

Climate Resilience: Adaptation under pressure

Key considerations for policymakers

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Adaptation is the continuous process of reducing vulnerability to climate change in response to current or future risks. Climate models project that, even under the strongest mitigation pathway, warming will not stop rising until at least the 2050s [1]. As the impacts of climate change continue to intensify, the adaptation measures put in place risk becoming harder to design, more expensive to maintain, less effective, and in some cases ineffective or counterproductive.

While the European Union has made positive steps to improve resilience against the impacts of climate change, in particular through the EU Mission on Adaptation to Climate Change, this document outlines key considerations to support policymakers in creating and implementing dynamic, integrated climate adaptation measures that are fit for purpose under projected future warming.

Key Messages

- Current legislation and adaptation measures are insufficient to manage the growing and increasingly interconnected impacts of climate change.
- For adaptation measures to be successful, they must be dynamic, be able to address compounding events and cascading risks, and adapt to the evolving climate conditions
- Scientific experts should be consulted during the creation, implementation, and review of adaptation-related policies to ensure that their impact is maximised, limits are considered, indicators are appropriate, and maladaptation is avoided.
- Adaptation measures for lower socioeconomic and vulnerable areas should be included in policies, strategies, and legislation relating to adaptation.
- For adaptation measures to be successful, they must go hand in hand with the highest possible ambition to ensure adaptation remains feasible.

Ensuring proposed adaptation measures are dynamic

Adaptation measures should use a dynamic approach that evolves with the changing climate. Much of our existing adaptation infrastructure (flood defences, drainage capacity, cooling systems, irrigation networks, etc.) is engineered against historical statistical baselines, such as a “1-in-100-year” flood event. As the underlying climate shifts, these reference events recur more frequently and with greater intensity, so measures and financing that were adequate at the time of design become insufficient well before their planned replacement or upgrade cycle. Historical records can no longer be assumed to reliably describe future conditions [1].

Policy implication: Adaptation measures should follow a dynamic model where possible and be based on projected future climate conditions rather than historical records. Policies that support climate adaptation measures should include explicit indicators that link outputs to changes in hazards, exposure, vulnerability, capacities, and reduced losses.



Addressing multi-hazard risks and impacts

Most adaptation measures are designed to manage a single hazard type in isolation. However, climate change is raising the probability of experiencing compounding events and cascading impacts. These include simultaneous multiple climate extremes, a single extreme covering multiple areas, a re-occurring extreme, and different extremes affecting various areas [2].

Policy implication: Integrated policy responses should be developed to reduce the current fragmented approach to natural hazards and include multi-hazard risk assessments in adaptation planning. They should consider interactions between different hazards, their impact across different populations, administrative regions, and sectors.

Integrating the soft and hard limits of adaptation in legislation

While adaptation measures can reduce climate risk, they cannot be treated as a single, definitive solution. The IPCC distinguishes two kinds of limits, soft and hard [3].

Soft limits exist where adaptation is technically possible but blocked by social barriers such as low funding, weak governance, or limited social acceptance.

Hard limits are generally set by physical or ecological thresholds, so no amount of funding or planning can overcome them [4]. The rate and extent of warming directly determines how quickly, and how widely, soft limits harden into unavoidable hard limits.

Policy implication: Soft limits can be shifted with innovation, policy change, or investment. Methods of overcoming them should be considered when creating and implementing new legislation.

Policy implication: Strong mitigation is a precondition for effective adaptation and should be considered in all related policy. Options for testing infrastructure investments under a high-warming scenario should be embedded in legislation to ensure they remain viable once warming limits are crossed.

Minimising maladaptation and unintended negative consequences

Maladaptation refers to policies or actions that inadvertently increase the risk of adverse climate-related outcomes. This includes adaptation measures that raise emissions, shift vulnerability elsewhere, reduce future flexibility, or create other negative consequences [5]. As the pace of warming accelerates, there is less time to identify and correct maladaptive choices before they become locked-in via long-lived infrastructure or institutional decisions.

Policy implication: The scientific community should help assess and evaluate proposed adaptation methods prior to their creation and implementation to ensure unintended negatives consequences are understood and avoided.

Adaptation is cost-effective

Investing more money into effective, dynamic climate adaption measures and policy strategy now will reduce future economic losses induced by climate extremes [6]. While climate adaptation measures require financing, they help to prevent and minimise the damage and losses caused by the increasing frequency and severity of climate hazards and risks. For example, damages from sea-level rise in 2100 are projected to be €872 billion annually under a high emissions scenario with no new coastal adaptation measures [7].

Policy implication: The cost of not acting should be considered alongside the cost of adaptation measures. The availability of finance for adaptation should also be reviewed on a regular basis to ensure it is keeping pace with adaptation needs.

Adaptation should be equitable and prioritise locally led solutions

Climate impacts, and the limits to adaptation, do not fall evenly. Regions across Europe will experience climate impacts differently and those with the least capacity to adapt, including older people, low-income households, outdoor workers, and under-resourced regions, are disproportionately affected [8]. They are also often the first to meet soft limits tied to funding and governance. Clear roles and responsibilities, effective coordination mechanisms, and opportunities for co-design and collective action are essential to translate adaptation priorities into concrete, locally owned and sustainable measures [8; 9].

Policy implication: Adaptation measures for lower socioeconomic and vulnerable areas should be included in policies, strategies, and adaptation-related policies. Policymakers should consider integrating Locally Led Adaptation [10] to support ownership, engagement, and response. Indicators that measure the effectiveness of climate adaptions measures specifically in marginalised communities should be included during policy evaluation.



Adaptation must be accompanied by mitigation

How far adaptation can protect us depends on the mitigation pathway: every avoided increment of warming keeps adaptation options open and pushes adaptation limits further away [11]. The 2026 summer heatwaves have increased political pressure for adaptation measures that can be implemented quickly. While this is a positive step, it's essential that these measures consider the dynamic nature of our climate and continue working toward long-term solutions, including those outside of our socio-economic and electoral cycles.

Policy implication: Not only should adaptation policies and framework consider mitigation and warming projections but aim to actively enhance them when possible. Measures that support both targets such forest restoration and climate-resilient and energy efficient infrastructure should be integrated into policy and adaptation planning.



More information

For more information on climate adaption, climate hazards and risks, please contact the EGU Climate Hazard and Risk Task Force via policy@egu.eu.

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