapter 7). Policy readiness is therefore understood as the capacity of the policy framework to enable adaptation options and reduce current and future climate risks.

The assessment draws on evidence collected in the risk analysis (Chapter 6), policy landscape mapping (Section 8.1), risk ownership assessment (Section 8.2) and adaptation analysis (Chapter 7). Evidence is synthesised at the level of the policy mix across a set of analytical dimensions, such as: (i) policy relevance and coverage, examining whether the risk is recognised and addressed; (ii) delivery and operationalisation, assessing implementation arrangements and monitoring mechanisms; (iii) enabling conditions, evaluating the extent to which policies support the governance, finance, knowledge and capacity requirements for adaptation options; (iv) maladaptation and policy coherence, identifying trade-offs and unintended consequences; (v) equity and just resilience; and (vi) governance, coordination and ownership, assessing whether responsibilities and coordination mechanisms are clearly defined.

A central feature of the readiness assessment is its close integration with the adaptation analysis. It explicitly considers whether the existing policy mix enables the implementation of adaptation options and supports the conditions necessary for adaptation to take place in practice.

The assessment draws on evidence-informed expert judgement to assess policy readiness across the abovementioned analytical dimensions. This multi-dimensional assessment will be synthesised into an overall readiness score using three or four categories (tentatively: limited, medium, advanced, very advanced) for the risk evaluation (see Section 9.2). The synthesis approach will be further specified and tested during implementation.

8.3.2 Policy gap analysis

This analytical step synthesises the findings from the readiness assessment to identify where the policy framework falls short in supporting effective climate risk management. Rather than focusing on individual policies, the analysis examines gaps at the level of the risks. These gaps may include shortcomings in governance and coordination, insufficient funding mechanisms, limited knowledge or monitoring capacities, weak implementation arrangements, inadequate consideration of just resilience, or inconsistencies between policies.

The gap analysis seeks to identify levers and areas where additional policy and governance efforts may be required. It therefore provides the bridge between the assessment of the current policy framework and the identification of priorities for action.

8.4 Policy interlinkages analysis

The interlinkages analysis will build on the adaptation bundles exercise (Section 7.4) by examining how policy instruments interact in supporting the implementation of groups of adaptation options. The objective is to identify synergies, overlaps, inconsistencies, and potential conflicts between policies that aim to influence the same or interconnected risks and systems. Particular attention is given to identifying trade-offs and risks of maladaptation, where policies may unintentionally increase vulnerability or undermine adaptation objectives in other sectors or regions, or other important European policy goals (e.g. climate change mitigation, biodiversity, public health, preservation of cultural heritage), or lead to unjust outcomes, in line with the work developed under the adaptation analysis (Section 7.3).

Therefore, such analysis will be developed at the cross-system level, and for a limited number of policy instruments. This step relies on the evidence collected during the systems-mapping exercises (particularly in relation to the mapping of functional dependencies within and across systems; see Chapter 3) and policy mapping and readiness phases and is complemented by expert workshops and targeted consultations with stakeholders.

8.5 Stakeholder engagement

Stakeholder engagement will inform and review the policy analysis at key stages (see Chapter 12 for a full overview of stakeholder engagement and relevant groups). EEA experts, relevant Commission services and, where appropriate, Eionet members will contribute to the identification of policy instruments and the assessment of policy readiness, risk ownership and gaps. Targeted consultations and workshops will support the identification of policy interlinkages, maladaptation risks, implementation barriers and conditions enabling the implementation of adaptation options.

The Risk Review Panel (Section 12.1) will provide an independent review of the assessment results and policy readiness scoring to ensure consistency across risks.

EUCRA-2 step	ISWG	TEGs	Eionet CCA group	EU research projects	Sounding board	Risk review panel
Policy landscape: mapping and characterisation	● ◇					
Solutions space: policy readiness & enabling conditions	● ✓	●	● ◇	●		
Risk ownership identification	● ✓	●	● ◇			
Policy readiness (jointly with risk severity and solution horizon)	●					◇ ✓
Legend	● Inform	◇ Review	✓ Validate			

9 Risk evaluation

9.1 Overall approach

Risk evaluation makes the outcomes of the risk, policy, and adaptation analyses actionable by determining how urgent it is for European policymakers to increase or improve actions to reduce a given climate risk. As in EUCRA-1, EUCRA-2 will present the results of the risk evaluation in distinct "urgency-to-act" categories for each major climate risk identified (see Table 7). These categories also give a broad indication of the type of action most suitable for managing a given climate risk (e.g. improving the implementation of existing policies, instating new policies, improving the knowledge base). This standardized information, based on central scenarios for climatic and non-climatic risk drivers, is a key input to the development of priorities for action (see Chapter 10). It will be complemented by qualitative information related to more adverse scenarios.

The determination of an aggregate "urgency to act" score as part of the risk evaluation was first introduced in the second UK CCRA36 from 2016. At its essence, this concept confronts information on risk severity with information on policy readiness (i.e. the extent to which current policies are capable to mitigate major climate risks). The first EUCRA further developed this approach, among others by including explicit information on the risk evolution over time and on the characteristic planning horizons of relevant adaptation options and policies.

In EUCRA-1, the urgency to act was determined algorithmically as a function of risk severity over time (for a high warming scenario), confidence in the risk severity assessment, the solution horizon, and the assessment of policy readiness. The core of this algorithm was a matrix for determining risk urgency based on risk severity, confidence, and policy readiness (see Table 8).

This algorithm reflects the following principles:

[36] UK Climate Change Risk Assessment 2017, Evidence Report, https://www.theccc.org.uk/uk-climate-change-risk-assessment-2017/

Higher risk severity increases the urgency of additional policy actions.
Higher policy readiness decreases the urgency of additional policy actions.
Higher confidence in the risk assessment (i.e. a strong evidence base) increases the specificity of recommended action whereas lower confidence increases the need for gathering additional evidence.

