On Known-Plaintext Attacks to a Compressed Sensing-Based Encryption: A Quantitative Analysis

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TARGETED ANALYSIS

InTerAlp

Interface Territories across the Alpine region

Spatial and sectoral governance in Alpine interface territories

November 2024

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1 Introduction

1.1 Aims and structure of the report

The ESPON InTerAlp project is part of a larger effort to improve the understanding and support territorial governance and spatial development across the Alpine region. The Alpine region is home to several major European cities (among others: Munich, Milan, and Vienna), and is traversed by key transport corridors that connect Northern Europe with the Mediterranean. It is also a region of significant environmental importance, as it provides vital ecosystem services, such as water supply and biodiversity conservation, to the rest of Europe.

The governance of the Alpine region is inherently complex, as it involves multiple levels of government, from local municipalities to governments of eight nation states, as well as a range of sectoral agencies and stakeholders. The region is subject to a number of transnational frameworks, including the Alpine Convention and the European Union Strategy for the Alpine Region (EUSALP). These frameworks provide a platform for cooperation between Alpine countries and regions, and they address challenges in terms of ensuring that policies are effectively coordinated. The InTerAlp project provides a detailed analysis of governance structures and their impact on spatial and sectoral dynamics in Alpine interface areas. The project builds on previous research conducted by the ESPON Alps2050 project, which focused on the spatial development of the Alpine region. The InTerAlp project extends this research by focusing specifically on Alpine interface territories and by providing a more in-depth analysis of governance structures and their impact on sectoral policies.

Interface areas are a very specific type of territory, linking mountainous inner-Alpine areas with pre-Alpine lowlands. The definition of interface territories is based on the Alpine settlement system, the transport infrastructure and morphological arguments such as topographical elevation and the river system. These areas are highly dynamic, characterized by intense flows of goods, services, people, and environmental resources across national and regional borders. The InTerAlp project analyses these dynamics, offering a clearer perspective on how policy and governance can address the pressing needs of these territories.

The present report addresses the challenges and opportunities associated with the governance of Alpine interface territories. The aim of this report is to provide a comprehensive, comparative analysis of spatial and sectoral governance structures and instruments that, at different territorial levels, may play a role in promoting more sustainable development trajectories for these territories. More in particular, the report aims to reflect on the effectiveness of the multiple overlapping governance frameworks that address spatial and sectoral dynamics within the Alpine area, with particular reference to their relevance for Alpine interface territories. These governance structures are complex, involving multiple administrative levels, sectors, and stakeholders. The report assesses how well these frameworks promote coordination across borders and between different levels of government and sectors, such as transport, energy, and water management.

The analysis focusses on identifying inspiring practices, gaps, and areas for improvement in governance, with the ultimate goal of fostering more integrated and sustainable territorial development in the Alpine region. This report complements the further InTerAlp results, supporting the development of evidence-based recommendations that will guide policymakers and stakeholders in improving governance systems.

1.2 Spatial configuration of Alpine interface territories

The Alpine region spans across eight different countries[1], each differentially concerned by their Alpine dimension. As the Alpine Convention and the Alpine Space Territorial Cooperation Programme play an important role in promoting the sustainable development of the regions, it is important to reflect on their role for governance in the Alpine region (see Map 1).

Singed in 1991, the Alpine Convention serves as the primary international framework for the protection and sustainable development of the Alpine region. It encompasses approximately 190,700 km² of the Alps and aims to safeguard sensitive ecosystems while promoting responsible use of resources and fostering cross-border cooperation. Specific measures implementing the principles laid down in the framework Convention are contained in the Protocols to the Alpine Convention, that cover different issues: (i) Spatial planning and sustainable development; (ii) Mountain farming (iii); Nature protection and landscape conservation; (iv) Mountain forests; (v)Tourism; (vi) Energy; (vii) Soil conservation and (viii) Transport.[2]

Austria holds the largest share of the Alpine Convention territory, covering 28.7% of its area and hosting approximately 23.3% of its population. Of Austria's nine federal states, eight are concerned by the convention perimeter – namely the federal States of Vorarlberg, Tyrol, Carinthia (whose territories are fully included in the perimeter), Salzburg, Upper Austria, Lower Austria, Styria, Burgenland – for a total of 65% of the national territory (54,819 km²). In Italy, about 17% of the country's surface area (52,104 km²) falls within the Alpine Convention territory, concerning seven regions over 20 (Liguria, Piedmont, Valle d'Aosta, Lombardy, Trentino Alto Adige, Veneto and Friuli Venezia Giulia – NUTS 2), 23 Provinces and the Turin Metropolitan City (over a total of 107 NUTS 3 units) and 1,654 municipalities (over a total of 7,896). In so doing, the Italian territories accounts for 27.3% of the total territory covered by the Convention, and about 30.6% of the total population concerned by the latter. In France, the Alpine region covers about 40,047 km², representing 21.4% of the Alpine Convention area and hosting 18.8 of its population. Of the 13 French regions located in the European continent (NUTS 1 since the reform of the regions in January 2015), only two regions are (partially) included in the Alpine Convention perimeter, namely Auvergne-Rhône-Alpes, Provence-Alpes-Côte d'Azur.

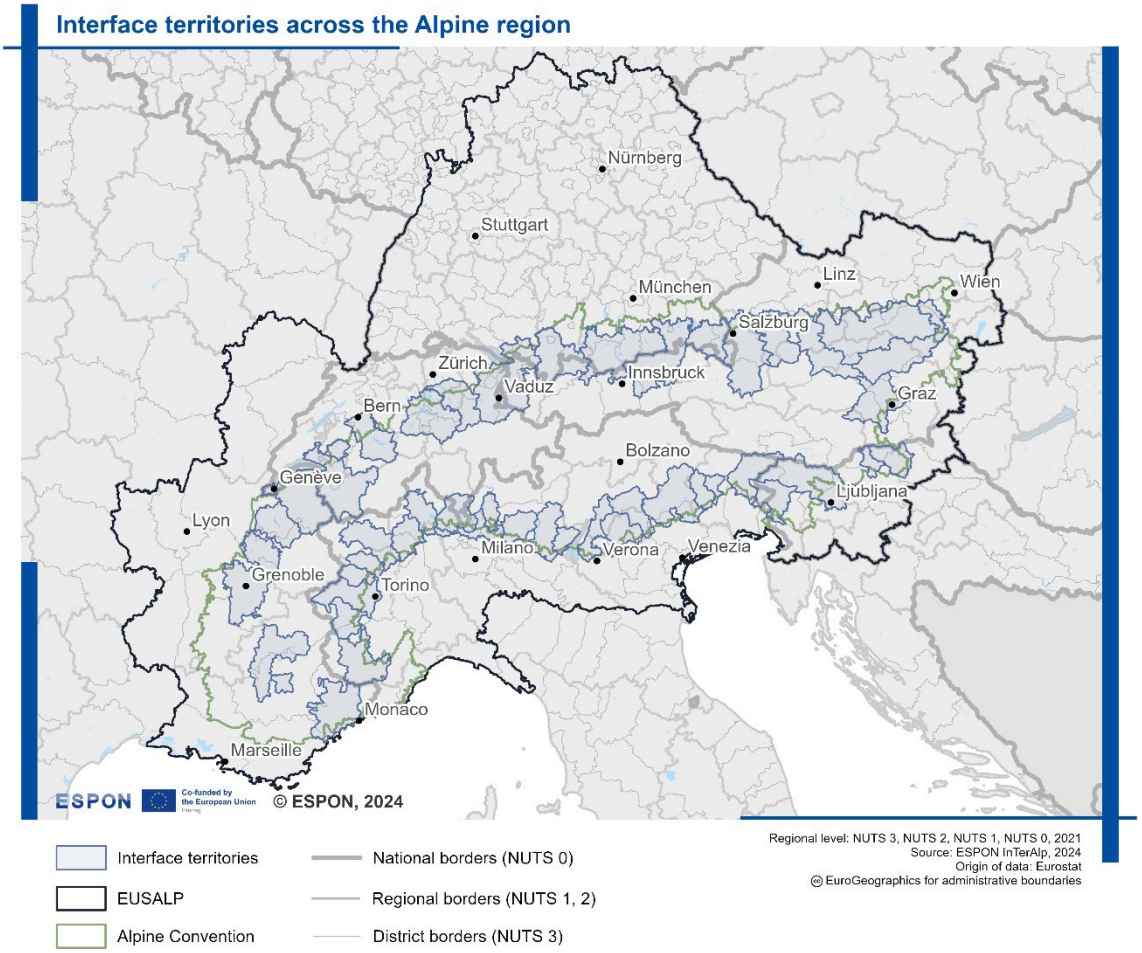
When it comes to NUTS 3 territorial units, this is true for 9 out of 101 departments (*départements*), with the département of Alpes-de-Haute-Provence, the département of Hautes-Alpes, the département of Savoie, and the département of Haute-Savoie that are fully concerned by the perimeter. In Germany, only about 3% of the national territory (11,157 km²) is concerned by the Alpine Convention, largely concentrated in Bavaria, the most prominent of its Länder with respect to Alpine matters. This makes Germany the country with the smallest share of its national territory within the Alpine Convention perimeter, following Italy and France. Conversely, Liechtenstein is fully covered by the Alpine Convention, with 100% of its territory (160 km²) falling within the convention perimeter. Slovenia, though smaller than its Alpine neighbours, has about 40% of its national territory included in the Alpine Convention. Switzerland has slightly over 60% of its total territory within the Alpine Convention, amounting to 25,254 km². Of the 26 Cantons (NUTS 3), 15 are included in the Alpine Convention area (of which only 10 to a full extent), namely Appenzell Ausserrhoden, Appenzell Innerrhoden, Bern, Freiburg/Fribourg, Glaris/Glarus, Graubünden/GrigioniGrischun, Luzern/Lucerne, Nidwalden, Obwalden, Uri, St. Gallen, Schwyz, Ticino, Waadt/Vaud, Wallis/Valais.

1 The countries composing the Alpine region are: Austria, France, Germany, Italy, Liechtenstein, Monaco, Slovenia and Switzerland. As the delimitation of the Alpine Interface Territories according to the methodology developed in the framework of the InTerAlp project, Monaco is not concerned by any interface territory. In this light, it has not been included in the analysis.

2 By 2002 all member states and the European Union have agreed on the various protocols. However, not all protocols have yet been ratified by all Contracting Parties, i.e. some have not yet passed national legislation to give the Protocols full legal effect on their territories. More details on the matter are available here: https://www.alpconv.org/en/home/convention/state-of-ratifications/

Map 1

How the different Alpine countries and regions are concerned by the Alpine Convention, the Alpine Space Programme and the Alpine interface territories



While the Alpine Convention focuses on the protection of the Alpine environment, the Alpine Space Programme takes a broader approach to transnational cooperation, incorporating regions and municipalities that lie in and around the Alps. The programme supports innovation, economic development, environmental sustainability, and regional connectivity. It covers a larger area than the Alpine Convention, including regions that may not be strictly within the Alpine core but are economically and geographically tied to it, in so doing fostering collaboration between Alpine and non-Alpine regions, providing a platform for joint projects that address common challenges. Austria is entirely covered by the Alpine Space Programme, meaning that all of its regions and federal states participate in the programme's transnational initiatives. This supports the country's efforts to maintain a balance between economic development and environmental sustainability, particularly in remote rural areas and dense urban centres. In Italy**,** the Alpine Space Programme covers seven regions (Friuli-Venezia Giulia, Liguria, Lombardia, Piemonte, Trentino-Alto Adige, Valle d'Aosta, and Veneto) and concerns approximately 4,075 Italian municipalities, i.e. more than half of the country total. In France**,** the Alpine Space Programme includes four regions: Bourgogne-Franche-Comté, Auvergne-Rhône-Alpes, Provence-Alpes-Côte d'Azur, and Grand Est. While only some of these regions are fully included in the programme's perimeter, the broader cooperation framework allows France to address key challenges such as climate change, regional development, and sustainable tourism. The Alpine Space Programme helps France integrate regional development with the preservation of natural landscapes, particularly in rural Alpine areas that are prone to economic challenges. Germany's participation in the Alpine Space Programme extends beyond Bavaria, incorporating regions in Baden-Württemberg, for a total of almost 30% of the country territory. For Liechtenstein, like the Alpine Convention, the Alpine Space Programme

encompasses 100% of its territory, fully integrating the country into the broader transnational cooperation framework. The same is true for Slovenia and Switzerland, whose entire national territories falls within the Programme. Their full participation allows the two countries to address their specific challenges as Alpine countries, particularly in terms of balancing economic development with environmental sustainability, and fostering stronger ties with neighbouring Alpine nations.

When it comes to the distribution of Alpine interface territories in the countries under investigation (see Map 1), of the 48 units identified through the analysis, 37 concern only one country. Italy hosts most of them (20), followed by France and Austria (6 and 5 respectively), Switzerland (4) and Slovenia (2), while no interface area is fully located in Germany or Liechtenstein. At the same time, 11 interface territories present a cross-border dimension, being positioned at the border between two countries – 5 between Austria and Germany, 2 between France and Switzerland, 1 between Italy and Slovenia, 1 between Austria and Slovenia and 1 between Italy and Switzerland. Finally, the Alpine Rhine Valley interface territory is share by four countries (Austria, Germany, Liechtenstein and Switzerland). Although most interface areas are located in Italy, they concern only 9% of the country's territory, a value that is similar to the one of Germany (8% of the country territory concerned by interfaces) and France (2%). These shares are rather low, when considering that in the cases of Austria, Slovenia and Switzerland interface areas concern the 28%, the 29% and the 30% of their respective national territories. Finally, the whole territory of Liechtenstein is included in the Alpine Rhine Valley interface territory.

These information and values show the important role that interface territories can play for sustainable development in the different countries and regions. This comes along with competing development agendas, involving a multitude of spatial and sectoral governance instruments and practices.

