European Network of the Heads of Environment Protection Agencies (EPA Network)

Policy Briefing

Ex-ante assessments of policies to foster successful climate change adaptation and to limit maladaptation

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Key takeaways

- Europe is the fastest-warming continent in the world. Extreme heat is becoming more frequent, while precipitation extremes but also droughts are increasing in severity and frequency. These events lead to major challenges and risks throughout Europe, especially because cascading effects aggravate the impacts of climate change.
- The EU and its Member States are advancing adaptation strategies and policies as well as to an increasing extent developing legislation to respond to these acute climate challenges and risks, as will the forthcoming European Climate Adaptation Plan (ECAP).
- However, the European Environment Agency by its European Risk Assessment and the European Court of Auditors indicate that there is an increasing evidence of unwanted effects of adaptation policy and measures, so-called maladaptation. Examples are possible vulnerability shifts to other regions or groups, increasing greenhouse gas emissions and other trade-offs with environmental sustainability.
- To foster successful and systemic adaptation, and to limit maladaptation, new or enhanced approaches are needed for evaluating adaptation policies in order to ensure that these are effective, sustainable and lead to the desired long-term outcomes.
- In this policy briefing, we propose such an improved approach for broad implementation across the EU. Our proposal is based on lessons learned from EU Member States, particularly Germany and Austria, which have shown the practical application of ex-ante assessments in shaping successful climate adaptation policies and in anticipating long-term climate risks, while simultaneously addressing the risk of maladaptation.
- The lessons learned include a change in thinking around common definitions and criteria, which could be included in European guidelines, – for example as part of the forthcoming ECAP – in order to help EU Member States to proactively evaluate strategies and anticipate risks of undesired effects, thereby minimising maladaptation and ultimately enhancing the effectiveness and sustainability of adaptation efforts.

1. A systemic approach is needed for successful climate change adaptation and to limit maladaptation

Europe is the fastest-warming continent in the world, with 2024 setting another record as the hottest year to date [1]. Extreme heat, drought, and precipitation extremes are increasing in both severity and frequency. These weather and climate events lead to major challenges and risks throughout Europe that can cascade from one region or system to another, affecting ecosystems, economies, the built environment, and human health across the whole of Europe.

Adapting to a changing climate is imperative. For climate change adaptation to be fully sustainable, also in the long-term, it is essential to not only address successful adaptation but also that maladaptation is minimised or avoided at best.

Current and projected climate challenges underscore the urgency of decisive, coordinated climate adaptation action to reduce these climate risks and associated vulnerabilities and to mitigate potential harm. The EU and its Member States have made considerable progress in this area by advancing adaptation strategies and policies, and developing related legislation.

However, the European Environment Agency (EEA)[2], and the European Court of Auditors[3] have identified growing evidence of the risk of negative effects, so-called maladaptation, in European policies and actions across many regions and sectors, for example when developing urban green areas, arranging agriculture or disaster insurance, and developing infrastructure. The IPCC[4] defines maladaptation as concerning *"actions that may lead to increased risk of adverse climate-related outcomes, including via increased GHG emissions, increased or shifted vulnerability to climate change, more inequitable outcomes, or diminished welfare, now or in the future. Most often, maladaptation is an unintended consequence."*

[1] EEA, European Environment Agency (2024): European Climate Risk Assessment. EEA Report 01/2024.
[2] EEA, European Environment Agency (2024): European Climate Risk Assessment. EEA Report 01/2024.
[3] European Court of Auditors (2024): Climate Adaptation in the EU – Action not keeping up with ambition, ECA Report 15/2024.
[4] IPCC, Intergovernmental Panel on Climate Change (2022a): Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. Cambridge University Press, Cambridge, UK and New York, NY, USA, 3056 pp., doi:10.1017/9781009325844;
IPCC (2023): Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, 184 pp., doi: 10.59327/IPCC/AR6-9789291691647.

The forthcoming European Commission's "Climate Adaptation Plan" (ECAP) is a pivotal opportunity to learn from both successful and maladaptive examples, to recognise maladaptation as a potential, unwanted outcome of adaptation efforts, and to develop therefore more robust, equitable, and effective adaptation strategies.

This opportunity involves more integrated, cross-sectoral and resilient approaches to secure coherent and effective strategies; a socially just, inclusive and equitable approach to ensure the needs of vulnerable communities are taken into account; and adaptive learning (monitoring, evaluation, and learning) as conditions change and new information becomes available. Taking such a systemic approach to climate change adaptation will strengthen integrated responses and support a sustainable and resilient future for Europe and beyond.

