

SCIENTIFIC OPINION PAPER // AUGUST 2025

Towards a climate resilient Europe

Recommendations for the European Climate Resilience and Risk Management Framework

Imprint

Publisher

Umweltbundesamt
Wörlitzer Platz 1
06844 Dessau-Roßlau
Tel: +49 340-2103-0
Fax: +49 340-2103-2285
buergerservice@uba.de
Internet: www.umweltbundesamt.de

Responsible unit:

KomPass – Competence Centre for Climate Impacts and Adaptation

Section I 2.8 Precautionary implementation strategies and instruments of climate change adaptation, natural climate protection action program

Section I 2.9 Finance, Monitoring, Capacity Building

Publication as pdf:

<http://www.umweltbundesamt.de/publikationen>

Dessau-Roßlau, September 2025

German Environment Agency: EU News

Do you want to receive updates on our latest publications, statements and events that are relevant for EU environmental policy? Our newsletter covers EU policies on climate mitigation and adaptation, zero pollution and circular economy and is tailor-made for policy makers, experts and journalists.

Subscribe to our newsletter at www.uba.de/eu-news.

SCIENTIFIC OPINION PAPER // August 2025

Towards a climate resilient Europe

Recommendations for the European Climate Resilience
and Risk Management Framework

By

Vivien Kargoll, Inke Schausser, Lukas Dorsch, Sebastian Ebert,
Clemens Haße, Andreas Huck, Cornelia Rietdorf, Kirsten
Sander, Johanna Siebenlist, Andreas Vetter & Petra van R th

On behalf of the German Environment Agency

Disclaimer: Any views expressed are the views of the German Environment Agency and may not under any circumstances be regarded as an official position of the Federal Ministry for the Environment, Climate Action, Nature Conservation and Nuclear Safety or the Federal Republic of Germany.

Executive Summary

Climate change is already impacting all regions of Europe, posing complex challenges for human well-being, ecosystems, and the economy. Even though significant progress has been made over the past years, the forthcoming European Climate Resilience and Risk Management Framework (ECRRMF) must take a more ambitious approach to ensure resilience and preparedness across Europe by 2050. This scientific opinion paper outlines key recommendations - based on 20 years of experience in Germany - to strengthen the design and implementation of the ECRRMF and proposes key objectives for the framework, as well as actionable pathways across enabling governance mechanisms, the climate adaptation policy cycle and cross-cutting considerations.

Key objectives for the ECRRMF

The overall objectives of the ECRRMF should be to strengthen climate resilience across the EU by systematically embedding climate adaptation into policies, governance, and investments, while reducing risks and safeguarding livelihoods. At the EU level, the framework should mainstream or uphold the mainstreaming of climate adaptation into all relevant strategies, legislation, and funding instruments, including agriculture, fisheries, cohesion, energy, infrastructure, and the EU Taxonomy to ensure coherent, long-term action. At the Member State level, the framework should promote stronger cooperation to address systemic and cross-border risks, considering the interconnections between hazards, systems, and communities, and integrate a long-term perspective on livelihoods. Across both levels, the ECRRMF should safeguard natural resources and ecosystem services through nature-based solutions, ecosystem restoration, and sustainable land and water management; protect populations by enhancing preparedness, early warning systems, and resilient infrastructure, ensuring no one is left behind; and engage the private sector by supporting workplace protection, climate-proof supply chains, and incentivising investment.

Enabling conditions for climate resilience

Effective and lasting climate adaptation in the EU depends on strong enabling conditions, especially a robust legal framework and well-structured finance. Within this context, the forthcoming ECRRMF offers a pivotal opportunity to embed a “duty to consider climate adaptation” across all relevant EU and national decision-making processes to reduce damage costs and investment risks for public actors. The framework can also help accelerate the integration of climate adaptation into EU sectoral policies - especially on environmental protection, human health, common security as well as trade policies - and further encourage Member States to develop both national adaptation strategies and detailed action plans with defined responsibilities, timelines, and measurable outcomes. In the context of finance, climate adaptation should be integrated into all EU budget planning, grounded in robust climate risk assessments and designed to promote climate resilient investments. Climate adaptation expenditures should be tracked separately from mitigation expenditures to improve transparency and accountability. The ECRRMF should also enhance consistency in loss and damage reporting by providing common methodologies and reliable data sources, encourage innovative local funding models that go beyond public sources, simplify EU fund access for municipalities and regions through streamlining, and actively mobilise private capital to scale up climate adaptation efforts through improved investment conditions, including regulatory clarity and risk-sharing mechanisms.

Climate risk assessments and minimum precautionary levels

Climate Risk Assessments (CRAs) are essential for informing national and EU adaptation strategies by identifying the most urgent climate risks and guiding targeted urgent action. Key methodological improvements to be taken up by the Member States and the EU in risk

assessments include integrating assessments of adaptation possibilities and acknowledging adaptation limits to strengthen links between mitigation and adaptation. Cross-sectoral collaboration and participation, as well as alignment with IPCC and ISO standards are crucial, while methodologies must remain purpose-driven and adaptable to targeted threatened systems. CRAs should incorporate a range of climate and socioeconomic scenarios, including high-emission scenarios and low-probability, high-impact events. To enhance consistency across Europe in planning adaptation, the EU should establish non-binding, politically endorsed minimum precautionary levels for climate resilience (e.g., +2°C by 2050 and +3°C by 2100), enabling harmonised planning and climate-proofing infrastructure.