1.3 Data and methods

In order to systematically analyse and comparatively assess the relevance of spatial and sectoral governance in the countries under investigation, with particular relevance for the promotion of a more sustainable development of the Alpine interface territories, an articulated methodology has been applied, drawing both on desk research as well as on the iterative interaction with country experts.

More in detail, the methodology of analysis has been composed by five phases.

Phase 1 – Framing the analysis. Firstly, the research team coordinating the analysis has developed the structure of the country report template ensuring that, for each country, information concerning the spatial and sectoral governance systems at the different territorial levels and relevant sectors were collected and presented in a comparable way (Box 1).

Box 1
Structure of the spatial and sectoral governance country reports

Country report structure and content of the different sections

1. Introduction

This section discusses the Alpine specificity of the country, and how and to what extent its territory, population and administrative units are concerned by the Alpine Convention, the Alpine Space Cooperation Programme and the Alpine interface territories.

2. Spatial governance and planning

This section introduces the spatial governance and planning system of the country with particular attention to the multi-level nature of the territorial administration structure and the responsibilities attributed to the various levels.

2.1 National level instruments

This section lists the spatial governance and planning instruments available at this level in the country at stake, assessing their relevance for the promotion of sustainable development of the Alpine interface territories. It also assesses the degree of Alpine integratedness of spatial governance and planning at this level, on the basis of six complementary variables.

2.2 Subnational level instruments

This section lists the spatial governance and planning instruments available at this level in the country at stake, assessing their relevance for the promotion of sustainable development of the Alpine Interface Territories. It also assesses the degree of Alpine integratedness of spatial governance and planning at this level, on the basis of six complementary variables.

2.3 Local level instruments

This section lists the spatial governance and planning instruments available at this level in the country at stake, assessing their relevance for the promotion of sustainable development of the Alpine interface territories.

3. Sectoral governance and planning

3.1 Transport governance

This section lists the transport governance and planning instruments available in the country at stake at the different territorial levels, assessing their relevance for the promotion of sustainable development of the Alpine interface territories. It also assesses the degree of Alpine integratedness of transport governance and planning at this level, on the basis of six complementary variables.

3.2 Energy governance

This section lists the energy governance and planning instruments available in the country at stake at the different territorial levels, assessing their relevance for the promotion of sustainable development of the Alpine interface territories. It also assesses the degree of Alpine integratedness of energy governance and planning at this level, on the basis of six complementary variables.

3.3 Water governance

This section lists the water governance and planning instruments available in the country at stake at the different territorial levels, assessing their relevance for the promotion of sustainable development of the Alpine interface territories. It also assesses the degree of Alpine integratedness of water governance and planning at this level, on the basis of six complementary variables.

4. Summary and concluding remarks

This section assesses the overall degree of Alpine integratedness of spatial and sectoral governance and planning at this level, on the basis of six complementary variables.

Phase 2 – Pre-compilation of the reports. The second phase concerned the pre-compilation of the country reports for the seven countries under investigation: Austria, France, Germany, Italy, Liechtenstein, Slovenia and Switzerland. This activity was operated by the research team coordinating the analysis, on the basis of desk research. Two main sources of information were adopted as reference:

- The National questionnaires produced in the ESPON COMPASS project (ESPON, 2018);
- The Country reports available on the ARL International Platform (https://www.arl-international.com/knowledge/country-profiles).

The information collected through the above sources were then complemented in relation to each country through *ad hoc* research on national websites and policy and planning documents relevant for the analysis, when necessarily translated with the support of Artificial Intelligence.

Overall, the pre-compilation of information followed the structure of the country report template presented above, in so doing dedicating particular attention to:

- Producing a comprehensive investigation of the spatial governance and planning settings that characterize each country of the Alpine region, with particular attention to interface territories. This investigation was driven by the recognition of the multilevel and multifaceted character of governance in the Alpine region, which spans different administrative levels, geographical dimensions and legal frameworks. In interface territories, a wide range of spatial dynamics overlap, and this applies to a series of issues – recreation, water supply, the labour market etc. The spaces of supply are highly connected with the places of demand through diverse connections and transit structures. This setting comes along with diverse and often competing interests that have to be addressed with adequate governance tools. Consequently, the analysis concerned institutional and governance arrangements at the different territorial levels, and dedicate particular attention to the transnational and cross-border dimension. It focused on both statutory and non-statutory instruments ('hard' and 'soft'), and concerned a heterogeneous set of spatial governance and planning tools, ranging from visions and strategic plans, to programmes and incentive schemes, coordination plans and legally binding instruments[3].
- Collecting evidence of sectoral governance and planning from a multi-sectoral perspective, deriving from the recognition of the high spatial relevance of sectoral fields for the sustainable development of Alpine interface territories. Given then high level of heterogeneity and complexity, it was not possible to explore all the sectoral policies that characterise the Alpine interface territories in a comprehensive way. However, in order to make sure that the relevance of sectoral policies and instruments was not overlooked, exemplary sectors that are of high relevance for the development of the Alpine interface territories were included in the analysis:

  (i) **Mobility and transport** are of most obvious relevance in interface territories, as they the flows of people and goods are amongst the most pressing issues.

  (ii) **Energy** issues represent a particularly relevant governance challenge that involves energy production, infrastructure construction, and energy supply management. These topics involve very different territorial patterns, in particular in interface territories.

  (iii) **Water governance** is a prominent topic in mountain research, given the high relevance and complexity of the issue. In the Alpine region, the sharp contrast between supply and demand regions, an increasing number of flood events as well as the high number of political boundaries pose particular challenges.

A final and particularly important activity concluded the pre-compilation of the country report and concerned the assessment of the overall spatial and sectoral governance and planning instruments as well

3 Importantly, due to the limited time and resources for the analysis, the exploration of spatial and sectoral governance and planning tools at the local level mostly focused on instruments favouring inter-municipal cooperation, and only in case they were explicitly addressed as relevant by the country experts the instruments produced by individual municipalities were taken into account.

as the relation to their different levels and sectors. Drawing on the collected information, a more normative perspective was employed in the analysis, aiming at assessing the effectiveness of the existing governance structures and mechanisms that are in place for a sustainable and inclusive territorial development of the Alpine interface territories, in so doing supporting the development of strategic options for the future. More in detail, the InTerAlp project reflects on the effectiveness of spatial and sectoral governance and planning in a multi-dimensional but pragmatic way, implementing a so-called 'degree of integratedness' as a composite indicator subsuming six different dimensions[4]:

- *Attention to multilevel coordination*, that captures which relevant institutional levels are involved and in what way;
- *Attention to cross-sectoral coordination*, that captures the extent the different sectoral priorities are involved;
- *Stakeholders engagement and participation*, that captures how the governance framework foresees to mobilise actors beyond the public sector, and opens the decision and policymaking arena to the private actors and the civil society;
- *Cross-border relevance*, which considers how cross-border issues like the interaction with institutions located beyond the national border are foreseen;
- *Congruency with functional patterns*, that measures to what extent the governance perimeters in place fit with functional integration spaces (resulting from Task 1 analyses).
- *Alpine specificity*, that addresses how governance structures or instruments take into consideration the particular characteristics of the Alpine region. In other words, the question is if the governance approach foresees to capture the place-based specificities in territorial development.

The performance of the different spatial governance level (i.e. national and subnational)[5] or sector (transport, energy, water) was assessed according to each dimension on the basis of a four-scores Likert scale, taking into account the scoring system presented in Table 1.1.

Table 1.1
Degree of Alpine integratedness – Scoring system

Dimensions	1 very low	2 low	3 high	4 very high
Attention to multilevel coordination	*No coordination between levels or hierarchical institutionalised arrangements*	*Mechanisms of coordination between two levels*	*Structures of coordination and consensus with relevant actors and institutions*	*Full multi-level coordination and cooperation between relevant actors and levels*
Attention to cross-sectoral coordination	*Mono-sector orientation*	*Focus on sectors, but acknowledging the relevance of and inter-dependencies with other policies*	*Attention is paid to addressing and coordinating with selected sectors*	*Multi-sectoral coordination and coherence with a spatial policy focus*
Stakeholders' engagement and Participation	*The role of the public sector is dominant; relevant stakeholders are informed*	*The role of the public sector prevails; selected groups of actors are consulted and/or engaged*	*More than one stakeholder group actively participate to decision/policy-making*	*Participation of broad public and private actors, e.g. final users, inhabitants and businesses.*

4 Four of the six dimensions take direct inspiration by the dimensions of good territorial governance developed in the framework of the ESPON TANGO project (ESPON, 2014). The other two, i.e. 'cross-border relevance' and 'Alpine specificity', have been introduced due to their particular relevance in relation to the subjects at stake.
5 Due to the impossibility to survey a representative number of local level instruments, we decided to avoid assessing the degree of Alpine integratedness of local spatial governance and planning, as the results could have been misleading and not necessarily representative of the real situation on the ground.

Dimensions	1 very low	2 low	3 high	4 very high
Cross-border relevance	*No cross-border logic or implications*	*Reference to cross-border implications is included in the documents/actions but has no direct implications*	*The instruments/actions present an explicit cross-border nature and have cross-border implications.*	*The instruments/actions present an explicit cross-border nature, produced in interaction with actors on the other side of the border.*
Congruence with functional patterns	*Based on jurisdictional criteria / administrative boundaries*	*Open for further spatial considerations based on institutional agreements*	*Integrating functional / case-based criteria*	*Defined by functional criteria and considering potential functional configurations*
Alpine specificity	*No mention of the Alpine area or mountain areas in general*	*Selected instruments/actions refer to the Alpine or mountain areas.*	*The Alpine or mountain areas constitute the focus of selected instruments/actions*	*The Alpine area constitutes the main focus of all instruments/actions*

Source: authors' own elaboration

The results of the assessment were then represented and illustrated through spider graphs that take inspiration from those developed in the framework of the ESPON ACTAREA project (ESPON, 2014). They can be seen as a particular form of institutional mapping, which facilitate a clear and concise representation a complex governance context.

Phase 3 – Testing and validation with country experts. The third step of the analysis concerned the testing and validation of the draft country reports produced in Phase 2. For each country, the members of the project consortium that have been engaged as national experts were required to validate and comment on the drafts concerning their respective countries. Each report was shared with the respective national expert at least twice during this process, and the reports were incrementally adjusted and fine-tuned as a consequence of the received comments. When necessary, dedicated online meetings between the research team coordinating the analysis and selected national experts were scheduled, in order to clarify particularly challenging aspects. During this phase, particular attention was dedicated to:

- Verify whether the assessment of the relevance of the identified instruments in relation to the promotion of sustainable and inclusive development of the Alpine interface territories was correct, or included any element to be amended;
- Complement the identified list of instruments with any element that may have overlooked by the research team coordinating the analysis, due to the scarce knowledge of the national contexts under investigation;
- Double-check the scoring attributed to the various dimension composing the degree of Alpine integratedness, in relation to the various spatial governance and planning levels and sectors.

As a result of these phases, the seven country reports were consolidated, and complemented with a transnational and cross-border report that collected all spatial governance and planning initiatives that concerned more than one country.

Phase 4 – Cross-weighting the assessment. The fourth phase of the analysis concerned the cross-weighting of the scoring attributed to the various dimensions composing the degree of Alpine integratedness, in relation to the various spatial governance and planning levels and sectors. The scores attributed to each level and sector in relation to each dimension were carefully examined comparatively, ensuring that the cross-country differences were adequately represented in the analysis and that the latter did not include any unmotivated outlier. When necessary, the scores were adjusted according to the result of this cross-weighting phase.

Finally, the overall Degree of Alpine integratedness has been calculated for each country, with each dimension weighted as an average of the national, subnational, and sectoral perspectives (each weighing one-third of the final score).

Phase 5- Comparative analysis. Drawing on the consolidated transnational and country reports, as well as on the adjusted scorings included in the latter, the information collected through the analysis were aggregated and compared, resulting in the comparative analysis presented in this report. Here, particular attention has been dedicated to highlighting the most inspiring practices that were collected through the analysis (see boxes 2 to 20, which are included in §2, §3 and §4). At the same time, for each spatial governance and planning level and sector, the main challenges and opportunities emerging from the assessment of the Degree of Alpine integratedness have been highlighted, aiming at providing a sound basis upon which to develop applicable policy messages aiming at promoting a more sustainable and inclusive development of the Alpine interface territories.

The results of the implementation of the described methodological phases are presented in the sections that follow.

2 Transnational and cross-border initiatives

2.1 Transnational and macro-regional initiatives

2.1.1 Conventions and agreements

The Alpine region is characterised by a series of cooperative agreements, in particular by means of the Alpine Convention (Focus 1). Established in 1991 and implemented since 1995, the Alpine Convention is an international treaty aimed at safeguarding the Alpine environment and promoting sustainable development across Austria, France, Germany, Italy, Liechtenstein, Monaco, Slovenia, and Switzerland. This Convention seeks to balance ecological, economic, and social interests, with core objectives to protect biodiversity, support sustainable economic activities like tourism and agriculture, and foster cooperation across national and regional lines. The Convention's comprehensive framework includes protocols guiding key areas such as mountain farming, renewable energy, sustainable tourism, and transport, all geared towards preserving the region's delicate ecological balance while promoting local economies. Considering the Convention's activities in fostering cooperation, it might play a strategic role in supporting the Alpine interface territories (Focus 1).

