

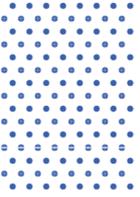
COMPRENDRE



CLIMATE CHANGE IN MOUNTAIN AREAS: MEETING THE CHALLENGE OF ADAPTING WATER MANAGEMENT AND TOURISM

Diverse perspectives on practices and policies in Europe





This publication presents the main findings of the study "Diverse perspectives on member states' policies in response to climate change in mountain areas".

The study was sponsored by the ANCT and funded by France's National Rural Network. It was conducted in 2023 by a group comprising Eurêka21, Euromontana and ADT Consult. The study was coordinated by Patricia Andriot (ANCT), Marie Laurent (ANCT) and Marie-Luce Ghib (ANCT).

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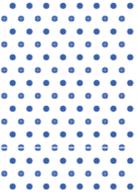
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Mobilisation of the European Structural Funds and Cohesion Fund is an important lever for territorial cohesion in France. The French National Agency for Territorial Cohesion (ANCT) leads on coordinating the ERDF¹ and the FSE² but is also active on the EAFRD³, jointly steering the National Rural Network alongside the French Ministry of Agriculture and Food Sovereignty and the Regions. Also, since 2017 the French government has been developing a proactive strategy to support rural areas, with the introduction of a rural agenda followed by a new programme launched in 2023: *France Ruralités*.

Naturally, therefore, our core concerns include understanding the roles of and links between these funds, especially the EAFRD, in relation to the national challenges around rural development, and observing what other countries are doing in terms of strategies for rural and mountain areas.

With participation from France's National Rural Network, the ANCT has therefore decided to conduct work in order to:

- assess and establish the value of the contribution that European funding represents for rural and mountain areas. In particular, this involves showcasing the EAFRD's contribution in support of measures that help to push the French rural agenda forward;
- identify how public policy in France and elsewhere in Europe is handling the themes inherent to developing rural and mountain areas.

The results of this work, published as three reports⁴, confirm the structural, and at times decisive, nature of European funding for rural development, not only in France but also in the other countries studied.

Beyond the histories and trajectories, which differ for each country studied, the work reveals some shared issues: a widely observed feeling that rural areas have been neglected, the development of public policies to support people in rural and mountain areas in responding to climate change, and in all the countries, a notable increase in reports of initiatives springing up in the regions, and about the role of engineering.

In fact, all three of these reports – about EAFRD's mobilisation in support of rural development, and about guidance on climate change adaptation measures in the countries studied – highlight the key role of engineering in overcoming these new challenges. This work fully confirms the relevance of the agency, its programmes and its customised engineering, as well as the absolute necessity and advantage of engineering as a means of optimising European funding.

Stanislas Bourron

**Managing Director
of the French National Agency
for Territorial Cohesion (ANCT)**

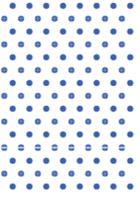
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¹ European Regional Development Fund

² European Social Fund

³ European agricultural fund for rural development

⁴ This publication *Climate change in mountain areas: meeting the challenge of climate change of adapting water management and tourism*, along with *Rural areas and rural policy in Europe*, and *Diverse perspectives on European funding and the French Rural Agenda* (all available on the ANCT website at <https://agence-cohesion-territoires.gouv.fr/>)



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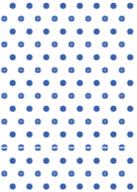
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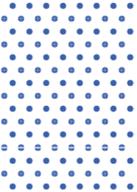
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INTRODUCTION: climate change adaptation in mountain areas

This study, "European benchmarking on climate change adaptation in mountain areas", is conducted as part of an action request launched by the French National Agency for the Cohesion of Territories (ANCT). It is targeted on mountain areas, with the aim of comparing the approaches being taken in five European countries as regards their strategies for adapting to climate change. The analysis will focus particularly on the themes of water management and winter sports tourism. This study will on the one hand fuel the discussions and actions of the projects that won funding under the national "Future of Mountains" (*Avenir Montagnes*) programme, and on the other, it will help improve the support offered to mountain areas by identifying routes for their evolution, along with themes and potential levers for action that may merit deeper exploration.

This final report presents a comparative analysis of the five European Union member states, focusing on:

- the content of public policies relating to mountain areas, with two specific focuses: adaptation of tourism strategies, and water management;
- the implementation methods that will facilitate the transitions in these domains in mountain areas, in terms of governance, participation and involvement of the different stakeholders in these regions, funding and engineering.

Lastly, this report includes recommendations on strategic and operational aspects, which may provide food for thought for the decision-makers and technicians who are instrumental to these transformations in mountain areas.

Recommendations on methodology

This report has been written based on:

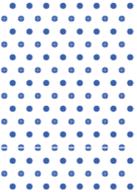
- document analysis (online resources and documents sent by local authorities, researchers/academics, etc.);
- interviews (three or four per country, on average) with people in the local authorities, ministries, universities, regions in question, etc. The full list is provided in Appendix 1;
- a discussion day held in Brussels on 12 September 2023, which brought together European institutional actors, research leads and also relevant contacts in the five countries studied (see Appendix 2 for the list of participants).

In addition, if the documentary research identified a practice used outside these countries, the team opted to include it. Lastly, all the documents, strategies and action plans mentioned in this report are accessible via web links provided in Appendix 2.

A close look at the five countries studied

This study is targeted on five EU countries: Austria, Spain, Italy, Romania and Slovenia. This choice was made with members of this study's Steering Committee, based on several criteria:

- shared criteria: the importance of the mountain areas and activities; major challenges linked to tourism and water management; identification of public policies, initiatives and projects that could provide examples and inspirational practices for actors in France;
- criteria on whether approaches in multiple domains are complementary: regional policy framework and methods of implementing these policies (level of awareness; methods of providing information, consulting people who will be significantly affected, and seeking consensus); types and origins of funding allocated; engineering and partnerships developed; good operational practices and cooperation at the level of the areas themselves.



Austria	<ul style="list-style-type: none"> - Federation of nine federal provinces (<i>Bundesländer</i>) and 2,100 municipalities with an average population size of 4090 inhabitants - 9.1 million inhabitants (2022 – World Bank) - Population density: 108 inhab./km² (2020 – World Bank) - Mountains cover more than 60% of Austria⁵ - 87% of farm operations are in mountain areas and in regions subject to natural constraints (2023 – RDP factsheet)
Spain	<ul style="list-style-type: none"> - Country comprising 17 autonomous communities and 2 autonomous cities; they all have legal and administrative independence - 47,615 million inhabitants (2022 – World Bank) - Population density: 95 inhab./km² (2020 – World Bank) - High mountain ranges cover almost half of Spain⁶
France	<ul style="list-style-type: none"> - Country comprising 13 metropolitan regions and 5 overseas regions, with 101 <i>départements</i> and 34,955 municipalities (2022) - 68 million inhabitants (2022 – World Bank) - Population density: 106 inhab./km² (2020 – INSEE) - Mountains cover 25% of metropolitan France⁷ - 7% of the French population live in a mountain area⁸ - France has nine mountain ranges, six of which are in metropolitan regions (Alps, Corsica, Massif Central, Jura, Pyrenees and Vosges) - 10% of land take in France between 2009 and 2019 occurred in mountain areas⁹
Italy	<ul style="list-style-type: none"> - Country comprised of 20 regions (15 ordinary ones and five that have been granted special autonomy), 107 provinces (104 ordinary, two autonomous and one statistical) and 7,983 municipalities - 58,857 million inhabitants (2022 – World Bank) - Population density: 198 inhab./km² (2020 – World Bank) - The Italian Alps cover nearly 17.4% of Italy's national territory and more than 27% of the territory in the Alpine Convention. Italy has more than 220 mountain peaks at altitudes exceeding 2,000 m - 43% of Italy's farmland is in mountain areas (2020 – ISTAT)
Romania	<ul style="list-style-type: none"> - Country comprised of 41 counties ("judets") divided between four macro-regions: 1, Transylvania (North-West and Centre regions); 2, Moldavia and Lower Danube (North-East and South-East regions); 3, Muntenia (South region, including Ilfov and the municipality of Bucharest); 4, Severina: South-West and West regions) - 19 million inhabitants (2022 – World Bank) - Population density: 84 inhab./km² (2020 – World Bank) - The Carpathian mountains are the second-largest mountain range in Europe and includes 14 mountain peaks at altitudes exceeding 2,000 m¹⁰ - Mountains cover 31% of the country (2023 – RDP factsheet) - 30% of Romania's farmland is in mountainous areas⁶
Slovenia	<ul style="list-style-type: none"> - Country comprising 12 administrative regions, 2 statistical regions and 211 municipalities (<i>občina</i>) that constitute the only decentralised level of the country - 2.1 million inhabitants (2022 – World Bank) - Population density: 104 inhab./km² (2020 – World Bank) - The Slovenian Alps cover 34% of the country, and include more than 350 mountain peaks at altitudes exceeding 2,000 m. The highest is Mount Triglav (2864 m)¹¹ - Most of Slovenia's farmland is located in mountain areas, and 82% is classified as less-favoured agricultural land⁷

Notes

⁵ Note: "Austria, a small European country with a high-performing niche economy", French Ministry of Economy, Finance and Industrial and Digital Sovereignty, 2022

⁶ Larousse, "Physical Geography of Spain" (*Géographie physique de l'Espagne*), online

⁷ Report: "Mountain tourism and the challenges of climate change" (*Le tourisme de montagne et les enjeux du changement climatique*), Economic Affairs Committee of the French National Assembly, 2022

⁸ Mountains Handbook (*Cahier Montagnes*), part of the Shift Project, 2022

⁹ Information from Cerema – Webinar on land take in mountain areas, 2022

¹⁰ Carpathian Convention, 2006

¹¹ Network for European Mountain Research, 2020

1. CONTEXT AND IMPACT OF CLIMATE CHANGE ON MOUNTAIN AREAS

MOUNTAINS: SENTINELS OF THE CLIMATE AND MORE AFFECTED THAN OTHER ENVIRONMENTS BY THE EFFECTS OF CLIMATE CHANGE

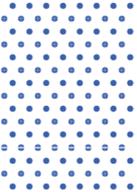
The Intergovernmental Panel on Climate Change (IPCC) estimates a rise in global temperature of between 1.5°C and 2°C by the end of the 21st century compared to pre-industrial levels¹², and mountain areas are among the first to be affected by climate change. On average, temperatures are rising more quickly in mountainous areas than in lowland regions. Studies of the surface air temperature of mountains in North America, the European Alps and Asia show an average warming rate of 0.3°C per decade in recent decades. In addition, measured precipitation increased between 5% and 20% during the 21st century, in most mountain regions (Himalayas, Asia, East Africa, Alps, Carpathians)¹³.

Since the end of the 19th century, temperatures in the Alps have thus increased by almost 2°C, which is double the average rate for the northern hemisphere¹⁴. Simulations run in May 2023 by *Météo et Climat* (the French professional body for weather and climate) indicate that 75% of glaciers in the French Alps may have disappeared by 2050.¹⁵ The same thing has been established for the Pyrenees, where the average temperature recorded over the last 50 years has increased by 30% more (1.2°C) than the global average (0.85°C)¹⁶.

Austria	Spain	France
<ul style="list-style-type: none"> - Temperature increase of 1.8°C since 1950 - Glaciers in the Austrian Alps are expected to have shrunk up to 20% in area by the end of the century¹⁷ - Snowfall is expected to decrease by 40%-80% by the mid-point of the century¹⁸ - Snow cover is expected to decrease by 10%-60% at altitudes between 2,000 and 2,500 metres, by the mid-point of the century¹⁴ 	<ul style="list-style-type: none"> - Regular temperature increase in the Pyrenees over the last thirty years¹⁹ - Snow cover is expected to decrease 50% by 2050, in Pyrenean mountain sites at altitudes between 1,800 and 2,200 metres²⁰ 	<ul style="list-style-type: none"> - In summer 2022, the snow blanket on all France's Alpine and Pyrenean glaciers disappeared from altitudes below about 3,500 metres²¹ - The duration of snow cover in the Alps has shortened by 36 days over the last 20 years²² - Snow cover is expected to decrease 50% by 2050, in Pyrenean mountain sites at altitudes between 1,800 and 2,200 metres²³

Notes

¹² *Synthesis Report of the IPCC Sixth Assessment Report, 2023.*
¹³ *Intergovernmental Panel on Climate Change, Special Report on the Ocean and Cryosphere: Chapter 2: High Mountain Areas, 2018*
¹⁴ *Alpine Convention, Climate change – How it affects the Alps and what we can do, 2017.*
¹⁵ *French professional body for weather and climate, quoted in the article "Melting glaciers: the bleak mountain" (Fonte des glaciers : le mont blême), Libération magazine, August 2023*
¹⁶ *Pyrenees Climate Change Observatory (OPCC), Climate change in the Pyrenees: impacts, vulnerabilities and adaptation, 2018*
¹⁷ *6th National Report of Austria – April 2022*
¹⁸ *Climate Change Post, Austria, 2022*
¹⁹ *Report by the OPCC CTP (Pyrenees Climate Change Observatory, Working Community of the Pyrenees), "Climate change in the Pyrenees: impacts, vulnerabilities and adaptation", 2018*
²⁰ *Redalyc Journal, 2020*
²¹ *France's High Council on Climate, 2023 Annual Report, p.40*
²² *Article, "Recent waning snowpack in the Alps is unprecedented in the last six centuries", Carrer, Dibona, Prendin and Brunetti, 2023*
²³ *Report, "Climate change in the Pyrenees: impacts, vulnerabilities and adaptation", OPCC CTP, 2018*



Italy	Romania	Slovenia
<ul style="list-style-type: none"> - Average temperature increase of 1.1°C over the last thirty years (2020 – WMO) - The duration of snow cover at 2,000 metres has shortened by about a month (36 days) over the last century²⁴ - 50% to 60% of river flow in the Po Valley comes from melting snow and glaciers in the Italian Alps 	<ul style="list-style-type: none"> - Average temperature increase of between 0.7°C and 1.1°C - Number of days with snow cover has reduced by about 11 days each decade, for resorts at altitudes below 1,000 metres²⁵ - 44% of the water used in Romania is contingent on the Danube²⁶ 	<ul style="list-style-type: none"> - Average temperature increase of 1.7°C over the last fifty years²⁷ - Temperature expected to increase by between 1°C and 4°C by the end of the 21st century²⁸ - Snow cover reduction of 14 to 40 days each year between 1980 and 2010²⁹

The vulnerability of the mountains to climate change has a considerable impact on the local ecosystems and populations, but also on society as a whole, due to the importance of the ecosystem services that the mountains provide. Mountains actually play a crucial provisioning role, especially regarding water (they act as a water tower), farming products, and cultural services through the landscapes and associated tourist activities. They also provide regulation services, for example preventing erosion and flooding.

Some consequences of climate change can already be seen in certain of the European ranges. In the Carpathians, where summer temperatures have already sometimes climbed 2.4°C higher than normal, the Carpathian Convention has warned of a major risk of drought. Even though there are no glaciers in the Carpathians, estimates suggest that a water shortage will have severe consequences for the availability of drinking water, and for key sectors such as livestock rearing, forestry, tourism and hydro-based energy production (which represents up to 1/3 of electricity generation in Romania)³⁰.

The Alpine Convention has also warned of the risk of increasing conflicts of water use in the Alps, where these resources are used by the ecosystems, agriculture, energy generation and also tourism. The same concerns have been raised about the Pyrenees by the Pyrenees Climate Change Observatory (OPCC), which has measured the potential impacts of climate change on different key sectors in the region³¹. In this region, the water deficit heightened by climate change will affect farming output, both crops and livestock, including pastoralism. The tourism sector is also vulnerable to rising temperatures.

A NEED TO ADAPT MOUNTAIN AREAS TO OVERCOME AND AVOID CLIMATE-RELATED EVENTS

Mountain areas in Europe are therefore especially vulnerable to climate change, with particular challenges that vary according to the specific local environmental and socio-economic characteristics. These environmental shifts subject the regions to new climatic constraints, which impact:

Notes

²⁴ *Climate Change in the European Alps: Adapting Winter Tourism and Natural Hazards Management, OECD 2007*

²⁵ *Article, "Changes in snow cover climatology in Romania (1961-2020)", Amihaesei, Micu, Cheval and Dumitrescu, 2023*

²⁶ *Climate Change Knowledge Portal – Country Summary – Romania*

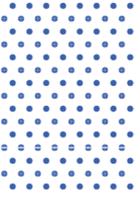
²⁷ *"Our environment", Publication by the Slovenian Environment Agency, Ministry of the Environment and Spatial Planning ("Nase okolje", Agencija Republike Slovenije za okolje, Ministrstvo za okolje in prostor), Ljubljana, February 2023*

²⁸ *Assessment of climate change in Slovenia until the end of the 21st century (Ocena podnebnih sprememb v Sloveniji do konca 21. Stoletja – Povzetek temperaturnih in padavinskih povprečij) – ARSO VREME, 2017*

²⁹ *Climate Change and the Future of Winter Tourism in Slovenia, M. Ogrin, D. Ogrin, University of Ljubljana, 2011*

³⁰ *United Nations Environment Programme, Outlook on climate change adaptation in the Carpathian Mountains, 2017 and 41751fb5-a9be-4942-924b-32365963ddd6 (economie.gouv.fr)*

³¹ *"Climate change in the Pyrenees: impacts, vulnerabilities and adaptation" – OPCC, 2018*



- tourist activity, especially in relation to winter sports, due to the reduction of snow cover that is wreaking havoc on local economies (see part 3),
- the preservation of mountain areas (e.g. biodiversity) and their habitability (see part 3),
- the water resource available, a source of usage conflicts between the different economic activities (tourism, farming, hydroelectricity, etc.) (see part 4).