Measurable climate adaptation targets and adaptation planning

To accelerate climate adaptation across the EU, the ECRRMF should promote the development of measurable national and EU-wide adaptation targets based on climate risk assessments and aligned with minimum precautionary levels. These targets should be developed through participatory processes and should address various sectors to help guide implementation, evaluate progress, and enhance accountability. Improved guidance for Member States is needed to evaluate climate adaptation progress across governance levels. In parallel, the ECRRMF should encourage the integration of ex-ante assessments into the planning of climate adaptation measures by developing common, non-binding EU guidelines and supporting knowledge exchange. These assessments help limit maladaptation, enhance policy coherence, and promote effective adaptation strategies. The ECRRMF should also promote the concept of transformational adaptation and highlight good practices to support implementation.

Monitoring, evaluation, reporting and learning (MERL)

While most EU Member States have established climate adaptation monitoring systems, considerable differences in methodology persist, and evaluating the effectiveness of climate adaptation policies as well as measures remains a key challenge. To strengthen MERL across Europe, the ECRRMF should promote common definitions on monitoring and evaluation, a shared set of basic indicators and practical methodologies for evaluation aligned with national policy cycles. The framework should support EU-wide research and peer learning. To promote efficient and partially automated monitoring of EU-wide indicators, data availability should be considered, - such as remote sensing data - to provide necessary comparative data for evaluation. Additionally, adjusting EU reporting requirements, such as extending the reporting cycle to every four years or introducing flexible opt-out options, would streamline administrative burdens while maintaining meaningful progress tracking.

Cross-cutting considerations

To ensure climate adaptation is effective, fair, and future-proof, the ECRRMF must systematically integrate cross-cutting considerations such as social justice and climate-security aspects. This means making “just resilience” a core principle, with a shared EU definition, clear indicators, targeted funding, technical guidance for Member States, and further research to ensure vulnerable groups are protected, inequalities are reduced, and adaptation benefits are fairly distributed across and within generations. At the same time, the framework must address climate-security aspects by embedding climate considerations into security, civil protection, and infrastructure policies to strengthen civil-military coordination, to ensure post-disaster reconstruction is climate-resilient, and to advance foresight research on climate-security linkages.

Table of content

- List of abbreviations 7
- 1 Introduction..... 8
- 2 Policy recommendations..... 10
 - 2.1 Enabling principles for climate resilience 10
 - 2.1.1 Strengthening the EU’s legal framework for climate resilience 10
 - 2.1.2 Enhancing climate adaptation finance.....11
 - 2.2 Recommendations along the adaptation policy cycle 13
 - 2.2.1 Climate risk assessments 13
 - 2.2.2 Minimum precautionary levels for climate resilience..... 14
 - 2.2.3 Measurable climate adaptation targets for the EU and its Member States..... 15
 - 2.2.4 Advancing climate adaptation planning 15
 - 2.2.5 Monitoring, evaluation, reporting and learning 16
 - 2.3 Cross-cutting considerations..... 17
 - 2.3.1 Advancing just resilience 18
 - 2.3.2 Integrating climate-security aspects..... 19

List of abbreviations

CRA	Climate Risk Assessment
DAS	German Adaptation Strategy
ECRRMF	European Climate Resilience and Risk Management Framework
EPA	European Environment Protection Agencies' Network
EU	European Union
EUCRA	European Climate Risk Assessment
MERL	Monitoring, Evaluation, Reporting and Learning
MFF	Multiannual Financial Framework
NAP	National Adaptation Plan
NAS	National Adaptation Strategy

1 Introduction

Climate change is already causing profound and uneven impacts across Europe, with major risks to ecosystems, infrastructure, public health, and economies. The European Climate Risk Assessment¹ (EUCRA) analyses over 36 major climate risks, 8 of which require urgent action, particularly in areas like coastal and marine ecosystems, infrastructure and human health. Many climate risks are transboundary and systemic, threatening the foundations of European societies and economies without decisive climate adaptation measures.

In response to the growing threats, the European Union (EU) has developed a set of policies to support adaptation. The EU Adaptation Strategy² outlines a vision for a climate-resilient³ Europe by 2050. The European Climate Law⁴ enshrines this vision into legislation, and the EU Mission on Adaptation⁵ fosters local innovation across more than 300 regions. Yet, a significant implementation gap persists. The EUCRA reveals that current adaptation measures remain fragmented, underfunded, and often reactive. National strategies are not keeping pace with the growing climate risks, and key enablers such as governance capacity, finance, monitoring, and equitable participation are often insufficient.⁶ The European Climate Law, while legally binding, lacks enforceable mechanisms to drive systematic adaptation at EU and Member State levels and the EU Mission on Adaptation, while being innovative, is limited in its implementation scope.

The forthcoming European Climate Resilience and Risk Management Framework (ECRRMF) thus presents a critical opportunity to move from high-level commitments to a more operational, accountable, and systemic action. **This scientific opinion paper provides evidence-based recommendations to strengthen the ECRRMF**, focusing on key enabling conditions, the adaptation policy cycle, as well as cross-cutting issues.

Within this context, we propose that the ECRRMF pursues the following core objectives:

- ▶ **At the EU level:** Systematically mainstream or uphold the mainstreaming of climate adaptation into all relevant EU strategies, legislation, and funding instruments including the Common Agricultural and Fisheries Policies, Cohesion Policy, Energy and Infrastructure Regulation and the EU Taxonomy.
- ▶ **At the Member State level:** Reduce systemic and cross-border risks through improved State cooperation with due consideration for the interconnections between risks and affected systems, and by integrating a long-term perspective on livelihoods.