Focus 1
Alpine Convention and Alpine interface territories

POTENTIAL CONTRIBUTION OF THE ALPINE CONVENTION TO ALPINE INTERFACE TERRITORIES

The Alpine Convention is conceived as an intergovernmental treaty for the protection and sustainable development for the Alps. It has the potential to significantly contribute to the agenda setting and recognition of interface territories. Across the different sectoral and working groups and activities, the Convention could emphasise the importance of these interface territories as part of a new spatial and governance geography. Amongst others, Alpine interface territories can also be considered in Reports on the State of the Alps. This geography could be central in fostering a more place-based and territorially sensitive approach:

- Identifying territorial dynamics that stem from existing planning and cooperation practices (whether formal or informal) within interface territories.
- Investigating and testing the existence of any political convergence (explicit or implicit) towards this new geographical framework.
- Involving local actors in the Alpine Convention's governance process through specific tools, such as establishing a "Forum of Alpine interface territories."
- Encouraging local actors to adopt a proactive approach, raising awareness of the strategic and operational importance of Alpine interface territories.

Source: authors' own elaboration

The governance of the Convention lies with the Alpine Conference, a decision-making body of representatives from all member parties, which meets every two years to oversee protocol implementation and steer new initiatives. The Convention's Secretariat, located in Innsbruck and Bolzano, coordinates activities, supports research, and works closely with local and regional stakeholders to meet the Convention's objectives. Initiatives like ARGE ALP, established in 1972 to foster cooperation across Germany, Austria, Italy, and Switzerland, have helped address regional challenges by creating networks that promote sustainable development and cultural preservation. More recently, the 2022 Simplon-Allianz initiative has rallied all Alpine states around a common goal of making the region's transport

climate-neutral by 2050. The Alpine Convention's alignment with European and international frameworks, particularly the EU Strategy for the Alpine Region (EUSALP), strengthens its impact by integrating sustainability goals into local and regional efforts.

International environmental agreements complement these goals, such as the Ramsar and Berna Conventions, which protect wetland habitats and regional biodiversity. Bilateral agreements on specific issues also play a role in regional cooperation. For example, Italy and Switzerland have longstanding treaties on water management that date back to the mid-20th century, addressing pollution and sustainable use. The recent Quirinal Treaty between France and Italy underscores this cooperative spirit, introducing the "basin de vie" concept, which identifies cross-border territories that connect communities' daily lives and livelihoods, encouraging cohesion and regional identity across borders (Focus 2).

Focus 2
BASSIN DE VIE and Alpine interface territories

POTENTIAL CONTRIBUTION OF "BASSIN DE VIE" CONCEPT TO ALPINE INTERFACE TERRITORIES

Bassin de vie is a French concept. It defines a functional area where people carry out their daily activities, such as working, shopping, going to school, and accessing services like healthcare. It is intended to stimulate functional reflections capturing how people interact with their surroundings beyond administrative or municipal boundaries. The concept is used in the fields of spatial planning, geography, and economics, although it has not yet been widely applied to cross-border cooperation. Due to the characteristics of the Alpine interface territories, the concept offers intriguing aspects that can be explored and exploited. Here are some aspects to take into consideration:

- **Conceptual level**: When delimiting the Alpine interface territories, it would be interesting to incorporate the "living area" approach to assess social relations.
- **Governance level**: When defining formal and informal governance models, it would be beneficial to expand their mechanisms by considering variables related to people-centred networks alongside institution-centred networks.
- **Cooperation level**: When exploring cooperation opportunities and initiatives, it would be helpful to focus on specific transboundary territories that reflect the citizens' preferred ways of living.

Source: authors' own elaboration

2.1.2 Macro-regional strategies

Macro-regional strategies add another layer to transnational cooperation in the Alpine region, providing a platform for countries to address challenges and opportunities specific to Alpine territories. The EU Strategy for the Alpine Region (EUSALP), launched in 2015, involves seven countries and 48 regions working together towards a prosperous, competitive, and sustainable region. EUSALP focuses on three main areas: economic growth through innovation, enhanced mobility and connectivity, and environmental sustainability. It promotes cross-border efforts to improve the region's competitiveness by fostering digital transformation, supporting small and medium-sized enterprises (SMEs), and advancing sustainable transport solutions. EUSALP also emphasises climate resilience and the protection of Alpine ecosystems, helping Alpine communities adapt to climate change's realities. The EU Strategy for the Adriatic and Ionian Region (EUSAIR), launched in 2014, and the EU Strategy for the Danube Region (EUSDR), established in 2011, also have an impact on Alpine areas, as they cover parts of Italy, Slovenia,

and Austria. While these strategies are not specifically focused on the Alpine region, they enable overlapping territories to benefit from regional cooperation initiatives. EUSAIR focuses on sustainable tourism, environmental protection, and connectivity within the Adriatic and Ionian regions, providing Alpine areas with additional economic development and cross-border integration tools. Similarly, EUSDR supports efforts to improve connectivity, energy efficiency, and environmental quality across the Danube basin, promoting cooperation on water resource management and biodiversity conservation that indirectly benefits the Alpine region. These macro-regional strategies create a collaborative environment where countries and regions can develop coherently and promote multi-level approaches to common challenges. Focus 3 reflects on the potential contribution of the EU macro-strategies to Alpine interfaces territories development.

Focus 3
EU strategies and Alpine interface territories

POTENTIAL CONTRIBUTION OF THE EUSALP TO ALPINE INTERFACE TERRITORIES

The EUSALP offers an important platform for discussing Alpine interface territories, in particular as its perimeter comprises all interface territories. By promoting transnational cooperation, this strategy can develop a common approach to support the Alpine interface territories through a cooperative perspective. Across the EUSALP's sectoral Action Groups, it might contribute to:

- Providing technical and political support to solidify the role of Alpine interface territories, in line with EU strategies and policies.
- Building a common (transnational) approach to this new "geographic category" by acknowledging their unique status.
- Understanding and promoting their needs and potential in terms of fair and balanced territorial development.
- Targeting these territories with specific, ad hoc initiatives. This could become easier if they are included in post-2027 discussions.

Source: authors' own elaboration

2.1.3 Transnational Interreg programmes

The Alpine region also benefits significantly from Interreg transnational cooperation programmes, which fund joint projects and foster cross-border networks. The Alpine Space Programme spans Austria, France, Germany, Italy, Liechtenstein, Slovenia, and Switzerland, and aims to enhance innovation, sustainability, and regional competitiveness. Aiming at sustainable development, the Alpine Space Programme funds projects focused on climate resilience, low-carbon mobility, and economic innovation. Projects within this framework tackle issues specific to the Alps, like risk management for natural hazards and reducing greenhouse gas emissions.

In addition to the Alpine Space Programme, other Interreg programmes such as Central Europe, Euro-MED, Danube, Northwest Europe, and IPA Interreg ADRION broaden the scope of transnational collaboration. These programmes allow Alpine areas to connect with other European territories with similar economic, environmental, and social challenges. For instance, the Interreg Central Europe programme emphasises innovation, resource efficiency, and sustainable urban development, which align well with the Alpine Space Programme's objectives. The Danube and Euro-MED programmes also prioritise environmental sustainability, connectivity, and climate resilience, further enhancing collaborative efforts across the Alpine region. These programmes enable regions within and around the Alps to draw on resources and knowledge from a more comprehensive network, fostering balanced growth and regional resilience. Each of these initiatives, from conventions and macro-regional strategies to Interreg

programmes, contributes to a cohesive and robust framework for addressing the unique challenges of the Alpine region. Through multi-level governance, shared resources, and focused strategies, Alpine countries and territories work together to safeguard the environment, boost economic competitiveness, and support sustainable development while preserving the distinct cultural and natural heritage that defines the Alps.

Table 2.1 shows the eligibility framework. Slovenia is eligible for most of these programmes, with the opportunity to participate in five of six transnational programmes. Italian and German regions can participate in four programmes, followed by Austria, France, and Switzerland, eligible to participate in only two. Finally, Liechtenstein is included in only one programme. If we look at the geographical coverage, Slovenia, Switzerland, and Liechtenstein are the only three fully eligible states, meaning their entire territory is included in the programmes. In contrast, the other countries are only partially eligible—typically, the eligible NUTS 2 entities are those close to the Alpine region.

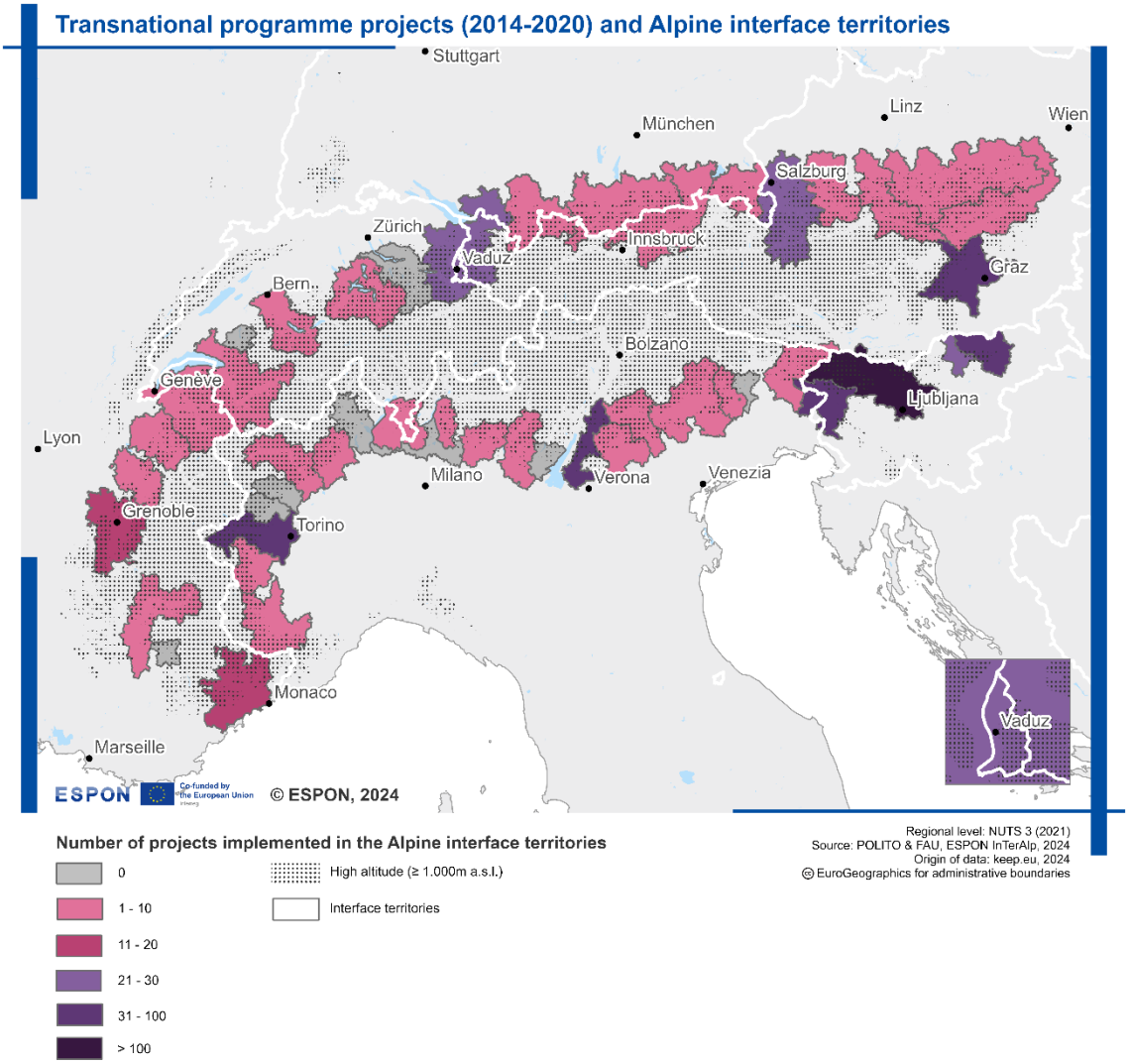
Table 2.1
State eligibility by Interreg transnational programmes

Programme	Austria	Germany	France	Italy	Liechtenstein	Slovenia	Switzerland
Alpine Space	X	X	X	X	X	X	X
Interreg Euro-MED			X	X		X	
Central Europe	X	X		X		X	
Danube	X	X				X	
North-West Europe		X	X				X
IPA Interreg ADRION				X		X	

Source: author's elaboration

Map 2 shows the spatial distribution of the projects implemented in the different LAU1 Alpine interface territories level. It can be noticed that some interface territories have been more proactive in attracting funds (Ljubljana, Gorizia/Nova Gorica, Trento, Torino, Salzburg and Graz, for instance) while others have less.

Map 2
Transnational Interreg programmes and Alpine interface territories



2.2 Cross-border initiatives

2.2.1 Cross-border EU programmes

Cross-border cooperation has become a cornerstone of development in European border regions, particularly in the Alps, where the shared geography presents unique challenges and opportunities. Historically, border areas were often seen as peripheral, dealing with regulatory and logistical issues that hindered growth. However, with the EU's Interreg initiative, many border-regions have transformed into vibrant zones of innovation and cooperation. Interreg programmes address a wide range of cross-border issues, from environmental protection to economic and social integration, helping border areas move beyond national boundaries and work toward common goals. The Alpine region, characterised by diverse ecosystems and varied socio-economic conditions, benefits from these EU-backed initiatives. Projects funded by Interreg and other cross-border programmes help Alpine regions tackle complex issues like climate adaptation, cultural heritage preservation, and economic resilience. This section delves into several key programmes, each uniquely contributing to the Alpine cross-border landscape, enabling Alpine communities to sustain growth, improve connectivity, and foster collaboration across borders.

In the Alpine region alone, ten cross-border programmes operate under the Interreg VI-A framework, with most of them targeting specific bilateral relationships. Italy is particularly active, engaging in five distinct programmes that address its varied border dynamics with countries like France, Austria, and Switzerland. Austria, France, and Switzerland are also deeply involved, each participating in four programmes that reflect the deep interdependence of Alpine countries. These programmes offer invaluable resources and structures for Alpine territories to design projects aligned with their unique needs, be it through integrated governance models, specialised project calls, or regional sustainability initiatives.