From now on, these mountain areas face the prospect of bearing the costs of climate-related events, which are already happening and may become more frequent (e.g. floods, avalanches, fires, storms, etc.). Thawing permafrost in mountain areas may lead to soil instability, subsidence and landslides, endangering infrastructure and the local communities. In Austria, damage arising from weather conditions is already costing an average of 2 billion euros per year. Average annual losses are expected to be in the region of at least 3 to 6 billion euros by 2030. By the middle of the century, climate-related costs will reach at least 6 to 12 billion euros per year³². As an example, the storms that buffeted France's Haute-Savoie region in 2017/2018 led to additional costs of 6.6 million euros. Landslides, mud flows and torrential lava flows have led to about 4 million euros of expenditure since 2014, peaking at 9 million euros in 2015³³.

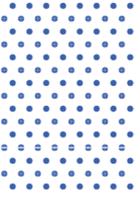
The scale and speed of climate change therefore call for an acceleration of adaptation measures, in order to limit the environmental, social and economic impacts for both the upland and lowland populations. The IPCC, which has analysed climate change adaptation measures implemented in mountain areas, found that most initiatives relate to the farming and tourism sectors. Also, the IPCC experts concluded that among the mountain adaptation measures analysed, 91% involve individuals who work in agriculture, including pastoralism, while local governments are involved in 31% of cases, regional or local civil society actors in 29% of the actions listed, and the private sector in only 10% of adaptation initiatives³⁴. Involvement of all stakeholders, to facilitate their acceptance of and participation in mountain area transitions, will be examined in part 5.2 of this report.

Notes

³² Article, "Economic Evaluation of Climate Change Impacts – Development of a Cross-Sectoral Framework and Results for Austria", Steininger et al. 2015

³³ Report by the High Council on Climate, France, 2023

³⁴ IPCC, Sixth Assessment Report, Climate Change 2022: Impacts, Adaptation and Vulnerability, Cross-Chapter (paper 5): Mountains. 2022.



2. CONSIDERATION OF MOUNTAIN AREAS AND THE IMPACT OF CLIMATE CHANGE IN THE FIVE COUNTRIES STUDIED

MOUNTAIN AREAS: A DEFINITION WITH VARIABLE GEOGRAPHY

At European level, the mountain ranges taken together are relevant to 21 European Union member states. According to the definitions, mountains account for 30-40% of EU territory and between 12% and 20% of the Union's population³⁵.

At European scale, successive attempts in the 1990s to adopt a joint definition of mountain areas ended in failure. This means there is no explicit European definition that applies jointly to all policies.

Eurostat, the statistical office of the European Union, and the EU Commission's Directorate-General for Regional and Urban Policy, have divided the mountain areas into zones based on altitude and gradient. According to these criteria, all zones whose altitude exceeds 2,500 metres are considered mountainous. For territories at altitudes of 300 to 2,500 metres, the definition also takes into account the degree of the slope in the kilometres surrounding the elevation point. This definition establishes three levels: 1,500 to 2,500 metres, 1,000 to 1,500 metres and 300 to 1,000 metres. At each level, the percentage gradient and distance from the elevation point are used to categorise whether or not the territories are mountainous. A specific topographic calculation can also be applied to territories at altitudes lower than 300 metres. Based on this methodology, in 2018 Eurostat classified 323 of the 1,348 NUTS2 regions in the European Union as mountainous³⁴.

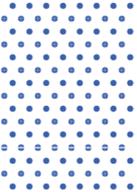
However, the methodology adopted by Eurostat does not apply to all the policies on support for mountain areas. Under the framework of the Common Agricultural Policy (CAP), for example, Regulation (EU) no. 1305/2013 of 17 December 2013 relating to the European agricultural fund for rural development (EAFRD) offers member states the option of allocating funds to mountain areas to support their rural development. Nevertheless, this regulation does not strictly define these territories, and leaves it up to each member state to establish a definition and the boundaries of mountain areas.

When it comes to defining mountainous areas, the decisive criteria for most European countries are altitude (minimum 200 metres in Ireland, but 1,000 metres in Spain) and gradient (ranging from 10% to 25%)³⁶. Some countries also factor in the climate (Germany), the agricultural conditions (Slovenia, Poland) or even "disadvantaged" living conditions associated with a lack of access to medical and social services and to basic national infrastructure (Romania)³⁷.

In this way, the definition of mountains varies according to the type of policies and support in application. Even though criteria do exist at EU level to improve assessment of funding amounts allocated to mountain regions, notably by virtue of article 174 of the Treaty on the Functioning of

Notes

³⁵ Senate Information Report no. 458 (2010-2011), A European policy on mountains, 27 April 2011
³⁶ Study requested by the EU Commission's Directorate-General for Regional and Urban Policy (DG Regio) from the Nordic research institute NordRegio, a study of Europe's mountain areas (2004)
³⁷ Law – Text of the Law of the Mountain in Romania, 2018



the European Union, there is no Europe-level definition of what constitutes a mountain, and the authority to establish the boundaries essentially remains with the member states³⁸.

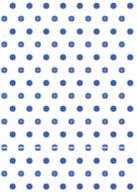
MOUNTAIN AREAS: THEIR PLACE IN PUBLIC POLICY

Some countries have a special legal framework for mountain areas

Austria	Spain	France
<ul style="list-style-type: none"> - No national Law of the Mountain. - Sectoral approach, for example the law for the preservation of Alpine ecosystems and culture. 	<ul style="list-style-type: none"> - No national Law of the Mountain. - High Mountains Law (passed in 1983) in Catalonia. It has four key components: <ul style="list-style-type: none"> o definition of a territorial area; o design of specific management tools, such as plans of mountain districts; o creation of dedicated bodies such as the General Council on Mountains (which consults and advises on mountain-related issues) and mountain advisory boards; o implementation of measures aimed at promoting and consolidating socio-economic development. 	<ul style="list-style-type: none"> - National Mountain Law (initially passed in 1985) and the "Mountain 2" Act since 2016. - Dedicated governance: Departmental Council on Mountains and Committees for each massif. - Definition of mountain areas, mentioning climate change. - Launch of the "Future of Mountains" (Avenir Montagnes) programme in 2021, to support mountain areas towards delivering a resilient and sustainable tourist offer.
Italy	Romania	Slovenia
<ul style="list-style-type: none"> - Law 97 of 31 January 1994, enacting new provisions for mountain zones to improve the populations' quality of life: environmental protection, nature conservation and measures to encourage local development (agriculture, tourism, traditional crafts...). - Mountain-specific sections in the National Strategy for Inner Areas and in the National Climate Change Adaptation Strategy. 	<ul style="list-style-type: none"> - Law of the Mountain (passed in 2018) based on the French example, led by the Ministry of Agriculture and Rural Development: <ul style="list-style-type: none"> o Objective: to provide a framework for inclusive, sustainable development and for the protection of mountain territories. o Mountains are considered as spaces offering strategic, economic, social and environmental benefits o Covers Romania's nine mountainous massifs o Dedicated governance, steered by the National Agency of Mountain Areas (linked to the Ministry of Agriculture) 	<ul style="list-style-type: none"> - No national Law of the Mountain. - Sectoral policies: Law on Triglav National Park, Mountain Paths (Trails) Act, Law on Forests, etc. - General mention of mountains in the National Spatial Development Strategy (2004).

Notes

³⁸ Senate Information Report no. 458 (2010-2011), A European policy on mountains, 27 April 2011



Mountain governance bodies in France

In **France**, there is a national Mountain Law ("Law relating to the development and protection of mountains"), passed in 1985, then revised in 2016. This law is intended to:

- define what constitutes mountain areas (municipalities with 80% of their surface area at an altitude exceeding 600 metres),
- create a legal framework for joined-up, cross-discipline management of mountain areas,
- find a balance between developing and protecting mountains,
- control urbanisation of mountain areas.

It introduces the creation of the National Mountain Council (CNM), a consultation space that gathers people who represent the mountains (regional and departmental representatives involved in mountain matters; socio-professionals) and is chaired by the First Minister. It also led to the creation of Committees for each massif, each having a mission to consider, discuss and propose strategies for sustainable development of the ranges, which results in "massif plans" that undergo regular review. The role of the administrative committees is to drive the bodies' activity and jointly steer funding from State-Region Interregional Plan Contracts (CPIER).

The 2016 revision incorporates mountain areas into a development framework that takes account of environmental factors and reaffirms the specific characteristics of these areas compared to other rural territories (e.g. difficulty of accessing jobs, services, etc.)³⁹.

The 2021 Climate and Resilience Law (Art. 251) also asked the Massif Committees to draw up a climate change adaptation plan. These plans should be finalised in late 2024 or early 2025.

Actors on these issues in France, like the Romanian or Catalan actors who introduced a legal framework and tailored governance for mountain areas, recognise that their action has led to a joint definition of mountain areas, and that this framework makes it easier to include said areas in public policies and in earmarking certain funds, subject to meeting certain criteria⁴⁰.

Approaching mountain locations via sectoral policies

Most of the countries studied are tackling the challenges of mountain areas through different policies (see Appendix 2 – links to all the strategies and action plans mentioned in this section), particularly:

- **National strategies for climate change adaptation**, many of which are adapted for application as regional strategies (Italy, Austria, Spain). They partly relate to mountain areas, and revisit issues around tourism in particular. Effective roll-out of these strategies at national or regional scale depends on the implementation methods (engineering support, etc.) that accompany them.

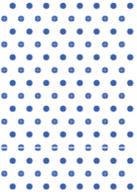
The strategy in **Italy**, for example, mentions the issues of diversifying winter tourism, promoting a beyond-winter development model for tourism, and ramping up existing resources in terms of observation, analysis and forecasting. **Austria** was the first EU country to define a national strategy for climate change adaptation, which has been produced as an operational action plan. It covers 14 activity domains, notably including tourism and water management.

In **Spain**, the National Climate Change Adaptation Plan for 2021-2030 acknowledges the specific challenges of mountain areas, and falls within the remit of the Spanish Office for Climate Change, within the Ministry for Ecological Transition and the Demographic Challenge (MITECO). Certain measures are particularly aimed at adapting tourism in the mountains, and generating knowledge

Notes

³⁹ Law 2016-1888 of 28 December 2016 on the modernisation, development and protection of mountain territories

⁴⁰ In the context of the "Future of Mountains" (Avenir Montagnes) programme, circular 6287-SG of 15 July 2021 specifies how the funds are to be used and divided among the massifs. It specifies which operations are eligible to receive the funding: equipment and investment projects led by the local authorities or other stakeholders (single or joint associations, etc.) and that "help to promote the assets of mountain regions as part of developing a resilient and sustainable tourist offer".



and training/awareness-raising actions about the tourist offer, the corresponding demand and how this links to climate change.

In **Slovenia** the climate issue is broached in the "Integrated National Energy and Climate Plan", drawn up in 2020. It mainly gives prominence to measures intended to reduce GHG emissions, without focusing on specific land areas.

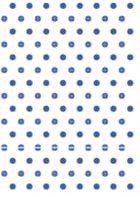
- **Tourism development strategies or plans** that specifically mention the issues encountered in mountain areas.

In **Italy**, the 2023-2027 plan for strategic tourism development states the importance of strengthening governance, upskilling professionals in the tourism sector to improve management of tourist flows, and ensuring the perennial nature of the snowy mountains through better management of water and energy use.

In **Austria**, the tourism master plan, defined in 2019, is intended as a blueprint guiding political decisions at all levels. As this country's tourism is mainly mountain-based, the plan champions improved dialogue with all the local stakeholders; it is aimed at making Austria a "green" destination, and supports cooperation between tourism and agriculture.

In **Spain**, a national strategy for sustainable tourism by 2030 has been introduced, to tackle the challenges of the sector in the medium and long term. The strategy should result in an action plan, which is being prepared.

- **Country-specific territorial strategies, for example:**
 - **Italy's** Strategy for Inner Areas, aimed at promoting the development of isolated regions (of which the mountains represent a large part) with a particular focus on support for services (health, education, mobility);
 - in **Slovenia**, the "National Spatial Development Strategy" adopted in 2004 identifies, in fairly general terms, the specific issues faced in mountain areas (economic difficulties, demographic decline, the climate and environment-related risks, etc.). This strategy highlights the need to support activities and services in mountain areas, and focuses especially on managing natural resources, developing sustainable agriculture, and generating renewable energy. It also mentions tourism as a major economic stake, particularly the Julian Alps (*Julijske Alpe*), with an ambition to manage tourist flows and avoid excessive concentrations of activities and infrastructure.
- In addition, there is strong support for farming in the mountains, particularly in **Austria** via the country's **agri-environmental Programme (ÖPUL)**. This aligns with implementation of the CAP and receives about 50% of its finance from European funds. The ÖPUL concentrates on protecting natural resources, namely water, soil, the climate, biodiversity and the farming landscape.
- **National strategies on the issue of water in a changing climate.**
Given the regular increases in temperatures and the multiplication of drought episodes, European countries are developing national and regional strategies for water management. In Spain, which suffers particularly, a national strategy was adopted in 2022 proposing tangible intervention measures and dedicated funding.



3. MOVING TOWARD A SHIFT IN THE TOURISM MODEL FOR MOUNTAIN AREAS

ECONOMIC AND SOCIETAL TURMOIL FOR COMMUNITIES IN MOUNTAIN AREAS

Impact on local economies

If they did not rely on snowmaking and if there were a temperature increase of 2°C, 53% of the 2,234 ski resorts in Europe would be exposed to serious risks to their operation. This figure would rise to 98% if the temperature were to increase by 4°C⁴¹.

Climate change and temperature increases have a direct effect on winter tourism: resorts affected by reduced snow cover receive fewer visitors, and experience a shorter season. These changes are taking place within the context of a ski market dominated by European countries, which currently host almost 60% of skiers worldwide each year³⁵. Lack of snow can also lead to the cancellation or postponement of sporting events such as the Skiing World Cup and other competitions, as happened in Italy (January-February 2023). In addition, the winter sports resort model that was developed in the 1960s-70s is having to cope with a change in practices, with interest in Alpine skiing on the wane and other activities expanding (snow-shoeing, cross-country skiing, etc.).

Austria	Spain	France
<ul style="list-style-type: none"> - 34% of inhabitants ski⁴² - a nation with 2,960,000 skiers - 48% of overnight stays each year linked to winter tourism⁴³ 	<ul style="list-style-type: none"> - 5% of inhabitants ski⁴⁰ - a nation with 2,329,000 skiers 	<ul style="list-style-type: none"> - 13% of inhabitants ski⁴⁰ - 250,000 jobs in the lowlands and valleys depend on the ski areas opening⁴⁴
Italy	Romania	Slovenia
<ul style="list-style-type: none"> - 12% of inhabitants ski⁴¹ - a nation with 7,266,000 skiers - 400,000 jobs depend on the ski economy⁴⁵ 	<ul style="list-style-type: none"> - 3% of inhabitants ski⁴² - a nation with 686,000 skiers⁴⁰ 	<ul style="list-style-type: none"> - 14% of inhabitants ski⁴² - a nation with 299,000 skiers⁴⁰

Climate change also has an impact on summer tourism, when soaring temperatures at the seaside and in urban areas prompt tourists to head for cooler destinations, close to nature. The result: an increase in visits to mountain areas, which was illustrated in particular after the Covid-19 public health crisis. This situation raises the question of managing tourist flows during the summer months, given that mountain areas are under increasing pressure (environment, water resources, etc.).

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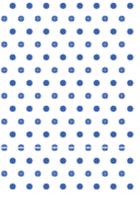
⁴¹ Study, "Climate change exacerbates snow-water-energy challenges for European ski tourism", *Nature Climate Change*, 2023

⁴² Statista "Share of people who ski in Europe as of 2021, by country", 2021.

⁴³ Data in the table are taken from the following study: 2022 International Report on snow and Mountain Tourism, Laurent Varnat, 2022

⁴⁴ Parliamentary report: "Mountain tourism and the challenges of climate change" (*Le tourisme de montagne et les enjeux du changement climatique*), Economic Affairs Committee of the French National Assembly, 2022

⁴⁵ Article, "Italy's ski industry fires cannon against climate change", Bernabei, 2023



In **Slovenia**, for example, 34% of registered overnight stays (summer and winter) are in mountain locations. It can be seen that over a longer period, numbers of visitors to these mountain regions have been increasing steadily, from 2.4 million overnight stays in 2010 to 4.8 million in 2022⁴⁶.

Societal constraints still strongly present

Beyond the economic impact tied to the skiing economy, societal aspects must be taken into account for several reasons:

- the association between skiing and winter family holidays is firmly planted in imaginations and tourist sector marketing, even though only a minority of each country's population actually goes skiing;
- A firmly anchored Alpine identity that still has close ties to skiing: an area of Tyrol, Austria (Hochfilzen, Pillerseetal) states that "Alpine skiing was born here, and each resident is a very regular, habitual skier. It's integrated in our culture." This deep anchoring of skiing in Alpine culture and local tradition can lead to incomprehension, if not a certain resistance to the idea of starting a transition of the skiing economy, even as the number of skiers diminishes yearly.

MOVING TOWARD LOWER-CARBON TOURISM: MITIGATION STRATEGY

Growing awareness around the carbon footprint of mountain tourism, as well as a desire to reduce it

All the countries studied (and/or regions, or equivalent) are endeavouring to transform their tourism strategy, giving greater or lesser priority to decarbonisation of this sector in order to achieve the targets in the Paris agreement. Particular emphasis is placed on mobility issues (accessibility of mountain areas and outdoor activity sites, etc.) and the use of more resource-efficient infrastructure.

Austria: strongly engaged at both national and regional levels

Austria: "a green destination"

In 2019, Austria's federal ministry of labour and economy defined a new blueprint for tourism. One of the objectives is to position Austria as a green destination, in particular by: encouraging professionals and the regions to have their processes certified; improving mobility options to make travel environmentally-friendly; and encouraging increased uptake of renewable energies.

