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ADAPTING TO NATURAL HAZARDS IN THE ALPS: STRENGTHENING RISK GOVERNANCE, RISK CULTURE, AND CLIMATE-RESILIENT LAND USE

AG8 – Risk Governance

Shaping future together

The following Policy Recommendations have been elaborated by the members of the Actions Groups of EUSALP, reflect the expertise of the AGs members and are meant for voluntary implementation by the decision makers when it comes to the Alpine Region.

EXECUTIVE SUMMARY

The Alpine region is experiencing an increase in the frequency and intensity of natural hazards, such as floods, landslides and glacial retreat, which are all driven by climate change.

Key gaps in the management of related risks include fragmented governance, limited public awareness, and the insufficient integration of climate risks into spatial and territorial planning.

This set of policy recommendations urges decision-makers at all levels to take immediate and coordinated action.

Key priorities include:

- Strengthening early warning and monitoring systems by investing in cross-border nowcasting infrastructure and harmonised data platforms.
- Build a shared risk culture by integrating natural hazard education into school curricula, establishing whole-of-society awareness programmes, and supporting civil protection systems with adequate training and resources.
- Introduce legally binding spatial planning principles that reflect future climate risks, prioritise nature-based solutions and discourage development in hazard-prone areas.

National governments and EU institutions should provide legal clarity, sustained funding and technical support, while regional and local authorities must implement context-specific measures and engage communities directly. Investing in coordinated, cross-border risk governance and nature-based solutions can help policymakers to reduce losses, enhance preparedness and protect communities, infrastructure and ecosystems. The time to act is now. Proactive, integrated policies anchored in cross-sectoral cooperation are essential to ensuring a safer, more resilient Alpine region.

INTRODUCTION

These policy recommendations aim to increase resilience to climate-induced natural disasters in Alpine regions. They do so by providing guidance on strengthening risk management systems, improving cross-border risk governance, and promoting climate-resilient land use strategies. The beneficiaries are local communities, and the main target groups are risk management actors and policymakers at all levels.

The Alpine region is experiencing more frequent and intense natural hazards, often in cascading and compound forms due to climate change. Key challenges include fragmented coordination across borders and governance levels, a lack of public awareness regarding residual risks, and insufficient integration of natural hazards and climate risks into spatial and territorial development planning. Above all, there is a lack of experience and knowledge in dealing with the increasing intensity and overlapping of such processes, as the interconnections between them are not yet fully understood or create additional uncertainties, nor is it clear what exactly to expect or how best to prepare. These challenges point to a persistent gap between existing risk governance frameworks and their practical implementation in the Alpine context emphasising the necessity of targeted policy interventions.

Given the transboundary nature of natural hazards such as floods and landslides, coordinated action at European, national, regional, and local levels is essential. Strengthened cross-border collaboration and structured knowledge and data exchange between Alpine countries are essential to address these shared risks.

Building on frameworks such as the EU Floods Directive, the Alpine Convention and its Climate Action Plan 2.0, national and regional risk reduction strategies and results from the Interreg Alpine Space project X-Risk-CC (see annex), the recommendations address persistent policy and implementation gaps. All recommendations outlined in this document are equally important. The order of the three main recommendations and the order of the individual bullet points under each do not reflect any ranking or prioritisation.

POLICY RECOMMENDATIONS

1. Improve targeted early warning systems, harmonized data collection and infrastructure investment

- Improve monitoring, early warning and alert systems and invest in forecasting and nowcasting systems [EU, N, R]
- Invest in an alpine wide infrastructure for a systematic monitoring network to observe glacial retreat, permafrost thaw, and slope movements [EU, N]
- Mandate systematic event and socio-economic loss recording and create a central, user-friendly and multi-level natural hazard database [EU, N]
- Review the climate fitness of existing protection infrastructure and anticipate climatic impacts on new structural protection measures. Establish systematic maintenance and joint financing programs across political levels and regions for ageing protection infrastructure and prioritize investments to ensure the desired level of protection [N, R]
- Invest in advanced technologies and modern protection measures and develop new, easily adaptable risk reduction approaches combining structural and non-structural solutions [N, R, L]

Responsible actors	EU institutions, national governments and agencies, regional authorities and local governments (for data input)
Expected outcome	• Faster and more accurate hazard detection • Improved early warning and real-time communication • Better coordination and prioritization of investments • Data-driven risk management across all levels
Resources needed	• Investment in advanced monitoring and forecasting technology (e.g. nowcasting systems) • Infrastructure upgrades & maintenance budgets • Cross-border data-sharing platforms • Technical staff & training

2. Establish an improved risk culture, enhance the local capacity to act, provide enabling political frameworks and introduce preventative insurance schemes