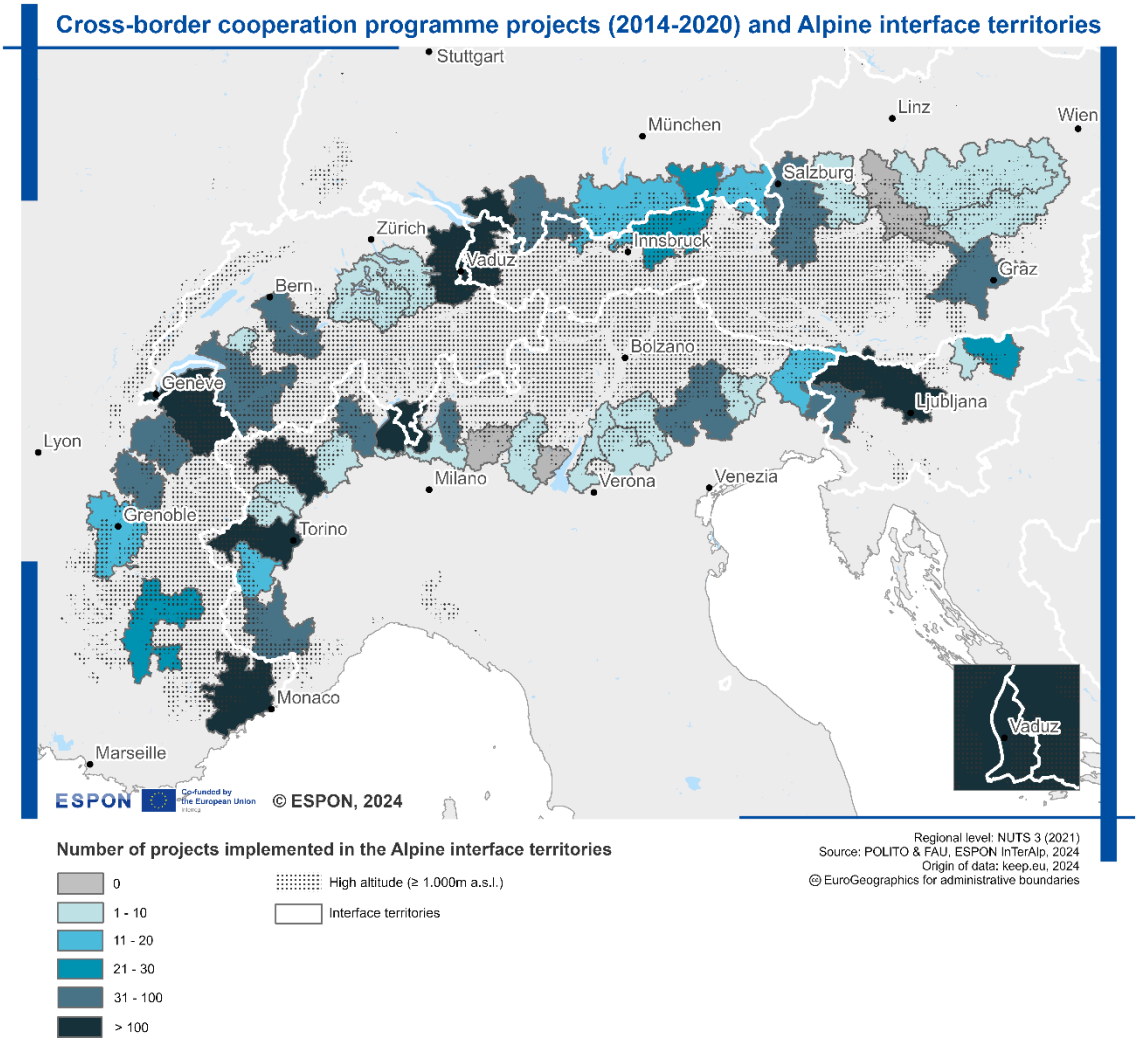
Table 2.2
Cross-border programmes' funds and Alpine interface territories

Programme	Total No. of Projects (2014-2020)
Interreg VI-A Austria-Germany/Bavaria	83
Interreg VI-A France-Italy (ALCOTRA)	159
Interreg VI-A France-Germany-Switzerland (Upper Rhine)	132
Interreg VI-A Germany-Austria-Switzerland-Liechtenstein (Alpenrhein-Bodensee-Hochrhein)	102
Interreg VI-A France-Switzerland	124
Interreg VI-A Italy-France (Maritime)	129
Interreg VI-A Italy-Austria	92
Interreg VI-A Italy-Slovenia	58
Interreg VI-A Italy-Switzerland	118
Interreg VI-A Slovenia-Austria	52

Source: authors' own elaboration

Map 3 shows the interplay between the eligible areas of the CBC programmes insisting on the Alpine area and the number of projects aggregated at the Alpine interface territories. Almost all interface territories have benefited from the EU cross-border cooperation programmes targeting the Alpine region.

Map 3
EU Cross-border programmes and Alpine interface territories



The Interreg VI-A Austria-Germany/Bavaria programme has focussed on cross-border research, natural resource management, and improved governance structures. This programme continues to shape regional dynamics in the 2021-2027 phase with an even stronger emphasis on sustainability and climate adaptation. For instance, cross-border collaborations in innovation and tourism have helped to bolster economic growth while maintaining a commitment to the environment. Another relevant initiative, Interreg VI-A France-Italy (ALCOTRA), facilitates cooperation between France and Italy's Alpine regions. ALCOTRA has promoted sustainable development through investments in local innovation, environmental protection, and social inclusion, with a special emphasis on addressing the socio-economic and geographical challenges unique to the mountainous Alpine landscape. A key feature of ALCOTRA is its PITER initiative, which offers a model of integrated territorial cooperation, focusing on areas like cultural heritage, sustainable tourism, and regional cohesion. The PITER initiative serves as an example of how cross-border strategies can address shared needs and foster a unified Alpine identity (Box 2).

Box 2
Territorial integrated plan (PITER) Alcotra Interreg

PITER

The PITER (*Piani Integrati Territoriali*) territories are part of the Interreg ALCOTRA program, which aims to foster integrated territorial cooperation between regions in France and Italy. PITER focuses on a range of themes, including sustainable tourism, environmental protection, cultural heritage, and socio-economic development in cross-border areas. The goal is to enhance regional cohesion and resilience through coordinated initiatives. The main characteristics of PITER are:

- Integrated approach: Unlike isolated projects, PITER initiatives focus on integrated strategies that address broader regional needs.
- Multi-stakeholder inclusion: PITER promotes the comprehensive inclusion of key stakeholders, ensuring that all relevant voices are heard.
- Participatory strategy development: Each PITER strategy is developed through an inclusive and participatory process. Importantly, each PITER is formalized as an Integrated Territorial Investment (ITI), which is a contract signed by all involved parties, clearly defining objectives and strategic goals.

How Can PITER initiatives inspire Alpine interface territories?

Key lessons that Alpine territories could adopt include:

- **Developing cross-border strategies**: Creating a strategy based on shared local needs, even when those needs span multiple regions and national boundaries.
- **Building a "Sense of Belonging"**: Encouraging collaboration among stakeholders to foster a collective sense of identity and shared responsibility.
- **Establishing a strong territorial identity**: Shaping a cohesive and attractive image of the territory to strengthen regional branding.
- **Integrating multiple projects**: Merging isolated projects into a comprehensive and coherent strategy allows for more significant impact and resource efficiency.

The Interreg VI-A France-Germany-Switzerland (Upper Rhine) programme illustrates another successful model of integration, spanning regions along the Rhine that share cultural and economic ties. Initially focused on promoting innovation, resource management, and mobility, this programme now strongly emphasises climate resilience and digital transformation. This evolution reflects a shift towards addressing modern challenges in a cohesive manner across national borders, underlining the importance of adaptability in cross-border programmes. Similarly, the Interreg VI-A Germany-Austria-Switzerland-Liechtenstein (Alpenrhein-Bodensee-Hochrhein) programme brings together four countries to address economic, environmental, and social issues. This programme has worked to promote competitiveness through digital innovation, environmental protection, and cross-border healthcare and tourism initiatives. The priorities of this programme – in particular the emphasis on environmental protection and civic engagement – are directly aligned with the needs of Alpine communities, creating a framework that fosters a resilient and connected Alpine region. The Interreg VI-A France-Switzerland programme emphasizes integration between French and Swiss regions, strengthening cohesion and bridging development gaps through joint efforts in the fields of environmental protection, mobility, innovation, and culture. Projects under this programme have improved the quality of life by addressing climate change, promoting sustainable tourism, and fostering a shared cross-border identity. As the programme progresses, its objectives are aligned with those of the EU Green Deal objectives, focusing on carbon neutrality, renewable energy, and biodiversity protection.

Focus 4 discusses the potential contribution of the cross-border Interreg programmes to support the development of the Alpine interface territories.

Focus 4
Cross-border Interreg programmes and Alpine interface territories

POTENTIAL CONTRIBUTION OF INTERREG ALPINE SPACE AND CROSS-BORDER PROGRAMMES ON ALPINE INTERFACE TERRITORIES

The Alpine Space programme as well as the cross-border cooperation programmes offer relevant platforms of territorial cooperation: this can actively promote tailored-made projects within interface territories. The programmes' scale and objectives align well with the geographic distribution of many Alpine interface territories. In this respect, territorial cooperation programmes can support the Alpine interface territories when it comes to:

- Promote new forms of formal (or informal) cooperation values through which emerge or consolidate existing cooperation initiative formats.
- Promote ad hoc projects or a set of projects that specifically target these territories.
- Funding new emerging governance experiences which implement various models (see the case of PITER promoted by the ALCOTRA programme).

Source: authors' own elaboration

2.2.2 CLLD, LAGs and EGTC

Community-Led Local Development (CLLD) is a powerful model for empowering local communities to lead their own development. Originating from the LEADER initiative in the early 1990s, CLLD brings together local actors – including businesses, community groups, and local authorities – to collaborate on addressing unique local challenges and leveraging opportunities. Unlike traditional, top-down development models where national or regional authorities dictate priorities, CLLD allows decisions to be made by those most familiar with the local context. This bottom-up approach empowers communities to create tailored Local Development Strategies (LDS), ensuring that projects meet specific needs and that resources are used effectively. These strategies often focus on sustainable growth, innovation, environmental protection, job creation, and social inclusion, with each strategy tailored to reflect local priorities. A key feature of CLLD is the formation of Local Action Groups (LAGs). These public-private partnerships, made up of representatives from local government, businesses, and civil society, are responsible for designing the LDS, managing budgets, and selecting projects to receive funding. By involving a wide range of stakeholders, LAGs ensure that decisions are inclusive and reflect the diverse interests of the community. This collaborative approach fosters ownership and responsibility among community members, strengthening the commitment to long-term development. CLLD's flexibility has allowed it to extend beyond rural areas to encompass urban, coastal, and fisheries contexts, adapting its core principles to address different local challenges. While rural areas might focus on issues such as depopulation and access to services, urban or coastal communities may prioritize solutions to unemployment, housing shortages, or environmental sustainability. Alpine countries, in particular, have embraced CLLD through a network of LAGs operating in different contexts in Alpine interface territories. This locally driven model allows Alpine regions to adapt solutions to their specific geographical and socio-economic challenges.

LAGs in cross-border areas

Local Action Groups (LAGs) operating in cross-border areas extend the principles of CLLD beyond national borders, which is particularly relevant in complex regions such as the Alps. These cross-border LAGs, such as the Dolomiti Live and HEurOpen groups, foster sustainable development and cross-border cooperation in the Alpine landscape. The Dolomiti Live LAG operates across Italy and Austria, covering parts of South Tyrol, Belluno, and East Tyrol. This LAG focuses on promoting economic growth,

preserving cultural heritage, and protecting the environment within the UNESCO-designated Dolomites. Recognizing the interconnected cultural and historical ties of these regions, the LAG addresses common challenges, such as managing sustainable tourism, protecting natural environments, and supporting the local economy through initiatives like promoting local products and crafts. Similarly, HEurOpen, operating between Italy and Austria, fosters cross-border partnerships by focusing on rural tourism, heritage conservation, environmental protection, and local entrepreneurship. By connecting stakeholders from both countries, HEurOpen works to bridge cultural and economic differences, promoting sustainable growth across the border. These LAGs demonstrate how the principles of CLLD can create effective cross-border cooperation, addressing shared challenges while promoting local identity and sustainable development.

European Grouping of Territorial Cooperation (EGTC)

The European Grouping of Territorial Cooperation (EGTC) is another mechanism designed to facilitate cross-border, transnational, and interregional cooperation in the EU. Established in 2006, the EGTC legal framework allows public authorities from different EU member states to work together towards common goals, overcoming traditional legal and administrative obstacles to cooperation. This model is essential for promoting the EU's cohesion policy, which aims to reduce economic, social, and territorial disparities. EGTCs allow public authorities to work across borders on infrastructure projects, cultural exchanges, environmental initiatives, and more. They provide a legal framework that goes beyond national borders, allowing the grouping to make contracts, recruit staff, and manage resources independently of the national regulations of the participating states. This independence makes EGTCs particularly effective for managing EU-funded projects under the European Structural and Investment Funds (ESIF) and the European Territorial Cooperation (ETC) programmes, commonly known as Interreg. Several EGTC initiatives have been established within the Alpine region. For example, the EGTC Euregio Tirolo-Alto Adige-Trentino brings together Italian provinces and Austria's Tirol region to promote regional development and cohesion. Similarly, the Parc européen Alpi Marittime-Mercantour EGTC unites protected areas in France and Italy to address environmental conservation and sustainable tourism in the shared natural landscapes of the Maritime Alps. These partnerships strengthen regional ties and facilitate cooperation on environmental protection, cultural exchange, and economic integration.