1 European Environment Agency (2024): European Climate Risk Assessment. Available at: <https://www.eea.europa.eu/publications/european-climate-risk-assessment>

2 European Commission (2021): Forging a climate-resilient Europe – the new EU Strategy on Adaptation to Climate Change. Available at: <https://eurlex.europa.eu/legalcontent/EN/TXT/?uri=CELEX%3A52021DC0082>

3 The terminologies “climate resilience” and “climate adaptation” are used interchangeably in this paper.

4 European Union (2021): Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 (‘European Climate Law’). Available at: <https://eur-lex.europa.eu/eli/reg/2021/1119/oj>

5 European Commission (2020): European Missions. Available at: https://research-and-innovation.ec.europa.eu/document/download/470f388c-1b44-43a1-87f5cf9119ee0251_en?filename=ec_com_heu_randi_missions_29092021.pdf

6 European Commission (2024): EU Climate Action Progress Report. Available at: <https://eur-lex.europa.eu/legalcontent/EN/ALL/?uri=COM:2024:498:FIN>

We furthermore recommend within the scope of the ECRRMF that the EU and its Member States should

- ▶ **Safeguard natural resources and ecosystem services:** Promote nature-based solutions, restore degraded ecosystems, and ensure sustainable land and water management as foundational elements of climate resilient livelihoods.
- ▶ **Protect populations:** Strengthen societal preparedness through earlier, more effective warning systems and greater resilience of critical infrastructure and services, supported by public investment. Ensure climate adaptation measures reduce vulnerability and uphold the “leave no one behind” principle.
- ▶ **Engage the private sector:** Encourage and provide knowledge to companies to protect employees from climate change impacts and create incentives for businesses to invest in climate resilience, including climate-proofing their supply chains.

In order to realise the EU’s 2050 vision of a climate-resilient society, the forthcoming ECRRMF must serve as a transformative instrument, not merely a policy update towards an integrated, just, and future-proof adaptation governance. The findings of the EUCRA leave no room for delay. The time for coordinated and accelerated action is now.

2 Policy recommendations

2.1 Enabling principles for climate resilience

Achieving climate resilience across the EU depends on the foundational conditions that enable climate adaptation to happen at scale and with lasting impact. Two critical enablers are: a strong legal framework that embeds climate adaptation into decision-making across sectors and governance levels, and well-structured climate adaptation finance. This chapter presents recommendations on how the ECRRMF can advance these enabling conditions.

2.1.1 Strengthening the EU’s legal framework for climate resilience

Fulfilling and ensuring consistency with global obligations

Climate adaptation is already legally addressed in the European Climate Law. However, the EU’s adaptation policy requires even stronger legislative support that goes beyond what is already enshrined in current EU law to collectively address the most urgent climate risks identified under EUCRA. In this regard, the UAE Framework for Global Climate Resilience⁷ must be taken into account when shaping future European legislation. Furthermore, greater coordination at the European level is also required to manage the cross-border risks identified in EUCRA.

Integrating a “duty to consider climate adaptation” into policy-making

A European legal framework for climate resilience at the EU and Member State level, should include a general provision requiring public authorities and organisations responsible for public tasks to systematically consider climate adaptation in their planning and decision-making in an interdisciplinary and integrated manner. In the long run, this reduces damage costs and investment risks for public actors. Such an obligation is already embedded in Germany’s Federal Climate Adaptation Act⁸ (Section 8 “duty to consider”):

“Bodies discharging public functions are to give due consideration in their planning and decision-making on a cross-disciplinary and integrated basis to the objective of climate adaptation as defined in section 1 [...]”.

Hence, implementing a concept that requires climate adaptation considerations to be taken into account more broadly and across different fields of application would improve the integration of climate adaptation concerns right at the start of any decision-making process.

Enhancing climate adaptation mainstreaming across EU sectorial policies

Such a “duty to consider climate adaptation” could moreover support mainstreaming climate adaptation into planned or already existing sectoral directives and regulations at the EU level. National climate adaptation efforts are already supported by some EU directives such as the Water Framework Directive, the Flood Risk Management Directive and the Nature Restoration Law, which all require national implementation.

7 UNFCCC (2023): UAE Framework for Global Climate Resilience (Decision 2/CMA.5). Available at: <https://unfccc.int/documents/636595>

8 Federal Republic of Germany (2023): Federal Climate Adaptation Act [Bundes-Klimaanpassungsgesetz, KAnG]. Available at: https://www.bmu.de/fileadmin/Daten_BMU/Download_PDF/Gesetze/kang_en_bf.pdf

Translating climate adaptation vision into effective action

Article 5 of the European Climate Law requires Member States to have both a national adaptation strategy (NAS) and a corresponding national adaptation plan (NAP)⁹, so that long-term resilience objectives are supported by concrete, time-bound actions. However, this requirement has not yet been fully implemented by all Member States. Within this context, the ECRRMF offers a valuable opportunity to further encourage Member States to develop both a NAS and a NAP. The NAS thereby provides an overarching vision and cross-sectoral priorities, while the NAP translates these into specific measures with clear responsibilities, resources, timelines, and evaluation steps to enhance coherence, comparability, and collective progress.

2.1.2 Enhancing climate adaptation finance

Future-proofing the EU budget against climate risks

The consequences of climate change affect a large number of policy areas, including those for which the EU has exclusive or shared responsibility. Therefore, adaptation to climate change should be considered as an integral part of all European fiscal policy and budgetary planning. All major programmes of the multiannual budget should systematically take the key impacts of climate change into account. The overall aim should be to foster investments that are climate-resilient by design. This concerns setting the right incentives in the Common Agricultural Policy, strengthening the resilience of Trans-European Transport Networks and Trans-European Energy Infrastructure, as well as the EU's Trade Policy. Therefore, the ECRRMF should not only focus on specific, standalone programmes to finance climate adaptation measures, but also systematically and strategically integrate climate-resilience and climate adaptation into the EU's key policy areas and their respective budget lines. All funding under the EU key programmes should be based on proper climate risk assessments and should overall aim to strengthen climate resilience, protect livelihoods and populations and, where possible, make use of opportunities, including economic opportunities.