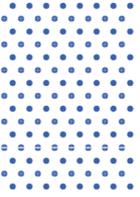
Focus on Tyrol: decarbonisation and adaptation of tourism

Given their responsibilities, the different *Länder* are an important link in terms of developing more sustainable tourism. Tyrol, for example, has introduced a strategy of climate change mitigation and adaptation, including a tourism-specific part that has three main components:

- continue actions that support sustainable travel: examples include transfer solutions for arriving and departing tourists, shifting suburban mobility towards resource-efficient transport, and raising tourists' awareness to try and convince them to choose train travel;
- diversify the tourism offer: develop year-round sustainable tourism that uses resources considerably;
- reduce energy use as far as possible, and meet demand using renewable energy sources. Examples include energy-efficiency actions, local energy generation and short circuits.

Notes

⁴⁶ Source: Statistical Office of the Republic of Slovenia



Spain: Catalonia has its sights set on zero-emission tourism by 2030

The organisation "FGC Turisme", part of the Government of Catalonia (*Generalitat de Catalunya*), has a mission to manage and promote a variety of tourist destinations in the region. It is aiming to achieve net zero carbon by 2030. To do this, it has drawn up the 2030 Climate Action Plan, which has five components:

- measure: For example, the FGC calculates the GHG emissions generated by tourists' travel to mountain resorts, according to the different types of public and private transport, and depending on the energy source (electric, petrol, diesel, hybrid);
- decarbonise: the objective is to halve water and energy consumption by 2025 and promote research, seeking innovative projects in the field of snow production (nanotechnology), so as to be able to produce more snow while consuming less energy and water;
- regenerate: value and promote "natural capital";
- cooperate: identify stakeholders (territories, clients, professional partners, etc.);
- finance, using three main sources of funding: income generated by the activity of ski resorts (owned by the organisation FGC), contributions to FGC Turisme from the government (*Generalitat*) and other grants.

Support for tourism professionals to adopt more ecological practices

This aim to reduce the carbon footprint of tourism creates the need to involve, encourage and support professionals in their sectors, including hospitality, catering, creation of new destinations, etc. In this regard, several countries have introduced labels or certifications as part of a continuous improvement process for the practices of those in the tourism sector.

Slovenia: Green scheme of Slovenian tourism – ZSST: creation of the "Slovenia Green" brand

The Green scheme of Slovenian tourism (ZSST) is a national program and certification scheme under the umbrella brand SLOVENIA GREEN⁴⁷ which:

- brings together all efforts directed towards more sustainable development of tourism in Slovenia;
- offers destinations and tourism providers concrete tools enabling them to evaluate and improve their sustainable operations;
- promotes these green endeavours through the "Slovenia Green" brand.

To obtain the "Slovenia Green Destination" label (Bronze/Silver/Gold/Platinum), the destinations must meet the "Green Destinations" criteria (integral specifications of the label). Providers, on the other hand, must first obtain or present one of the internationally recognised labels that are also verified by Slovenia Green, in order to obtain the Slovenia Green label. This label covers a range of categories: accommodation, parks, travel agencies, attractions, eateries and beaches.

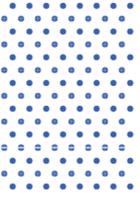
At present, label-holders are as follows: 60 destinations, 142 accommodations, 4 parks, 8 travel agencies, 12 attractions, 60 restaurants and 2 beaches.

France: French label "Flocon vert" for sustainable, responsible tourism

Developed by the Mountain Riders association to support these areas in their environmental transition, the process of attaining the "Flocon vert" label (= "green (snow)flake") guarantees a commitment to sustainability by mountain tourism destinations. In 2012, the first Flocon Vert label specifications were developed, in collaboration with more than 70 actors in the sectors of tourism and sustainable development of the mountains. The specifications comprise 8 themes and 42 indicators. A new version of the specifications was brought out in 2017. The main purpose of this update was to make the indicators simpler to understand and limit the criteria to the 20 most important ones. It was also an opportunity to work on aligning the reference documents with the

Notes

⁴⁷ For further information, see: https://www.slovenia.info/uploads/zelen_a_shema/2021_02_sto_zsst_ang_v02.pdf



international standards on sustainable tourism (of the Global Standard Tourism Council). The latest version of the specifications (2022-2027) targets four areas: governance and resilience of the destination; sustainable economy (viable, local and fair); social and cultural dynamics; management of resources⁴⁸. 22 destinations currently hold the Flocon Vert label, with varying levels of progress (from 1 to 3 flakes), in a continuous improvement approach.

TOWARD NEW FORMS OF TOURISM: DIVERSIFICATION AND "FOUR-SEASON" TOURISM

Objective: to diversify and promote "two/four-season tourism"

The diversification of tourism and development of four-season tourism are among the top priorities mentioned in the countries studied (National Climate Change Adaptation Plan for 2021-2030 in **Spain**, National strategy for Eco-tourism Development in **Romania**, National strategy for year-round tourism in **Slovenia**, and National Climate Change Adaptation Strategy in **Italy** and **Austria**). The objective is to diversify the tourist destinations, encourage tourism within a local area and outdoor activities, promote the attractiveness of cultural and natural assets, especially in less-visited areas, develop more enduring activities that can take place all year round, and improve quality of life for the people who live and work in these mountain areas, and even encourage new people to come and live there.

Italy: Developing eco-tourism in the mountains of the Valtellina region

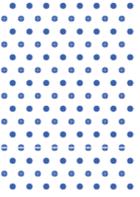
Valtellina is a mountainous region in northern Italy, known for its popular ski resorts such as Livigno and Bormio. The region has started to focus on developing four-season tourism, to offset the impact that climate change is having on winter tourism. To do this, it has invested in developing summer activities such as hiking, mountain biking, climbing, zip-lines and abseiling. The region has also set up initiatives to promote ecologically friendly, sustainable tourism, by using renewable energy in hotels and encouraging visitors to travel by public transport. These initiatives have had a positive impact on the region's economy, creating new jobs and generating extra revenue for local businesses. In addition, they have served to diversify the tourist activities on offer, reducing the region's dependence on winter tourism.

The ski resorts, especially those at low and medium altitudes that suffer more acutely when the snow cover reduces or even disappears, planned ahead for this scenario and have now developed a highly varied pool of activities (see part 3).

Aside from outdoor activities, a closer relationship with farming also opens up opportunities. This is the case in Romania, for example, where the Law of the Mountain prioritises the economic development of mountain sites, by providing support for agricultural and also non-agricultural activities. In this way, the authorities are supporting the emergence of products bearing the label "produced in the mountains", to promote producers and processing businesses in mountain locations, and also "Local Gastronomic Points" where people can eat meals at mountain farms. Recognition of the value of agri-tourism and eco-tourism has also been reinforced by the Covid-19 pandemic, following which tourists have expressed a growing demand for activities further away from "mass" tourism, and which also support local economic development.

Notes

⁴⁸ Specifications of the Flocon vert label: <https://www.flocon-vert.org/wp-content/uploads/2023/07/Cdc-Flocon-Vert-2022-VF-23.pdf>



A balancing act between nature conservation and the development of "four-season tourism"

The development of year-round tourism offers ecological transition opportunities for mountain areas, but can also generate adverse external effects. For example, developing outdoor activities in protected spaces or on sites that were previously in a rest state for six months of the year; massive influx of vehicles to natural environments, etc. Therefore, as the IPCC reminds us, an important first step is to protect, maintain and even expand spaces that are free of human activity.

In fact, the IPCC declared in 2019 that only 28% of the Earth's surface remains pristine, spared the effects of human activities. And yet, when soils become damaged, their capacity to store carbon is reduced, which adds to the effects of climate change. Consequently, the IPCC experts recommend several solutions, including restoring ecosystems by limiting human activities (e.g. farming, urban development) and managing land along sustainable principles. A wide range of adaptation and mitigation responses has the potential to make positive contributions to sustainable development and enhancement of ecosystem functions and services. Examples could include "preserving and restoring natural ecosystems (...) biodiversity conservation, reducing competition for land, fire management, soil management, and most risk management options (e.g. use of local seeds, disaster risk management and risk-sharing instruments). Ecosystem-based adaptation can, in some contexts, promote nature conservation, and can even provide co-benefits by removing greenhouse gases (through improved carbon storage)⁴⁹.

Example of a practice outside the study scope

Greece: reducing the ecological impact of human activities in mountainous Natura 2000 sites

In January 2022, the Greek government opted to ban the construction of roads and infrastructure in six Natura 2000 sites in mountain areas, with a combined surface area of 974 km² (the Lefka Ori, Saos, Tymfi, Smolikas and Hatzi mountains). Human activities in land use and construction have a serious impact on ecosystem services such as flood control, carbon storage capacity and the development of biodiversity. In view of the increasing urbanisation and development of infrastructure for renewable energies, Greece therefore decided to minimise this expansion in the country's preserved and protected sites, which also proved beneficial for the local communities: more eco-tourism, less pollution, and so on.

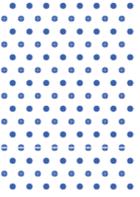
This means that today, only low-impact interventions are accepted in these spaces (e.g. erecting signs, maintaining paths); by contrast, motorised or nuisance-causing activities are prohibited (which also applies to wind farms).

Spain: the CANEM project (2022-2024) to better identify and add value to natural capital

In April 2022 the Catalan tourism body FGC, in association with the Catalan government and the CREA (Ecological and Forestry Applications Research Centre), launched a cooperation plan to tackle the climate emergency. The fruit of this collaboration is the CANEM project, devised to assess the stock of "natural resources and ecosystem services in tourist resorts", as the latter are committed to more sustainable operation. Deployment of the plan started in the mountain resorts of Vall de Núria and La Molina, with the objective of subsequent application in the other FGC-managed mountain areas.

Two objectives: to define the characteristics of the natural capital at the different resorts, and to introduce actions that increase this capital. Natural capital can be defined as a way of describing or quantifying the nature and behaviour of elements of a place, such as water, plants, animals and minerals. It follows that the objective of this plan is to be able to quantify the natural resources and ecosystems present at the different resorts, and to try and find places where this capital can be boosted through improvement actions.

Notes
⁴⁹ Source: IPCC Report 2019, Summary for Policymakers: https://www.ipcc.ch/site/assets/uploads/sites/4/2022/11/SRCCL_SPM.pdf



Going beyond ecosystem preservation, several territories are discussing how to manage tourist flows in certain areas that are currently or due to be protected, or in any mountain location, in order to respect the balances between the different functionalities of these lands (e.g. farming).

In **France**, for example, a national strategy of action to regulate visitor flows has been drawn up in collaboration with tourism sector professionals and the Grands Sites de France network. Unveiled in June 2023, this strategy has four main strands: 1/ creation of a shared knowledge base (resource-sharing, how-to guides, a network of local ambassadors, certification labels); 2/ raising awareness among tourists and the tourism sector; 3/ measuring and managing the visitor flows; 4/ supporting the regions in their regulation of visitor numbers (engineering, and skills upgrades for the tourism professionals)⁵⁰.

European cooperation – SpeciAlps2: measures for managing visitor flows in the mountains (2020 – 2022)

This project, created by the International Commission for the Protection of the Alps (CIPRA International) and the community network "Alliance in the Alps", was implemented in four pilot regions: the Tiroler Lech Nature Park (Austria), the Kamnik-Savinja Alps (Slovenia), Balme Mountaineering Village (Italy) and the town of Bad Reichenhall in the Bavarian Alps (Germany). Its aim is to pinpoint successful examples of tourism flow management, develop them and put them forward as a source of inspiration for other areas.

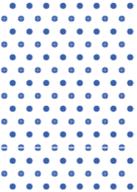
- Municipality of Balme in Italy (Lanzo valleys): counting the hikers on the protected "Pian della Mussa" plateau and coming up with possible solutions for controlling the numbers, chiefly through actions linked to options for accessing the site.
- Austria (Tiroler Lech Nature Park): the project team developed a plan for managing tourist visits, including an "awareness-raising" component to educate visitors and residents alike about Alpine nature, and the development of actions to manage visitor pressure in tourist areas; for example signage, managing mobility, monitoring numbers of people using the wild rivers and ponds for water sports activities, etc.). A steering group has been set up to monitor the implementation. The project team is also planning to increase the dedicated human and financial resources.
- German pilot region of Bad Reichenhall: here, the focus was on the issue of mobility, because the town is a traffic bottleneck, with tourist hotspots such as Lake Thumsee and the Nonner Oberland – popular starting points for hiking tours. On the one hand, parking space management and digital parking guidance systems are to provide the region with some relief from 2023 onwards, enabling visitors to find out in advance about the number and availability of parking options. Also, a workshop was held to identify opportunities for sustainable mobility in the region: e-bikes, shuttle buses, carpooling schemes and the expansion of the bicycle infrastructure. Similar experiments have been conducted in the Alps, with common features including efforts to communicate with visitors, consultation with local stakeholders, and the development of a suitable, considered public transport offer combined with access restrictions for users of private vehicles.
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European cooperation – Creating itineraries around mountain foothills for better distribution of tourist flows, with the “EMbleMatiC” project (2016-2019)

With the involvement of nine Mediterranean mountains (Canigó and Sainte-Victoire in France, Olympus and Ida in Greece, Pedraforca and Serra de Tramuntana in Spain, Etna and Gran Sasso in Italy, and Cika in Albania), the Interreg MED "EMbleMatiC" project aimed to rebalance tourist flows by directing visitors from popular coastal zones and peaks toward the foothills of these nine

Notes

⁵⁰ File "Gestion des flux touristiques" (Regulating visitor flows), French Ministry of Economy, Finance and Industrial and Digital Sovereignty, 2023



mountains, to boost local economies by involving local residents and sector actors, and to extend seasonality.

This cooperative project has helped co-build a new tourism offer in these mountain foothills, by creating nine eco-itineraries based on the iconic features of each territory and on ecological transition criteria (such as mobility, short circuits etc.). In Italy, for example, the project provided the means to build a path on the slopes of Etna, passing through villages and so giving visitors a chance to discover the local heritage and activities, with a view to rebalancing the tourist flows that were concentrated solely on summit and coast.

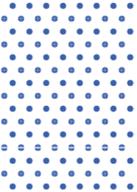
CLOSE-UP ON SKI RESORTS: IS A GREEN TRANSITION POSSIBLE WITHOUT CHANGING THE MODEL?

The importance of skiing in the different countries studied

Austria	Spain	France
<ul style="list-style-type: none"> - Estimated loss of winter business in Austria has increased from 600,000 to 1.5 million overnight stays, given the reduction in snow cover⁵¹ - 70% of slopes in Austria depend on artificial snow⁵² - Between 1994 and 2004, around 800 million euros were invested in snowmaking facilities⁵³ - The number of annual hours conducive to snowmaking has decreased by 26% between 1961 and 2020⁵⁴ - Since 1980, the non-skiing proportion of the population has climbed from 42% to 63%⁴⁶ 	<ul style="list-style-type: none"> - The number of skiable days per year is steadily decreasing in the Pyrenean ski resorts⁵⁵ - 56% of ski resorts in the Pyrenees could not operate without artificial snow in the context of 2°C of warming compared to pre-industrial levels⁵⁶ - 50% of slopes in Spain are covered with artificial snow⁵⁷ - The variation in ski resort opening dates (based on the availability of natural snow) has shifted from 5 to 55 days in low-altitude resorts and 5 to 30 days in medium-altitude ones⁵⁸ - in the last 10 years, 140 million euros have been invested in producing artificial snow 	<ul style="list-style-type: none"> - the tourist mountain economy generates 20 billion euros per year⁵⁹ - 250,000 jobs in the lowlands and valleys depend on the ski areas opening⁵⁴ - 39% of slopes in France operate using artificial snow - In 2019, snowmaking was the second-largest investment item for resorts, after mechanical ski lifts⁶⁰ - 63% of outdoor recreation professionals are seeing their activity disrupted by at least one significant effect of climate change (e.g. mountaineering, water sports...)⁶¹

Notes

⁵¹ Article, "Climate change and winter outdoor activities in Austria", 2021
⁵² Article, "Winter tourism in the climate crisis", CIPRA, 2023
⁵³ Article, "L'enneigement artificiel dans l'arc alpin" ("Snowmaking in the Alpine arc"), summary report, Hahn, 2004
⁵⁴ Article, "Mountain tourism and water and snow management in climate change context". J. Alp. Research, Reynard, 2020
⁵⁵ Over the period from 1960 to 2010 inclusive, there has been a significant reduction in the annual number of days with a snow layer of thickness 0 to 30 cm and 30 to 100 cm, in all ski resorts.
⁵⁶ IPCC – Data on Pyrenean ski resorts, 2021
⁵⁷ International Report on Snow & Mountain Tourism, Laurent Vanat, 2020
⁵⁸ "Climate change in the Pyrenees: impacts, vulnerabilities and adaptation" – IPCC, 2018, and Pyrenean Climate Change Strategy: A climate action cooperation strategy – IPCC
⁵⁹ Parliamentary report: "Mountain tourism and the challenges of climate change" (Le tourisme de montagne et les enjeux du changement climatique), Economic Affairs Committee of the French National Assembly, 2022
⁶⁰ General Commission for Sustainable Development: "Water in ski resorts: a resource under pressure", 2019
⁶¹ File: "The impact of climate change on mountain-based outdoor recreation", AURA region, 2021



Italy	Romania	Slovenia
<p>- In 2019, 13% of overnight tourist stays in the country were in mountain locations⁶²</p> <p>- 90% of ski slopes in Italy depend on artificial snow⁶³</p> <p>The cost of artificial snow has increased from 2 euros per m³ in 2021-2022 to 3-7 euros in 2022-2023⁵⁸</p> <p>In the Monte Cimone ski resort, 5 million euros were spent on snowmaking during the 2022-23 season⁶⁴</p>	<p>- 70% of ski slopes are equipped with artificial snowmaking systems⁵³</p> <p>- Half of skiable areas operate for fewer than 100 days per year, making insufficient profits to cover their investments (2017-2018 season)⁶⁵</p> <p>- 20% of mechanical ski lifts were installed or upgraded within the last 15 years⁵²</p> <p>- in Poiana Brasov (one of the highest-regarded ski resorts), 25 million euros were invested in snowmaking in 2011⁶⁶. A further 285,000 euros were invested in 2022, to add 10 new snow cannons.⁶⁷</p>	<p>- 34% of overnight tourist stays in the country are in mountain locations (2019 – Statistical Office of the Republic of Slovenia)</p> <p>- 40% of slopes in Slovenia depend on artificial snow (2021 – Statista)</p>

Ski resort transitions that differ according to vulnerability to climate change

Decreased snow cover has a severe impact on the local economy, especially the parts of it that rely on skiing activity. A number of trends can be observed:

- fewer winter visitors to ski resorts at medium and low altitudes;
- shortening of the ski season / reduction in the number of skiable days (which results in fewer overnight stays);
- increased natural hazards, leading to high costs for the local authorities.