- Longer policy/solutions horizons increase the need for considering risk levels further in the future for current decisions. This means that more action may be needed even if risk severity is currently limited but projected to increase.

The EUCRA approach has inspired several recent national CRAs in Europe, including in Belgium, Ireland, Spain, Sweden and the United Kingdom.

9.2 Specific approach and innovations in EUCRA-2

Role of policy analysis and adaption analysis

The determination of the urgency to act in EUCRA-1 combined information about current and future risks (that may require action now) with information about current policy readiness. This overall analytical approach of combining forward-looking risk information with current readiness and capacities is maintained in EUCRA-2. The considerable expansion of forward-looking elements in the adaptation and policy analysis – for instance on the availability, readiness/feasibility and effectiveness of enhanced adaptation options - are not considered in the formal assessment of risk severity and the urgency to act, as the urgency-to-act assessment is intended to inform the implementation of these actions. These aspects play a central role, however, in the identification of priorities for action and to bring a solutions-perspective to the climate risks assessment (see Chapter 10).

Revision of the urgency-to-act classes

EUCRA-2 makes a minor modification to the urgency-to-act categories from EUCRA-1, taking into consideration experiences from recent national CRAs. The classification system continues to distinguish the urgency of risk-reducing action from the urgency of knowledge-improving actions, but an additional category 'Urgent investigation needed' is added so that the revised framework comprises three action and investigation categories each (see Table 7).

The urgency to act categories are ranked in a way that the urgency of acting is most important, and the type of response is of secondary importance. Therefore, the new category 'Urgent investigation' is ranked above 'More action'. This category 'Urgent investigation / more action needed' is motivated by the possibility of a risk to be evaluated as 'Urgent action needed' once the evidence base is strengthened. Furthermore, this category may include the recommendations under 'More action' if confidence is (already) medium or policy readiness is low. This variant reflects that the two categories of action are not mutually exclusive, and some risk reducing action may still be warranted even in the face of a limited evidence base. These aspects can be addressed in more detail in the determination of the 'Priorities for action' (see Chapter 10).

Table 7: Description of the revised urgency categories

Urgency to act	Description
Urgent action needed	The combination of very severe risks, insufficient policy readiness, and a strong evidence base calls for urgent new, stronger or different action in the coming years to reduce climate risks. Such actions include policymaking, implementation, capacity building or enabling the environment for adaptation, over and above those already planned.

Urgent investigation / more action needed *	The combination of very severe risks, insufficient policy readiness, and limited evidence calls for urgent action to gather additional evidence. Such actions include dedicated research, monitoring or policy evaluation. * In cases of medium confidence or low policy readiness, this category includes the recommendations of the category 'More action'.
More action needed	The combination of severe risks, limited policy readiness and sufficient evidence call for more action to be implemented. It is crucial to initiate processes that strengthen adaptation action to avoid critical impacts of climate change.
Further investigation	The combination of severe risks, limited policy readiness and limited evidence does not currently call for substantial investments specific new action. Priority should be given to gathering additional evidence to determine if more action is needed and to low-regret measures with co-benefits beyond reducing this specific climate risk.
Sustain current action	Current or planned levels of activity are appropriate to manage the risk, but continued implementation of these policies or plans is needed to ensure that the risk continues to be managed in future. A monitoring and evaluation process should be in place to evaluate policy effectiveness, with a view to continuous improvement.
Watching brief	The evidence in these areas should be kept under review, with continuous monitoring of risk levels, so that further action can be taken if necessary.

Revision of the algorithmic approach for determining the urgency to act

EUCRA-2 retains the overall algorithmic approach for determining the urgency to act developed in EUCRA-1. However, the input related to policy readiness and policy/solutions horizon is based on more sophisticated policy and adaptation analyses, compared to EUCRA-1.

- **Risk severity** (for all time periods under the central warming and NCRD scenario): embeds among others the magnitude of climate impacts (including economic and health impacts), and their potential to trigger cascading effects (see Section 6.3.6).
- **Confidence** in the risk severity (for all time periods): considers the amount and agreement of the available evidence as well as its reliability, independence and representativeness (see Section 6.3.5).
- **Solutions horizon** (formerly policy horizon): considers the lead time for actions (i.e. the time needed before risk-reducing action becomes effective on the ground) and the lock-in period (i.e. the period during which decisions not informed by climate change may increase future exposure or vulnerability) (see Section 7.3).
- **Policy readiness:** synthesises the agreed readiness dimensions, into three or four categories (see Section 8.3).

Furthermore, the risk urgency matrix is adapted to allow for the introduction of the new category 'Urgent investigation needed' (see Table 8). The rows of the risk urgency matrix refer to combinations of risk severity and confidence (for a given period and warming level), whereas the columns refer to the policy readiness evaluation.

Table 8: Matrix for determining urgency to act in based on risk severity, confidence and policy readiness

Risk severity	Confidence	Policy readiness		
		Very advanced	Advanced	Medium / limited
Catastrophic	High	More action needed	Urgent action needed	Urgent action needed

	Medium	Further investigation	Urgent investigation / more action needed	Urgent action needed
	Low	Further investigation	Urgent investigation	Urgent investigation / more action needed
Critical	**High**	Sustain current action	More action needed	Urgent action needed
	Medium	Sustain current action	Further investigation	More action needed
	Low	Sustain current action	Further investigation	Further investigation
Substantial	**High**	Sustain current action	Sustain current action	More action needed
	Medium	Sustain current action	Sustain current action	Further investigation
	Low	Sustain current action	Sustain current action	Further investigation
Limited	**High**	Sustain current action	Sustain current action	Watching brief
	Medium	Sustain current action	Sustain current action	Watching brief
	Low	Sustain current action	Sustain current action	Watching brief

Note: This matrix applies for a given time period and the central warming scenario. The evolution of risk severity over time and the solutions horizon are considered in a separate step.