- Communicate clearly and promptly with affected populations, including tourists and seasonal workers, using innovative channels to inform about residual risks and the absence of absolute safety, thereby creating a risk culture [R, L]
- Strengthen cross-sectoral, interregional, and cross-border knowledge, experience, and technology transfer, and share best practices for risk reduction among Alpine countries [EU, N, R]
- Establish whole-of-society risk culture programs by integrating natural hazards topics into school curricula, providing training for local governments and technicians, politically enabling and strengthening volunteer engagement and support systems for civil protection and creating systematic lifelong education programs for the public about natural hazards [EU, N, R, L]
- Enhance preparedness and response capabilities by strengthening civil protection systems through targeted training programs and adequate resources and equipment [N, R, L]
- Provide decision-makers with reliable information on climate-related risks and their impacts to enable informed decisions promote risk assessments at various political levels, develop (best-practice) frameworks for elaborating tailored adaptation options through participative and multilevel governance approaches and provide sufficient economic resources for the implementation of actions [N, R, L]
- Improve risk governance by raising public awareness and by directly integrating local knowledge when determining protection goals and preparing contingency- and emergency plans, as well as for monitoring and other civil protection activities, through structured participation processes [R, L]
- Introduce natural hazard insurance and use fiscal policies to discourage development in hazardous areas, reward preventative behavior and property protection through insurance and compensation schemes [EU, N]

Responsible actors	EU (frameworks, funding), national governments (policy & funding), regional and local authorities (implementation, engagement), civil society, education institutions
Expected outcome	• Improved risk awareness and preparedness among the population • More resilient and responsive civil protection systems • Empowered local authorities and communities • A long-term cultural shift toward risk prevention

	Financial systems that discourage development in hazardous areas
Resources needed	- Public education and awareness materials - School curriculum integration - Training for local staff, volunteers, and decision-makers - Civil protection equipment and logistics - Legal and financial frameworks for insurance and incentives - Platforms for public participation

3. Develop climate-resilient land use strategies through risk-based spatial planning, nature-based solutions, and preservation of areas relevant for risk mitigation

- Promote and implement nature-based solutions by establishing funding mechanisms and integrating them into risk management and spatial planning [EU, N, R, L]
- Support the protective functions of forests and natural floodplains by maintaining and actively restoring the relevant areas. Create a political framework and financial support that enables and incentives the provision of land, while mediating potential conflicts over land use. [EU, N, R, L]
- Develop obligatory land use strategies that reduce soil sealing and create more space for natural hazard processes by securing retention areas and green spaces, keeping them free from development. [N, R, L]
- Make spatial planning an important risk reduction tool by introducing binding principles at all political levels, integrating climate risk assessments and adaptation strategies, and updating regulations to reflect future risk levels and uncertainties. Climate change and respective cascading risks should be mapped and assessed and integrated into spatial planning and zoning to reduce residual risks and prevent the creation of new ones. [N, R, L]
- Create legal frameworks and tools for conflict mediation that support residual risk management, including forward looking strategies for relocating infrastructure and buildings from high-risk areas and strengthening the legal incorporation of hazard zones in spatial planning and building laws. [N, R, L]
- Strengthen cooperation between different political administrative units (e.g. municipalities, regions, countries) to secure land for risk mitigation measures or relocation measures through legal guidelines and financial incentives

Responsible actors	National, regional, and local authorities responsible for spatial planning, EU (funding mechanisms & legal alignment), forest & land management agencies, municipalities
Expected outcome	- Reduced exposure through strategic land use - Preserved and restored natural risk buffers (forests, floodplains, etc.) - Reduced soil sealing and more space for natural processes - Legally binding spatial planning instruments reflecting future risks - Better coordination between administrative levels
Resources needed	- Legal and regulatory tools for climate resilient spatial planning - Incentive for protection forests, natural floodplains and nature-based solutions - Conflict mediation frameworks - Inter-municipal coordination structures

Alpine Space

Beneficiaries

Local communities, including municipalities, property owners, businesses, tourists and residents in hazard-prone areas, will benefit from improved risk mitigation, early warning systems and resilient land use strategies.

Risk management actors such as civil protection agencies, infrastructure operators and planners will benefit from enhanced technical capacity, better data and more integrated governance structures.

Policymakers and public authorities at local, regional, national and EU levels will be supported through clearer decision-making frameworks, access to reliable risk information and increased cross-sectoral and cross-border cooperation.

Anticipated Impacts

Together, the recommendations will help to make Alpine communities and systems more resilient by strengthening emergency services, improving data-driven decision-making and enhancing local capacities throughout the risk management cycle.

Risk management actors will be better equipped and trained, working with more responsive and risk-aware populations. Participatory planning processes will improve trust and cohesion, enabling the development of locally adapted risk management approaches. Climate resilient spatial planning will reduce exposure and vulnerability by steering development away from high-risk areas and prioritising nature-based solutions. In the long term, these measures will minimise damage and recovery costs, safeguard critical infrastructure and contribute to biodiversity and the achievement of climate mitigation goals. A well-informed and proactive society will be better prepared not only for natural hazards, but also for shaping resilient, sustainable Alpine regions.