Remark by the Interest Group's recent technical work on maladaptation:

We also include also a technical briefing for more details. It includes examples of maladaptation across various domains, including infrastructural, institutional, behavioural, and regulatory dimensions. This work aimed to deepen our understanding of the concept of maladaptation, analyse potential adverse effects that may lead to maladaptive outcomes in the long- term, and propose solutions to address these challenges. A key lesson learnt has been the need for ex-ante assessments to limit, and ideally prevent, maladaptive outcomes, thereby fostering successful climate change adaptation.

The following adaptation measures and policies were examined in detail:

- Structural flood protection measures
- Green urban infrastructures
- Climate insurance mechanisms
- Conflicting objectives of relevant EU Directives (e.g. the Floods Directive, Water Framework Directive, and Habitats Directive)

The informal technical briefing of the IG on limiting maladaptation to climate change is attached to this email by the EPA Network.

2. Ex-ante assessments: A proven approach to foster successful climate change adaptation and to minimise maladaptation

Ex-ante assessments can help to foster successful climate change adaptation and to minimise maladaptation when designing policies and measures. We therefore propose to integrate ex-ante assessments in the planning process of adaptation policies.

Ex-ante assessments are proactive evaluations carried out during the planning of adaptation strategies or measures, enabling policymakers to anticipate potential risks and unintended consequences, as well as opportunities associated with proposed measures. By identifying adaptation options that are not only effective in reducing climate risks but also prevent maladaptation early on in the planning process, ex-ante assessments help to maximise the success of adaptation actions, including co-benefits and synergies, while minimising adverse outcomes such as increased vulnerabilities, inequitable impacts, higher greenhouse gas emissions, and conflicts with long-term adaptation efforts or sustainability goals. Well-designed ex-ante assessments can also help in ensuring the cross-sectoral and geographical contexts of adaptation measures are thoroughly considered, enhancing the overall effectiveness of adaptation efforts.

Within an EU context, a well-developed application of ex-ante analyses can also help to avoid conflicts between the EU Adaptation Strategy and its underlying policies on the one hand and other related EU strategies and directives on the other hand. As the European Commission sets out to develop the future ECAP, the development of guidelines for common ex-ante assessments offers an opportunity to promote more coherent adaptation planning across the EU and to boost the impact of adaptation policies and measures taken.

In the following section, the suitability of ex-ante assessments in shaping successful climate adaptation policies will be shown by highlighting good practices from Germany and Austria. Besides, it will be discussed how these successful experiences can be leveraged to promote resilience and reduce the risk of maladaptation across Europe.

2.1 Tested approach: Leveraging of ex-ante assessment for effective climate change adaptation

Approaches to ex-ante assessments on climate adaptation are beginning to materialise in some European countries. In Germany, for example, these assessments have played an important role in shaping federal action plans for climate change adaptation policy since the policy's inception. It was recognised that the intersectoral nature of climate adaptation requires a systemic approach across policy areas and that climate adaptation policy instruments must be integrated into existing sectoral policies. Ex-ante assessments, therefore, serve as a crucial tool to develop well-tested proposals for policy instruments that advance both climate resilience and sustainable development.

Ex-ante assessments were tested across two policy cycles for the German Adaptation Strategy.[5] They were carried out by the Federal Authority's Network on Climate Change Adaptation in Germany, which supports the Interministerial Working Group on Climate Change Adaptation in implementing the strategy. The methodology and criteria for these assessments were

[5] The first round of application ex ante analysis was conducted in 2019 to support the third Adaptation Action Plan, that was published as a part of the second progress report in 2020. The second round took place in 2024 and was part of the policy process to develop the new precautionary Adaptation strategy, published in 2024.

developed based on three main principles: (i) to focus on the most relevant criteria, (ii) to enable an effective expert-based assessment, and (iii) to integrate an intersectoral perspective into the assessment approach. This collaborative effort between the federal authority's network that was supported by a scientific consortium resulted in a well-tested methodology for ex-ante assessments. The applied criteria, which are detailed in Table 1 below, illustrate the integration of scientific findings and practical insights into the policy development process.