Risk severity can differ across the three time periods assessed in EUCRA-2 (current, mid-century or late century). Hence, urgency scores can also differ (usually increase) for the same risk over time. This is where the time dimensions of risk progression and the implementation of solutions come into play. As in EUCRA-1, the overall urgency to act for a given risk is determined as the highest urgency score throughout the solution horizon (for the central warming scenario; see Section 5.2.2 for further information and a comparison with EUCRA-1). Thus, the urgency to act for risks with a short solution horizon is determined only by the risk severity and confidence for the current period, whereas the risk severity for mid-century and late century is additionally considered for risks with a medium or long solution horizon, respectively.

In this way, a long solution horizon can act as a worsening factor in the risk evaluation. In the face of increasing risk severity over time, risks that require long lead times for planning, implementation or delivery are assigned higher urgency to act because delayed action may substantially reduce future adaptation options, increase lock-in effects, or make it impossible to avoid severe consequences.

9.3 Stakeholder involvement

Determination of the urgency to act is an algorithmic process based on inputs from the risk, adaptation and policy analysis; therefore, stakeholder involvement is not required for this step. However, considerable involvement of stakeholders and external experts is foreseen during the analysis steps that inform the risk evaluation, in particular through Thematic Expert Groups and a Risk Review Panel (see Chapters 6, 7, and 8 as well as Section 12.1).

9.4 From the urgency to act to identifying priorities for action

The urgency to act categories determined in the risk evaluation serve as the highest level of aggregation for risk prioritisation. They provide the primary basis for identifying priorities for action by

indicating which risks require the most immediate attention, based on evidence related to risk severity and confidence over time, information on the solutions horizon and policy readiness.

Further dimensions of the solution space are not incorporated directly into the urgency-to-act score but are instead presented as complementary narrative elements alongside it. This applies in particular to the theoretical and practical potential for adaptation (e.g., hard and soft limits and readiness of adaptation options), and to the scope and type of solutions (e.g. primarily available within the system or depending on external or systemic interventions). While these factors are highly relevant for decision-making, they address a different analytical question: not how urgent it is to act on a given risk, but rather what opportunities and constraints exist for reducing that risk. The only exception is where adaptation considerations directly influence the timing of action. Factors such as implementation lead times, lock-in effects, or the need to act before critical thresholds are reached are reflected through the solutions horizon dimension of the risk evaluation. Beyond these temporal considerations, adaptation-related findings are better communicated through structured narrative assessments that provide essential context for interpreting urgency scores and identifying potential ways for action.

Overall, the risk evaluation is primarily risk-focused, synthesising evidence to assess how urgent it is to act upon each risk. Subsequently, the priorities for action (see Chapter 10) are solutions-focused, aimed at identifying which operational, feasible, and adaptation-enabling policy interventions can be prioritised. This distinction reflects the overall narrative of the report: a progression from risks to solutions.

10 Identification of priorities for action

Note: *The Identification of priorities for action described in this chapter is a central step of EUCRA-2 that aims to integrate all results from previous analysis steps. Key decisions regarding the operationalisation of the workflow described below will be taken after the publication of this interim methodology report, in close dialogue with relevant experts and EUCRA-2 stakeholders.*

The identification of priorities for action for EU-level policy makers translates the evidence generated across the risk, adaptation and policy analyses into a structured and policy-relevant set of actionable directions to address the urgency to act. In this context, priorities for action refer to policy actions at EU level that can strengthen the enabling conditions for adaptation and support the implementation of relevant adaptation options, rather than to the adaptation options themselves. **The objective is then to identify robust, evidence-based priorities for policy action, highlighting key areas where strengthened efforts at EU level could support adaptation implementation and avoid lock-in or maladaptation to most effectively reduce climate risks.**

The EUCRA-2 report will present priorities for action according to their policy relevance, including (where applicable): the policy area(s) concerned; the specific climate risk(s) addressed; and categories of policy action (see the preliminary identification of possible actions below in Section 10.1). Cross-system priorities - cutting across traditional sectoral or policy silos - will be explicitly identified, reflecting the systemic nature of climate risks and the need for coordinated responses across domains.

10.1 Identification of candidate actions

A first step consists of compiling a broad list of potential actions emerging from across the assessment. Candidate actions are identified through a gap analysis merging results from both the adaptation and policy analyses. This gap analysis also encompasses a structured assessment of the causes underlying low readiness scores, governance and ownership challenges, policy gaps, and barriers to adaptation deployment. For each identified gap, the analysis explores a range of policy actions to strengthen

resilience in Europe aiming at enabling and expanding the solutions space. This considers potential adjustments in policy frameworks, governance arrangements, funding approaches, coordination mechanisms, knowledge development, and implementation practices. Actions will be developed by identifying and combining solutions that address the identified gaps, and by translating them into EU-level policy levers that can enable their implementation.

This perspective supports a comprehensive understanding of how policies across sectors and adaptation options can contribute to multiple objectives simultaneously and helps strengthen the overall case for adaptation. **This long list of potential actions includes a wide spectrum of possible policy and implementation levers, addressing knowledge development and information gaps; regulatory and institutional frameworks; incentives and policy instruments; investment and financing needs; and no-regret and low-regret measures, including those delivering co-benefits across systems.**

10.2 Prioritisation of actions

Building on this comprehensive identification of potential actions, a next step consists in defining a set of prioritisation criteria to support the selection and refinement of the most relevant ways of action.

The urgency to act constitutes the primary basis for prioritising actions, but additional results of the risk, adaptation and policy analysis are used to ensure a more differentiated and policy-relevant selection. These may include, for example, considerations related to non-climatic risk drivers, particularly affected groups, systemic intervention points, stress-testing, risk ownership, feasibility and effectiveness of action, EU-added value, systemic value, co-benefits, and just resilience, without being limited to these dimensions.