There is great contrast between the situations in different mountain areas. High mountain locations are maintaining a development model that is still squarely focused on Alpine skiing. The closure of resorts positioned lower down, coupled with the prospect of continued precipitation at altitude, are effectively pushing higher-altitude resorts to stick to the "just ski" model.

At medium altitudes (up to 1,500 m) the situation is very different, but on the whole, resorts are keen to keep some Alpine skiing facilities in operation, where technical resources permit (i.e. snowmaking). Therefore, there are numerous climate change adaptation strategies, depending on the economic and geographic characteristics of the mountain areas, and sometimes relying on individual actions customised to the different resorts, as a reflection of the local exposure level and the scale of the expected impact. This is especially true in countries such as Spain and Italy which, like France, have ski resorts at a range of altitudes.

The climate change adaptation strategy of Italy's Aosta Valley, partly directed at issues around winter sports

In its [Climate change adaptation strategy](#), Italy's autonomous Aosta Valley Region highlights the fact that resorts at altitudes above 2,000 m will remain competitive, thanks to snow cannons. However, the Region also recommends implementing adaptation measures that must support the transition in the following fields:

Notes

⁶² Article, "Turismo in Italia: Numeri e potenziale di sviluppo" (Tourism in Italy: Figures and Potential for Development), A. Petrella, Bank of Italy, 2019

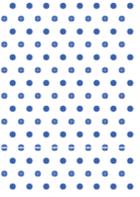
⁶³ Nevediversa 2023: Winter tourism in the era of climate crisis, 2023

⁶⁴ Euronews, "Delaying the inevitable: Italy's desperate attempts to revive snowless ski resorts", 2023

⁶⁵ Article, "The Development of Ski Areas in Romania. What environmental, political and economic logic?", Cernaianu, Sobry, 2020

⁶⁶ Romanian National News Agency, "Romania's ski area opens at Poiana Brasov Mountain resort", 2011

⁶⁷ Romania Insider, "Brasov City Hall purchases 10 new snow cannons for the Poiana Brasov ski slopes", 2022



- knowledge: the need to boost knowledge about the effects of climate change, about the possible adaptation scenarios (environment, economy, resource management, risks, etc.), and about the analysis of the resorts' vulnerability, so as to optimise the definition of pertinent strategies (continue with activities as they are, modernise the equipment, dismantle, change to new activity, etc.);
- diversification: advantage of promoting new strategies for tourism and marketing (such as diversification, adjusting the tourist season(s) and developing digital tools) and linking existing resources together more effectively (for example culture, gastronomy, well-being, health, "cool hubs");
- information / skills: there is a need to ramp up efforts to train and inform tourism providers about the adaptation actions that should be included in the tourism offer;
- transport: the importance of adapting transportation flows and modes in order to develop new practices (diversification of tourist destinations and activities);
- governance: support the upgrading of tourism strategies at municipality scale; encourage cooperation between towns; specify the guidelines for private businesses in order to steer investments and resort management towards achieving environmental and energy-use objectives.

Keeping skiing going for as long as possible: a short-term perspective

Despite reduced snow cover, shorter seasons and fewer overnight stays, skiing remains at the heart of the economy, as well as anchored in the local culture, for many mountain areas. This means that often, public and private stakeholders alike keep providing support through sizeable investments, to maintain the snow cover or minimise its shrinkage at least in the short term, and sometimes the medium term (in the scenario of the climate warming more than 3°C compared to pre-industrial levels, these technologies would not prevent the closure of most ski areas). Also, they still have a desire to host major sporting events that require special equipment⁶⁸. This contributes to their local economy and profitability, linked in particular to sales of ski passes.

In this way, the majority of investments to maintain snow cover at resorts involve funding for "snow farming" (see box below), and/or the development of infrastructure considered to be "more eco-friendly" because it consumes less energy and water (snow cannons, ski lifts, etc.) and artificial snow production, with all its inherent resource management issues (water and energy).

This innovation-led approach does enable some resorts to deliver an environment-friendly and also profitable response, whereas others consider it short-term "tech solutionism" that will not save them from the inevitable in the long term. As such, even if 50% of Europe's ski resorts operated using artificial snow, staying within the framework of 2°C of warming, the activity of 27% of resorts could be in jeopardy. With 4°C of warming, this figure would rise to 71%⁶⁹.

Close-up on snow farming: a technique that helps ecology?

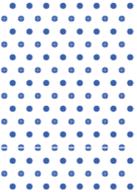
Snow farming (or "snow banking") is a technique whereby snow is piled up during the winter, close to the slopes, and then covered with sawdust or wood shavings, to an average height of around 50 cm, until the start of the next season. This layer of natural materials shields the snow from summer heat and prevents it from melting. Generally speaking, it is impossible to conserve the entire volume of snow stored from the previous winter. From one winter to the next, about 20% is lost. According to some ski resorts, "this technique is spectacular, astonishing and above all, environmentally friendly. When the stored snowpile comprises natural snow, the snow farming process mitigates the amount of water used to produce artificial snow with snowmaking machines at the start of the season"⁷⁰. Nevertheless, snow farming features among the artificial snow production techniques, and as such can be considered one of the "intensive forms of snow

Notes

⁶⁸ Courchevel spent 1.4 million euros on bringing its infrastructure into line with standards, in order to host the Women's Skiing World Cup in December 2010 – Article "[Les stations de ski explorent de nouvelles pistes](#)" (*Ski resorts are exploring new routes*), Guillaume Errard, 2010

⁶⁹ Article, "Climate change exacerbates snow-water-energy challenges for European ski tourism", *Nature Climate Change*, 2023

⁷⁰ Website of the Haute Savoie Nordic domain: <https://www.haute-savoie-nordic.com/oupratiquer/snowfarming/>



management (that) are a blemish on the Alpine landscape (visual "scars" in the snow blanket at the snow storage site) and require the use of heavy mechanical equipment" (= energy use, noise and exhaust emissions)⁷¹.

Making artificial snow also has an impact. According to a report by the International Commission for the Protection of the Alps (CIPRA), almost 1,000 litres of water are required to produce around 2.5 cubic metres of artificial snow, or around one million litres of water for one hectare of ski slope⁷². In the French Alps, artificial snow production consumes 20 to 25 million m³ of water per year, equivalent to the annual water use of a city the size of Grenoble⁷³. Artificial snow accounts for 5 to 10% of the price of a ski pass⁶⁶. The Italian environmental association *Legambiente* points out that of the Alpine countries, Italy is one of the most dependent on artificial snow (90%), followed by Austria (70%), Switzerland (50%) and France (39%), compared to 25% in Germany⁷⁴. According to the experts in this association, the cost of producing artificial snow is also increasing, from about 2 euros per cubic metre in 2021-22 to 3-7 euros per cubic metre in 2022-23⁶⁷. Making artificial snow also results in higher energy consumption. This means that total electricity demand for artificial snow production is set to increase by 18% in a scenario of 2°C of warming (compared to pre-industrial levels), and 24% in a 4°C scenario⁷⁵.

Spain: the Aragon region sets its sights on the 2034 Winter Olympics

In Aragon, snow tourism represents 7% of GDP, and skiers generate roughly 170 million euros of revenue for the area each season⁷⁶. This region has a climate change strategy with a target date of 2030. Alongside this, it wants to create a Snow Plan to make the Spanish Pyrenees a major ski destination for the 2034 Winter Olympic Games. This Plan would be based on three essential components: investment in snow infrastructure, ramp-up of the sports training project, and hosting international sporting events⁷⁷.

Slovenia: close-up on Krvavec and its smart equipment for improved energy management

Created from nothing in 1958, Krvavec is a ski resort situated 25 km from the Slovenian capital Ljubljana. This resort, one of the biggest in the country, is not part of a village but managed by a private company. It is visited by 150,000 to 200,000 skiers per year. There are not many accommodation options at the resort, which mainly receives day visitors (there is one hotel and a few private apartments, offering 300 beds in total). The ski resort would like to reduce its energy expenditure linked to artificial snow production, ski lift operation and heating. With the European project Smart Altitude, the resort has been able to fund the development of more modern equipment, enabling "smart" management of snowmaking and improved energy efficiency in the tourist accommodation. According to the resort operators, the main advantages of the innovations are lower operating costs – especially those linked to electricity and gas – an improved image for the ski resort, and a more enjoyable visitor experience.

Notes

⁷¹ Stance of CIPRA Switzerland: https://www.mountainwilderness.fr/IMG/pdf/df_652_cipra_position_gletscherabdeckungen.pdf (May 2007)

⁷² "L'enneigement artificiel dans l'arc alpin" ("Snowmaking in the Alpine arc"), summary report, Felix Hahn, CIPRA-International (2004)

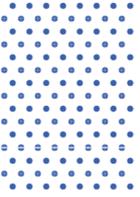
⁷³ Educational memo by the France Nature Environnement association (AURA): "artificial snow" – page 3

⁷⁴ Legambiente Environmental association – *Nevediversa report 2023* – page 34

⁷⁵ Article, "Climate change exacerbates snow-water-energy challenges for European ski tourism", *Nature Climate Change*, 2023

⁷⁶ Figures from the Spanish Tourist Association of Mountain Ski Resorts (ATUDEM), 2016 – Report by the OPCC CTP (Pyrenees Climate Change Observatory, Working Community of the Pyrenees), "Climate change in the Pyrenees: impacts, vulnerabilities and adaptation", 2018

⁷⁷ Article: "*Aragón trabaja en un proyecto estratégico de inversiones en la nieve y en un plan de formación de deportistas*" (Aragon is working on a snow-related strategic investment project and on a training plan for athletes), Government of Aragon, June 2022



A transition towards "mountain resorts"

Climate change is prompting ski resorts (especially those most affected by reduced snow cover) to rethink their development model. This involves a shift from being ski resorts (with all snow-based activity, concentrated in the winter period) to so-called mountain resorts, offering a variety of outdoor activities all year round (same principle as "four-season" tourism).

In **Slovenia**, the local authorities in mountain areas have had to rethink their activities gradually over time, adapting and diversifying the winter activities, as well as developing alternatives for summer (e.g. Kranjska Gora, Rogla...). This evolution is aided by a level of geographical proximity between these resorts and the small mountain towns and villages, since unlike the large Alpine resorts that followed the 1960s-70s model, few of the Slovenian resorts were built from nothing. The mountain areas also enjoy a good level of summer tourism, often exceeding the winter numbers, enabling a more effective shift towards more diversified practices throughout the year. For many destinations, the development of out-of-season tourism is as much about alleviating summer concentrations of visitors as creating an alternative to diminished winter activities.

France: the end of skiing anticipated well in advance for the Métabief ski resort

The Mont d'Or Mixed Syndicate (Syndicat Mixte du Mont d'Or, SMMO) manages the Alpine ski resort of Métabief, located in the Jura mountains at an altitude ranging between 900 and 1,400 m. The skiable area offers approx. 40 km of slopes and has about twenty ski lifts. Due to twofold challenges: financial (costly investments, cost of producing the artificial snow that covers 40% of the skiable area) and technical, the resort opted as far back as 2016:

- to plan for Alpine skiing to end by 2030-2035, in alignment with climate-related projections;
- to adopt decisions consistent with a route towards the end of Alpine skiing: investment to maintain the quality of the ski lifts (rather than installing new ones), development of outdoor activities (MTB, trail running/walking, etc.) and new activities (e.g. summer sledging), and promotion of the natural and cultural heritage.

Spain: In Catalonia, "mountain resorts" open all year round

Over the last decade in Catalonia's ski resorts, the total number of non-snow activities has jumped from 42 to 69, the most popular being hiking trails (provided by all the resorts) and mountain biking, neither of which require a lot of dedicated infrastructure. A second group of activities, chiefly intended for families with children, includes adventure trails, play areas, some water sports and horse or pony rides. The most recent additions fall into the category of discovering nature and heritage, with tours and outings to nearby places valued for their environmental and/or cultural qualities⁷⁸.

Notes

⁷⁸ Fraguell et al., 2017

Stations	2010	2015	2019																						Total
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
Baqueira-B.	2	7																						6	
Boí-Taüll	4	3																						4	
Espot Esquí	0	1																						9	
La Molina	13	12																						13	
Masella	1	3																						7	
Port-Ainé	0	4																						6	
Port Comte	6	6																						7	
Tavascan	1	3																						5	
Vall de Núria	8	9																						7	
Vallter 2000	7	5																						5	
Total	42	53	4	2	2	10	1	3	1	3	6	5	3	3	3	5	3	1	3	1	3	3	2	2	69

Original (png, 62k) [↓](#)

Tableau 2 : Activités non hivernales dans les stations de Catalogne espagnole (2019)

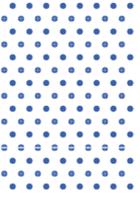
1. Excursion à cheval ou poney / 2. Navigation / 3. Tir à l'arc / 4. Randonnée / 5. Gyropode Segway / 6. Tubbies / 7. Spas / 8. Observation de la vie sauvage / 9. VTT / 10. Pêche et sports nautiques / 11. Observatoires / 12. Patrimoine / 13. Télésiège / 14. Circuits d'aventure ; parcs de loisirs / 15. Alpinisme, escalade / 16. Nordic walking / 17. Quads, karting / 18. Golf frisbee / 19. Course virtuelle, trail / 20. Tours en véhicules tous-terrains / 21. Cyclisme / 22. Paintball

Source : compilé à partir des sites internet des stations (consultés en février 2019).

Italy: Piani di Artavaggio: a new approach to winter tourism that generates jobs and activities throughout the year

In this part of the valley of Valsassina, mountain tourism has changed radically over the last two decades. In 2007, the municipality of Moggio acquired ownership of ski lifts that had been abandoned in the 2000s due to lack of snowfall. The town returned the cable car to service, but also dismantled the ski lifts at higher altitudes. This type of operation was unusual at the time. The area has since seen an influx of cross-country skiers, snowshoers and hikers. Then in the summer, mountain bikers, e-bike users and hikers find the environment to be better protected. Today, there are some thirty people working at the site's five refuges, as well as four cable car operators, four seasonal workers for the "magic carpet" lifts in winter, and three ski instructors.





4. CHALLENGES FOR MOUNTAIN AREAS IN TERMS OF WATER RESOURCES

MOUNTAIN AREAS ARE SUBJECT TO GROWING TENSIONS AROUND WATER RESOURCE MANAGEMENT, RESULTING IN CONFLICTS OVER USE

Increase in water consumption alongside a reduction in the quantity available

In Europe, projections indicate that annual demand for water in the context of climate change will tend to increase considerably: the figure looks set to rise from +8% to +25% in a scenario of 2°C of warming, and from +14% to +42% with 4°C of warming (compared to pre-industrial levels)⁷⁹.

Austria	Spain	France
<ul style="list-style-type: none"> - Glaciers to reduce in area by 20% by the end of the century⁸⁰ - 23% reduction in available groundwater expected by 2050⁸¹ - 11-15% increase in water demand expected by 2050⁷² - 10% increase in the water volume deficit during winter periods (1961 to 2005)⁸² - 48 million m³ of water used each year to make artificial snow⁸³ 	<ul style="list-style-type: none"> - 12% reduction in the available water resource in the Pyrenees, since 1980⁸⁴ - 14% to 40% reduction expected in the available water resource in the Pyrenees, in a scenario of 2°C of warming⁸⁵ - 50% of stations measuring flow in the Ebro river basin, alongside the Pyrenees, record a significant reduction in annual water flow since 1950⁸⁶ - Up to 20% reduction in groundwater recharge capacity predicted for certain areas of the Pyrenees by 2050⁷⁸ 	<ul style="list-style-type: none"> - 20% to 30% of the volume of French glaciers lost since 1980⁸⁷ - 32% of ski resorts equipped with snowmaking facilities⁸⁸ - artificial proportion of snow cover in skiable areas rising from 19% to 35% between 2010 and 2019⁸⁹ - Rate of water withdrawal in mountain areas stands at 278 m³ per inhabitant, compared to 150 m³ per inhabitant on average⁸²

Notes

⁷⁹ Study, "Climate change exacerbates snow-water-energy challenges for European ski tourism", *Nature Climate Change*, 2023

⁸⁰ Sixth national report of Austria, April 2022

⁸¹ Article, "Austria's Water Treasure", Federal Ministry of Agriculture, Regions and Tourism, 2021

⁸² Holzmann et al. Federal Ministry of Agriculture, Forestry, Regions and Water Management (2010)

⁸³ Article, "Austria's Water Treasure", Federal Ministry of Agriculture, Regions and Tourism, 2021

⁸⁴ Pyrenees Climate Change Observatory, OPCC-CTP, 2018

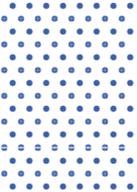
⁸⁵ Minimum quality requirements for water reuse in agricultural irrigation and aquifer recharge – Towards a legal instrument on water reuse at EU level. Alcalde-Sans, L., & Gawlik, B.M., 2017

⁸⁶ Pyrenees Climate Change Observatory, "Water resources", 2023

⁸⁷ Climate Change Adaptation Resource Centre, Ministry for Ecological Transition & Territorial Cohesion, "Mountains, on the frontline of climate change", online

⁸⁸ Annual report of the French Court of Accounts, 2018

⁸⁹ Report from the Ministry for Ecological Transition, "Water in ski resorts: a resource under pressure", 2019



Italy	Romania	Slovenia
<ul style="list-style-type: none"> - 5 regions of Italy affected by extreme drought in 2022, resulting in the mobilisation of 36.5 million euros of emergency funding⁹⁰ - Water stress expected to increase by 25%⁹¹ during this century - 65% drop in winter precipitation over the period 1991-2020⁹² 	<ul style="list-style-type: none"> - Reduction of snow cover in more than 80% of resorts between 1961 and 2010⁹³ - In 2022, the Danube experienced its lowest level for 30 years, while Romania depends on it to supply 44% of national water demand⁹⁴ - Over the period from 1961-2010, the Carpathian mountain areas experienced between two weeks and six months of moderate drought per year⁹⁵ 	<ul style="list-style-type: none"> - Risk of the country's last two glaciers (Triglav and Skuta) disappearing in the coming decades⁹⁶ - Low precipitation in summer and heavier precipitation in winter, increasing the likelihood of natural hazards

In areas with medium-sized mountains, recent studies have recorded less summer precipitation, maintained winter precipitation (falling as rain rather than snow below 2,000 m) and widespread melting of the glaciers, which are gradually losing their function of storing water ahead of the warmer months. These changes have a significant impact on farming (upland and lowland), hydroelectricity, tourism and fishing.