Disaggregating climate adaptation and mitigation financial tracking

In order to measure the success and efficiency of climate adaptation actions, it is crucial to track adaptation finance in a transparent and consistent manner. In the past, the MFF has not distinguished properly between climate mitigation and climate adaptation (“climate action”).¹⁰ However, measuring climate mitigation and adaptation hugely differ in kind and methodology. The clear designation of expenditure for climate adaptation measures in national and EU budgets is becoming increasingly important, also in light of reporting requirements under the UNFCCC. Therefore, we strongly recommend to earmark financial flows for climate mitigation and adaptation separately within the new MFF (and later in all relevant reporting), allowing for subsequent tracking of financial flows in climate adaptation. The methodology developed by the German Environment Agency for the federal budget could serve as a model in this regard.¹¹ Similar approaches had been carried out in the United Kingdom and France.

⁹ European Union (2021): Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law'). Available at: <https://eur-lex.europa.eu/eli/reg/2021/1119/oj>

¹⁰ European Commission (2018): A Modern Budget for a Union that Protects, Empowers and Defends- The Multiannual Financial Framework for 2021–2027 (COM (2018) 321 final). Available at: [https://www.eumonitor.eu/9353000/1/j4nvke1fm2yd1u0_j9vvik7m1c3gyxp/vko2t84wgkyj/v=s7z/f=/com\(2018\)321_en.pdf](https://www.eumonitor.eu/9353000/1/j4nvke1fm2yd1u0_j9vvik7m1c3gyxp/vko2t84wgkyj/v=s7z/f=/com(2018)321_en.pdf)

¹¹ German Environment Agency (2023): Federal Expenditures for Climate Change Adaptation: A First Overview for the Period 2010–2021 [*Ausgaben des Bundes für die Anpassung an den Klimawandel: Eine erste Übersicht für den Zeitraum 2010–2021*]. Available at: <https://www.umweltbundesamt.de/publikationen/ausgaben-des-bundes-fuer-die-anpassung-an-den>

Aligning national damage assessments

To date, the estimation on losses and damages caused by extreme weather events differs between Member States. There is a lack of commonly agreed methods and reliable data sources. For example, the European Environment Agency currently relies on estimations from third parties rather than on data submitted by Member States. In the long-run, this inconsistency hampers data comparability and also poses problems for instruments like the European Solidarity Fund. Therefore, the EU should promote recommendations and provide support for the systematic assessment of losses and damages. The aim should be to improve and align (not to harmonise) data collection efforts across Member States. This should be achieved by providing tools and guidance to support data collection and aggregation by Member States. The Slovenian approach for recording damages and reporting them to the national level could be a source of inspiration in this context.

Improving the conditions for financing local adaptation

Local authorities increasingly discuss alternative ways for financing climate adaptation, including adjusting local taxes and charges, cooperating with the insurance industry, engaging private businesses, and involving the financial markets. Several projects under the EU Mission on Adaptation are testing and developing such approaches. The ECRRMF should facilitate the widespread adoption of these innovative financing models by providing targeted information to local decision makers, adjusting the EU legal framework accordingly to enable such alternatives and by providing financial support (e.g. through dedicated investment support programmes). Over the past years, the European Investment Bank has gained an important role within this context. This should be enhanced by combining loan and grant programmes for climate adaptation.

Making EU climate adaptation funding accessible to all regions

Local governments and municipalities bear much of the responsibility for implementing climate adaptation, as measures must be tailored to local conditions. However, current EU programmes are mainly accessed by well-resourced regions with the capacity to handle complex applications and strong networks, while the most vulnerable regions are often not able to benefit. The ECRRMF should therefore include a clear commitment to reducing administrative burdens that delay or discourage climate adaptation efforts. This involves simplifying application processes for EU programmes such as Horizon Europe (including the EU Mission on Adaptation) and under the forthcoming European Competitive Fund. It also requires improving the accessibility of funding instruments for local governments, small municipalities, and civil society actors. In practice, this could involve streamlined application procedures for small-scale projects, increased pre-financing, and targeted technical assistance, thereby lowering entry barriers and ensuring that vulnerable regions are not left behind.

Fostering climate adaptation finance by third parties

In order to strengthen climate resilience in light of current and future climate change impacts, substantial investments in climate adaptation are necessary. The ECRRMF should go beyond public funding and actively mobilise additional private capital for climate resilience. A growing market is expected as investment in climate adaptation often deliver multiple benefits and can deliver a significant return on investments.¹² Thus, the ECRRMF should be designed in a way to especially encourage private investment in climate adaptation. As a result, this could lead to more investment-friendly conditions for companies (particularly small and medium-sized

¹² European Environment Agency (2023): Assessing the costs and benefits of climate resilience. Available at: <https://www.eea.europa.eu/publications/assessing-the-costs-and-benefits-of>; U.S. Chamber of Commerce (2024): The Preparedness Payoff: The Economic Benefits of Investing in Climate Resilience. Available at: <https://www.uschamber.com/security/the-preparedness-payoff-the-economic-benefits-of-investing-in-climate-resilience>

enterprises). In context of the ECRRMF, the further expansion of support for local adaptation measures via Invest EU is highly encouraged. The OECD's Investment Framework for Climate Adaptation could help here to further integrate private finance into adaptation policies in a holistic way.¹³

2.2 Recommendations along the adaptation policy cycle

To accelerate effective and coherent climate adaptation across Europe, the ECRRMF should support Member States in systematically advancing all phases of the climate adaptation policy cycle. This chapter outlines key recommendations for strengthening each stage of the cycle—ranging from climate risk assessments to monitoring, evaluation, reporting and learning. It highlights where targeted EU-level support can help ensure more consistent, impactful, and equitable adaptation efforts across Member States, and also includes proposals for enhanced action at the EU level. Together, these recommendations aim to build greater climate resilience across Europe.