A workflow and criteria for the prioritisation of actions will be developed based on a combination of targeted literature review and expert judgement; it will be further refined through dedicated exchanges with stakeholders. This step ensures transparency in the prioritisation logic and alignment with both scientific evidence and policy needs. The final output will be a list of priority EU-level policy levers, organised by policy area, to enable actions for strengthening resilience. The final prioritisation criteria and process will be documented in the final EUCRA-2 methodology report, reflecting their further development and testing during implementation.

10.3 Stakeholder engagement

Throughout the prioritisation process, stakeholder engagement and expert input are central to ensuring the credibility, relevance and usability of the results. Stakeholder engagement supports the prioritisation of actions by helping validate prioritisation criteria, identify actions with the greatest resilience benefits, assess distributional implications, and highlight opportunities for implementation. Stakeholders will include Thematic Expert Groups and EU policy makers from the Inter-Service Working Group. Engagement may take place through workshops, consultations, surveys, and expert review processes.

EUCRA-2 step	ISWG	TEGs	Eionet CCA group	EU research projects	Sounding board	Risk review panel
Prioritisation of actions	● ◇	●				
Legend	● Inform	◇ Review	✓ Validate			

Governance and implementation process

11 Institutional framework

EUCRA-2 is governed through an agreement between the European Commission and the EEA. The agreement designates the EEA as the scientific service provider that will manage the assessment.

The European Commission's Joint Research Centre (JRC) and Directorate-General for Research and Innovation (DG RTD), along with the European Centre for Medium-Range Weather Forecasts (ECMWF), are also contributing to EUCRA-2.

- The JRC contributes scientific expertise, modelling and foresight inputs to EUCRA-2, supporting the assessment of climate risks, future scenarios and potential impacts across sectors and systems.
- DG RTD connects EUCRA-2 with EU-funded research and innovation to ensure that the climate risk assessment is informed by the latest scientific knowledge (see Section 12.1 for more details.)
- ECMWF provides information on climate impact drivers information through climate data and storylines, as well as novel DestinE modelling outputs.

The EEA has contracted a multi-partner consortium to deliver the scientific work. The consortium is led by Ramboll Management Consulting, in collaboration with Eurac Research, CMCC, Syke, and the Stockholm Environment Institute. The partnership is further strengthened by sub-contracted experts who provide specialised senior input across all relevant policy areas covered by EUCRA-2.

The governance and coordination of EUCRA-2 involves two groups of stakeholders:

- **Steering Group:** comprising senior representatives from DG CLIMA, the EEA, and other contributing DGs (Directorate-General for European Civil Protection and Humanitarian Aid Operations [DG ECHO] and Directorate-General for Environment [DG ENV]), meets regularly to approve the scope, monitor progress against the work-plan, and resolve any methodological or resource-related adjustments.
- **Interservice Working Group** (ISWG): a cross-Directorate-General coordination body convened by DG CLIMA and composed of European Commission officials from policy areas relevant to climate risk. Members of this group are nominated by the European Commission's Inter-services Coordination Group. The ISWG is a key interface between the assessment and Commission services, contributing from the outset to shaping the scope, framing and policy relevance of EUCRA-2. As part of the five defined consultation periods (see Section 12.2), the climate risk assessment includes ongoing institutional engagement through information exchange and strategic feedback on progress, including periodic briefings to key EU bodies such as the European Parliament, through the Committee on the Environment, Climate and Food Safety (ENVI Committee), Member State groups and relevant Council working structures.

12 Approach to stakeholder engagement

The overarching aim of stakeholder engagement in EUCRA-2 is to co-produce a robust knowledge base that is relevant and actionable for policymakers. Shifting from the largely consultative approach used in EUCRA-1, EUCRA-2 adopts a co-design model in which stakeholders act as active partners throughout the process. Stakeholder contributions are systematically integrated throughout the assessment process.

12.1 Stakeholder groups

EUCRA-2 steering group: project owners, which act as funders and co-coordinators of EUCRA-2. These actors play a central role in steering the overall direction of the assessment and ensuring that its findings are taken up in EU policy processes (see Chapter 11). The steering group is not included in the table below, as its involvement is ongoing throughout the assessment and focuses primarily on project governance and strategic oversight.

Interservice Working Group (ISWG): lead stakeholder group in terms of validation and usability (see Chapter 11).

Eionet Group on Climate Change Impacts, Vulnerability and Adaptation (CCA): a specialised working group within the European Environment Information and Observation Network (Eionet) that brings together national environmental agencies and experts from the EEA member and cooperating countries. Its core mission is to coordinate the collection, analysis and dissemination of information on climate-change impacts, vulnerability assessments and adaptation measures across Europe. This group is engaged in EUCRA-2 through, *inter alia,* pre-scoping and refinement of analytical approaches, contributing national expertise and helping ensure policy relevance across Member States.

Coordination with **EU-funded research projects**, facilitated by the European Commission's Directorate-General for Research and Innovation (DG RTD), ensures uptake of recent scientific findings and fosters synergies across initiatives.

Thematic expert groups (TEGs): purpose-built panels of scientists, expert practitioners, potential risk owners, and domain specialists, that can inform the sector-specific evidence base, solutions insight and policy perspectives needed to support the thematic assessments underpinning EUCRA-2. A call for expressions of interest for forming TEGs opened in October 2026 with a view to confirming the groups by end 2026.

The EEA will also convene the **EUCRA-2 sounding board**: a high-level advisory group bringing together representatives from European and international policy, scientific, financial and strategic organisations. The sounding board provides reflections on the overall direction and progress of EUCRA-2, supporting its continued relevance within the wider European climate risk and policy landscape. It offers feedback at key milestones on the framing, emerging findings and messaging of the assessment, including its alignment with strategic European and international policy developments. The group operates in a light-touch, non-technical capacity and contributes to identifying dissemination opportunities and pathways for policy uptake.