Effects on winter and summer tourism

In the domain of winter sports, the presence of water (and snow) above 2,000 m is important, and incites resorts situated at such altitudes to pursue their current development model without the water resource being a determining stake in either the short or the medium term.

At lower altitudes, there is a more of a need to use artificial snow, given the greater pressure on the water resources and also on the environment, due to the multiplication of hillside storage reservoirs⁹⁷. Even where water is abundant in certain massifs, such as the Julian Alps in Slovenia, periods of heavy use of snow cannons put stress on local resources. When the hydric conditions are less favourable, conflicts over usage are more pronounced and take their toll on local provision of water. In Romania, the increasing use of artificial snow results in the harvesting of large quantities of water, especially from lakes, rivers and human-made pools in mountain areas. These removal operations increase the pressure already affecting the resource, and also incur risks for other activity domains (farming, hydroelectricity generation and tourism)⁹⁸. The same is true in the Spanish Pyrenees, where the snow cover looks set to halve by 2050, according to the projections of the Pyrenees Climate Change Observatory.

The issue of dwindling water resources and increased demand is also acutely present in summertime, when the mountain areas are dealing with increased numbers of tourist visitors (who are tending to change destination, due to higher temperatures on the Mediterranean coast, coupled with the development of year-round mountain tourism...).

Regarding places closer to valley level, the reduction of summer rainfall, coupled with the glaciers melting more quickly, exacerbates the risk for inputs to watercourses and rivers, compromising their capacity to provide flow for generating hydroelectricity and irrigating crops. In fact, 68% of lowland farmland depends on a supply of mountain run-off for its irrigation⁹⁹.

Notes

⁹⁰ World Bank, "Water crisis in Italy", 2023
⁹¹ World Health Organization, 2007, and 2023 report by Climate Change Post (online)
⁹² Joint Research Centre, European Commission, "The ongoing drought in Northern Italy threatens agriculture yields and energy production, Commission studies warn", 2022
⁹³ *Impacts du changement climatique sur l'écoulement des rivières en Roumanie (Impacts of climate change on river flow in Romania)*, 35th annual conference of the International Association of Climatology – AIC 2022 (Liliana Zaharia, Gabriela Ioana-Toroimac, Gabriela Adina Morosanu).
⁹⁴ Romania Journal, "Water crisis in Romania", 2022
⁹⁵ Article: "Estimating the water needed to end the drought or reduce the drought severity in the Carpathian region" – Hydrol. Earth Syst. Science, 19, 177-193. Antofie, T., Naumann, G., Spinoni, J. & Vogt, J. 2015
⁹⁶ Slovenian Environment Agency, 2022
⁹⁷ 142 hillside storage reservoirs counted in Italy by the Legambiente Environmental Association
⁹⁸ "The threat of climate change for the ski slopes in Romania," (January 2022)
⁹⁹ IPCC report, "Climate Change and Land", 2020

Hydroelectricity and farming under particular stress

Austria	Spain	France
<ul style="list-style-type: none"> - 14,747 megawatts of hydroelectric power produced in 2021¹⁰⁰ - Generation fell from 45 TWh in 2020 to 42 TWh in 2021, due to a reduction in the water level¹⁰¹ - 87% of farm operations are in mountain areas¹⁰² 	<ul style="list-style-type: none"> - 20,425 megawatts of hydroelectric power produced in 2021¹⁰³ - A 48% drop in hydroelectricity generation in 2022 compared to 2021, due to droughts¹⁰⁴ - 3.77 million hectares of farmland benefit from irrigation systems¹⁰⁵ 	<ul style="list-style-type: none"> - 25,494 megawatts of hydroelectric power produced in 2021⁹⁸ - In 2022, hydroelectric power production was 22% lower than in 2015-2019¹⁰⁶ - 2.71 million hectares of farmland benefit from irrigation systems⁹⁸
Italy	Romania	Slovenia
<ul style="list-style-type: none"> - 22,593 megawatts of hydroelectric power produced in 2021⁹⁶ - 90% of electricity used in South Tyrol comes from hydroelectric power plants¹⁰⁷ - 3.97 million hectares of farmland benefit from irrigation systems⁹⁸ 	<ul style="list-style-type: none"> - 6,593 megawatts of hydroelectric power produced in 2021⁹⁶ - 1,232 water storage reservoirs contribute to hydroelectric power production and irrigation¹⁰⁸ - 80% of hydroelectric power production facilities are located in the Carpathians¹⁰⁹ - 30% of the country's farmland is in mountain areas¹¹⁰ 	<ul style="list-style-type: none"> - 1,354 megawatts of hydroelectric power produced in 2021⁹⁶ - 70% of Slovenia's farmland is in mountain areas (Slovenia ICID – International Commission on Irrigation and Drainage)

Beyond the effects of climate change on biodiversity and ecosystems in the mountains, there are also severe impacts on farming and forestry. Higher temperatures, changes in precipitation patterns and extreme weather events can alter crop growth cycles, reduce the diversity and size of tree species, and exacerbate the risk of droughts and forest fires. These harmful effects are already generating conflicts of use, especially over water.

A great many of the tributaries and groundwater flows that feed into the basins of the Ebro and Bidasoa rivers in Spain, and the Adour, Garonne and Aude in France, originate in the Pyrenees mountain range. The Pyrenees contain 70% of the total flow of the Ebro, which passes through the autonomous community of Catalonia¹¹¹. These mountains are a crucial element of water provision, not only for farming and electricity generation but also for industry and domestic water use.

The reduced resource also affects farming activities and energy generation in Italy. In the Aosta Valley, drought periods have led to a need for arbitration to divide water resources between hydroelectric power stations and downstream agricultural activities. In the Friulian area of the Dolomites national park, the catchment basin of the Meduna and Cellina rivers, there is insufficient water. In 2022, due to low levels in multiple areas (snow cover, precipitation, water table and

Notes

¹⁰⁰ Statista, "Leading countries in cumulative installed hydropower capacity in Europe in 2021"

¹⁰¹ RFI, "Climate change challenges hydropower-dependent Austria", 2023

¹⁰² Rural Development Program Factsheet, Austria, 2023

¹⁰³ Statista, "Leading countries in cumulative installed hydropower capacity in Europe in 2021"

¹⁰⁴ National Grid Operator data, REE, 2022

¹⁰⁵ File: "Water resources across Europe – confronting water scarcity and drought", European Energy Agency, 2009

¹⁰⁶ Report by France's High Council on Climate, 2023

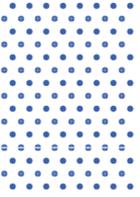
¹⁰⁷ BBC, "The Alpine villages producing their own power", 2022.

¹⁰⁸ Article, "Romania: Integrated Water Resources Rapid Assessment", World Bank, 2014

¹⁰⁹ Article, "Water resources in the Romanian Carpathians. Genesis, territorial distribution, management", Gastescu, 2014

¹¹⁰ Rural Development Program Factsheet, Romania, 2023

¹¹¹ Observatorio Pirenaico para el Cambio Climático – Comunidad de Trabajo de los Pirineos (Pyrenees Climate Change Observatory – Working Community of the Pyrenees) [OPCC-CTP], 2018



artificial lakes), there was a need to change the rules governing division of the resources (hydroelectricity, farming) and the irrigation processes (creation of extra reservoirs, use of water from disused quarries, drip-feeding...)¹¹².

In Romania, river flow is dwindling in parallel with an increase in domestic electricity use, resulting in a risk to farming activity, hydroelectricity production and the development of tourist activities, in mountain areas specifically¹¹³. To address these problems, the Law of the Mountain in Romania sets limits on water use in mountainous areas of the country. In particular, it prohibits water being used for hydroelectric power plants without first meeting the needs of wild and domestic animals, or where the local natural environment would benefit from the water in question. When construction projects are launched for micro-hydroelectric power plants, they must be approved by the local departments responsible for forest management and by the local administrative authorities¹¹⁴.

STRATEGIES AND ADAPTATION MEASURES

Variable degrees of water consideration in national strategies

Today, the water resource issue is an important element of climate change adaptation strategies, with special attention paid to farming activities and management of the water table during droughts.

In Austria, the National Strategy for climate change adaptation, and corresponding operational action plan, devote particular attention to water resources, yet do not propose specific actions for mountain areas. This strategy particularly considers the need to guarantee the good ecological health of the water resources, ensure that they receive sufficient supply, improve the processes of informing and coordinating key players, use the resources responsibly, control flood risks, etc. The national KLAR! programme dedicated to rural territories (including mountain areas) also provides a means to address this issue, by funding measures to adapt water resource management to the effects of climate change.

In Italy, the National Climate Change Adaptation Strategy highlights the need to improve the systems used for monitoring and measuring water management and for providing alerts and information, plus the need to develop tools that aid negotiation and participation. The 2023-2027 plan for strategic tourism development, for its part, states the importance of ensuring the perennial nature of the snowy mountains through better management of the water resources.

In Spain, a national strategy for water management in a climate change context was adopted in 2022. Immediately afterwards and by way of a contribution, in 2023 the Ministerial Council approved the hydrological plans, emphasising the aspect of combating climate change. In total, these plans represent more than 6,500 measures, which will enable the mobilisation of 22,844 billion euros of investment (2023-2027). The largest budget items will be put towards drainage infrastructure (6,643 million) and the next-largest to irrigation (5,070 million).

Wide diversity of adaptation strategies depending on local situations

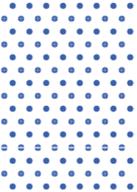
The level of awareness around this factor is more variable in mountain areas. There are contrasting situations between high-altitude areas, which continue to receive precipitation and snow cover, notably enough for them to maintain winter sports activities (with no significant issues linked to the water resource), and medium- or low-altitude areas, which face multiple conflicts over water use and issues relating to infrastructure (hill dams and reservoirs).

Notes

¹¹² Legambiente Environmental Association – [Nevediversa report 34](#)

¹¹³ Climate Change Knowledge Portal – [Country Summary – Romania](#)

¹¹⁴ Article 13, Law of the Mountain, Romania



In **Austria**, for example, there are noticeable differences between the themes being tackled by the territories trying to adapt to climate change. In Tyrol, for example, territories are mainly focusing on tourism, the mountain economy, water management and especially water shortages, particularly in ski resorts.

This Land's strategy of climate change mitigation and adaptation specifically addresses the issue of water and the necessity of adapting its management, via the following components:

- long-term safeguarding of the water resources as habitat and a means of subsistence;
- ensuring the provision of high-quality drinking water;
- ecologically sound purification of waste water;
- reinforcing protection of the population against natural hazards, in changing climatic conditions.

It must be noted that with regard to water management, infrastructure condition is a recurrent issue, with drinking water losses through leakage ranging from 20% to 40% depending on the European country. As water is managed at local level, the investment requirements often far surpass the financial capacities of the regional actors, which stimulates discussions about privatising water (e.g. in Spain, Slovenia...).

In addition, several towns and cities in Austria have implemented climate change adaptation policies specifically targeting water. This is the case in Salzburg, for example, which is already suffering from the effects of climate change – experiencing a drop in water table levels, and risks to the supply of water for both drinking (since development for tourism has increased the demand for water) and hydropower generation – and whose nearby mountains can no longer fulfil their water storage role.

To respond to this situation, Salzburg has applied several measures in the framework of its climate change adaptation policy, including:

- installation of an information system about water;
- development of a hydrological information system for flood prediction;
- implementation of projects to protect against floods;
- increasing awareness with regard to drinking water use (a campaign called "*TrinkWasser*");
- creation of a drinking water provision network.

A need for improved knowledge and engineering

Although the question of water management is factored into national policies on climate change adaptation, and also into certain local adaptation strategies, approaches specific to mountain environments are still quite rare, which makes it difficult for the local stakeholders and municipalities to anticipate the near future and deploy effective adaptation strategies.

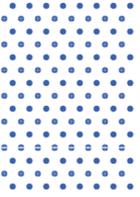
One of the difficulties is the huge diversity of mountain environments with regard to this resource. This diversity, arising from differences in altitude, orography, climate, geology etc., requires a higher capacity for analysis and engineering, which remain underdeveloped for these territories. This analytical capacity is crucial for devising future public policies, but also, further upstream, for making the relevant actors (e.g. elected officials, residents) more aware of the changes occurring.

Knowledge about the availability and use of resources is still only partial at local level, and could be improved in order to guide public policies, provide information and involve all the actors more effectively in the change processes under way (e.g. both public and economic stakeholders, tourists, citizens, and so on).

The Pyrenean strategy on climate change, for example, takes on this challenge and spotlights the need to improve knowledge about the status and availability of water resources at the top of water catchment basins, based on studies at Pyrenees-scale. Also, the need to promote integrated management measures applicable to the whole area, particularly in the most vulnerable sectors. The Strategy identifies two action routes:

- evaluate the availability of water resources based on climate change scenarios and demand modelling, at the scale of the mountain range;
- promote measures for managing the water offer and demand in the most vulnerable sectors.

Several projects in application are also targeting the same thing, at Pyrenees scale (PIRAGUA project) and for the Alps (RESERVAQUA project), with the objective of increasing knowledge about the water resource to improve the way it is managed.



PIRAGUA: characterising the water cycle in the Pyrenees against the backdrop of climate change

Under this project¹¹⁵, coordinated by the Spanish National Research Council (*Conseil supérieur de la recherche scientifique, CSIC*)¹¹⁶, the partners involved conducted nine studies and drew up a strategy to assess future water resources (by 2030 and 2050) in the Pyrenees based on projections about climate change and future water use, to measure the impact of the Pyrenean region's main economic activities on surface water resources, and to explore adaptation strategies.

RESERVAQUA: improving knowledge about water resources at Alpine sites

The aim of the RESERVAQUA project¹¹⁷ is to characterise the water resources at cross-border scale between the Canton du Valais (Switzerland), and two regions in Italy: the autonomous Aosta Valley and the Piedmont.

The cross-border regions are facing similar problems with regard to water resource management. As such, the partners have identified the obstacles encountered in the regions, and have concluded that:

- there was insufficient knowledge about the water resources used and about potential stored or unexploited reserves in the Alpine zone,
- there were no known joint or shared political instruments for managing water resources in the cross-border zone.

Consequently, the partners conducted a study on the resource availability (anticipation of water deficits on the Alpine pastures, data collection, development of criticality indices) in the cross-border Alpine zone. For each problem set, the strengths and opportunities of the area were identified, along with possible response measures (e.g. measure drinking water catchments, adapt herds to the resources...). Next they turned their attention to developing integrated water management strategies for mountain and rural areas, with a view to the long-term use of Alpine water resources and protection of their quality.

All these data have contributed to the [creation of a map-based cross-border information system](#), which provides data about meteoric water, surface water, groundwater and management of the water resource, which makes it easier to devise water preservation measures.

Notes

¹¹⁵ PIRAGUA was 65% co-financed by the European Regional Development Fund (ERDF) as part of the Interreg V-A Spain-France-Andorra Programme (POCTEFA 2014-2020).

¹¹⁶ The Spanish National Research Council (CSIC) is the main public governmental body for research in Spain. Assigned to the Spanish Ministry of Education and Science, the CSIC is multi-disciplinary and carries out research in all scientific domains, thanks to over a hundred centres throughout Spain.

¹¹⁷ Funded by the V-A-Italy-Switzerland Interreg programme from 2018 to 2023

5. METHODS OF APPLYING ADAPTATION AND TRANSITION STRATEGIES IN MOUNTAIN AREAS

LOCAL, MULTI-LEVEL GOVERNANCE DEDICATED TO MOUNTAIN AREAS

Horizontal and vertical cooperation

Climate change adaptation in mountain areas encompasses many domains (water resource management and protection, spatial planning and urbanisation/land take, renewable energy development, agriculture, tourism, traditional crafts and more) which overlap with the activities of various ministries (at either national or regional scale, depending on the country's level of decentralisation). The main ministries concerned are those responsible for the economy (which often manage tourism), the environment and climate, and agriculture. This calls for some coordination to make sure each one is contributing at its level. Similarly, plans will include some organisation between the different territorial levels, from national to local.

In Spain, Catalonia has created a consulting body exclusively for mountain issues

The approval and entry into effect of Law 2/1983 on the High Mountains led to the creation of a collective body, the General Council on Mountains, which acts as a consultant and advisory body for all questions on mountain-related policy. It is attached to the Ministry of Territory and Sustainability. Its members are representatives of the *Generalitat* Government departments, representatives of the *comarca* (= county) councils¹¹⁸, one representative chosen by the municipality/ies of each of the three largest mountain massifs, and two representatives of isolated mountain settlements, designated by the associative organisations of the local authorities.