2.2.3 Other cooperation formats

In addition to structured programmes such as Interreg, various grassroots cooperation initiatives have emerged in European regions to address specific territorial needs. These initiatives are bottom-up, meaning that they originate from the direct interests and needs of local communities rather than being mandated by higher authorities. They typically involve a wide range of stakeholders, including local governments, non-governmental organisations, businesses, and citizens' groups, allowing them to effectively respond to specific regional challenges through flexible, adaptable frameworks. As these initiatives are often voluntary, they lack a rigid structure, making them versatile and highly responsive to local circumstances. These grassroots cooperation efforts serve a variety of purposes and focus on issues that reflect the unique social, environmental, and economic needs of each region. Below are some prominent examples of such initiatives:

- Environmental conservation networks: These include efforts to protect and sustainably manage natural resources that span borders. Examples include watershed management groups or nature reserves operating under cross-border agreements, like River Basin, Lake, or Wetland Area Contracts. These networks address environmental challenges that cross political boundaries, such as managing water quality and biodiversity, ensuring coordinated conservation efforts across borders.
- Economic development partnerships: Through collaborative efforts to bolster local economies, these partnerships often focus on joint tourism promotion, business development, and shared infrastructure projects. By working together, bordering regions can enhance economic resilience and create new growth opportunities that would be difficult to achieve independently.
- Social and health services collaboration: To improve the accessibility and quality of healthcare and social services, these initiatives coordinate resources across borders. They may involve

joint emergency services, shared healthcare facilities, or responses to public health issues, addressing the gaps that arise when healthcare needs cross regional lines.

- Cross-border soft mobility: These efforts aim to create better mobility options across borders, including pedestrian-friendly and bike-accessible routes, improving connectivity between regions without relying heavily on motorised transport.
- Tourism and energy sector initiatives: With an emphasis on sustainable tourism and energy provision, these initiatives often focus on enhancing local tourism appeal while promoting renewable energy sources, such as green hydrogen, which has gained traction in areas like the Alps where ecological sensitivity is paramount.

2.3 Challenges and opportunities

Cooperation in the Alpine region offers significant potential but also brings particular challenges. As communities, governments, and organisations work together to bridge diverse national and cultural landscapes, they must navigate coordination, environmental protection, economic disparities, and funding sustainability complexities. These challenges underscore the intricacies of fostering unified, sustainable development in areas where political boundaries intersect with shared natural resources and cultural ties. Identifying and addressing these obstacles is essential for maximising the impact of cross-border initiatives and ensuring equitable growth for all participating regions. Based on that, a selection of challenges is provided:

- **Coordination across different stakeholders and borders:** Coordinating efforts between local governments, NGOs, businesses, and citizen groups from different countries can be challenging due to varying regulations, administrative processes, and priorities. Achieving alignment requires intensive communication and negotiation, especially in initiatives that span multiple jurisdictions.
- **Environmental and resource management in shared ecosystems:** Environmental issues such as water quality, biodiversity preservation, and climate adaptation are complex in cross-border regions, as natural resources do not adhere to political boundaries. This creates challenges in implementing unified conservation strategies and ensuring sustainable resource use across borders.
- **Economic and social disparities:** Economic and social inequalities between bordering regions can make it difficult to implement cohesive development strategies. Differences in economic development, access to resources, and social services require tailored approaches to ensure equitable progress and mutual benefit.
- **Funding and sustainability of grassroots initiatives:** Many grassroots initiatives lack steady funding and formal structures, hindering long-term sustainability. Securing funding from cross-border programmes such as Interreg or maintaining local stakeholder support can be challenging, especially for smaller, voluntary efforts without institutional backing.

While cooperation brings challenges, it also opens doors to many opportunities for growth, resilience, and shared prosperity. Community-led approaches like CLLD and frameworks such as EGTCs allow border regions to take control of their development, fostering locally-driven solutions attuned to unique regional needs. Collaborative efforts in environmental conservation, economic partnerships, and cultural exchanges strengthen regional ties and promote innovative governance and sustainable economic growth. These opportunities provide a pathway for border communities to thrive together, creating stronger, more resilient regions that benefit from shared resources support. With this in mind, a selection of potentials is provided:

- **Enhanced regional resilience through local empowerment:** CLLD and LAGs foster local decision-making, which allows regions to address unique needs more effectively and strengthens community ownership. This bottom-up approach promotes resilience by empowering communities to take charge of their sustainable development, environmental management, and economic growth.
- **Cross-border environmental management and conservation:** Initiatives like River Basin and Wetland Area Contracts might provide a framework for joint environmental stewardship, allowing

regions to address ecological challenges collaboratively. This cooperative approach is essential for managing shared resources, mitigating climate change impacts, and protecting biodiversity.

- **Innovative governance models and institutional learning:** EGTCs and other cross-border frameworks offer new governance models that transcend traditional boundaries, enabling local authorities to collaborate more seamlessly. These frameworks provide valuable lessons in multi-level governance, which can be adapted to other regions seeking to improve cross-border cooperation.
- **Increased cultural exchange and social cohesion:** Grassroots initiatives, particularly those focused on social services and health, strengthen ties between communities and foster a shared identity. By addressing social challenges collectively, border regions can build trust and cohesion, enhancing stability and mutual understanding across borders.

3 Spatial governance and planning

3.1 A comprehensive overview of Alpine multilevel governance

Spatial governance and planning systems in the Alpine region show a wide range of approaches, reflecting the historical, institutional and cultural contexts of each country. While some countries emphasise decentralisation and local autonomy, others maintain a rather strong central oversight.

More specifically, Austria, Germany and Switzerland are characterised by federalised spatial governance and planning systems. Austria grants significant autonomy to its nine federal states, with spatial planning responsibilities that are shared between the federal government, the Länder and municipalities. The hierarchical planning structure is typical of federal, comprehensive integrated spatial planning systems (CEC, 1997), with State Development Strategies and Regional Plans) at the upper levels. However, municipalities have a strong position in local spatial planning, producing local development strategies, land-use plans, and building schemes. The Austrian Conference on Spatial Planning facilitates coordination across the different levels of government, particularly for sectoral planning objectives such as environmental protection, infrastructure development, and open space preservation. Also in Germany the Länder hold significant power over spatial planning, though federal frameworks establish general principles. The federal reform of 2006 further devolved spatial planning responsibilities to the Länder, allowing for regional variation in planning approaches. Germany's 16 federal states have their own constitutions and spatial planning systems, while local authorities manage community-level functions. Regional planning is a key aspect of the German system, with 104 regional planning authorities coordinating land use and development. Switzerland's spatial planning system is also highly decentralized, with the country's 26 cantons that hold significant powers in spatial governance, and municipalities playing an important role in local planning and zoning.

Despite not being a federal country, also in Italy the spatial governance and planning system is characterized by significant regional heterogeneity, resulting from the constitutional shared distribution of competences between the state and regions. Each of the 20 regions composing the country is characterised by its own spatial planning law, and produces Regional Territorial Plans and Regional Landscape Plans focusing on socio-economic development, infrastructure, and environmental protection. Subnational spatial planning in Italy is further articulated through an additional level with 93 provinces and 14 metropolitan cities, that are responsible for coordinating municipal planning and strategic planning (metropolitan cities only). This subnational double articulation also characterises France, where the 18 regions (of which 13 located in continental Europe and 5 oversea) are further subdivided into 101 departments. However, despite the recent decentralisation of the territorial administrative system, in France the central government continue to maintain an important role in the promotion of territorial development, as it pertains the regional economic planning tradition of the *amenagement du territoire* (CEC, 2000). Similarly, relevant for the country spatial planning is the prominent role of intercommunality, whose introduction dates back to the beginning of the 1900. The creation of inter-municipal groupings, such as *Métropoles*, represents a move toward greater coordination at the local level and represent the basic planning units cooperating in the preparation of the SCoTs (Scheme of Territorial Coherence) and of the PLUs (Local urban plans).

Spatial governance and planning in Liechtenstein is the result of a balance between the role of the central government and the country's grassroots democracy and strong autonomy of its 11 municipalities, which are granted the constitutional right to self-governance. This reflects the country's small size, that do not require any subnational governance level. Finally, Slovenia, spatial planning system that has evolved significantly since the 1990s. The country is divided into 12 statistical regions – that however do not hold any formal administrative power - and 212 municipalities. The national government, through the Ministry of Natural Resources and Spatial Planning, is responsible for setting spatial development strategies, while municipalities manage local spatial planning. The absence of a formal regional governance structure has led to challenges in coordinating development at the sub-national level, leading to the reintroduction of regional planning through the 2021 Spatial Planning Act.

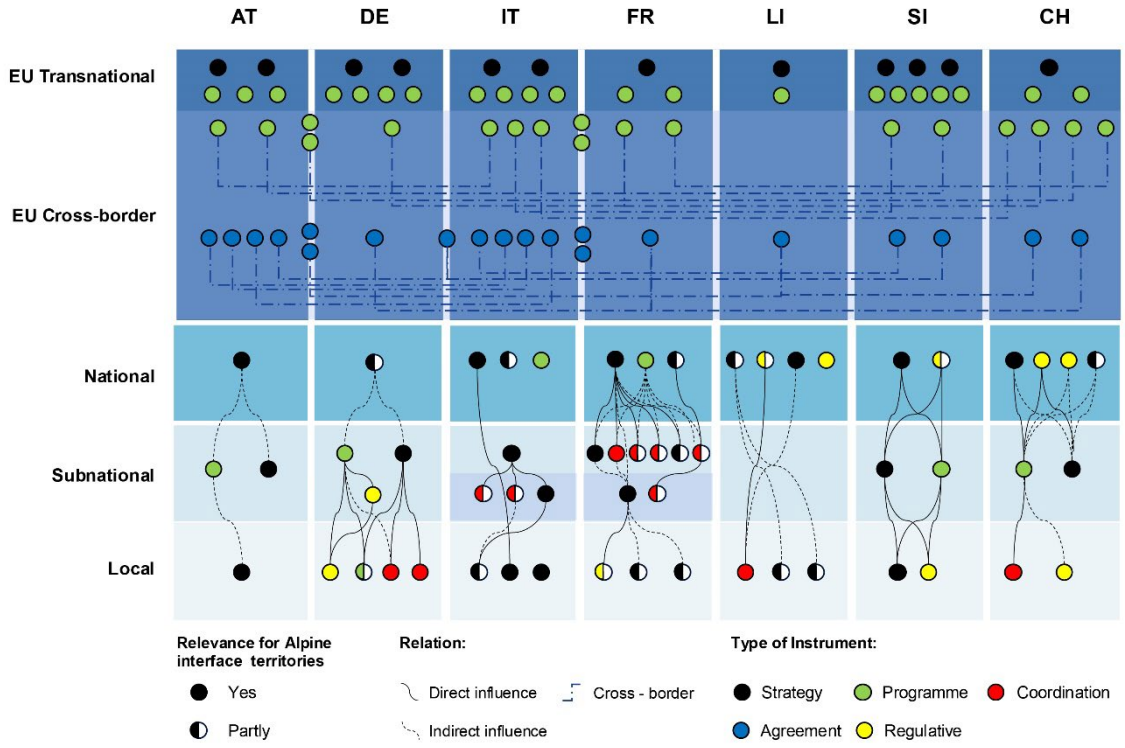
Overall, as clearly represented in Figure 1, at least five levels of territorial governance concur in shaping the spatial development trajectories of the Alpine interface territories:

- The *transnational level*, in particular the Alpine Convention, the EUSALP macro-regional strategy, the Alpine Space Programme.
- The *cross-border level*, which is characterised by a high number of 'soft' cooperation formats and funding options, even if also the more formalised EGTCs have be institutionalised (Europaregion Tirol-Südtirol-Trentino, EGTC Go, Rhine-Alpine Corridor on a larger scale).
- The *national level*, involving seven countries (some of them with the complete territory, others only partly included): Austria, France, Germany, Italy, Liechtenstein, Slovenia and Switzerland;
- The *regional and provincial levels* (depending on the country: Cantons, Länder, Régions, Metropolitan Cities and provinces etc.).
- The *local level*, concerning a plethora of municipalities ranging from the dense urban areas of Torino and Munich to dispersed mountain inner municipalities, that enjoy a rather large autonomy in the definition of their local development priorities and the regulation of land-use and spatial planning.

The following subsections will explore all these instruments and their implications for the sustainable and inclusive development of the Alpine interface territories.

Figure 1

Multilevel institutional mapping of spatial governance and planning in the Alpine region



3.2 National level

3.2.1 Relevant instruments and initiatives

When comparing the spatial planning documents adopted by Alpine countries, several commonalities and differences emerge, particularly in their approach to managing the unique geography of the Alpine region (Table 3.1). These documents, shaped by each country's distinct socio-political context, reflect varying degrees of emphasis on sustainability, regional development, and governance structures while still aligning on many core objectives concerning the balance between human activity and environmental protection.