The **Risk Review Panel (RRP)** serves as an independent body of senior experts in climate risk, impact modelling, and policy, providing a critical quality assurance function within EUCRA-2. Its role is to review and, where necessary, validate or refine the project team's assessments of risk severity and solutions space outcomes. Members are drawn from academia, public institutions, EU agencies, and relevant research and practitioner communities, ensuring a balanced and cross-cutting perspective across sectors and policy areas. The EEA intends to convene this group in Q2 2027.

National climate risk assessment practitioners, both from the Eionet CCA group and beyond, may apply or adapt EUCRA methodologies for national, sub-national or regional climate risk assessments. These actors play a key role in operationalising the framework across Europe and are engaged *ad hoc* during the assessment. They have already contributed much to the development of this methodology. It is anticipated that some national CRA practitioners will participate in Thematic Expert Groups and/or the Risk Review Panel.

Table 9 provides an overview of the planned involvement of the various stakeholder groups, distinguishing between contributions to **inform, review and validate** various steps of the assessment.

Table 9: Planned involvement of stakeholder groups during EUCRA-2

EUCRA-2 step	ISWG	TEGs	Eionet CCA group	EU research projects	Sounding board	Risk review panel
Methodology development	● ◇ ✓		● ◇	●		
Solutions shortlisting	✓			●		
Non-climatic risk drivers & storylines	●					
Policy landscape: mapping and characterisation	● ◇					
Risk identification and selection	◇ ✓					
Call for evidence against selected risks	●	●	●	●	●	
Solutions space: policy readiness & enabling conditions	● ✓	●	● ◇	●		
Risk ownership identification	● ✓	●	● ◇			
Impact chain development	●	●				
Risk analysis	◇	● ◇		●		
Risk severity, solutions horizon and policy readiness	●					◇✓
Bundles and policy interlinkages	●	●				
Prioritisation of actions	●◇	●				
EUCRA-2 outputs	◇ ✓	● ◇	●	●	◇	
Legend	● Inform	◇ Review	✓ Validate			

The proposed engagement points, timelines and formats mentioned in this table and elsewhere in this document should be considered indicative, do not preclude additional engagement throughout the assessment process, and may be refined as methodological approaches are consolidated, resource requirements are assessed, and the feasibility of the different analytical tasks is further evaluated.

12.2 Consultation rounds

Stakeholder engagement throughout the assessment is organised according to five distinct phases of the project

- H1 2026 – Methodology, scope, structure
- H2 2026 – Thematic scoping and evidence base development
- H1 2027 – Knowledge co-production and analytical development
- H2 2027 – Review and prioritisation of draft thematic texts and outputs
- H1 2028 – Open consultation (main report)

The first consultation round informing the development of this report started with a briefing to the Commission Working Group on Adaptation in January 2026. Additional briefings to institutional stakeholders include the Commission's Inter-service Coordination Group (March), European Parliament ENVI Committee (June). A first in-depth workshop with the Interservice Working Group (ISWG) in March was followed up by a second workshop in July 2026 focusing on specific aspects (policy and adaptation analysis) of the draft methodology. Inputs were also received via EU projects (webinar & workshop, July 2026). These and other prior consultations confirmed the overall scope of the assessment and the structure of the report package.

The development of this draft methodology report was also informed by (during May/June): EEA internal review, EEA Scientific Committee, three workshops with the Eionet Group – Climate Change Impacts, Vulnerability and Adaptation (Eionet CCA Group), ISWG workshop in July followed by a written consultation, and written consultation with the Eionet CCA Group during July/August. The formal completion of this first consultation round is the publication of this interim methodology report (in October 2026).

The second consultation round: **Thematic scoping and evidence base development** aims to establish both the thematic scope and the underpinning evidence base for the technical papers. This includes, as appropriate, analytical steps such as risk identification and selection, development of climatic and non-climatic drivers, identification of data sources via a call for evidence, and initial framing of the policy landscape and adaptation options.

Engagement during this phase supports the testing and refinement of assumptions, data and methods, using a mix of formats such as targeted data collection, expert workshops and written exchanges. Interaction with contributors, stakeholders and knowledge providers intensifies, including through the establishment of Thematic Expert Groups and ongoing exchanges with institutional and other stakeholders.

The round concludes (end 2026) with validation (Steering Group, Interservice Working Group) of the overall analytical frame—covering priority risks, key knowledge inputs, elements of the policy landscape, interdependencies and an initial set of adaptation options—providing the basis for subsequent analysis and drafting.

The third consultation round is focused on **Knowledge co-production and analytical development** and most of the activity is focused in the first half of 2027. It develops the core analysis across risk, policy and adaptation, including impact chains, risk drivers, policy readiness and ownership, the assessment of adaptation options and analysis of adaptation bundles to address systemic intervention points.

This phase combines desk analysis with targeted engagement (workshops, interviews, written input) to refine assumptions, validate results and integrate scientific, policy and practice-based knowledge. It delivers consolidated analytical outputs (climate risk analyses, gap analyses and emerging priorities for action) that underpin the next phase of review and prioritisation.

The fourth consultation round focuses on the **review of draft thematic texts and outputs**, alongside the consolidation and prioritisation of results (H2 2027). It builds on completed analyses (such as risk

evaluation, gap analysis, bundles of measures and draft priority actions) to refine outputs and ensure consistency across policy, risk and adaptation streams.

The scope of stakeholder engagement widens at this stage to include a broader range of sectoral actors. The consultation aims to clarify outstanding issues, test the feasibility of proposed measures and priorities for action, and align narratives. Through written review, workshops and targeted exchanges, feedback is integrated into revised drafts. The round concludes with approved draft texts (by at least the ISWG and Steering Group) and a clear, consolidated set of priorities for action ready for the final report.