2.2.1 Climate risk assessments

Climate Risk Assessments (CRAs) form the scientific basis for setting targets in adaptation strategies and plans. They identify key climate risks and help to determine where adaptation actions are most urgently needed. Germany has published its third CRA in 2021¹⁴, offering key lessons learned for the forthcoming ECRRMF, but particularly with regard to the next EUCRA, and CRAs at the MS level.

Key recommendations for climate risk assessments in the ECRRMF:

- ▶ Integrate assessments of climate adaptation possibilities to reduce climate risks to support the development and implementation of effective adaptation plans.
- ▶ Since climate adaptation depends on effective climate mitigation to minimise the impacts of climate change as much as possible, CRAs should also identify the hard and soft limits of climate adaptation. Reaching hard limits highlights the need for enhanced climate mitigation, while reaching soft limits signals the necessity for transformative action.
- ▶ Engaging experts from different national authorities in the process of conducting a national CRA helps to evaluate a wide range of sectoral and cross-sectoral climate risks. Such collaborative process strengthens policy coherence, increases the implementation of adaptation measures beyond the CRA itself and fosters the co-ownership of climate adaptation measures. The more stakeholders are involved and understand climate risks, the higher the acceptance and effectiveness of climate adaptation actions.
- ▶ To improve the common understanding and to harmonise CRAs across Europe, they should be aligned by the EU with the current IPCC definitions and EN-ISO standards (such as ISO 14091:2021¹⁵). However, CRA's methodology must remain flexible and purpose-driven. In

¹³ OECD (2024): Climate Adaptation Investment Framework. Available at: https://www.oecd.org/en/publications/climate-adaptation-investment-framework_8686fc27-e

¹⁴ Kahlenborn, W., Porst, L., Voß, M., Fritsch, U., Renner, K., Zebisch, M., Wolf, M., Schönthaler, K., Schauser, I. (2021): Climate Impact and Risk Assessment 2021 for Germany (Summary). Available at: <https://www.umweltbundesamt.de/publikationen/KWRA-English-Summary>

¹⁵ International Organization for Standardization (ISO) (2021): ISO 14091:2021 – Adaptation to climate change: Guidelines on vulnerability, impacts and risk assessment. Available at: <https://www.iso.org/standard/68508.html>

this context, Germany has published methodological guidelines for municipalities¹⁶ and enterprises.¹⁷

- ▶ CRAs should be based on a range of climate and socioeconomic futures. **Climate scenarios for CRAs should also include high-emission scenarios and wild cards** – unexpected events with a low likelihood and high impacts – to assess a wide range of possible futures. EU Guidelines for common baseline scenarios for climate risks could help to harmonise CRAs in this context. They should be selected by considering minimum precautionary levels (see below).

2.2.2 Minimum precautionary levels for climate resilience

The current range of possible temperature levels up to 2100 projected by existing IPCC scenarios (RCPs, SSPs) is too broad to provide clear and actionable climate adaptation guidance for public authorities and companies. To overcome this barrier, **EU-wide minimum precautionary levels for climate resilience are needed**. Such minimum precautionary levels for climate planning and actions can help concretise and operationalise existing vague terms such as “climate resilience-proofing” or “resilience by design”. A precedent for this approach exists in France, which politically set a “warming trajectory” towards a +3°C world by 2100” in 2023¹⁸. Minimum precautionary levels should provide detailed temperature signals for specific points in time, such as a +2°C world by 2050 and a +3°C world by 2100. In Germany, the *German Meteorological Service* (“Deutscher Wetterdienst”) is currently **developing a methodology on how such levels could be technically implemented** by using ensembles of climate scenarios to derive reference ranges for different climatic parameters over time. These reference ranges are needed for impact modelling, the development of climate-resilient technical infrastructural standards, infrastructure planning, as well as guidance for investments in adaptation.

Key recommendations for minimum precautionary levels in the ECRRMF:

- ▶ Minimum precautionary levels for climate resilience should be introduced through a **high-level political decision at the EU level** to support a harmonised EU adaptation effort.
- ▶ These **levels should be designed as non-binding recommendations** to set climate adaptation standards, which can be exceeded or undercut. However, if undercut, responsible institutions should be encouraged to disclose their reasoning.
- ▶ The **technical implementation** of minimum precautionary levels should be **conducted by the national meteorological services of the Member States** to take regional specifications into account. The meteorological services should be encouraged by the EU to harmonise their approaches.