Romania: a multi-level territorial organisation dedicated to mountain areas

Romania has introduced specific governance dedicated to mountain areas. It is made up as follows:

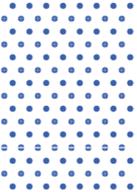
- at national level, a national agency for mountain areas;
- at mountain range level, committees for each of the nine massifs, each with the objective of escalating the needs and problems encountered at local level. They are composed of 18 members from different backgrounds (associations, LAGs (local action groups) in the LEADER programme, etc.);
- at mountain territory level, a network of seven mountain development regional centres, represented by a mountain expert/specialist who gathers information on the ground;
- at local level, 32 mountain development offices. Each one has 20 to 40 settlements assigned to it (corresponding to two mountain basins).

A National Council of Mountain areas, chaired by the Prime Minister, forms the link between the government and the different territorial levels taking action in mountain areas.

This governance plays a part in improving the inclusion of mountain considerations in different public policies.

Notes

¹¹⁸ A *comarca* is intermediate in size, between a canton and a district (equivalent to a sub-prefecture). It is a geographical, historical, cultural, ethnographic, economic etc. division within a defined territory, around a commercial town centre that serves as its county seat.



Transnational cooperation at massif scale

Cross-border work at mountain range scale has also been highlighted as a source of added value, in terms of either political engagement, strategy definition and involving the territories themselves.

Political and operational engagement, two approaches compatible with the Alpine Convention and the European Union Strategy for the Alpine Region (EUSALP, or SUERA in French)

The purpose of the international treaty of the Alpine Convention, which came into effect in 1995 for the sustainable development and protection of the Alps, is to make the Alps a pioneering region for sustainable living, and demonstrate national governments' political commitment to more environmentally friendly mountain activity. It defines protocols covering numerous themes (nature protection, agriculture in the mountains, tourism, energy, protecting the soil, etc.) and encourages all active parties in Alpine territories to adhere to them.

The EUSALP, which is complementary to the Alpine Convention, is the European Union's fourth macro-region strategy (2016). This strategy is intended to ramp up cooperation and synergies between the countries and the Alpine regions. Its action is focused on economic and social development, and supports the development of projects linked to its priorities (water management, tourism, preservation of natural spaces, etc.) by mobilising European credits (especially the Interreg ERDF) as well as national and regional ones, dedicated to development in the Alpine massif.

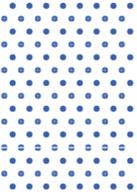
INVOLVEMENT OF ALL STAKEHOLDERS TO FACILITATE ADOPTION OF AND PARTICIPATION IN THESE TRANSITIONS

Mobilising actors in advance of policies

Undertaking climate change adaptation measures calls for certain prerequisites to ensure that all the parties involved will adopt them, contribute and take part. This may involve:

- acculturation of inhabitants or socio-professional / public actors, raising their awareness to improve understanding of the stakes and the transitions that must take place. In practice, it may take the form of workshops and conferences led by experts, to boost the participants' skills in certain fields. These sessions are often a preliminary for setting up more long-term consultation mechanisms, with a view to defining strategies or action plans;
- stakeholder consultation, to share and enrich new policies and measures. This may be fairly broad or concentrated on a specific type of audience (for example, tourism sector professionals);
- stakeholder participation in, and contribution to, a process of co-defining policies and measures in support of adaptation to climate change in mountain areas. This falls within a longer-term process and mobilises actors from various backgrounds.

This stakeholder mobilisation approach takes different forms depending on the territories.



Participation of citizens, especially young people, in the Pyrenean strategy on climate change, and corresponding operational plan

In October, 2021, the [Trans-Pyrenean Youth Forum](#) was held in El Pueyo de Jaca (Huesca, Aragon) as part of the Pyrenean Youth project (co-funded by the Erasmus+ programme). The event brought together 60 young people from the seven territories that make up the Pyrenees. During the forum, the young people's anxiety about climate change was emphasised. The Appendix to the Pyrenean strategy on climate change details the ideas that came out of the participatory workshop held during the forum, particularly on the following measures:

- promoting ideas about other kinds of tourism for the areas most affected by climate change, and increasing funding for this action;
- increasing annual tourism (not centred on ski seasons, for example) with "green" alternatives aimed at curbing pollution, e.g. by using standard public transport, producing goods locally, etc.;
- set up tourist routes that are compatible with the climatic conditions and seasonal changes of mountain areas;
- create a regional network of sustainable tourism.

Going beyond consultation with young people, the Pyrenean strategy on climate change led to a participatory process conducted with entities of the region, plus work with expert climate advisors from the seven territories in the Working Community of the Pyrenees (CTP), to define 72 specific actions that all feature in the operational plan for 2030.

<https://opcc->

[ctp/sites/default/files/editor/220125_planoperationnel_2030_fr_ebauche_consultpub.pdf](https://opcc-ctp/sites/default/files/editor/220125_planoperationnel_2030_fr_ebauche_consultpub.pdf)

France: training elected officials via the national "Future of Mountains" programme

As part of the national "Future of Mountains" programme, the ANCT has asked the *Fabrique des transitions* (350+ actors committed to the environmental transition) to lead a support pathway, to provide the *Avenir Montagnes Ingénierie* elected advisors with the resources to achieve a successful transition, i.e.:

- manage new tourism client bases that require an operational response;
- incorporate the consequences of climate change into decisions;
- enable all inhabitants to live and work in their mountain area, and preserve a rich and fragile environment, etc.

Around ten pilot territories will receive in-depth support during the different phases of deployment (training, diagnosis, work in peer groups, co-constructed territory-specific support). The goal: to find key solutions for the winners of *Avenir Montagnes Ingénierie* funding and all mountain territories.

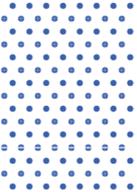
Close-up on information and acculturation of the actors

The issue of awareness and understanding of the climate change stakes in mountain areas ("understand, so as to suffer no longer¹¹⁹") is crucial for defining public policies, both medium- and long-term, that address the challenges and factor in all the dimensions (social, economic and societal) and interactions between themes (e.g. tourism and water, farming and tourism...). Climate change adaptation strategies often include a component on improving knowledge. The Aosta Valley Region's strategy, for example, mentions the need to boost knowledge about the effects of climate change, about the possible adaptation scenarios (environment, economy, resource management, risks, etc.), and about the analysis of the resorts' vulnerability, so as to optimise the definition of pertinent strategies (continue with activities as they are, modernise the equipment, dismantle, change to new activity, etc.); For its part, Catalonia's Strategy for Adaptation to Climate Change, 2021-2030 (ESCACC30)¹²⁰ includes a section¹¹⁶ devoted to actions and good practices for adapting to climate change, with the objective of: improving knowledge about climate change

Notes

¹¹⁹ "Territorial resilience to remain on course for the ecological transition", *The Shift Project*

¹²⁰ [Catalonia's Strategy for Adaptation to Climate Change, 2021-2030, Government of Catalonia](#)



impacts on mountain areas, encouraging the training and awareness-raising needed in order to manage the change, and introducing new governance systems to help deploy more joined-up policies in the mountain territories.

However, information is not always available, especially at certain scales (e.g. local, cross-border). Several countries have observatories that contribute certain territory-specific data, often in partnership with stakeholders in the academic and scientific sectors.

Catalonia: Bulletin of climate change indicators in the Pyrenees

The first Bulletin of climate change indicators in the Pyrenees (BICCPiR) was published in 2022. It provides information about changes in the climate of the Pyrenees, using data from 1959 to 2020, via a set of indicators grouped according to system. The BICCPiR is one of the results of the [ADAPYR project \(a POCTEFA-funded Interreg project\)](#), the fruit of cooperation between the managing entities of the official meteorological networks of the project partners (Catalonia, Basque Country, Navarre, Andorra, Aragon, Occitania and New Aquitaine). The data provided will serve to create, for the first time, a shared view of the status of climate change in the Pyrenees.

A cross-border observatory to improve consideration of climate change impact in the Pyrenees

The Pyrenees Climate Change Observatory (OPCC) is a cross-border regional cooperation initiative of the Working Community of the Pyrenees (CTP), launched in 2010. The OPCC's objective is to monitor and understand the phenomenon of climate change in the Pyrenees, and thereby help the region adapt to its impacts. Its operation is based around a technical committee, a steering committee and an advisory committee. The technical committee comprises expert climate advisors from the seven territories in the CTP¹²¹, and its function is to guide and set the priorities. The project partners constitute the steering committee, which is responsible for coordinating and implementing operational parts of the project. The advisory committee is made up of scientists and representatives of the massif's socio-economic sectors. Its mission is to ensure that the Observatory's work is scientifically rigorous, and provide strategic guidance.

The OPCC has identified ten challenges of climate change in the Pyrenees:

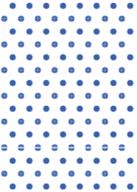
- preparing the preparation to deal with extreme climate events;
- increasing safety precautions against natural hazards;
- support for actors in the territory in dealing with water shortages and droughts;
- guaranteeing the quality of surface water and aquifers;
- keeping the Pyrenees attractive for tourism;
- dealing with changes in productivity and crop quality, and leveraging emerging opportunities;
- predicting irreversible changes to the landscape;
- considering possible biodiversity losses and ecosystems changes;
- adapting to imbalances between energy supply and demand;
- dealing with more widespread crop diseases, pests, and invasive species.

France: the Shift Project think tank is creating a platform called "Territoires au Futur" (Future territories)

This platform synthesises several French public databases (INSEE, CRATer project on food resilience, ADEME on the ecological transition...) in order to diagnose the resilience of a territory (a municipality, inter-municipal organisation, *département*, etc.) based on a simple postcode. The

Notes

¹²¹ The CTP and OPCC members are the Principality of Andorra, two French regions – New Aquitaine and Occitania – and the Spanish autonomous communities of Aragon, Catalonia, Euskadi (= the Basque Country) and Navarre.



themes addressed are: GHG emissions and land take, farming and food, economy and jobs, day-to-day mobility, housing and habitat). These data are used to characterise the municipality or inter-municipal organisation based on these different items, and help decision-makers to rank their actions by priority, to boost resilience.

Close-up on the participation of involved parties within a long-term perspective

Going beyond the participatory processes introduced when defining local, regional or national strategies, some territories have specified how to place a participatory approach at the centre of implementing and monitoring measures. The steps of mobilising inhabitants and introducing local governance aid adoption of these measures, which can deliver societal, economic or social impacts.

In Romania, participatory management in national parks

Participatory monitoring of mountain biodiversity in the Rodna Mountains National Park¹²²

More than 7,450 volunteers are involved in a variety of activities in the Rodna Mountains National Park (a 47,000-hectare area, protected since 1990), the priority being the inventory, mapping and monitoring of biodiversity. Most volunteers come from the surrounding localities of the Rodna Mountains. The Rodna Mountains National Park Administration, in collaboration with the ECO-RODNA association (a non-governmental organisation comprising over 1,000 volunteers, teachers and researchers around the protected area), has implemented numerous projects in order to create and develop an interactive process of volunteer involvement in biodiversity management and conservation in the Rodna Mountains (26 projects in partnerships with 35 institutions, valued at over 4 million euros).

Devising a participatory management plan in the Piatra Craiului National Park¹²³

To establish its guidelines, the Piatra Craiului National Park has drawn up a participatory management plan which guides conservation and development actions in the protected zone. It is constructed around:

- the local community. The local residents and surrounding communities are encouraged to become active participants in managing the park. Their knowledge and experience are taken into account when decisions are made in relation to conservation and the use of natural resources;
- an advisory council, which facilitates communication and collaboration between the different stakeholders. This council brings together representatives from the local authorities, NGOs, local residents and other relevant parties. It provides a way to exchange information, discuss management issues and make recommendations.

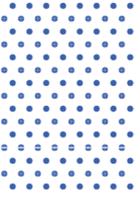
"Mountain communities" and "green communities" in Italy

In 1971, "mountain communities" were created to improve the commercial value of these territories and encourage their development (economy, environment, culture, tourism),

Notes

¹²² Online: <https://www.interregeurope.eu/good-practices/participatory-monitoring-of-biodiversity-in-rodna-mountains-national-park-romania>

¹²³ Online: <https://www.coe.int/fr/web/bern-convention/-/piatra-craiului-national-park>



particularly through joint capitalisation actions (tourism, farming, environment, energy). For some years, the regional authorities have been reorganising these communities which have gradually been merged, removed or transformed into other cooperative structures (e.g. inter-municipality territorial unions, municipality unions, etc.). In this context, the National Union of Mountain Municipalities, Communities and Authorities (UNCCEM) has defended the development of "green communities", and initial pilot sites were tested between 2009 and 2012. The green communities are local projects and initiatives aimed at developing an environmentally friendly local economy, and also encouraging citizens to be active participants in the decision-making. These projects may include promoting organic local farming, generating renewable energy, reducing waste, preserving biodiversity and promoting sustainable tourism.

As an example, the "Val di Fiemme green community" was created in 2018 to encourage a transition to a more sustainable development model in this valley region. It joins together local actors such as local authorities, tourist businesses, environmental associations and citizens, who will work together on tangible projects seeking to reduce the environmental impact of the tourism industry and promote sustainability. In particular, it works to help ski resorts transition towards more sustainable activity models, by encouraging them to use renewable energy and reduce greenhouse gas emissions, and by promoting more sustainable management of the natural resources. This green community also encourages eco-tourism practices and champions local products to support the local economy.

FROM A NATIONAL FRAMEWORK TO OPERATIONAL DEPLOYMENT IN THE REGIONS: A CLOSE LOOK AT AUSTRIA'S KLAR! PROGRAMME AND FRANCE'S *AVENIR MONTAGNES*

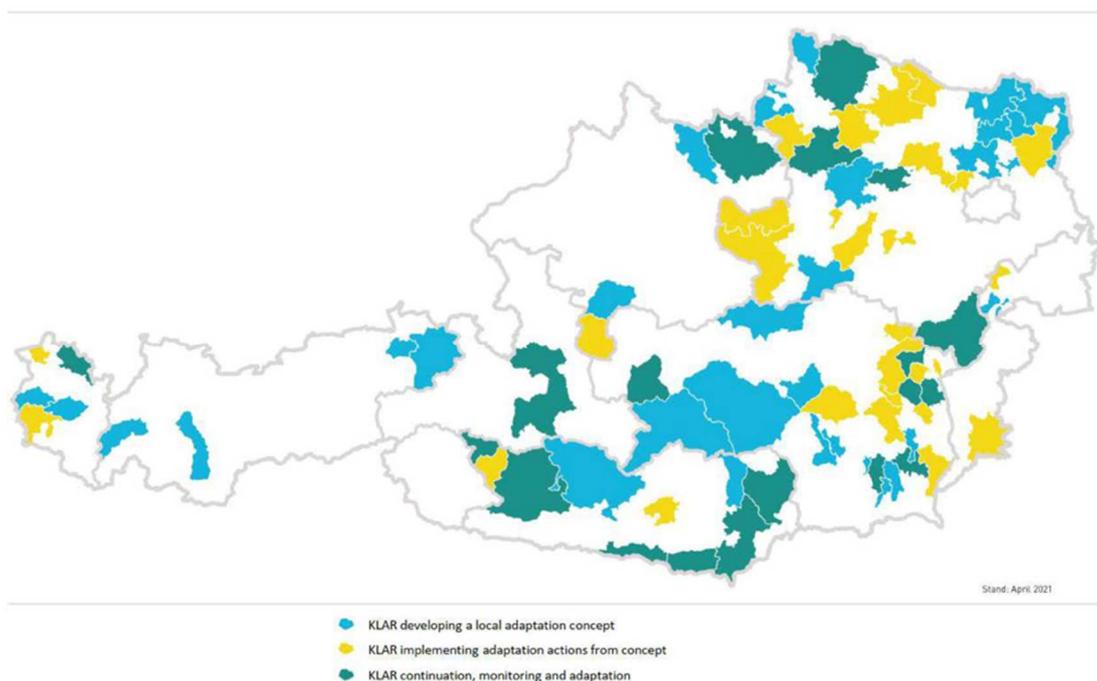
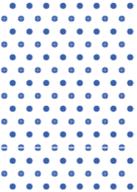
KLAR! programme, supporting rural territories with their climate change adaptation strategy

KLAR! is a German acronym for "*Klimawandel-Anpassungs-Modellregionen*", which means "Climate Change Adaptation Model Regions"¹²⁴. This programme was set up by Austria's Federal Ministry of Climate Action and the Environment in 2016, in partnership with "*Klima und energiefonds*" to encourage the territories to adapt to climate change. It enables operational implementation of the National Strategy for climate change adaptation.

The objective of KLAR! is to make the territories more resilient to the impacts of climate change, by identifying the risks and opportunities associated with this phenomenon and applying suitable adaptation measures. The programme also aims to encourage collaboration between the different local stakeholders, especially the local authorities, businesses, civil society organisations and citizens. At present, 89 territories have been selected as KLAR! regions (there were 20 at the first call for projects).

Notes

¹²⁴ The term "Region" here means "territories"



Selection is via an annual call for projects, and is aimed at rural territories with 3,000 to 60,000 human inhabitants (which means a substantial proportion is in mountain areas).

The call for projects is structured in two phases:

- Phase 1 (one year): concept development-local adaptation strategy (average value 45,000 euros),
- Phase 2 (two years): implementation of concrete measures, with the option of applying to do a further three years (average value 150,000 euros for two years and 200,000 euros for three years).

In addition, the territories can apply to run their project for three years, in order to continue implementing the actions.

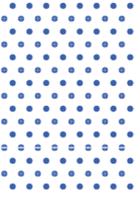
75% of the financing comes from "*Klima und energiefonds*" (an independent organisation funded by the Ministry of Climate Action) and 25% is contributed by the territory applying. Primarily, this makes it possible to fund engineering, raising awareness of climate change issues, networking and communication. To support the concrete actions, other funding is available:

- KLAR INVEST, via calls for specific projects that emerge according to the needs of the territories awarded funding. For several years, such projects have systematically focused on measures to adapt to heat spikes, and shifts in the water resource (e.g. tree planting, rainwater collection);
- other financial support from "*Klima und energiefonds*" which funds other measures in these plans.