The fifth and final consultation round takes place in H1 2028 and includes: an invited **online consultation of the draft main report**, and one or more synthesis workshops that bring together all previous expert groups, civil society organisations, regional and local authorities and the broader stakeholder community. The aim of this round is to gather a final consolidated comment set that informs the last refinements before publication.

13 Knowledge management

13.1 Integration of quantitative and qualitative lines of evidence

EUCRA-2 remains an expert-driven assessment, consistent with established practice in large-scale climate risk assessments, drawing on a heterogeneous evidence base: peer-reviewed scientific literature, authoritative institutional assessments (e.g. EEA, JRC, Eurostat, ECMWF, Copernicus, World Health Organisation (WHO), IPCC), curated datasets and interactive platforms (Climate-ADAPT, European Climate Data Explorer (ECDE), Disaster Risk Management Knowledge Centre (DRMKC) Risk Data Hub), outputs of EU-funded research projects, processed and quality-controlled model simulations (e.g., C3S, DestinE), and structured expert and stakeholder inputs. These are treated as complementary lines of evidence to be integrated coherently, not as interchangeable alternatives.

Expert elicitation inputs, including foresight exercises, are particularly vulnerable to opacity in a large multi-author assessment. EUCRA-2 addresses this risk by treating these inputs as a distinct evidence source: each expert and stakeholder grouping is recorded and can be linked to analytical statements and the impact chain nodes it informs, so that the expert-based evidence remains visible and auditable in the final product.

An interactive impact chain tool will provide the shared architecture for integrating quantitative and qualitative evidence across all assessment areas. It will allow the causal pathway from climatic and non-climatic drivers through exposure and vulnerability to direct and indirect impacts to be implemented as a structured ontological database. Each node and link in an impact chain will contain bibliographic references, connected to key information sources, thereby enabling authors and reviewers to navigate the evidence base systematically. This tool will support active quality control: by representing evidence relationships explicitly, it allows systematic detection of gaps (nodes with no supporting reference), inconsistencies (contradictory evidence/ statements on the same factor), and duplications (the same claim supported by the same source in multiple risk areas). Section 13.3 further elaborates how this tool will contribute to traceability of the assessment.

Heterogeneous lines of evidence will also be integrated into both the policy and adaptation analyses, including scientific literature, evaluation studies, implementation reports, indicators, monitoring data, case studies, and expert judgement, providing a robust evidence base to assess policy readiness, adaptation options, enabling conditions, and remaining gaps.

13.2 Key information sources

To manage the diversity and volume of evidence used across EUCRA-2, the assessment introduces a Key Information Sources (KIS) catalogue, a structured register of the quantitative and qualitative sources on which the assessment draws, shared across all risk areas and authoring teams.

Scope and characterization

A Key Information Source (KIS) is a recognised source of evidence: a platform, database, EU project, body of literature or a stakeholder grouping, from which specific information items (individual citations: a dataset version, a permalink to a specific view, a report chapter) are drawn. The catalogue is built at the source level; individual items are managed in the shared bibliographic library (Zotero). KIS categories include:

- Authoritative institutional reports and indicators: EEA, IPCC, Eurostat, JRC, ECMWF, Copernicus, WHO, European Central Bank (ECB) and European Banking Authority (EBA) stress tests, etc.
- Curated databases and interactive platforms: Climate-ADAPT, the European Climate Data Explorer (ECDE), the DRMKC Risk Data Hub, the C3S Atlas;
- Quality-controlled model simulations and reanalyses: C3S, ERA5-Land, CORDEX/CMIP6 scenario ensembles. EUCRA-2 will also receive specific contributions from Destination Earth (DestinE) offering novel advances in quantitative risk assessment;
- EU-funded research project outputs: deliverables and published results from relevant Horizon Europe and predecessor projects as well as from the EU Mission on adaptation to climate change;
- Peer-reviewed scientific literature: journals and conferences that include citable articles and papers;
- Grey literature and policy instruments: national adaptation strategies and plans, intergovernmental assessments, and relevant policy frameworks, impact assessments, binding regulations, directives, standards, funding streams and financial mechanisms;
- Structured expert and stakeholder inputs: outputs from foresight, elicitation processes, workshops, consultations and other interactions. (Each formal engagement vehicle is registered as a distinct KIS in the catalogue, with its own entry describing scope, mandate, participating institutions, and referencing/ traceability approach.)

Selection, prioritisation, and quality

Sources are selected based on relevance to the risk, policy and adaptation components being assessed, geographic and temporal fit, and collective coverage across the KIS set, as well as other relevant criteria depending in the intended use of the source. Higher-level, processed, and peer-reviewed sources are preferred over raw data on the grounds of interpretability and evidentiary weight. Novel model outputs may be used in specific cases (e.g. from the DestinE Climate Digital Twin); European-scale sources are preferred for EU-level statements, with national or sub-national sources used for cross-checks or where European coverage is absent. National and sub-national sources may also provide relevant and authoritative methodological examples, and evidence for geographically specific risks or contexts. Sources in languages other than English, e.g. national climate risk assessments and adaptation strategies and plans, are assessed on the same basis as English-language sources, with translation used where necessary. Where available, English-language metadata or summaries, including those facilitated through Eionet, can support accessibility and use of authoritative national-language sources.

Each KIS is characterised against criteria such as authority, relevance, compliance with FAIR/TRUST principles[37], information readiness (raw data, processed indicator, directly citable finding), spatial and temporal coverage adequacy. This contextual information, recorded as metadata in the KIS catalogue, will help authors navigate and use sources appropriately, as well as support confidence statements in the risk evaluation.