¹⁶ Porst, L., Voß, M., Kahlenborn, W. and Schauser, I. (2022): Climate Risk Assessments at the Municipal Level: Recommendations for the Implementation of ISO 14091. Available at: <https://www.umweltbundesamt.de/publikationen/climate-risk-assessments-at-the-municipal-level>

¹⁷ Dorsch, L., Kind, C., Fleischmann, D., Loew, T. and Schauser, I. (2022): How to perform a robust climate risk and vulnerability assessment for EU Taxonomy reporting? Recommendations for companies. Available at: <https://www.umweltbundesamt.de/en/publikationen/how-to-perform-a-robust-climate-risk-vulnerability> (Accessed: 4 August 2025)

¹⁸ Corre, L., Ribes, A., Bernus, S., Drouin, A., Morin, S., Soubeyroux, J-M. (2025): Using regional warming levels to describe future climate change for services and adaptation- Application to the French reference trajectory for adaptation. Available at: <https://doi.org/10.1016/j.cliser.2025.100553>

2.2.3 Measurable climate adaptation targets for the EU and its Member States

To accelerate effective climate adaptation across the EU, the establishment of national sectoral goals and corresponding measurable adaptation targets is essential. Measurable targets should be focused on the reduction of the assessed climate risks and steer effective measures in the right direction. They create clarity and liability regarding policy goals, foster implementation of measures, and enable monitoring and evaluation of progress. Despite growing recognition of the need for resilience, adaptation planning and implementation often lack concrete targets, making it difficult to evaluate progress, foster learning among Member States, or hold institutions accountable. The forthcoming ECRRMF presents a critical opportunity to embed long-term goals and measurable targets at both the EU and Member State level. In Germany, the federal ministries developed sectoral goals and measurable adaptation targets for the German Adaptation Strategy (DAS)¹⁹.

Key recommendations for climate resilience targets in the ECRRMF:

- ▶ The ECRRMF should motivate Member States to set measurable targets and provide them with guidance and definitions for determining a coherent target system and targets itself. Additionally, the EU should formulate measurable targets for itself in line with the targets agreed upon in the UAE Framework for Global Climate Resilience under the Global Goal on Adaptation of the Paris Agreement.
- ▶ Measurable targets should be based on the needs for action identified in national CRAs and at the EU-level in the EUCRA. They should be aligned with minimum precautionary levels (see 2.2.2). Their ambition levels need to be aligned to the importance of associated risks and should be updated when risks levels are changing.
- ▶ The development of measurable targets at the national or EU level should be conducted in a participatory, cross-sectoral process to strengthen ownership, drive indicator development and define and ensure implementation of adaptation action.
- ▶ The measurable targets should primarily drive and support the implementation of climate adaptation measures to reduce climate risks. Thus, they should be useful to evaluate progress in adapting to a changing climate.
- ▶ National adaptation targets can have a guiding function for regional or local adaptation strategies. Measuring and evaluating adaptation progress in a multi-level governance system within Member States is still challenging. Guidance and learning for a systematic progress assessment across vertical administrative levels is needed.

2.2.4 Advancing climate adaptation planning

The European Commission's Guidelines on Member States Adaptation Strategies and Plans²⁰ emphasise the role of multi-criteria analyses to support the assessment and prioritisation of adaptation measures in national climate adaptation plans. Within this context, the Heads of European Environmental Protection Agencies' Network (EPA Network) highlighted in a policy

¹⁹ Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) (2024): 2024 German Climate Adaptation Strategy. Available at: <https://www.bundesumweltministerium.de/en/download/2024-german-climate-adaptation-strategy>

²⁰ European Commission (2023): Guidelines on Member States' Adaptation Strategies and Plans. Available at: <https://ec.europa.eu/newsroom/clima/items/797945>

briefing the importance of ex-ante assessments in reducing maladaptation risks and developing successful climate adaptation strategies²¹, supported by a technical paper offering methodological guidance for limiting maladaptation²². Such assessments help identify risks, synergies, and policy coherence but remain underused across Member States. Germany provides a rare example, applying multi-criteria ex-ante assessments in its 4th National Adaptation Action Plan to evaluate policy instruments, resulting in more robust and harmonised proposals²³. A set of policy instruments was assessed by the following criteria: effectiveness, sustainable impact, cost of implementation and interactions between policy instruments. The step-by-step expert-based multi-criteria analysis led to significantly improved and interdisciplinary harmonised proposals for policy instruments. The analysis also generated ideas for innovative measures, responding to the calls in Germany's latest climate risk assessment and the EUCRA for more transformational adaptation.

Key recommendations for improved adaptation planning in the ECRRMF:

- ▶ **Developing common, non-binding European guidelines for ex-ante assessments** to strengthen their integration into policy-making at the Member State level to ensure effective and sustainable adaptation planning.
- ▶ **Integrate knowledge about applied and transferable methods on ex-ante assessments into existing EU knowledge platforms** (e.g. Climate-ADAPT, EU Mission Implementation Platform, etc.). Furthermore, enable exchanges about feasible approaches for ex-ante assessments that are efficient and easy to implement at the Member State level.
- ▶ The concept of **transformational adaptation should be further integrated into adaptation planning**. The ECRRMF could provide a common understanding of the potential of transformational adaptation options to address urgent climate risks. Additionally, good practices for transformational adaptation options are needed to improve implementation.

2.2.5 Monitoring, evaluation, reporting and learning (MERL)

Monitoring the impacts of climate change is already well established in most EU Member States. However, there are considerable differences in methodology and a lack of indicators for evaluating the effects of adaptation actions (response indicators). Germany is currently starting preparations for its fourth Monitoring Report, integrating indicators for the measurable targets of the DAS. Nonetheless, evaluation and reporting on the progress of climate adaptation remains a challenge, especially when it comes to measuring the effects of climate adaptation policies and efforts. Research, guidance and peer learning are important corner stones to address this gap. The ECRRMF should address these aspects to improve the understanding and measurability of progress and effectiveness of climate adaptation in the EU. Moreover, the reporting obligations should be simplified and aligned with other reporting cycles.