Programme funding winners also gain access to the services of the national platform which proposes meet-ups (about three per year) and training featuring talks by experts. The subjects can be highly diverse: spatial planning, risk management and prevention of natural disasters, agriculture, tourism, communication and more. If even a part of these territories falls within a LEADER territory, they are obliged to coordinate their efforts. The methods of linking with the *Länder* vary widely, depending on the situation. Some become part of these territories' regional networks, others not so much.

There are also differences between the themes addressed by the territories: in Tyrol, for example, they have a major focus on tourism, the mountain economy, water management and especially water shortages, particularly in ski resorts.

Austria has also introduced a similar programme called the KEM (*Klima und Energie Modellregionen*), aimed at eliminating the use of fossil fuels (oil and gas) and supporting clean energies. It is operated according to the same principles as KLAR!: national call for projects, network of funding winners, partly financed by "*Klima und energiefonds*", funding for engineering and investments.



The French plan "*Avenir Montagnes*": engineering to support the areas' shift towards more environmentally friendly, resilient tourism

The "Future of Mountains" plan¹²⁵ sets out to support mountain areas in their process of developing resilient and more eco-friendly models of tourism. It comprises an investment component, in which 300 million euros are distributed between the State and the Regions, and a technical assistance component that receives 31 million euros. In order to make engineering available to local actors, the latter component is divided into three schemes:

- **Future of Mountains, Engineering (*Avenir Montagnes Ingénierie*) (16 million euros).** This scheme provides mountain areas with customised support for two years, to devise and implement their projects for a transition to more diverse and sustainable tourism. 62 territories received this support in 2021-2022. A support pathway for the selected projects has also been set up;
- **Future of Mountains, Mobility (*Avenir Montagnes Mobilités*) (10 million euros).** This scheme provides technical assistance for the development of projects on inclusive, innovative and environmentally friendly mobility in mountain areas. 100 projects were selected to receive such support in 2022;
- **France Tourism Engineering (*France Tourisme Ingénierie*) (5 million euros).** This component offers two years of technical assistance to mountain resorts seeking to renovate their recreation infrastructure. Out of an expected 50 resort territories, the first 25 were selected in 2021 to receive support for this process.



FUNDING MOBILISED

National calls for projects combining engineering and investment support

Austria, with its KLARI and KEM programmes and its Climate and Energy fund, like France with its Future of Mountains plan, are providing support on the one hand for engineering, networking and communication, but also investments tied to renewable energies in the case of KEM (solar PV, wood-fired heating, solar thermal systems, electric vehicles and retrofitting of buildings) and investments in sustainable leisure and tourism in the case of *Avenir Montagnes investissement*.

Combined funding from local to Europe-level sources

Many mountain areas draw on a combination of funding sources coming from different regional levels. Under Romania's Law of the Mountain, 1 billion euros of national funding will be mobilised to encourage activities in mountain areas over the period 2018-2028¹²⁶, and this will be supplemented by European Structural and Investment Funds (ESIF) and the EAFRD.

Similarly, the climate change adaptation strategies in the different countries studied refer to a diverse range of funding, both public and private (businesses, foundations, insurance, etc.), from local to Europe level. For example, Spain's National Climate Change Adaptation Plan for 2021-2030, which acknowledges the specific challenges of mountain areas, mentions as funding sources both national initiatives (the "*PIMA Adapta, el Plan de Impulso al Medio*" (Plan to Support the Environment for Adapting to Climate Change), and European schemes (*Next Generation EU*, ERDF, EAFRD, sectoral programmes such as Horizon Europe and the Life programme, etc.)¹²⁷.

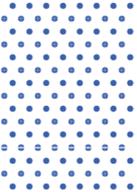
Local, regional and national organisations can also act as representatives in order to access European funding. In Slovenia, for example, the regional development agencies are an important

Notes

¹²⁵ <https://agence-cohesion-territoires.gouv.fr/avenir-montagnes-ingenierie>

¹²⁶ World Bank, "Mountain areas in Romania: Then and Now", 2023 (provisional document, obtained after conducting an interview with Mark Redman)

¹²⁷ *Plan nacional de adaptación al cambio climático* (National Climate Change Adaptation Plan) – PNACC: https://www.miteco.gob.es/es/cambio-climatico/temas/impactos-vulnerabilidad-y-adaptacion/pnacc-2021-2030_tcm30-512163.pdf



intermediary in terms of providing expertise and technical assistance on projects, and helping mountain territories access EU funding.

Local funding: shifting towards eco-taxation or "tourist tax"?

Within the Spanish research project "ADAPTUR"¹²⁸, which uses the Aragonese Pyrenees as its case study and focuses on climate change adaptation in mountain destinations, one of the recommended action routes is to promote an eco-tax. This fund, for use in climate change adaptation efforts, could receive inputs from the tourist tax and other tax revenue linked to tourism.

The Government of the *Generalitat de Catalunya*, for its part, has applied a tax to carbon dioxide emissions produced by vehicles. Revenue raised through this tax is evenly divided between the Climate Fund and the Natural Heritage Fund, as anticipated in Catalonia's Law on Climate Change, approved by the region's Parliament in 2017¹²⁹.

Climate change is gradually becoming an essential consideration in strategies and funding, as illustrated by the call for expressions of interest issued by the Slovenian government in 2022, in relation to funding for new ski lifts in the country's eight biggest ski resorts (total budget: 45 million euros). To be eligible, projects must sign up to a strategy of developing both winter and summer activities. Likewise, Italy's National Climate Change Adaptation Strategy of 2014¹³⁰ does not question the use of new investments and technologies to continue providing winter sports activities, but emphasises the need for greater consideration of the cost-benefit ratio these investments represent in the medium term¹²¹.

Interreg programmes and European sectoral programmes to support engineering and/or pilot actions

European projects also play a coaching role, by supporting pilot projects and exchanges of experience between partners from different European countries. Financed as part of sectoral programmes (Life, Horizon 2020 then Horizon Europe, Erasmus+...), and Interreg (TranStat, BeyondSnow, Smart altitude, etc.), they are often sources of innovation and action-research, particularly due to their cross-border/transnational nature and the mobilisation of various actors from complementary sectors (regional authorities, associations, research centres, universities and so on). The Interreg Alpine Space project "Beyond Snow" (2022-2025), for example, is intended to help ski resorts at medium altitudes, and stakeholders in these territories, to factor in more effectively the socio-economic consequences of reduced snow cover. The project funds pilot activities in about ten territories, and there are plans to design a decision support tool in digital form. The project simultaneously mobilises regional authorities, development agencies, research actors (the Eurac centre) and ski resorts such as Métabief in France.

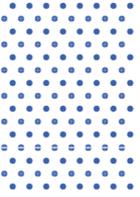
Sectoral programmes such as Life, which provide the means to act on the environment and climate, are often also mobilised by mountain territories, whether to support implementation of a national adaptation strategy as in the Greece example below, or as part of regional and/or local projects.

AdaptInGreece project, European Life programme (2019-2026)

In order to deploy its climate change adaptation strategy, Greece is being supported by the European LIFE project "AdaptInGR"¹³¹. The aim of this project is to support deployment of the national strategy for climate change adaptation (2016-2025) and prepare to transition to phase two of the strategy (2026 and beyond). To do this, the project aims to:

Notes

¹²⁸ ADAPTUR project portfolio, online, 2023
¹²⁹ Generalitat de Catalunya: <https://atc.gencat.cat/ca/agencia/noticies/detall-noticia/20230420-padro-provisional-CO2.html>
¹³⁰ Strategia Nazionale di Adattamento ai Cambiamenti Climatici, Ministero dell' ambiente e della sicurezza energetica (National Climate Change Adaptation Strategy, Ministry of Environment and Energy Security), 2014
¹³¹ AdaptiveGreece project (LIFE-IP AdaptInGR), online, 2023



- develop the capacities of the public authorities responsible for defining and implementing adaptation policies/strategies,
- create a mechanism for monitoring, evaluating and updating the adaptation policies,
- develop pilot projects on climate change adaptation in three regions and five municipalities in Greece, in domains considered high-priority (managing flood risk, managing coastal areas, protection against forest fires, sustainable management of water, spatial planning),
- increase the wider public's awareness about climate change,
- mobilise additional European and national funds in order to implement climate change adaptation policies,
- share examples of good practices in Greece, the eastern Mediterranean region and in the EU.

So far, the project has made some preparatory actions possible: identification of national and regional requirements in relation to climate change adaptation, mobilisation of relevant actors, definition of monitoring and evaluation indicators, etc. To continue this work, a number of concrete actions are in progress: implementation of pilot actions and different components of the adaptation strategy, plus communication and information-sharing. These actions must continue until 2026. Ultimately, the project will provide the means to evaluate the adaptation measures applied in Greece, identify good practices in this area, and strengthen a network of pertinent and skilled stakeholders so that these policies can continue.

This project is to run for eight years and relies on a budget of 14.2 million euros. Of this funding, 8.3 million euros comes from European funds, 2.4 million from national funds, 3.2 million from the project partners and 0.3 million euros from private funders.

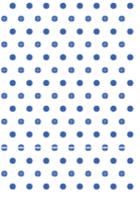
Although these European projects facilitate innovation and experimentation, their long-term impact is more uncertain, as the actions and activities tested often remain restrictively confidential. This tendency is explained on the one hand by excessive restriction of spin-offs, often limited to the actors connected to the European programme, and on the other hand by funding coming to an end. Therefore, the issue of releasing results of these projects to external actors who work in fields linked to climate change adaptation in mountain areas needs to be considered, as a step towards transforming "testing" and prompting a change at the scale of European projects like these.

The formation of local financial groups created as part of the Life project "ECOadapt50", presented below, could provide a response to this challenge via support for dynamics initiated in cooperation projects. Since the project has just started, there are only predictions as this stage.

The aim of "[eCOadapt50](#)" is to promote climate change adaptation in different areas of Catalonia and provide funding catalysts. The project involves multiple partners: regional (provincial administration, LEADER LAGs, etc.), different research centres, the Catalonian Office for Climate Change, and socio-economic partners¹³². Funded through the European Life programme, the aim is for the project to act as a catalyst and activate myriad connected projects, thanks to funding from public and private sources. A financial advisory group has been created; it includes ethical banking entities, an insurance brokerage firm and managers of European funds: *Generalitat de Catalunya*, the Catalan Energy Institute (ICAEN), the Catalan Water Agency (ACA) and the Catalan Finance Institute (ICF), so that they can assess which actions are likely to receive funding.

Notes

¹³² *Barcelona Chamber of Commerce, trade unions, forest owner associations, etc.*



Close-up on the Pillerseetal-Leukental-Leogang region in Austria: a strategic, joined-up approach to funding

Located in the federal state of Tyrol, in the Kitzbühel district, the local development centre of Pillerseetal-Leukental-Leogang is carrying out numerous climate change adaptation actions. The territory in question is part of the Alpine massif, with economic activity mainly based on tourism and agriculture. To tackle the challenges of climate change, the territory has harnessed several schemes that support both engineering and investment:

- the national KEM programme (to eliminate the use of fossil fuels): funding was initially won for two parts of the territory (the Pillerseetal and Leukental KEM projects), before being secured again between 2019 and 2021 for the whole area. The objective was to succeed in managing the resources sustainably, but also to contribute to Tyrol's vision for 2050 (its energy policy, aiming to achieve energy independence for Tyrol by 2050). Measures were applied in collaboration with the authorities, businesses, students and citizens;
- The KLAR! national programme on climate change adaptation;
- the LEADER programme (LAG Regio³ Pillerseetal-Leukental-Leogang), whose implementation is coordinated with the other local schemes.

Via these programmes, the territory is concentrating its actions in the key domains of agriculture, forestry and tourism, to support its local development. Actions to raise awareness among the wider public have also been developed, to encourage people to play their part in climate change adaptation, to nudge behaviour change and to implement a policy that is compatible with the current climate issues.

6. RECOMMENDATIONS

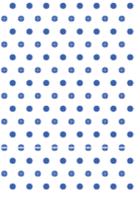
Recommendations of relevance to:	- European countries 
	- France in particular 
	- the European Commission 

CONVERGING APPROACHES, MOVING TO A MORE RESILIENT TOURISM MODEL

This comparative analysis highlights a need to observe and encourage, earlier on, the support for mountain areas **in a new, more resilient development model**:

- continue developing the cultural tourism offer in areas that are committed to transitioning toward "two- and four-season" tourism;
- anticipate visitor flows to avoid mass tourism to protected spaces in summer, maintaining the balance between developing two- and four-season mountain tourism and the need to preserve protected spaces (avoid the adverse effects of introducing new outdoor activities in the summer);
- anticipate changes in water resources and demand, and work with different stakeholders to prepare strategies focused on a reasonable use of this scarce (or soon to be) resource; support a change of culture on this point (from using an abundant commodity to managing a precious one);
- reflect on how to diversify mountain economies beyond the tourism sector (whether four-season or not) in order to reduce dependence on activities with a high environmental impact and/or those most severely affected by climate change. This also means working on the skills of the tourism sector professionals involved (e.g. providing two kinds of activity, new activity outside tourism, etc.);
- for ski resorts in particular, provide suitable means-tested support according to the resorts' specific characteristics (altitude, snow cover, economic scope etc.).

These transitions can only be carried out if they are supported at strategic and policy level, on the one hand, and operationally on the other.



PROMOTE PUBLIC POLICIES THAT SPECIFICALLY TARGET MOUNTAIN AREAS

Climate change affects all territories, but mountain areas are experiencing its impacts more quickly, and often in more extreme ways. It is therefore urgent to take action in these areas, and test new development models by engaging all actors; the mountains would become test beds for solutions that could be useful for other territories. The specific nature of mountain areas calls for policies – at European, national and more local scale – that factor in these characteristics, along with the sudden force of the effects of climate imbalance on these territories.

⇒ Increase awareness of issues faced by mountain areas in discussions for the future Cohesion Policy, in accordance with Article 174 of the Treaty on the Functioning of the European Union (TFEU)

- Establish earmarking of funds for mountain areas in all the strategic objectives of the Cohesion Policy, as requested by the European Parliament in its resolution of 13 December 2022¹³³ and by the European Committee of the Regions in its Opinion Factsheet of 1 December 2022¹³⁴. Even though 60% of funding in the Cohesion Policy 2021-2027 has been allocated to Objectives 1 and 2, for a smarter and greener Europe, mountain areas struggle to access this funding.
- Promote Community-Led Local Development for Mountains (*DLAL Montagnes*)¹³⁵ via the objective of bringing "Europe closer to citizens" (project territories working on a specific strategy for seven years with all their stakeholders). This comparative study has shown that a territorial approach is preferable when it comes to tackling the issues of climate change adaptation in mountain areas. These DLAL may be multi-funded in order to address the economic, environmental and also societal problems. Experiences in the Tyrol LAGs, with their one-stop shop approach to the managing authority for example, could be a source of inspiration¹³⁶. Supporting Community-Led Local Development (DLAL) for mountains would not mean isolation of the territories concerned, because a cooperation component would allow them to work in partnership with neighbouring territories, or even at massif scale. Such cooperation is especially necessary when dealing with the themes of water management, tourism, natural disasters or jobs. Anticipate integrating mountain areas in the Just Transition Fund, to support the transition in their economies and jobs with the prospect of a changing climate and a question mark hanging over the ski economy.



⇒ Implement national or regional public policies specifically aimed at mountain areas

- Being given a legal basis such as the laws on the mountains (as in France, Romania and the Region of Catalonia) seems to facilitate the inclusion of these spaces and their issues in public policies and in the development of specific multi-level governance. And yet, this legal framework must be accompanied by funding programmes to guarantee that the local development strategies will be deployed in practice at mountain scale (see the recommendation "Ensure that mountain areas are able to implement transitions successfully").
- Involve the regional level in this inclusion of mountain areas, so as to offer at least a strategic framework with economic, social and environmental guidelines.
- Take greater account of the specific stakes of mountain areas in national or regional legislation and sectoral policies (on economy, climate, risk, water, energy, etc.).



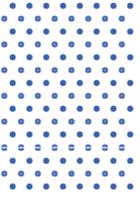
Notes

¹³³ [European Parliament resolution of 13 December 2022 on a long-term vision for the EU's rural areas – Towards stronger, connected, resilient and prosperous rural areas by 2040.](#)

¹³⁴ [European Committee of the Regions Opinion Factsheet of 1 December 2022 – Enhancing Cohesion Policy support for regions with geographic and demographic handicaps \(art. 174 of the TFEU\)](#)

¹³⁵ *Community-Led Local Development (DLAL) is an approach developed by the European Commission and draws heavily on the LEADER programme, in which "local communities" set up a local partnership to devise and implement an integrated development strategy.*

¹³⁶ (http://elard.eu/wp-content/uploads/2020/04/CLLD_Austria_Tyrol.pdf)



FACILITATE AWARENESS AND ACCEPTANCE OF THE TRANSITIONS ASSOCIATED WITH MOUNTAIN AREAS

Mountain areas can only carry out successful transitions once all players (decision-makers, economic players, residents, young people, seasonal workers, associations etc.) become committed, convinced stakeholders in this transformation. This requires, on the one hand, detailed knowledge about climate change impacts on their territory, which helps with decision making, and on the other, the participation and involvement of everyone.

