



EUROPEAN MANIFESTO FOR A GOVERNANCE OF GLACIERS AND CONNECTED RESOURCES

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Glaciers represent a fundamental component of the hydrological cycle, and their progressive retreat is causing significant impacts on the environment, human health, and well-being, and on the climate itself, thus jeopardizing the achievement of sustainable development goals. The severity of this situation has been emphasized by the United Nations General Assembly (UNGA), which proclaimed 2025 as the **International Year of Glaciers' Preservation** (IYGP).

Climate emergencies are neither an opinion nor an ideological choice but a scientifically proven, objective reality that we cannot afford to ignore. The World Meteorological Organization (WMO) recently confirmed that **2024 was the hottest year ever recorded**, reiterating the urgency of the situation with repeated red alerts on the state of the global climate, including the dramatic retreat of glaciers.

The cryosphere, which includes glaciers, ice caps, snow, sea ice, and permafrost, is one of the most sensitive components of the Earth's environment. It plays a crucial role, as over two billion people worldwide depend on snow and ice from mountains that feed rivers, lakes, and aquifers - essential resources for ecosystems, agriculture, energy, industry, and domestic use.

A large part of Europe is experiencing winters with significantly fewer snow days than average, followed by exceptionally hot summers like those of recent years. These changes are causing record ice losses in European glaciers. According to a recent study published in *Nature*, the glaciers of the central European mountain ranges (Alps and Pyrenees) lost the largest mass in proportion to their size on a global scale over the period 2000-2023. Specifically, they were affected by a volume reduction of 39% in just a quarter of a century (5% is the global volume reduction of mountain glaciers, excluding the Antarctic and Greenland ice caps). Global warming and subsequent unprecedented deglaciation are almost exclusively attributable to human-generated greenhouse gas emissions. European mountains are warming at about twice the rate of the rest of the continent, providing a preview of the future that awaits other European regions in the next decade. In mountain areas, the loss of natural resources is compounded by increasing geomorphological instability. Phenomena such as glacial instability, landslides, and debris flows have become some of the most evident manifestations of the transformations occurring in high-altitude areas due to the global climate crisis. It is not so much the individual events that are concerning but their increasing frequency and intensity, which have reached high levels over the past 30 years.

Understanding the cryosphere is of fundamental importance. Glaciers, true natural archives, hold essential climatic and environmental data and proxies for understanding the past. It is therefore crucial to question how future impacts on glacial mass might accelerate the loss of this valuable information. At the same time, it becomes essential to develop methods for measuring and interpreting the evolution of glaciers and permafrost and to build models that, based on their dynamics, improve our understanding of climate and environmental changes. These models will be fundamental for predicting the evolution of glacial areas and developing effective strategies to address the challenges related to the cryosphere crisis.

Cryosphere science represents a critical field for addressing numerous questions and serves as a meeting point for various disciplines. It integrates Earth Sciences, statistics, engineering, legal, economic, and social sciences—all essential for deepening the understanding of glacial systems and their environmental and social implications. Unveiling the processes responsible for these phenomena requires harmonized and freely accessible data and tools, enabling innovative, multidisciplinary, and interdisciplinary research. Only in this way will it be possible to obtain an integrated vision of glacial ecosystems, considering them as a resource to be valued for their crucial role in providing numerous ecosystem services.

The economic, social, and environmental impacts of climate change demand immediate and targeted political responses. Policymakers must be able to assess the current and future effects of these changes and to develop effective and sustainable adaptation strategies.

It is essential to address key questions: How will the hydrology of high-altitude water systems change, and what will be the impact on water availability downstream? How will changes in the cryosphere affect the frequency, intensity, and trends of hazards and disasters in both mountainous and downstream areas? What will be the implications of these transformations for ecosystems, species, livelihoods, and communities living in mountainous areas? What actions and policies are needed to respond to these challenges in the short and long term?

It will thus be necessary to radically revise **the planning of new facilities and infrastructure**, especially in the tourism sector, for adapting to ongoing changes and ensuring long-term sustainability.

The **European Common Agricultural Policy** (CAP) must better take into account ecological principles to encourage resettlement in mountainous areas and reorganize a series of essential services, such as slope maintenance, wildfire prevention, soil erosion containment, biodiversity conservation, and sustainable water resource management.

It is essential to address **the issue of risk** without prejudice or stereotypes. In this context, it is necessary to broaden the approach, including the human and perceptual dimensions in risk assessments. Too often, responses to disastrous events are limited to restoring the “status quo” or isolated interventions that fail to consider the complexity and interconnections of the territory in terms of soil, hydrology, and geomorphology, as well as the transformations underway. To improve risk management in mountainous areas, as indicated by the European Nature Restoration Law, a broader and scientifically grounded use of Nature-Based Solutions (NbS) and Green Infrastructure is needed.

The involvement of local communities is essential, as they are the primary experts on their territory, water resources, and specific needs. Their participation is crucial not only for fostering collective and widespread awareness of the importance of glaciers and the cryosphere, but also for ensuring the effectiveness of adaptation strategies. Without their active contribution, the implementation of an effective climate change adaptation policy would, in fact, be unfeasible.

Climate change knows no borders and represents a global challenge. It is essential, starting from cross-border areas that share the same geomorphological settings and functional ecological units, to implement coordinated actions.

To achieve this, the promoters and supporters of the Manifesto commit to undertaking common actions, including:

- **Supporting the value and protection** of glaciers, permafrost, and emerging habitats in proglacial areas.
- **Collaborating with universities, research centers, and schools** to raise awareness among citizens and institutions, developing educational pathways aimed at creating new expertise in the field of climate change mitigation and adaptation.
- **Establishing forums** that involve regional and local administrators, research groups, associations, and businesses to promote dialogue and collaboration.
- **Promoting and networking experiences** from different geographical, political, and climatic contexts to strengthen cooperation.

At the European level, in particular, the following actions will be pursued:

- **Creating a European cryospheric risk monitoring system**, fostering the sharing of experiences gained at local and regional levels, and developing a common set of monitoring rules.
- **Establishing a multidisciplinary network of shared expertise** to form a European Glacier Governance (EGG).
- **Enhancing international tools and policies** for mitigating and adapting to the climate crisis in European glacial areas.
- **Supporting Europe’s leadership/leading role on a global level** by orienting European Union policies towards the protection of glacial environments, from polar ice caps to glaciers, and promoting the reduction of impacts on the cryosphere, land use, and water resources.

The International Year of Glaciers’ Preservation represents a unique opportunity to unite global efforts in the fight against the climate crisis. Only through effective collaboration and shared commitment will it be possible to ensure a sustainable future for glaciers and the communities that depend on them. It is crucial to pursue urgent and ambitious emissions reduction targets, alongside increasingly coordinated and ambitious adaptation actions, to promote climate resilience and sustainable development. The challenge is enormous, but the time to act is now!

Promoters

CAI (Italian Alpine Club)

CGI (Italian Glaciological Committee)

CIPRA Italia (International Commission for the Protection of the Alps – Italia)

EUMA (European Mountaineering Association)

Legambiente