Table 1: Assessment criteria for effective and sustainable adaptation policy instruments (applied for the German Adaptation Strategy)

Criteria		Description, characteristics
1	Effectiveness	The effectiveness criterion assesses the potential target achievement of the policy instrument, i.e. its impact in reducing vulnerability or enhancing resilience. It is operationalised by the three indicators 'probability of successful impact', 'broad impact', and 'long-lasting impact'.
2	Sustainable impact	This criterion assesses the overall impact of a policy instrument in the three sustainability dimensions of environmental, economic and social aspects. The criterion intends to ensure that the policy instrument supports sustainable development in order to preserve natural resources and strengthen sustainable economic activity and social cohesion. The criterion is operationalised by key questions, which are differentiated according to the three sustainability dimensions.
3	Interactions between policy instruments	This criterion reflects the extent to which the policy instrument has positive or negative interactions with the other proposed policy instruments. As a result, the overall impact of the policy mix should be as favourable as possible by achieving synergy effects and avoiding or reducing conflicts of objectives between the policy instruments as far as possible.
4	Costs of implementation	The calculation of costs takes into account all costs for the state, companies and private individuals as well as NGOs in the following categories: (a) one-off investment costs or initial costs, (b) ongoing costs such as operating or maintenance costs (c) transaction costs such as licenses or planning costs for infrastructures, etc.

2.2 Emerging approach: Applying ex-ante assessments to limit maladaptation

With growing evidence of maladaptation, the Austrian Strategy for Adaptation to Climate Change[6] stands out as one of the few national adaptation policy documents from an EU Member State that, since 2017, explicitly and prominently addresses maladaptation, next to guiding principles for 'good adaptation'. Framing maladaptation as "measures that are

[6] BMK, Federal Ministry of Climate Action (2024): Österreichische Strategie zur Anpassung an den Klimawandel. Teil 1 - Kontext. [Austrian Strategy for Adaptation to Climate Change. Part 1 - Context]. Wien, 2024.

predominantly reactive, pure symptom control, promising only in the short term, but counterproductive in the long-term", the Austrian national adaptation strategy (NAS) states the avoidance of maladaptation as one of its overarching objectives, defines a set of criteria for the prevention of maladaptation, and provides generic process-oriented guidance for applying them. Moreover, the National Adaptation Action Plan[7] identifies conflict potentials across all action fields, focusing in particular on managing maladaptation risks for each of its recommended actions.

The criteria summarised in Table 2 largely correspond to the criteria set out in the Austrian NAS, which are science-based. Interdependencies and overlaps between the individual criteria exist and are to some extent unavoidable, but altogether they provide a rather comprehensive assessment framework for identifying, evaluating and, potentially, tracking maladaptation for adaptation planning, which is open to further operationalisation.

Table 2: Assessment criteria for avoiding and minimising maladaptation (based on the Austrian National Adaptation Strategy)

Criteria		Description, characteristics
1	Vulnerability increase, vulnerability shift	Direct or indirect *increase of current or future climate vulnerability or risk* for the intended beneficiary of an adaptation option *('re-bounding vulnerability')*; may include net increase in vulnerability over time (i.e. short-term adaptation benefits outweighed by long-term negative outcomes). *Transfer (re-distribution) of vulnerability* to other places, groups, sectors, or systems *('shifting vulnerability')*.
2	Conflicts / trade-offs with mitigation of climate change	*Increase of GHG emissions*, including through direct emissions, higher net emissions over the life cycle of an adaptation measure, or reduction of storage capacities of natural carbon sinks. Impeding or rendering impossible the *feasibility and effectiveness of mitigation options*, e.g. through mono-functional, incompatible use of limited space or land.
3	Conflicts / trade-offs with environmental sustainability	Negative externalities on ecosystems, natural resources and environmental goods. Adaptation options leading to: depletion or degradation of biodiversity and ecosystem services; increased consumption of non-renewable resources; non-sustainable use of renewable natural resources; impairment of environmental quality; intensified conflicts over resource use.

[7] BMK, Federal Ministry of Climate Action (2024): Österreichische Strategie zur Anpassung an den Klimawandel. Teil 2 - Aktionsplan: Handlungsempfehlungen für die Umsetzung. [Austrian Strategy for Adaptation to Climate Change. Part 2 - Action Plan: Recommendations for action]. Wien, 2024.

Criteria		Description, characteristics
4	Conflicts / trade-offs with social sustainability	Negative externalities on social justice and equity through inequitable social distribution effects. Unfair distribution of costs and benefits of adaptation options, e.g. disproportional burdening or increased vulnerability of vulnerable groups (e.g. low-income, single parents, children, marginalised ethnic minorities) and/or benefits mostly for privileged groups only. Losses in societal welfare, e.g. through adverse effects on public goods, basic provisioning, or employment. Undermining intergenerational equity, e.g. by transferring higher vulnerability or excessive cost to future generations.
5	Detrimental path dependencies	Adaptation measures that, simultaneously with high future uncertainty, are irreversible or inflexible, i.e. that are impossible or difficult to correct, re-direct, or retract. Measures with high risk of causing vulnerability lock-ins, reducing adaptive capacities and solution space over time, and resulting in high and unavoidable damage and loss if adaptation limits are reached. Indicative characteristics of adaptation options with elevated risk of maladaptive pathways: structural ('grey') measures with high, returning and accumulating (public) costs; adaptation choices creating self-reinforcing dynamics through capital tie-up and reinforcement of business-as-usual (legal, administrative, mental) regimes. Measures inhibiting transformation potentials, i.e. deep, systemic change, e.g. through narrow focus on single risk for specific sector or by reinforcing the unsustainable status quo of a system.
6	Inefficiency and ineffectiveness	Highly unfavourable cost-benefit ratio: measures with excessive public cost (considering entire life cycle) combined with lack of effectiveness. High opportunity cost, especially in comparison with alternatives. Ineffective adaptation measures, if they require high public financing.
7	Adverse effects on market competition	Investment-intensive measures that push other competitors out of the market, leading to market concentration, reduced competition and higher cost of living for consumers. Measures that result in the strongest market players, not the best solutions, prevailing.