⇒ Improve all actors' knowledge of the impacts of climate change on their territory

- Make it easier to identify, from territorially differentiated data, the impact of climate change at both territory and mountain range scale (e.g. observatories). These data are necessary before any transformation takes place, and aid decision-making. Initial tools have been developed, but are not yet at European or massif scale. In France, for example, the Shift Project (see inset p.37) has developed a platform for use at municipality or inter-municipality scale, which provides an overview of the situation on GHG emissions and land take, and presents some initial challenges regarding farming and food, economy and jobs, day-to-day mobility, housing and habitat¹³⁷. Other systems exist (at municipality level), such as the land take portal¹³⁸.
- Strengthen the links between researchers and regional actors, particularly via applied research and collaboration as part of European projects. Certain actors choose to link in with research centres, to be able to measure, analyse and thereby anticipate the impacts of tourist activities, whether skiing-related or new activities introduced with the aim of diversifying tourism (so multi-discipline skills are crucial, including sociology). Data relating to the issue of water and how its use is distributed are sorely lacking in some territories.
- Continue the work of mountain area observatories, and champion the idea that decision-makers could use these structures more effectively in the local and regional climate change adaptation strategies.
- Address the question of territorially differentiated data, as both a decision support tool and to aid collaboration with people in scientific circles, for example at a webinar provided for "Future of Mountains" applicants. The objective would be to identify joint needs for data and to talk about the practices developed by certain territories.



⇒ Deliver training and raise awareness, so that the transformation works for everyone

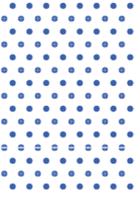
- Mobilise experts in the social sciences of transition to improve support for the transition stakeholders and avoid the phenomena linked to "imposed" transitions. Research/action work could be ramped up in cooperation with social science laboratories and mountain areas. More could be done to capitalise on and share experimental projects already run in these fields. Work needs to continue on the issue of inhabitants' participation and raising stakeholder awareness, via education actions tailored to different audiences, including elected officials, technicians, businesses, farmers and citizens, to ensure better understanding of the stakes and facilitate adoption of the transformation challenges in mountain areas. Beyond awareness-raising, an official training programme could be set up and developed by the chambers of agriculture, commerce and industry, by the CEREMA, the Massif Committees or the associations of elected representatives, and delivered to the various mountain territory actors. It would also be intended for businesses, which are still under-mobilised in the adaptation initiatives, according to the latest IPCC report.
- Wherever possible, choose methods that involve positive, game-based approaches, such as "serious games" and simulations, in order to bring under-engaged people on board effectively. Several examples of such tools have been developed, particularly as part of



Notes

¹³⁷ <https://territoiresaufutur.org>

¹³⁸ <https://artificialisation.developpement-durable.gouv.fr/>



Horizon 2020 cooperation projects. For example, the online simulation game "PHUSICOS NBS"¹³⁹ which looks at the issue of managing natural disasters, or the serious game "Play with fire"¹⁴⁰ on fire risk scenarios.

⇒ **Develop actions to mobilise and involve all the actors upstream of local strategies and projects**

- In countries where it is not already present, set up specific governance dedicated to mountain areas (e.g. at regional scale) to bring together and mobilise the different sectors contributing to mountain area development.
- Encourage bottom-up approaches founded on the needs of local public and private actors with varying backgrounds and aims (economic, environmental and social). This may be steered by the local authorities themselves or via approaches such as territory-based start-ups¹⁴¹ (a dynamic of citizen mobilisation and collective entrepreneurship).
- Mobilise professional branches and training providers that still have insufficient contact with the territorial actors, to adapt local skills to the evolutions and transitions.
- Allow young people to have their say, so as to gain a different insight into the future of mountain areas, whether in relation to defining, implementing or developing projects in such areas. For example, the Interreg programme Alcotra ran a survey of young people when it was designing the operational part of the programme. It encourages projects made for or by youngsters and promotes the "youth" aspect when showcasing its projects.
- Instigate a change of culture among funders and investors, to promote more long-term development strategies characterised by more considerate and restrained management of resources (space, biodiversity, energy, water).



ENSURE THAT MOUNTAIN AREAS ARE ABLE TO IMPLEMENT TRANSITIONS SUCCESSFULLY

⇒ **Support the development of skills and engineering in mountain areas**

The analysis has shown that all the countries studied had at least defined national and/or regional strategies for climate change adaptation, but there are several conditions involved in implementing these effectively.

- Combine forms of multi-level governance: a national-level policy framework dedicated to mountains, a strategy at regional level, and support and funding granted to territories with a view to operational roll-out.
- Favour a territory-based approach as opposed to opportunistic investments (through calls for projects relating to solar photovoltaic technology, ski lifts etc.). If these investments are necessary, they must integrate within a strategic approach at the scale of each mountain area. Project territories (which may sometimes be LAGs) seem to present a suitable scale for local action.
- Support the development of technical assistance in the territories (not just investment support) over the long term (three years is often not long enough to define and develop projects and capitalise on the experiences). Six years seems an appropriate length of time



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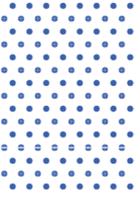
¹³⁹ *The PHUSICOS NBS simulation (a Horizon 2020 project) is a multi-player online simulation that focuses on the challenges related to implementing Nature-Based Solutions (NBS) for disaster risk reduction. The simulation places emphasis on the negotiations that occur between stakeholders during the decision-making process to implement nature-based solutions or alternative solutions. To find out more, see:*

<https://phusicos.socialsimulations.org>

¹⁴⁰ *"Play with fire" (a Horizon 2020 FIRE-RES project) is a serious game igniting wildfire risk awareness. It is a puzzle-based serious game that encourages players to collaboratively solve a landscape puzzle consisting of 49 hexagons. Each hexagon represents different variables that, when combined in specific ways, can create conditions favourable or unfavourable to the outbreak of a wildfire. To find out more, see: <https://fire-res.eu/play-with-fire-a-serious-game-igniting-wildfire-risk-awareness>*

¹⁴¹ <http://startupdeterritoire.fr>





to define a strategy and an action plan involving all the stakeholders, implement them including testing the actions, and capitalise on them. Recruitment of technical assistance personnel in mountain areas can be difficult, despite the opportunity it represents, which raises questions about the habitability of mountain locations (access to services, culture, broadband, etc.). Schemes such as the VTA (Territorial Administrative Volunteering) developed in France can sometimes help "test" a first-time role in a rural or mountain area. France's "Future of Mountains" and Austria's KLAR! and KEM (all of which issue calls for projects at national level) are good examples of programmes of local action enabled thanks to funding for engineering, and support with defining strategies and action plans, and with networking in mountain territories. Longer-term support should be promoted for the French programme, along with a broadening of the themes addressed, as these are currently very focused on tourism.



- Encourage exchanges of technical assistance between mountain territories: short-term exchanges of programme facilitators from the winning territories (*Avenir Montagnes* network) could be organised to foster diverse perspectives. Similarly, at European level, an Erasmus+ "mobility" programme could operate between several countries, for facilitators of mountain territory projects.
- Foster cooperation with neighbouring mountain areas, particularly on certain themes such as water management, development of services, diversification of the mountain economy, etc. LEADER Cooperation scheme connections and expertise may provide a means of supporting these cooperations.



⇒ **Explore the possibility of broadening the scope of the French *Avenir Montagnes* network** across all topics related to the ecological transition (beyond tourism): sharing water and wood resources, managing mountain forest regions, food and farming in the mountains, economic activity sectors and housing, especially for young people...

⇒ **Combine funding**



In addition to any funding awarded by national or regional organisations for the purpose of introducing strategies in mountain territories, other funds must be mobilised, particularly at European level.

- Support mountain areas and their strategy in the framework of the future Cohesion Policy (set up Community-Led Local Development (DLAL) for mountains?) – in the medium term.
- In addition to structural funds, mobilise the EU and Interreg sectoral programmes to test projects and solutions: Horizon Europe, Life, Erasmus+... The latter programme especially is currently underused by mountain communities, whereas it could play a part in increasing or broadening skills to tackle the challenges they will have to face.

The funding mobilised should provide the means to support both "soft" actions (technical assistance, identifying territorially differentiated data, networking, defining strategies, etc.) and "hard" actions (investments...).

BE ABLE TO MEASURE AND MONITOR IN ORDER TO ADJUST ADAPTATION POLICIES AGAINST A CONTEXT OF UNCERTAINTY



⇒ **Turn previous experiments into successes by capitalising on the network**

- Start capitalising on experiments conducted (especially in the framework of sectoral programmes or Interreg projects) to encourage the sharing of their findings and contribute to a change of scale within the territory or outwards to others.



- Organise exchanges at massif scale (macro-regional strategies) or national scale ("Future of Mountains" network in France) between mountain areas, and open them to cooperation projects, which are often little known among these groups. At European level, these exchanges could form part of the CAP network, notably regarding water and agriculture issues, and on the new Rural Pact community platform where a "mountains" group has just been created¹⁴².
- Extend delivery of the "Future of Mountains" programme at national and mountain range scale, to stimulate inter-peer exchanges and enable the territories to progress further based on results.



- ⇒ **Set up the right conditions for continuous monitoring and adaptation**
- At the strategy design stage, define measurable indicators to ensure that the strategies can be monitored and evaluated, and also amended if necessary.
 - Make use of mountain governance bodies to provide monitoring and any shifts in direction.

Notes

¹⁴² https://ruralpact.rural-vision.europa.eu/groups/mountain-areas_en

7. APPENDICES

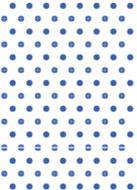
APPENDIX 1: LIST OF INTERVIEWS

Austria
<ul style="list-style-type: none">- Anna Schmidt, member of the team dedicated to the KLAR! programme Federal Environment Agency, 16 May 2023- Andreas Franze, project officer, local development centre of the region comprising Pillerseetal, Leukental and Leogang, 22 May 2023- Katharina Swettler, project officer for the Alpine Convention, Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, 2 June 2023
Spain
<ul style="list-style-type: none">- Marian Gonzalez Solano, Esmontañas, Spanish association of mountain municipalities, 19 May 2023- Bernat Claramunt, CREAM researcher and coordinator of NEMOR (Network for European Mountain Research), 23 May 2023- Rosa Colomer, Berguedà Development Agency, Catalonia, 25 May 2023- Thomas Bunel, Assistant Commissioner of the Pyrenees massif, 26 May 2023
Italy
<ul style="list-style-type: none">- Massimo LAPOLLA, Policy advisor on R&D and cohesion for the Piedmont region; Represents the Piedmont region in Brussels; Representative to the European Union Strategy for the Alpine Region (EUSALP). Interview conducted on 22 May 2023- Elena di Bella, Sustainable development and mountains department, Metropolis of Turin. Interview conducted on 2 May 2023- Stefano Sala, Project Manager, University of Milan, Representative to the European Union Strategy for the Alpine Region (EUSALP). Interview conducted on 22 April 2023
Romania
<ul style="list-style-type: none">- Danut Ungureanu, Director at the National Agency of the Mountain Area, Ministry of Agriculture and Rural Development, 28 April 2023- Mark Redman, Highclere Consulting, partner of the MOVING project (MOUNTAIN Valorisation through INTERconnectedness and Green growth) financed by Horizon 2020, 3 May 2023- Sorin Banciu, Secretary of State at the Ministry of Environment, Water and Forests, 25 May 2023- Adina Pasarel, World Bank, 30 August 2023
Slovenia
<ul style="list-style-type: none">- Matej Ongrin, Lecturer at the University of Ljubljana, Geography Department, President of CIPRA Slovenia (International Commission for the Protection of the Alps). Interview conducted on 25 April 2023- Klemen Langus, Director of tourism, municipality of Bohinj. Interview conducted on 28 April 2023
Cross-functional
<ul style="list-style-type: none">- Emmanuelle Georges, INRAE (Transtat project)

APPENDIX 2: LIST OF PARTICIPANTS IN THE DISCUSSION DAY HELD IN BRUSSELS ON 12 SEPTEMBER 2023

"European seminar: Diverse perspectives on rural and mountain approaches in Europe", held in the context of studies sponsored by the ANCT and more specifically European benchmarking studies on rural and mountain areas.

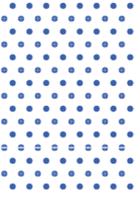
Organisation	First name	LAST NAME
Ministry of Agriculture and Food Sovereignty	Hanane	ALLALI-PUZ
Permanent Representation of France at the EU	Emmeline	ALLIOUX
ANCT	Patricia	ANDRIOT
MOVING project – Horizon 2020	Dominique	BARJOLLE
ADE	Monika	BECK
Euromontana	Beatrice	BELLAVIA
Auvergne-Rhone-Alpes delegation	Rose	BERGE
Administrative committee of the Massif Central	Nicolas	BERNARD
Committee of the Regions	Klaus	BOELE
Tuscany delegation	Fabio	BOSCALERI
Eurêka 21	Séverine	BRESSAUD
Administrative committee of the Pyrenees	Thomas	BUNEL
Euromontana	Blandine	CAMUS
CREAF (Ecological and Forestry Applications Research Centre in Catalonia)	Bernat	CLARAMUNT
Grand Est delegation	Marie	CLOTTEAU
Euromontana	Guillaume	CORRADINO
Acadie	Xavier	DESJARDINS
Permanent representation of France at the European Union	Hortense	DUHAMEL
Eurêka 21	Cécilia	DUMESNIL
Permanent representation of Romania at the European Union	Carmen	ENESCU
Acadie	Philippe	ESTEBE
Government of Catalonia – Delegation to the European Union	Judith	ESTOL
ANCT	Luc	FARALDI
Government of Catalonia – Delegation to the European Union	Elisenda	FATJO-VILLAS MARCH
Permanent representation of France at the European Union	Julie	GARREC
Council of European Municipalities and Regions	Marine	GAUDRON



ANCT	Marie-Luce	GHIB
LEADER France and ELARD (European LEADER Association for Rural Development)	Eva	GUELHO
Acadie	Clara	HODENT
CIPRA	Julika	JAROSH
AEIDL (European Association for Innovation in Local Development)	Claire	JORDAN
Klima- und Energiefonds	Nicole	KRICHBERGER
ANCT	Marie	LAURENT
LEADER France and ELARD (European LEADER Association for Rural Development)	Alexis	LEBRAT
Sorbonne University	Joséphine	LECUYER
MOVING project – Horizon 2020	Carla	LOSTRANGIO
Permanent representation of Slovenia at the European Union	Katja	MANFREDA
ANCT	Véronique	MENEZ-SAUNIER
ADT Consult	Georges	MERCIER
Delegation of the Friuli-Venezia Giulia region	Giovanna	PANTE
LEADER France and ELARD (European LEADER Association for Rural Development)	Marie	PERMINGEAT
Company ZaVITA	Matevz	PREMELC
University of Tartu, Estonia	Garri	RAAGMAA
European Commission, DG AGRI (Directorate-General for Agriculture and Rural Development)	Alexia	ROUBY
University of the mountain ("UNIMONT"), Edolo, a satellite of the University of Milan	Stefano	SALA
Tuscany delegation	Simona	SIMONI
Territorial authority of Corsica	Marion	TORREGANO-SILVANI
Romanian Ministry of Agriculture – National Agency of Mountain Areas	Dănuț	UNGUREANU
Spanish Ministry for Ecological Transition and the Demographic Challenge (MITECO)	Gonzalo	VALENCIA
Delegation of the Veneto region	Cristina	ZERBINATI

APPENDIX 3: WEB LINKS TO THE NATIONAL AND REGIONAL STRATEGIES ON CLIMATE CHANGE ADAPTATION, AND OTHER PUBLIC POLICIES MENTIONED IN THE STUDY

Austria
<p>Climate change National Strategy for climate change adaptation, and operational action plan (2012)</p> <p>Tourism Master Plan for Tourism (2019)</p> <p>Water Water Right Act (1959)</p> <p>Farming Austria's agri-environmental Programme (ÖPUL)</p>
Spain
<p>National scale</p> <p>Climate change: National Climate Change Adaptation Plan for 2021-2030 Tourism: National strategy for sustainable tourism by 2030 Water: Water management strategy (In progress – forthcoming publication)</p>
<p>Aragon Climate change: Aragonese Strategy for Climate Change. Horizon 2030 (EACC 2030) (2019)</p>
<p>Catalonia Climate change: Strategic reference framework for adaptation to climate change: Catalan Strategy for Adaptation to Climate Change. Horizon 2030 (ESCACC30) (2023)</p>
Italy
<p>Mountains Law for the Mountain (enacted 31 January 1994) National Strategy for Inner Areas</p> <p>Climate change National Climate Change Adaptation Strategy (2014) National Climate Change Adaptation Plan (2022)</p> <p>Tourism 2023-2027 plan for strategic tourism development (2023 – forthcoming publication)</p>
Romania
<p>Mountains Law of the Mountain (2018)</p> <p>Climate change 2021-2030 Integrated National Energy and Climate Plan</p>



<p><u>Romania's Sustainable Development Strategy 2030</u></p> <p>Water <u>Water Law</u></p>
<p>Slovenia</p> <p>Mountains <u>National Spatial Development Strategy (2004)</u></p> <p>Climate change <u>Integrated National Energy and Climate Plan (2020)</u> <u>Strategic framework for climate change adaptation (2016)</u></p>
<p>France</p> <p>Mountains <u>Mountain 2 Act (2021)</u></p> <p>Climate change <u>National Climate Change Adaptation Plan 2018-2022</u> <u>National Low Carbon Strategy (2020)</u></p> <p>Tourism Future of Mountains Plan https://www.ecologie.gouv.fr/sites/default/files/23021_AvenirMontagneTransitions_DP_pourBAT6_0.pdf https://agence-cohesion-territoires.gouv.fr/avenir-montagnes-ingenierie</p>

COMPRENDRE

RURAL AREAS AND RURAL POLICY IN EUROPE



The European Union is setting out a new ambition with the «rural pact». Various countries are redefining their policies for rural areas, notably France with the transition from the « Rural Agenda » to the « France ruralités » plan. The National Agency for Territorial Cohesion (ANCT) intended to carry out a comparative study of national policies for rural areas. The ANCT commissioned the Acadie cooperative to carry out this study. The countries studied are Germany, Spain, Estonia, Ireland and Poland. While the instruments used to promote rural development are fairly similar throughout Europe, the objectives and expectations of the Member States rural policies differ widely. Everywhere, the ecological transition is calling these policies, their instruments and their objectives into question.