13.3 Traceability of the climate risk assessment

Transparency and reproducibility in large, multi-author climate risk assessments remain a well-recognised challenge. EUCRA-2 addresses this through a traceability framework operating across three layers.

Source layer - KIS Catalogue

- Every source used in the assessment is recorded in a KIS catalogue with the metadata necessary to locate, retrieve, assess and use its information, e.g.: source; provider; title and version or publication date; source type; geographic and temporal coverage; main contributions to the assessment (i.e.: risk analysis, solutions, policy, drivers.); information readiness (low if raw data only; high if directly citable analysis); FAIR/TRUST scores; access conditions; confidence note; and referencing guidelines.
- The resulting catalogue will be published as an EUCRA-2 product.

Reference layer (Zotero library)

- Individual information items, the specific dataset, map, article, or report used, are held as distinct entries in a shared Zotero library, linked to their parent KIS by a stable identifier.
- Structured expert and stakeholder inputs are held to the same standard as formal publications. Key interactions with a stakeholder group (a workshop, interview, elicitation) produce a referenceable document held as a Zotero item linked to its parent KIS, following the specific format and templates for that group or interaction type. The level of detail will be further defined, to ensure that expert knowledge is attributable and auditable in the final product, while keeping the process frictionless and productive.
- When relevant, datasets and structured knowledge products generated through the EUCRA-2 process (e.g., policy and solutions characterisation datasets, NCRD lists and priority table, and other analytical outputs) may be published incrementally (e.g. via Zenodo), when relevant, to create stable, citable records, ensuring that internally produced knowledge is traceable on the same terms as externally sourced evidence.

Assessment layer (assessment templates and impact chain tool)

- Assessment templates provide the authoring medium through which diverse evidence is synthesised into EUCRA findings. Each substantive statement in a template cites one or more Zotero references, which trace back to KIS catalogue entries. The foreseen templates are:
    - **Data collection template**: a structured spreadsheet used to systematically gather and organise information on policy instruments and adaptation options
    - **Analytical template**: a document used to analyse collected data in depth, supporting risk, adaptation, policy, and systemic climate risk assessments.
    - **Panel / risk scoring template**: a document providing the framework for the Risk Review Panel to evaluate and score risks, adaptation options, and policies, including their severity, readiness, and solutions horizon.
    - **Synthesis template**: a format used to convert results into clear, report-ready text aligned with the final report structure.

[37] https://doi.org/10.1038/sdata.2016.18, https://doi.org/10.1038/s41597-020-0486-7

- The impact chain tool encodes the same evidence relationships in a structured ontological form, making the causal logic of the assessment explicit and navigable. This bidirectional linkage (from statement to reference, to source, and back) is what constitutes end-to-end traceability.

Evidence gaps are explicitly flagged in the templates and carried forward as a structured output identifying research and data needs. Where sources conflict, the inconsistency is documented, the selection justified, and the residual uncertainty reflected in the assessment confidence statements (e.g.: regarding risk severity and urgency to act).

Annex 1. Structure and outline of EUCRA-2 reports

This annex presents the draft structure and outline of the EUCRA-2 report package.

Annex 1.1 EUCRA-2 product types

The EUCRA-2 report will be structured into the following layers of products:

- EUCRA-2 Executive summary
- EUCRA-2 Main report
- EUCRA-2 Technical papers

These products may be complemented by **sector-specific information products** and/or **interactive viewers**, to be decided at a later stage, in function of the ongoing discussions on the European Integrated Framework on Climate Resilience.

The remainder of this Annex presents the purpose of these product types, presents the draft outline of the two top layers (EUCRA-2 Executive Summary and Main report), and gives an overview of the planned EUCRA-2 Technical papers. The information presented here is subject to revision in view of the evolving policy context and operational requirements.

Annex 1.2 EUCRA-2 Executive summary

The Executive summary focusses on the knowledge needs of senior policymakers with cross-cutting responsibilities at the European and national scales. The language is easily accessible language with minimal use of technical terms. Illustrations are professionally laid out and are available separately for download. The Executive summary comprises approximately16 pages. It is available separately and included as part of the main report.

Tentative outline: Executive summary

ES.1 Key messages and call for action

- Climate resilience gaps and needs
- Evolving policy context
- Priorities for resilience action and link to the EU priorities
- Needs for faster, systemic and sustainable solutions for climate risks

ES.2 Summary of all climate risks (per system)

- Risk severity
- Regional hotspots and vulnerable groups
- Policy readiness
- Urgency to act
- Adaptation solutions

ES.3 What are the drivers for climate risks?

- Climate change in Europe
- Snapshot of recent extreme climate events
- Non-climatic risk drivers
- Outside-in climate-related risk drivers
- Risk cascades and systemic risks

ES.4 What is the European Climate Risk Assessment?

- Mandate and scope
- Brief methodology

Annex 1.3 EUCRA-2 Main report

The Executive Summary focusses on the knowledge needs of senior policymakers with sector-specific responsibilities and of other policymakers with cross-cutting responsibilities at the European and national scales. The language is accessible with limited use of technical terms. The Main report, including the Executive summary, comprises around 80 pages.