Table 3.1 // Relevant spatial planning tools at the national level

Level	Country	Name of the instrument (native language and English)	Nature of the document (strategy, coordination, programme, regulative)
NATIONAL LEVEL	AT	***Österreichisches Raumentwicklungskonzept – ÖREK*** (Austrian Spatial Development Concept)	Strategy/Recommendation
	FR	***Directive Territoriale D'Aménagement – DTA*** (Territorial Development Directive)	Strategy/Coordination
		Programme Avenir Montagne (Future Mountains Programme)	Programme
		Stratégie Nationale pour les Aires Protégées (National Strategy for Protected Areas)	Strategy
	DE	***Leitbilder und Handlungsstrategien für die Raumentwicklung in Deutschland*** (Concepts and strategies for Spatial Development in Germany)	Strategy
	IT	***Strategia Nazionale per le Aree Interne*** (National Strategy for the Internal Areas)	Strategy
		Strategia Nazionale per la biodiversità (National Biodiversity Strategy)	Strategy
		Fondo per lo sviluppo delle montagne italiane (Fund for the development of Italian mountains)	Programme
	LI	**Vision 2050 Spatial Development Strategy**	Vision
		Landesrichtplan (Spatial Development Plan)	Regulative
		Raumkonzept (Spatial Development Strategy)	Strategy
		Berggebietssanierung (BGS) (Mountain Area Remediation)	Regulative
	SI	***Strategija Prostorskega Razvoja Slovenije 2050 (SPRS)*** (Spatial Development Strategy of Slovenia 2050)	Strategy/Coordination/ Regulative
		Prostorski red Slovenije (Decree of Spatial Order of Slovenia)	Coordination/Regulative
	CH	***Progetto Territoriale Svizzera / Projet du Territoire Suisse / Raumkonzept Schweiz*** (Territorial Spatial Concept Switzerland)	Strategy/Vision
		Politica degli agglomerati / Politique des Agglomérations / Agglomerationspolitik (AggloPol) (Federal Agglomeration Policy)	Strategy
		Politica per le aree rurali e le regioni montane / Politique pour les espaces ruraux et les régions de montagne / Politik für die ländlichen Räume und Berggebiete (Policy for mountain regions and other rural areas)	Strategy
		Strategia per uno sviluppo sostenibile 2030 / Stratégie pour le développement durable 2030 / Strategie Nachhaltige Entwicklung 2030 (Sustainable Development Strategy)	Strategy
		Nuova Politica Regionale / Nouvelle politique régionale / Neue Regionalpolitik (New Regional Policy)	Programme

Source: authors' own elaboration

A prominent commonality across all these countries is the central focus on sustainability and the protection of natural environments, particularly in the face of climate change. Whether it's Austria's ÖREK or Switzerland's Territorial Spatial Concept, there is a shared commitment to ensuring that development respects ecological constraints and promotes the long-term preservation of natural landscapes. For instance, Austria's spatial development framework stresses efficient land use and environmental protection, while Italy's National Biodiversity Strategy places a strong emphasis on conserving ecosystems and promoting sustainable agricultural and forestry practices in mountainous areas. France's National Strategy for Protected Areas (SNAP) similarly outlines the need to preserve biodiversity and expand protected regions, a goal echoed in Slovenia's Spatial Development Strategy and Germany's national plans, which also focus on balancing human and ecological needs.

Another significant area of convergence is the recognition of the multi-level governance required for effective spatial planning. All the reviewed documents emphasise the importance of cooperation between national, regional, and local authorities, as well as the inclusion of non-governmental stakeholders in the decision-making process. Austria's ÖREK Partnerships, for example, bring together multiple levels of government and relevant partners to develop more detailed spatial solutions. Similarly, Italy's National Strategy for Internal Areas (SNAI) places local actors at the forefront, using a bottom-up approach to ensure that local needs and opportunities are addressed while still coordinating with regional and national policies (Box 3).

Box 3
National Strategy for the Inner Areas, Italy

Strategia Nazionale per le Aree Interne (National Strategy for the Inner Areas), Italy
2012 - Strategy

Map of the Selected Inner Areas in Italy. Source: SNAI website

The National Strategy for Inner Areas (SNAI) is a territorial policy aimed at improving the quality of citizen services and economic opportunities in inland territories at risk of marginalisation, first contemplated in the National Reform Programme of the year 2014 and defined in the 2014 - 2020 and confirmed in the 2021-2027 cycle. The SNAI in adopting a functional area approach, targets those territories located at a significant distance from essential service centres, typically by small, low-density settlements and experiencing phenomena such as ageing, depopulation, and impoverishment, while at the same time hosting significant environmental and cultural resources.

The general objective of the SNAI is to reverse the decline of these forgotten territories, counteracting the factors that have caused their socio-economic and structural fragility. It sets three interrelated objectives for inner areas: *i)* preserving and securing the territories; *ii)* promoting the natural and cultural diversity of these places; *iii)* enhancing the potential of underutilized resources.

What are the benefits of *SNAI* for Alpine interface territories?

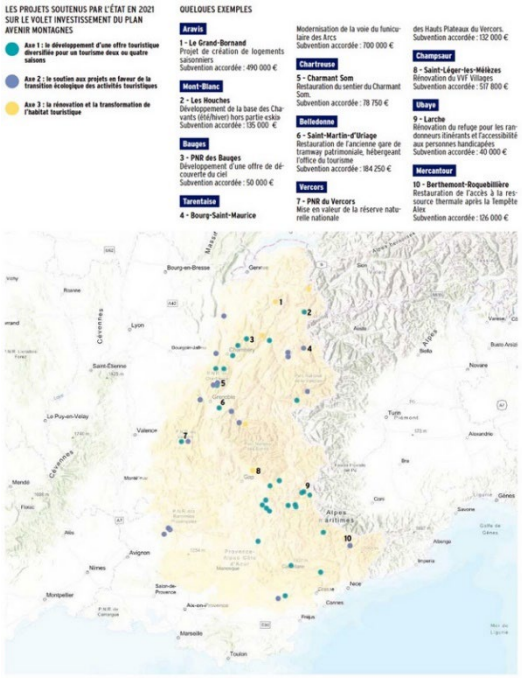
- **Multi-level governance model and supra-local collaboration**: The SNAI employs a multi-actor, multi-level governance system involving local, regional, and national actors. Local authorities are required to form supra-local entities for joint management of services, fostering cooperation across municipalities and pooling resources for greater efficiency. This ensures local needs are met while benefiting from regional and national resources.
- **Combining top-down and bottom-up approaches**: While national and regional levels set the framework and provide essential services (healthcare, education, mobility), local actors define the specific development trajectories, ensuring that the unique needs of each area are addressed.
- **Relevance of the functional approach**: The functional approach allows SNAI to effectively tailor local strategies to the specific challenges of remote areas. By focusing on practical needs and socio-economic conditions, it ensures targeted interventions that support local actors in reversing negative trends and making governance more impactful.

See also: ESPON InTerAlp Scientific annex VII: Governance report for Italy

In France, the Future Mountains (Avenir Montagnes) programme reinforces this approach by aligning national and local efforts to promote sustainable tourism in mountain regions (Box 4). Germany and Switzerland also highlight the need for multi-level governance and cross-border cooperation, especially for issues like transportation, tourism, and environmental conservation in their Alpine areas.

Box 4
Future Mountains Programme, France

Programme Avenir Montagne (Future mountains programme), France
2021 - Programme



Projects supported by the state in 2021 under the investment section of the Programme Avenir Montagnes. Source: https://www.montagnes-magazine.com/actus-avenir-montagnes-quel-futur-les-territoires

The *Programme Avenir Montagnes* is a national funding programme (2021) to support mountain areas in transition. The programme, which joins other inter-ministerial programmes managed by the ANCT (National Agency for Territorial Cohesion), provides operational support to some sixty mountain areas wishing to rethink their development strategy and move towards a diversified tourism offer, suitable for all seasons, sustainable, respectful of biodiversity and landscape, and with sparing use of natural resources and land. The five principles guiding State action for *Avenir Montagnes* are as follows: Starting from the regions and their projects; Providing a tailored response adapted to the strategies of the different mountains; Mobilising the *Comité de Massif* in supporting the regions; Combining national and local approaches; Giving time to transition (action in synergy with the *Contrats de Transition Écologique – CTEs*, Ecological Transition Contracts).

What are the benefits of *Programme Avenir Montagne* for Alpine interface territories?

- **Support for sustainable and diversified tourism:** It provides funding and operational support for Alpine territories as they transition towards a more sustainable and diversified tourism model, conserving natural resources and respecting biodiversity.
- **Tailored and collaborative regional support:** It offers solutions adapted to the strategies and needs of different mountain regions, promoting collaboration between national and local entities in shaping development strategies.
- **Strengthened territorial cohesion:** Managed by the National Agency for Territorial Cohesion, the programme enhances economic and social resilience in Alpine areas, equipping them to face economic and environmental challenges.

See also: ESPON InTerAlp Scientific annex V: Governance report for France

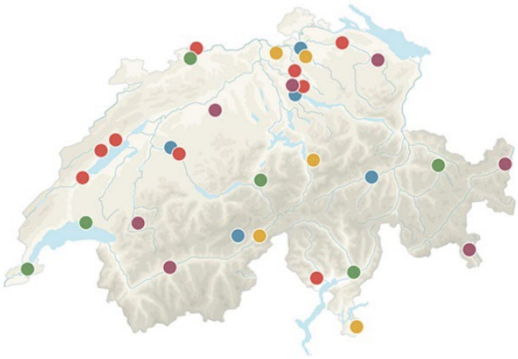
A further point of alignment across countries is the shared focus on balanced regional development. Countries like Austria, Switzerland, and Slovenia prioritise ensuring that all regions - including remote Alpine territories - have equitable access to infrastructure, services, and economic opportunities. This is seen in France's DTA (Territorial Development Directives), which focuses on multipolar urban development to avoid over-concentration in a single metropolitan area while ensuring sustainable transport and housing for. In Italy, the SNAI explicitly addresses the socioeconomic fragility of inner, often Alpine, areas, seeking to reverse population decline and economic stagnation by fostering local development initiatives alongside improving essential services like healthcare, education, and transportation. De-

spite these shared goals, the countries' specific strategies and focus areas differ. Austria's ÖREK framework is more strategic and broader, offering general guidelines that aim to harmonise spatial development across all regions, with regular updates to reflect changing conditions. Germany's approach stands out for its emphasis on subsidiarity, where local governments retain a high degree of autonomy in spatial planning but within a federal framework that stresses collaboration across levels of governance. This approach allows flexibility to address the diverse needs of different regions, including the Alps, while aligning with overarching national goals. Switzerland's Agglomeration Policy, while also focusing on rural and mountain areas, integrates these regions into a broader policy aimed at enhancing urban-rural connectivity, especially in transport and service delivery (Box 5).

Box 5
Federal Agglomeration Policy, Switzerland

Politica degli agglomerati / Politique des Agglomérations / Agglomerationspolitik (AggloPol) (Federal Agglomeration Policy), Switzerland

2001 - Regulative



2020-2024 Sustainable Land Development Model Projects. Source: Ufficio federale dello sviluppo territoriale (ARE)

With the Agglomeration Policy the Swiss Federal Government aims to promote the sustainable development of agglomerations, including the cities and municipalities that are part of them. This transversal policy is implemented with a series of specific measures and instruments that complement other sectoral policies (i.e., transport policy or social policy) and that, in turn, contribute significantly to the development of agglomerations. Implementation requires the involvement of actors at the level of the Confederation, cantons, regions, cities, municipalities, and the bodies and organisations responsible for development in functional spaces. Together and in collaboration with private actors, they contribute to the development of agglomerations and the coherent territorial development of the country. The updated Federal Agglomeration Policy has a "networks of cities" approach. It is based on a tripartite system including confederation, cantons, cities, and local governments.

What are the benefits of Agglomeration Policy for Alpine interface territories?

- **Improved coordination of settlement development and transport:** The Alpine interface territories can benefit from better integrating transport infrastructure with settlement planning, ensuring more efficient and sustainable mobility options supporting regional development.
- **Comprehensive development support:** Through specific measures and instruments that complement sectoral policies (such as transport and social policy), *AggloPol* provides holistic support for the development of Alpine territories, fostering sustainable growth.
- **Enhanced collaboration and governance:** The policy promotes efficient collaboration across multiple levels of governance (Confederation, cantons, cities, municipalities) and private stakeholders, enabling more coordinated and effective territorial development for the Alpine regions.

See also: ESPON InTerAlp Scientific annex X: Governance report for Switzerland

Yet important, the timeframe for planning varies between countries. Austria, France, and Germany regularly update their spatial plans, while Liechtenstein's Vision 2050 and Slovenia's Spatial Development Strategy 2050 look much further ahead, considering the long-term implications of spatial decisions. These forward-looking plans aim to create sustainable spatial structures that will last generations, addressing both current challenges and future uncertainties, particularly in light of climate change and demographic shifts. In conclusion, the spatial development documents adopted by Alpine countries play a critical role in addressing the unique challenges faced by Alpine interface territories. These regions, characterised by their diverse landscapes, environmental fragility, and socio-economic pressures, require a careful balance between development and conservation.

Finally, the importance of these documents lies in their ability to provide tailored responses to the specific issues confronting Alpine areas, such as climate change, depopulation, transportation, and tourism management. For instance, Italy's National Strategy for Internal Areas (SNAI) focuses on reversing population decline in remote mountain areas, while France's Future Mountains Programme is dedicated to promoting a more sustainable tourism model in Alpine regions. In contrast, Germany's spatial strategies emphasise balancing local autonomy with federal coordination, ensuring that even the most remote Alpine territories benefit from integrated planning and investment. These strategies are vital for managing the Alpine interface territories, where urbanisation, environmental protection, and socio-economic disparities intersect. The documents promote multi-level governance, ensuring that local, regional, and national stakeholders collaborate effectively to address these challenges. For example, Austria's ÖREK Partnerships and Switzerland's Territorial Spatial Concept encourage cooperation between various governance levels to harmonise spatial development and maintain territorial cohesion. Moreover, the forward-looking nature of documents like Slovenia's Spatial Development Strategy 2050 and Liechtenstein's Vision 2050 reflect the importance of long-term planning in regions where the effects of climate change and demographic shifts will be particularly pronounced. These strategies ensure that Alpine territories remain resilient and adaptable in the face of future uncertainties.

3.2.2 Spatial planning and territorial governance assessment at the national level

This comparative analysis assesses the degree of Alpine integratedness in the spatial planning systems of Alpine countries under analysis. The evaluation is based on six dimensions: multilevel coordination, cross-sectoral coordination, stakeholder engagement, cross-border relevance, congruence with functional patterns, and Alpine specificity. The comparative analysis (Figure 2) reveals that Switzerland and France display the strongest degree of Alpine integratedness, excelling in multilevel coordination, cross-sectoral integration, cross-border cooperation, and Alpine specificity. Austria, Germany, and Italy perform moderately across most categories, with strengths in functional patterns and multilevel coordination but lacking comprehensive Alpine strategies. Slovenia and Liechtenstein, while exhibiting progress, show limited development in specific dimensions, particularly in stakeholder engagement and Alpine specificity. The subsections present the assessment results in detail based on the six assessment categories.