²¹ EPA Network (2025): Ex-ante assessment for effective and risk-proof climate change adaptation. Available at: https://epanet.eea.europa.eu/reports-letters/policy-briefing-exanteadaptation_epa-interest-group-climate-change-adaptation_final_30-06-2025.pdf/view

²² EPA Network (2025): Preventing maladaptation – supporting effective climate change adaptation. Available at: https://epanet.eea.europa.eu/reports-letters/technical-paper-on-maladaptation_epa-interest-group-climate-change-adaptation_final_30-06-2025.pdf/view

²³ Hölscher L., Rau V., Hippe F., Kaufmann S. and A. Kohli (2025): Development of an ex-ante assessment methodology for policy instruments of the Fourth Adaptation Action Plan [*Entwicklung einer ex-ante Bewertungsmethodik für Politikinstrumente des Aktionsplan Anpassung*]. Available at: <https://www.umweltbundesamt.de/publikationen/entwicklung-einer-ex-ante-bewertungsmethodik-fuer>

Key recommendations for MERL in the ECRRMF:

- ▶ **Monitoring and evaluation** of climate adaptation for the EU and Member States **should focus on defined indicators** that reflect changes in natural and social systems caused by climate change, as well as measurable targets to evaluate progress in adapting to these changes.
- ▶ **Evaluating adaptation plans and planned measures** in Member States **should be carried out by those responsible for their implementation**. Relevant data should be made available for the progress evaluation.
- ▶ To reduce monitoring and evaluation efforts and to enable (partial) automation of data collection for the planned EU-wide indicators, **priority should be given to indicators that rely on publicly available data** (e.g. remote sensing) and **are applicable for all EU Member States**.
- ▶ Under the UAE Framework for Global Climate Resilience²⁴, all signatory States are required to develop a MERL Framework by 2030. To support this, the ECRRMF should promote the **development of common definitions** including a distinction between monitoring and evaluation, **shared (response) indicators** to measure progress and effectiveness of adaptation, and **guiding methodologies for insightful and cost-effective evaluations in Member States**. In order to achieve this, the ECRRMF should foster **more research and peer exchange opportunities** on MERL.
- ▶ **EU reporting obligations should be adapted to national policy cycles**. Many Member States follow adaptation policy cycles of 4 to 8 years. In contrast, the current EU reporting requires updates every two years. As a result, every second submission often repeats unchanged information, despite requiring considerable coordination and administrative efforts. Therefore, the reporting cycle should either be extended to every four years, or introduce a flexible solution such as a “skip pass” (e.g. a “skip this reporting cycle” button in Reportnet 3), allowing Member States to opt out of reporting when there are no substantial updates. This would significantly reduce administrative burdens and increase reporting efficiency.

2.3 Cross-cutting considerations

To be effective, inclusive, and future-ready, the ECRRMF must integrate key cross-cutting considerations that shape the fairness, coherence, and long-term sustainability of climate adaptation efforts. These include social justice and equity (“just resilience”) and climate-security aspects. Such dimensions cut across sectors and governance levels, influencing how adaptation is designed, implemented, and experienced. Without deliberate attention to these factors, climate adaptation policies risk exacerbating existing inequalities, triggering maladaptation, or overlooking systemic vulnerabilities. The ECRRMF should embed cross-cutting considerations systematically and measurably into its targets, instruments, and monitoring frameworks, ensuring that climate adaptation in Europe is not only effective, but also just, inclusive, and resilient in the broadest sense.

²⁴ UNFCCC (2023): UAE Framework for Global Climate Resilience (Decision 2/CMA.5). Available at: <https://unfccc.int/documents/636595>

2.3.1 Advancing just resilience

The impacts of climate change and the benefits of adaptation measures are distributed unevenly. Vulnerable populations, such as low-income households, elderly people, and those in climate-exposed occupations or regions are often hit hardest, yet have the least capacity to adapt. Without specific attention to equity, climate adaptation can exacerbate social injustices, shift or increase risks, and/or reinforce structural inequalities. The concept of “just resilience” calls for adaptation measures that not only reduce climate risk but also strengthen social cohesion, protect human rights, and ensure that no one is left behind. Despite this growing recognition, the EU currently lacks a clear definition, shared indicators, and operational guidance on just resilience.²⁵ As a result, justice considerations remain inconsistently applied across Member States and sectors.²⁶ However, by making just resilience a central pillar of the ECRRMF, the EU can lead by example in building a climate-resilient society that safeguards all populations with particular attention to protecting the most vulnerable/at-risk groups ensuring that no one is left behind.

Key Recommendations for the ECRRMF on just resilience:

- ▶ The framework should introduce a **common EU definition for just resilience** embedded in the key concepts of justice, equity, inclusion and transformational adaptation. The definition should emphasise the dimensions of climate justice such as distributive justice (fair allocation of benefits and burdens), procedural justice (inclusive decision-making), and recognition (valuing diverse knowledge, identities, and experiences). It should also explicitly incorporate principles of intragenerational justice (fairness among current populations) and intergenerational justice (responsibility to future generations). This definition should guide EU climate adaptation policy and Member States’ implementation.
- ▶ The EU should support the **development of a core set of justice indicators** to monitor the equity and justice dimensions of climate adaptation across scales. These might include:
 - exposure and vulnerability of at-risk/ vulnerable groups (e.g. in regards to heat stress, flooding, water availability, food scarcity, etc.),
 - access to adaptation finance and services,
 - levels of public participation in adaptation planning and decision-making.