Tentative outline: Main report

Executive Summary (see above)

1. **Priorities for action towards resilience**
    - 1.1. Summary of EU policy context and developments
    - 1.2. Priority actions (per policy area) (incl. knowledge needs)
    - 1.3. Interlinkages, synergies and trade-offs across solutions and policies
2. **Enabling a resilient Europe**
    - 2.1. Progress and gaps on adaptation at EU level
    - 2.2. Guiding principles to expand the solutions space
    - 2.3. Cost of inaction and investment needs
    - 2.4. From adaptation options to adaptation bundles
    - 2.5. Key EU policies influencing climate risks
    - 2.6. Risk ownership, governance and implementation challenges
3. **Drivers of increasing climate risk**
    - 3.1. Observed climate change in Europe (incl. attribution of extreme events)
    - 3.2. Projections of future climate change in Europe
    - 3.3. Climate storylines for Europe (incl. selected earth system tipping points)
    - 3.4. Non-climatic megatrends and structural uncertainties
    - 3.5. Outside-in climate-related risk drivers
4. **Major climate risks and solutions**
    - 4.1. Overview of major climate risks and urgency to act
        - Synthesis of risk, adaptation, and policy analysis
    - 4.2. Natural ecosystems and their services
        - Terrestrial and freshwater ecosystems
        - Marine and coastal ecosystems
    - 4.3. Food system and bioeconomy
        - Food system (agriculture, fisheries and aquaculture, supply chains)
        - Bioeconomy (incl. biomass and fibre provision)
    - 4.4. Infrastructure, built environment, and related services
        - Water (supply and wastewater management)
        - Energy
        - Transport
        - Housing and built environment (incl. cultural heritage)
        - Digital infrastructure *
    - 4.5. Health and wellbeing

- Human health, healthcare infrastructure and services

4.6. Industry, services and finance
- Industry, tourism, and business
- Finance and insurance

4.7. Domestic and international security
- Civil protection and emergency management *
- International security and defence *

4.8. Systemic climate risks and solutions
- Europe under adverse futures
- Climate risks cascading across systems
- Policy interlinkages and adaptation bundles for systemic resilience

4.9. Cross-cutting and complementary perspectives
- Risks driven by outside-in climate-related risk drivers
- Climate risks across regions and focal areas (incl. European Arctic)
- Just resilience considerations

5. About the European Climate Risk Assessment
- Mandate, framing and scope of the analysis
- Methodological approach (incl. key innovations over EUCRA-1)
- Guide to underlying evidence (incl. technical papers and online viewers)

Note: *Owing to resource constraints and analytical considerations, the entries in Chapter 4 marked by * will be subject to a less detailed analysis, compared to other topics. This may imply, for example, synthesizing readily available information on key climate-related challenges without a dedicated analysis of adaptation options and policies. As such, these topics are not included in the overview of systems at risk to be addressed that is presented in Annex 2.*

Annex 1.4 EUCRA-2 Technical papers

EUCRA-2 Technical papers jointly cover all knowledge areas relevant for EUCRA-2 in a more detailed manner than is possible in the main report. They address stakeholders with more detailed knowledge needs related to specific systems, sectors or topics. They also provide the detailed evidence based underlying the system-specific assessments in main report.

Technical papers on climate risks and solutions for each system at risk

Technical papers provide the detailed evidence underlying the system-specific assessments in Chapter 4 of the main report. This evidence is structured by systems at risk or system clusters. This information may be published either in separate technical papers for each system or in a single publication ('Technical Report') with chapters for each system at risk.

Further technical papers

Further to the technical papers/report addressing specific systems at risk, the following **additional technical papers** on cross-cutting topics are currently planned:

1. **Methodology report**
   (this document; interim version: October2026; final version: Q3/2028)
2. **Drivers of increasing climate risks in Europe**
   (underlying Chapter 2 of the main report; key inputs from C3S/ECMWF)
3. **Advances in quantitative climate risk assessment**
   (supporting Chapter 4 of the main report; key inputs from Destin-E/ECMWF and JRC)

Disclaimer: *The technical papers outlined above represent an initial set of possible outputs that could support EUCRA-2. Their final scope, format, timing and publication status will be determined at a later stage, considering evolving stakeholder requirements, available resources, and project priorities.*

Annex 2. Overview of systems at risk addressed in EUCRA-2

The risk assessment in EUCRA-2 will be structured by systems, grouped into systems cluster. The selection of systems at risk and the related system clusters is presented in Table 9 below, together with an indicative list of policy areas that are influencing the risks within these systems. The European systems below include supply chains and other key links from outside Europe, where relevant. EUCRA-2 will combine system-specific analyses for the systems shown below with a dedicated cross-system perspective to identify cross-system interdependencies, cascading effects and key transmission pathways across systems.

Table 10: Overview of system clusters, systems and related policy areas addressed in EUCRA-2

System cluster	System	Indicative policy areas influencing the risks within this system cluster
Natural ecosystems and their services	• **Terrestrial and freshwater ecosystems** • **Marine and coastal ecosystems**	• Climate, water and environmental policies • Spatial context policies (incl. spatial planning and cohesion policies) • Food and agriculture policies • Marine and maritime policies • Domestic security (incl. civil protection) policies • Health policies • …
Food system and bioeconomy	• **Food system (agriculture, fisheries and aquaculture, and food value chain)** • **Bioeconomy (including biomass and fibre provision)**	• Food and agriculture policies • Bioeconomy policies • Human health policies • Environmental policies • Industrial policies (incl. space, circular economy) • Marine and maritime policies • Spatial context policies (incl. spatial planning and cohesion policies) • International policies • …
Infrastructure, built environment, and related services	• **Water (supply and wastewater management)** • **Energy** • **Transport and mobility** • **Housing and built environment (including cultural heritage)**	• Built environment and infrastructure policies • Energy policies • Spatial context policies (incl. spatial planning, geospatial data and cohesion policies) • Economic policies

		• Industrial policies (incl. space, circular economy) • Domestic security (incl. civil protection) policies • Environmental policies • International policies • …
Health and wellbeing	• **Human health, healthcare infrastructure and services**	• Human health policies • Social policies • Spatial context policies (incl. spatial planning and cohesion policies) • Built environment and infrastructure policies • Domestic security (incl. civil protection) policies • Migration policies • …
Industry, services and finance	• **Industry, tourism, and business** • **Finance and insurance**	• Economic policies • Industrial policies (incl. space, circular economy) • Finance and fiscal policies • International policies (e.g. labour mobility and just transition policies) • Built environment and infrastructure policies • Environmental policies • …

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