Attention to Multilevel Coordination

In some countries, multilevel coordination is central to spatial planning, ensuring coherence between national, regional, and local authorities, such as Austria, France, Germany, and Switzerland. These countries emphasise well-structured multilevel coordination frameworks. Austria, for example, has established ÖROK, fostering cooperation across government levels, while France's *Comités de Massif* and programmes like *Avenir Montagnes* support strong coordination across regions. Germany integrates the subsidiarity principle in spatial policies, promoting local autonomy. Switzerland guarantees coordination through its Constitution as a federal state, ensuring vertical and horizontal coherence across cantons. In Italy, the issue of multilevel coordination is mainly addressed by the SNAI (National Strategy

for Inner Areas), which fosters integration between local and national authorities. However, this coordination is more prominent in selected areas rather than being systematic across the country. Regarding the other Alpine countries, it can be said that Slovenia highlights the importance of coordination, though it remains one-sided with national dominance in decision-making. The local level follows national directives with limited proactive engagement, while in Liechtenstein, multilevel coordination is most probably less emphasised due to its small administrative scale, where spatial planning tends to be centralised.

Attention to cross-sectoral coordination

Regarding the issue of cross-sectoral coordination as an integration of spatial planning with policies in transport, environment, health, and other sectors, it can be affirmed that France, Italy, and Switzerland show solid cross-sectoral coordination. France applies a robust cross-sectoral approach in its Avenir Montagnes programme, addressing tourism, risk management, and environmental sustainability. Italy's SNAI connects spatial planning with the transport, health, and education sectors. Switzerland promotes cross-sectoral integration through its Territorial Spatial and Landscape Concept, linking spatial planning with sustainable land use. In other cases, Austria stresses sectoral integration in biodiversity and climate change planning, while Germany advocates for early-stage integration of spatial policies with environmental and public service sectors. Slovenia has established commissions and instruments to improve sectoral coherence, though practical integration remains a work in progress. Finally, in Liechtenstein, cross-sectoral coordination is relatively underdeveloped.

Stakeholders' engagement and participation

Stakeholder participation is important for transparent decision-making and effective policy implementation. Historically, Switzerland has a strong tradition of public participation among the Alpine countries, with tools like referendums ensuring broad involvement in spatial planning. Germany promotes civic engagement to enhance public understanding and support for public services and environmental protection initiatives. Slovenia: Slovenia's spatial planning process includes participatory techniques at the national and local levels. However, obligatory participation often focuses on public hearings and consultations. In other cases, such as Austria, France, and Italy, the attention to stakeholder engagement is moderate. More in detail, Austria incorporates participation via ÖREK Partnerships, while France delegates stakeholder involvement to lower governance levels. Italy focuses on participation primarily at the local level, particularly through Local Action Groups (LAGs) in the context of rural development. Finally, in Liechtenstein stakeholder engagement is minimal, with little evidence of systematic mobilisation in spatial planning processes.

Cross-border relevance

Cross-border cooperation is vital for regions like the Alpine space, where environmental, economic, and infrastructure challenges transcend national borders. In this respect, France, Germany, Switzerland, and Austria prioritise cross-border cooperation at a higher level. France engages in cross-border initiatives, such as the European Park Alpes-Maritimes-Mercantour. Germany promotes cross-border collaboration through initiatives like the Cross-Border Metropolitan Regions Initiative. Switzerland actively participates in cross-border policies, particularly within the Alpine region. Austria advocates cross-border coordination at the municipal and national levels. Given its geographic location, Liechtenstein, cross-border cooperation emerges as a relevant issue, and this is reflected in the country's spatial planning documents. Finally, while Slovenia acknowledges the need for cross-border cooperation, particularly in the Danube and Alpine macro-regional strategies, Italy's spatial planning documents lack significant cross-border relevance despite its shared borders within the Alpine region: this can be attributed to the fact that the country has limited land borders shared with other countries and historically the issue has not been at the top of the political agenda.

Congruence with functional patterns

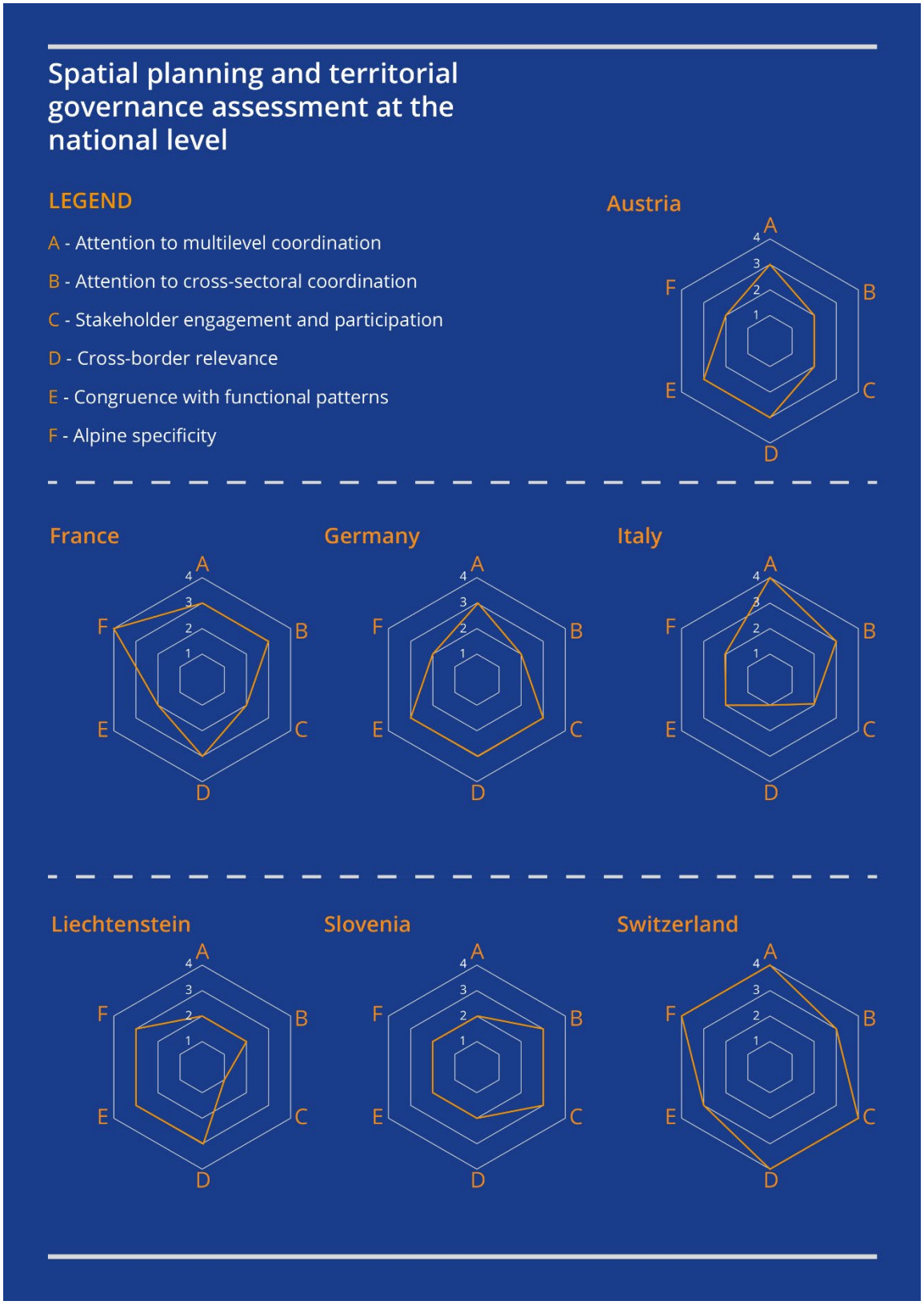
Congruence with functional patterns refers to spatial planning's alignment with natural and human geography, including living spaces and ecosystems. Austria, Germany, and Switzerland display strong

alignment with functional patterns. Austria highlights the importance of the "functional living spaces approach," advocating for the provision of services beyond administrative boundaries. Germany promotes functional cooperation, particularly in urban-rural partnerships. Switzerland's agglomeration policy is focused on overcoming administrative barriers and fostering multilevel cooperation across functional regions. On the other side, France, Italy, and Slovenia show moderate alignment. France lays the foundations for functional coordination through Comités de Massif. Italy limits its functional approach to identifying inner areas within the SNAI. Slovenia's Spatial Development Strategy 2050 addresses functional patterns through urban area planning, but implementation is still nascent. Finally, Liechtenstein's small-scale and institutional context makes functional cooperation less prominent, although it is encouraged in the Spatial Development Strategy.

Alpine specificity

Alpine specificity refers to the consideration of the Alpine region's unique geographic, environmental, and socio-economic conditions in spatial planning. Looking at the set of spatial documents, it can be affirmed that France and Switzerland exhibit the highest degree of Alpine specificity. In detail, while France develops detailed strategies for the Alpine space through laws like Loi Montagne and programmes like Avenir Montagnes, addressing tourism, transport, and risk management, Switzerland incorporates Alpine-specific policies across its planning documents, emphasising sustainable development and the protection of sensitive Alpine habitats. Also, Austria and Germany acknowledge the Alpine context, particularly concerning natural hazards, but have not developed comprehensive strategies for Alpine regions. Germany mentions Alpine protection but does not prioritise specific development strategies. Despite its small size, Liechtenstein shows high Alpine specificity, particularly in the Mountain Area Remediation, which focuses on sustainable development in the Alpine region. Finally, Slovenia and Italy demonstrate limited Alpine specificity. Slovenia mentions the Alpine dimension only in long-term strategies like the Spatial Development Strategy 2050. Meanwhile, Italy lacks any specific reference to the Alpine region in its national spatial planning documents because only a limited part of the country's territory is geographically defined as Alpine territory.

Figure 2
Spatial planning and territorial governance assessment at the national level



3.2.3 Challenges and Opportunities

Assessing spatial planning systems across the Alpine countries reveals several key challenges and opportunities for the Alpine interface territories.

- **Multilevel governance and coordination complexities:** The diversity in governance structures across Alpine countries - from strong federal systems in Switzerland and Austria to more centralised approaches create coordination challenges. These territories are influenced by various national, regional, and local policies that may not always be aligned. Accordingly, ensuring coherent planning across national and regional borders remains challenging, especially when addressing shared resources like water, biodiversity, and land use. However, with solid federal-local cooperation, countries like Austria and Switzerland provide models for improved multilevel governance. In particular, the Swiss Agglomeration policy logic can be used to support collaboration. In addition, multilevel coordination could be improved through better use of EU frameworks and funding mechanisms (e.g., INTERREG, Alpine Space Programme), which promote collaboration across governance levels.
- **Attention to cross-sectoral coordination:** In several Alpine countries, spatial planning often occurs in sectoral silos, with limited integration across sectors like transport, energy, tourism, and environmental conservation. This fragmentation can undermine holistic regional development strategies. In these territories, economic development goals in sectors like tourism or transport may conflict with environmental conservation efforts, especially in sensitive Alpine ecosystems. In contrast, the introduction of integrated planning models can help. Countries like France and Switzerland demonstrate how cross-sectoral coordination can be achieved, particularly through programmes like *Avenir Montagnes*, which balance economic development with environmental sustainability. In this respect, there is potential for Alpine interface territories to integrate sustainable sectors (e.g., renewable energy, eco-tourism) into spatial planning. This can harmonise environmental preservation with economic growth.
- **Stakeholders' engagement and participation:** Supporting public engagement should become a priority: In some countries (e.g., Liechtenstein, Italy), there is limited mobilisation of stakeholders, particularly non-institutional actors, in spatial planning. Strengthening participatory models can be beneficial for establishing the Alpine interface territories. Countries like Switzerland, where direct democracy tools such as referendums are integral to decision-making, offer models for increasing the effectiveness of stakeholder participation in spatial planning. When possible, expanding participatory techniques beyond formal consultations could lead to more inclusive and innovative planning solutions. This initiative should be addressed to leverage local knowledge and help identify context-specific challenges and solutions, particularly in rural and environmentally sensitive Alpine regions.
- **Cross-border relevance:** Despite the geographic interconnectedness of the Alpine region, cross-border cooperation is hindered by different national legal systems and planning frameworks. This is particularly challenging in countries with limited cross-border engagement (e.g., Italy, Slovenia). Managing shared natural resources (e.g., water, forests, and biodiversity) across borders can be difficult without aligned policies, resulting in fragmented conservation efforts. To better explore the potentialities of Alpine interface territories, when needed, strengthening cross-border frameworks might become a priority. Promoting joint governance bodies and projects that can facilitate the management of transnational resources and infrastructure might be an opportunity.

Yet, the limited use of a functional approach and the lack of an exclusive Alpine approach make exploiting Alpine interface territories' potentialities unexplored. Spatial planning that adheres strictly to administrative borders often fails to reflect the functional realities of how people live, work, and move across regions. On the other side, some countries (e.g., Italy, Slovenia) do not have specific spatial planning policies tailored to the unique challenges and opportunities of the Alpine region. This limits the

ability to coherently address issues like tourism management, climate resilience, and biodiversity conservation.

3.3 Subnational Level

3.3.1 Relevant instruments and initiatives

Moving to the sub-national level, it is interesting to note that while Alpine territories share the overarching goals of sustainable development, environmental protection, and social equity, achieving them reflects each country's administrative structures, geographic contexts and planning tools (Table 3.2). For instance, France's centralised framework, Bavaria's stringent zoning, Austria and Italy's region-specific autonomy, and Switzerland's regional plans with strong federal support illustrate the diversity in Alpine spatial planning, each approach contributing uniquely to the shared objective of preserving and sustainably developing the Alpine interface territories.