These justice indicators should be integrated into EU monitoring tools (e.g. the Climate-ADAPT platform, national adaptation reporting). In doing so, the process should build on and align with existing social indicator frameworks such as the European Pillar of Social Rights²⁷,

²⁵ European Environment Agency (2025): Social fairness in preparing for climate change: how just resilience can benefit communities across Europe. Available at: <https://www.eea.europa.eu/en/analysis/publications/social-fairness-in-preparing-for-climate-change-how-resilience-can-benefit-communities-across-europe>

²⁶ *Ibid.*

²⁷ European Commission (2021): European Pillar of Social Rights- Action Plan. Available at: <https://op.europa.eu/webpub/empl/european-pillar-of-social-rights/en/#annex2>

the Sustainable Development Goals²⁸, the OECD' social indicators²⁹, as well as the indicators currently being developed and agreed upon under the UAE-Belém programme.

- ▶ EU adaptation funding should apply **justice-related eligibility and evaluation criteria**. For example, funding calls could require applicants to demonstrate how their measures address the vulnerable/at-risk groups, reduce inequality, or ensure participatory planning.
- ▶ The EU with the support of the European Environment Agency should provide **guidance documents and technical support** for Member States to integrate just resilience into national and local strategies. This includes methods for assessing distributive impacts, conducting inclusive risk dialogues, and co-producing solutions with vulnerable/at-risk groups.
- ▶ The EU should further invest in **interdisciplinary research and innovation** through Horizon Europe and the EU Mission on Adaptation to develop novel approaches to just resilience, especially in urban areas, rural peripheries, and border regions. Community-led innovation and social innovation should be central.
- ▶ The ECRRMF should also highlight the EU's global responsibility by linking just resilience in Europe to **international adaptation justice**, including support for the Global Goal on Adaptation and fair climate finance for vulnerable countries under the Paris Agreement.

2.3.2 Integrating climate-security aspects

Climate change poses a growing security challenge for the EU and its Member States. Its effects can exacerbate local and global conflict through resource scarcity, food and water insecurity and climate-induced migration. Territorial conflict might arise over newly accessible regions and resources. Member States' security and defence personnel, equipment and infrastructure themselves will be affected by more frequent and severe weather events. Extreme weather events have the potential to increase other extreme events ("compound events") or spread through different sectors (cascading events). As climate-related disasters become more frequent, the demand for their services in disaster relief - within and beyond the EU - will likely be more frequent. Within the EU, unevenly distributed climate-related burdens (as mentioned in 2.3.1) and unequal handling of the consequences of the climate crisis could exacerbate political tensions, jeopardise economic stability and ultimately undermine the unity and future viability of the EU.³⁰ Strain and disruption of critical infrastructure systems caused by climate change weakens public institutions. Cumulatively these developments carry the risk of undermining trust in democratic institutions and the international order, especially when government action is perceived as inadequate. The ECRRMF can help to strengthen the climate-security nexus to the extent that security relevant issues are taken into account in climate adaptation processes and long-term preparedness and climate-resilient reconstruction are emphasised in disaster risk management.

²⁸ United Nations Statistical Commission (2025): Global Indicator Framework for the Sustainable Development Goals and Targets of the 2030 Agenda for Sustainable Development. Available at: [21252030 Agenda for Sustainable Development web.pdf](#)

²⁹ OECD (2024): Society at a Glance 2024: OECD Social Indicators. Available at: https://www.oecd.org/en/publications/society-at-a-glance-2024_918d8db3-en.html

³⁰ Metis Institute for Strategy and Foresight, adelphi, Federal Intelligence Service and Potsdam Institute for Climate Impact Research (2025): National Interdisciplinary Climate Risk Assessment [*Nationale Interdisziplinäre Klimarisiko-Einschätzung*]. Available at: https://metis.unibw.de/assets/pdf/Nationale_Interdisziplinäre_Klimarisiko-Einschaetzung_OfficeDruck.pdf

Key Recommendations for the ECRRMF on climate-security aspects:

- ▶ In both the EU and its Member States, security-related policy areas such as civil protection, defence, critical infrastructure, and disaster risk management must explicitly include climate risks, as well as compound and cascading risks in their considerations in the sense of an all-hazard approach. This approach is pursued in the EU Preparedness Union Strategy³¹ and should be further emphasised in the ECRRMF. The interfaces between climate adaptation and security policy must be explicitly identified in the ECRRMF so that they can be effectively addressed at Member State level.
- ▶ More frequent and severe weather events will likely increase the demand on Member States' security and defence forces for disaster relief within and beyond the EU. For a timely and effective response, civil-military coordination and readiness, as well as capacity building measures and disaster preparedness and relief should be strengthened. In addition, security agencies must consider climate risks at the top of their priority list in terms of their own vulnerability to climate change impacts.³²
- ▶ Member States should be supported in making post-disaster reconstruction climate-resilient. This means that appropriate governance mechanisms and structures are institutionalised and non-state actors such as insurance companies are encouraged to take climate resilience principles as well as future climate risks into account in reconstruction processes.
- ▶ Interdisciplinary research under Horizon Europe and/or the EU Mission on Adaptation should investigate climate-security linkages using foresight methods to anticipate emerging climate security risks.

³¹ European Commission (2025): EU Preparedness Union Strategy to prevent and react to emerging threats and crises. Available at: https://ec.europa.eu/commission/presscorner/detail/en/ip_25_856

³² Federal Ministry of the Interior and Community (2023): National Security Strategy: Integrated Security for Germany – Defensible. Resilient. Sustainable [*Nationale Sicherheitsstrategie: Integrierte Sicherheit für Deutschland – Wehrhaft. Resilient. Nachhaltig.*]. Available at: <https://www.nationalesicherheitsstrategie.de/>