2.3 Proposal for developing a combined ex- ante framework for adaptation policies, drawing on experiences of Member States

Learning from the approaches and experiences in Germany and Austria, the EU can move towards a more unified approach that not only strengthens climate resilience, but also ensures that adaptation efforts minimise or even prevent maladaptation.

The German approach underscores the value of ex-ante assessments in creating effective and feasible adaptation strategies. These assessments have been integrated into federal action plans since the early stages of Germany's adaptation policy, resulting in actionable insights that strengthen climate resilience while minimising unintended consequences. Austria, in addition

explicitly addresses the prevention of maladaptation as a core objective. The Austrian Adaptation Strategy integrates maladaptation considerations into the entire adaptation process of planning and implementation, providing a process-oriented guidance for limiting unintended consequences.

To more effectively and efficiently adapt to climate change while simultaneously limiting maladaptation, we propose that the European Commission develops a set of common guidelines that synthesise the good practices from Member States such as Germany and Austria. This could be part of the forthcoming ECAP development process and can be extended with further reflection on good practices from other EU Member States

This common guidelines should include:

- integrated criteria, resulting in a comprehensive evaluation matrix;
- a dynamic application of ex-ante assessments iteratively during policy planning and implementation to account for new information and evolving risks;
- policy coherence to ensure that adaptation measures align with the European Green Deal, the EU Adaptation Strategy, EU directives, and sustainability goals.

By following such good-practice guidelines and developing a unified common approach to limit maladaptation, the EU can foster not only effective but also resilient and equitable adaptation strategies that safeguard European societies, economies and ecosystems against the impacts of climate change, also in the long term.

3. Recommendations for shaping successful climate change adaptation strategies across the EU

Ex-ante assessments have shown their value in adaptation planning in some EU Member States, allowing policymakers to evaluate consequences associated with particular measures, minimise maladaptation, and enhance the effectiveness, equity, and sustainability of adaptation policies and measures.

The IG CCA of the EPA Network is dedicated to support the EU Commission's work in building a more climate-robust, resilient, and sustainable Europe while simultaneously minimising the risks of maladaptation. In this regard, we see the forthcoming ECAP as a pivotal opportunity to achieve these objectives. With this policy briefing we want to support this process by the following recommendations.

Recommendations

- Strengthening adaptation strategies through common European guidelines for ex-ante assessments.
  Developing common European guidelines for ex-ante assessments can contribute to consistency among adaptation policies and measures across the EU and its Member States, and improve cross-border and transboundary collaboration, thereby enhancing the outcome of a future ECAP.
  Such guidelines can help Member States to proactive evaluate their adaptation strategies, anticipate and manage climate risks, minimise maladaptation, and thus ultimately optimise effectiveness, synergies and co-benefits of adaptation efforts.
- Adopt a systemic approach: Promote integrated, cross-sectoral frameworks on all levels of governance that account for interactions between adaptation and other policies. It must also account for interdependencies between natural, social, jurisdictional, and economic systems and be sensitive to territorial differences, aligning with EU goals such as the European Green Deal and Adaptation Strategy.
- Provide examples of good practices: The case of Germany demonstrates the practical application of ex-ante assessments for effective, just and sustainable policies, and Austria addresses in a complementary way maladaptation risks and promotes their proactive consideration at all levels to shape successful climate adaptation policies. This offers valuable insights for broader implementation across the EU, such as with the forthcoming ECAP.
- Enhance adaptive learning: Embed ex-ante assessment into strengthened mechanisms for continuous monitoring, evaluation, and learning, thereby enabling adaptation policies to evolve in response to new information and changing conditions.
- Foster knowledge sharing: Promote the exchange of knowledge and good practices from EU Member States in the development of the ECAP, to inspire more effective policy design across Europe.