IMPLEMENTATION

The effective implementation of the proposed policy recommendations requires **action and commitment at all levels of governance: European, national, regional and local**. Political frameworks are essential for providing direction, defining responsibilities, securing the necessary financial resources and ensuring legal clarity. These overarching frameworks must be complemented by concrete actions, tools and support mechanisms at local and regional levels, where implementation occurs.

Public authorities and private sector actors, including companies, infrastructure operators and landowners, are all key for implementing the outlined measures. Their involvement must be supported through targeted funding, guidance and the development of practical tools. Civil society and local communities also play a crucial role, particularly in fostering a risk culture and ensuring participatory planning processes.

Where possible, implementation should be integrated into **existing cooperation bodies and programmes**, such as the Alpine Convention, EUSALP, and Interreg initiatives. These platforms already facilitate cross-border coordination and can help to integrate the recommendations into existing policy frameworks. Finally, it is important to embed these recommendations in existing legislation and planning instruments to ensure consistency. A combination of binding regulations, flexible policy instruments and adequate financial incentives will be required to implement the proposed recommendations and actions.

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The content of this document was discussed during AG8 meetings. Draft versions were circulated among all AG8 members for input and review. The recommendations were shared and agreed upon by AG8 members.

Annex:

Analyzed documents for the cross-check of recommendations

Document/source	Elaborated by	Year
NATURAL HAZARD RISK GOVERNANCE - Report on the state of the Alps - Edition 7	Alpine Convention	2019
IP 2024 – Summit Final conclusions and recommended actions	INTERPRAEVENT	2024
X-Risk-CC WP4 - policy gap explorer	Environmental Agency Austria	2025
GreenRisk4Alps - Report New Recommendations for governance of protection forests and ecosystem-based risk mitigation	BFW Austria	2022
Climate-neutral and Climate-resilient Alps 2050 - declaration of Innsbruck	Alpine Convention	2019
Beyond the Expected: Dealing with the Case of Overload and Residual Risk of Natural Hazards in the Alpine Region	Eurac Research	2018
Adaptation South Tyrol - Klimarisiken und Anpassung Südtirol	Eurac Research	2025
Recommendation: Spatial Planning and Natural Hazard	BAFU - Bundesamt für Umwelt Schweiz	2006
CLISP - Climate Change Adaptation by Spatial Planning in the Alpine Space - WP 6 Risk Governance & Risk Communication	BFW Austria, Environmental agency Austria	2011
Guidelines for Climate Change Adaptation at the local level in the Alps	Alpine Convention	2016
Alpine Strategy for Adaptation to Climate Change in the Field of Natural Hazards	Alpine Convention	2013
Klimaanpassung im Raumordnungs-, Städtebau- und Umweltfachplanungsrecht sowie im Recht der kommunalen Daseinsvorsorge	Environmental Agency Germany	2017
Nature-Based Solutions for Flood Mitigation and Coastal Resilience - Analysis of EU-funded Projects	European Commission	2020
Nature-based Solutions - State of the Art in EU-funded Projects	European Commission	2020
CONHAZ Report on Costs of Alpine Hazards	Uni IBK, alpS, CSCG	2011
Boosting Disaster Prevention through Innovative Risk Governance Insights from Austria, France and Switzerland	OECD	2017
Trends in Risk Communication Policies and Practices	OECD	2016
GoApply - Multidimensional Governance of Climate Change Adaptation in Policy Making and Practice. Climate Adaptation Governance in the Alpine Space	FOEN - Federal Office for the Environment Switzerland	2019
Contingency planning	Alpine Convention	2021
Climate Action Plan 2.0	Alpine Convention	2021
INTEGRAL NATURAL HAZARD RISK MANAGEMENT: RECOMMENDATIONS	Alpine Convention	2006
NATURE-BASED SOLUTIONS IN THE CONTEXT OF NATURAL HAZARDS	Alpine Convention	2023
ÖROK-EMPFEHLUNG NR. 57: „HOCHWASSERRISIKOMANAGEMENT“	Austrian Conference on Spatial Planning (ÖROK)	2018
ÖROK-EMPFEHLUNG NR. 54 „RISIKOMANAGEMENT FÜR GRAVITATIVE NATURGEFAHREN IN DER RAUMPLANUNG	Austrian Conference on Spatial Planning (ÖROK)	2016
Die Österreichische Strategie zur Anpassung an den Klimawandel - Executive summary	Federal Ministry for Climate Protection	2024
Klimawandelanpassung - Strategie Steiermark 2050	Government Styria	2017
FOREST FIRES IN THE ALPS - State of knowledge, future challenges and options for an integrated fire management	EUSALP AG8	2020
Mitigating mountain hazards in Austria – legislation, risk transfer, and awareness building	M. Holub and S. Fuchs	2009
START_it_up - Common Strategic Paper and Final Booklet	BMFLUW, WBV, IRSTEa, ONF, GeoZS, Aosta, Carinthia, HAFL	2014