Table 3.2
Relevant spatial planning tools at the subnational level

Level	Country	Name of the instrument (native language and English)	Nature of the document (i.e. strategy, coordination, programme, regulative)
SUBNATIONAL LEVEL	AT	***Landesentwicklungsprogramme*** (Development programmes of the Austrian provinces; they exist in all federal states except Vorarlberg)	Strategy / Programme
		Regionale Entwicklungsprogramme (Regional planning programmes)	Programme
	FR	***Schéma Interrégional du Massif des Alpes – SIMA*** (Interregional scheme for the Massif des Alpes)	Strategy / Coordination
		Convention interrégionale du Massif des Alpes 2021-2027 – CIMA (Interregional Convention of the Alpine Massif 2021-2027)	Coordination / Regulative
		Schéma Regional d'Aménagement, de Développement durable et d'Égalité des Territoires – SRADDET (Regional Scheme for Planning Sustainable Development and Territorial Equality)	Strategy / Coordination
		Schéma Régional de Développement Economique, d'Innovation et d'Internationalisation – SRDEII (Regional Scheme for economic development, innovation and internationalisation)	Strategy / Coordination
		Plan Montagne Régional (Regional Mountain Plan)	Strategy / Coordination
		Plan d'Action Territorial Aires Protégées (Protected Areas Territorial Action Plan)	Coordination / Regulative
		Schéma de Cohérence Territoriale (SCOT) Métropole Savoie, SCOT Grenoble, SCOT Bassin Annecien, SCOT de l'agglomération Nice Côte d'Azur (Scheme of Territorial Cohérence)	Strategy / Coordination
		Parcs Naturels Régionaux (PNR) des Bauges, PNR de Chartreuse, PNR du Vercors, PNR des Baronnies Provencales, PNR Queiras (Regional Nature Parks)	Strategy / Coordination
	DE	***Landesentwicklungsprogramm*** (LEP, state development program)	Strategy / Regulative
		Alpenplan *(*Alpen Plan) as part of the *Landesentwicklungsprogramm*	Strategy / Regulative

Level	Country	Name of the instrument (native language and English)	Nature of the document (i.e. strategy, coordination, programme, regulative)
		Regionalplan (Regional Plan)	Strategy / Coordination, regulative
	IT	***Piano Territoriale Regionale*** (Regional Territorial Plan, each region can specify the name of the plan)	Strategy / Coordination
		Piano Territoriale di Coordinamento Provinciale (Provincial Coordination Spatial Plan)	Coordination
		Piano Territoriale Generale Metropolitano (General Territorial Metropolitan Plan)	Coordination
		Piano Strategico Metropolitano (Strategic Metropolitan Plan)	Strategy
	LI	**n.a.**	
	SI	***Regionalni Prostorski Plan (RPP)*** (Regional Spatial Plan)	Strategy / Coordination
		Regionalni Razvojni Programi (Regional Development Program)	Coordination / Programme
	CH	**Supra-municipal spatial plans may have different names at the local level**	Strategy and/or Regulative

Source: authors' own elaboration

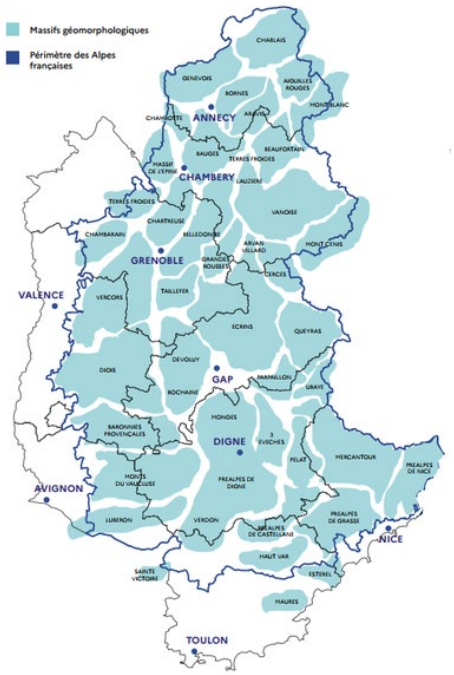
The spatial planning documents reveal varied approaches to sustainable development, environmental conservation, inter-regional cooperation, and governance structure tailored to each country's unique geographical and administrative context. Austria's approach to Alpine planning is notably decentralised, with each federal state developing its own *Landesentwicklungsprogramme* (LEP), which reflects the specific challenges and priorities of the region. For instance, Salzburg's LEP includes binding regulations on spatial structure and environmental zoning, while Vienna's non-binding Urban Development Plan (STEP) focuses on innovation and climate resilience within an urban setting. This federal approach allows each territory to prioritise locally relevant objectives, leading to diversity in spatial planning across Austria. In contrast, France uses a more centralised framework for the French Alps. The *Schéma Interrégional du Massif des Alpes* (SIMA) coordinates development across multiple regions under a unified strategy that includes cross-border collaboration, environmental conservation, and sustainable economic development (Box 6). Complementing SIMA, the Interregional Convention of the Alpine Massif (CIMA) specifies objectives for the French Alps, addressing climate adaptation, sustainable tourism, and ecological resilience. France's approach establishes a consistent set of priorities across the French Alpine regions, supported by regional documents like the SRADDET and SCOT, which integrate development with environmental conservation and regional equity. Germany, focusing on Bavaria, implements a robust combination of zoning and conservation in its Alpenplan (Box 7). This zonal structure exemplifies Germany's balance between development and conservation, where only minimal activity is allowed in the most protected zones. Italy's spatial planning integrates tools like the Regional Territorial Plan in Lombardy. Italy's plans address environmental preservation and socio-economic growth, similar to the Valle d'Aosta's Territorial Landscape Plan, which includes measures to protect Alpine landscapes while promoting eco-tourism. Slovenia and Switzerland both use a regional approach, where Slovenia's Regional Spatial Plans (RSP) define spatial strategies for functional urban areas, transportation, and green infrastructure. Switzerland, in turn, utilises Cantonal Structure Plans, developed by each canton, to support sustainable development and align local strategies with national and EU cohesion goals. Switzerland's New Regional Policy focuses on economic resilience for mountain regions through

digitalisation and diversification, mirroring elements of France's SRDEII and SRADDET, which promote economic growth through green jobs and digitalisation. While Switzerland's structure plans offer flexibility for each canton's specific Alpine needs, the NRP ensures cohesion in sustainable economic and environmental strategies across cantons.

Box 6
Interregional scheme for the Massif des Alpes, France

Schéma Interrégional du Massif des Alpes – SIMA (Interregional scheme for the Massif des Alpes), France

2006 – Strategy, Vision



Perimeter of the Schéma Interrégional du Massif des Alpes – SIMA Source: Présentation du massif des Alpes

The *Schéma Interrégional du Massif des Alpes*, in force since 2006 and actualised in 2013 and 2020, is a relevant document of the multi-level governance of the Alpine space and is characterised by policies aimed at the overall development of the mountains and by an integrated approach. The SIMA constitutes the specific strategic orientation document for the French Alps. It identifies the main challenges in this area and sets the guidelines and priorities for public action. Which will then be implemented through the *Convention Interregionale du Massif des Alpes 2021-2027 – CIMA* (Interrégional Convention of the Alpine Massif 2021-2027). The *Schéma Interrégional du Massif des Alpes* is based on four strategic priorities for the sustainable development of the Alps and related measures: ensuring the diversity and long-term balance of natural and heritage resources; consolidating and diversifying the specific activities of the massif by adapting them to change; organising and structuring the region; integrating the French Alps into their regional, cross-border and transnational environment. A further relevant aspect is that the entire document places special emphasis on inter-regional, inter-municipality and cross-border cooperation with bordering Italy and Switzerland.

What are the benefits of *SIMA* for Alpine interface territories?

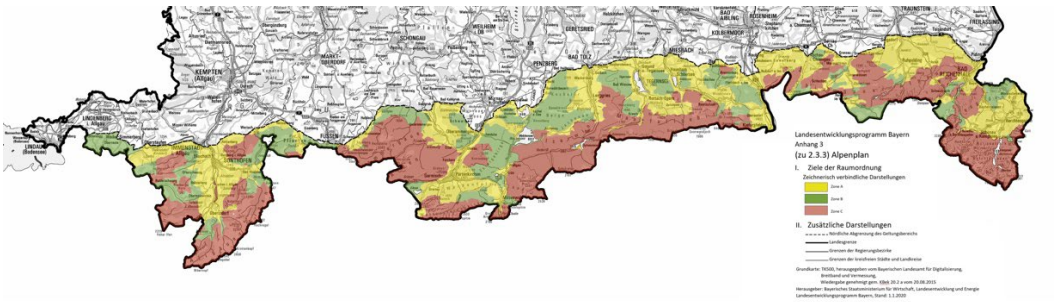
- **Sustainable management of natural and heritage resources:** The *SIMA* prioritizes the long-term balance and preservation of natural and cultural heritage, allowing Alpine interface territories to benefit from sustainable resource management practices.
- **Adaptation and diversification of economic activities:** The *SIMA* focuses on adapting traditional Alpine activities (e.g., tourism, agriculture) to changing conditions and diversifying economic opportunities, which helps the territories remain resilient and economically viable.
- **Improved regional structure and organization:** The *SIMA's* strategies help to organize and structure the Alpine region, enabling more efficient spatial planning and territorial management for the benefit of local municipalities and communities.
- **Enhanced cross-border and inter-regional cooperation:** Special emphasis on cooperation with neighbouring countries (Italy and Switzerland) and between municipalities promotes stronger regional and transnational partnerships, fostering greater integration and development for the Alpine territories.
- **Integration into larger regional and transnational networks:** The *SIMA* facilitates the integration of the French Alps into broader regional, cross-border, and transnational frameworks, ensuring the Alpine territories are part of larger economic and social networks.

See also: ESPON InTerAlp Scientific annex V: Governance report for France

Box 7
Alpen Plan, Bavaria - Germany

Alpenplan (Alpen Plan) as part of the Landesentwicklungsprogramm (LEP), Germany

1976 – Strategy, Regulative



Alpenplan. Source: Landesentwicklungsprogramm

In Germany, the Bavarian Alpenplan is internationally recognised as an exemplary spatial planning instrument with the aim of environmentally compatible development of the Bavarian Alps. The Alpen Plan divides the Bavarian Alpine region into three different zones: Zone A ("development zone"), which corresponds to the 35% of the area and includes the settlement areas and intensive land use in the valleys, and where development projects are generally permitted; Zone B ("buffer zone"), which corresponds to the 22% of the area, where development projects are only possible in individual cases and after detailed examination; Zone C ("quiet zone"), corresponding to the 43% of the area, designed as a protection zone, i.e. no projects are permitted, except for necessary cultural measures (e.g. forest and alpine roads), where only landscape-related, non-motorised recreational use is permitted.

What are the benefits of the *Alpenplan* for Alpine interface territories?

- **Environmental protection and controlled development:** The *Alpenplan* offers a structured framework to prevent uncontrolled development in sensitive Alpine regions, helping the Alpine interface territories manage development while preserving environmental sustainability.
- **Strategic spatial planning with legal impact:** The *Alpenplan* is recognised as a legally impactful spatial planning instrument embedded in the state's development programme. This model of structured, long-term planning can help the Alpine interface territories achieve both development and conservation goals.

See also: ESPON InTerAlp Scientific annex VI: Governance report for Germany

Though the mechanisms vary, cross-border cooperation is a priority across the Alpine countries. France leads in formalised cross-border agreements through SIMA and CIMA. French Alpine planning integrates multi-level consultations and encourages inter-regional dialogue, with bodies like the *Comité de Massif des Alpes* coordinating these efforts. Switzerland's NRP fosters cross-border cooperation within Alpine regions and supports collaborations like the Metropolitan Development Area around Zurich, which aligns with Germany's Alpenplan and Austria's regional development programs. Slovenia's cross-border collaborations occur within the EU cohesion framework, primarily for infrastructure and environmental projects, without the formal Alpine-specific structures in France and Switzerland.

The governance structure in Alpine planning varies from highly decentralised to standardised multi-level systems. Austria and Italy emphasise regional autonomy, allowing each Land/region to set its own goals and tailor strategies to its specific needs. This differs to France's multi-level governance framework. Through documents like SIMA and SRADDET, France participates stakeholders across levels, from

regional councils to departmental inputs, ensuring a coordinated approach that aligns local, regional, and national priorities. Germany's governance in Bavaria reflects a more top-down structure, where the Alpenplan's zoning regulations are strictly binding across lower-level plans, ensuring adherence to conservation goals without the participatory frameworks seen in Austria or France.

Finally, the analysed plans, and in particular, Turin's Strategic Metropolitan Plan, have shown the importance of building a geographical narrative around the alpine territories (Box 8). By introducing the concept of *Torino Metro(Poli)Montana*, the metropolitan areas aimed to stress the importance of the mountains as constituting part of their metropolitan territory.

Box 8
Turin's Strategic Metropolitan Plan, Italy

Piano Strategico Metropolitano di Torino (Turin's Strategic Metropolitan Plan), Italy

2014 – Strategy

Metropolitan and mountain relations. Source: PSM 2024-2026, Torino Metro(poli)montana

The Strategic Metropolitan Plan (SMP) defines the social, economic and environmental development of the metropolitan territory. The SMP of the Metropolitan City of Turin 2024-2026, named *METRO(POLI)MONTANA*' proposes a sustainable development model based on a new vision of interdependence and mutual collaboration between towns and mountains. The Plan intends to strengthen the metro-mountain (or rather, metro-rural-mountain) relations system, reducing dependencies and favouring equal access to resources and services throughout the metro-mountain territory.

What are the benefits of *SMP* for Alpine interface territories?

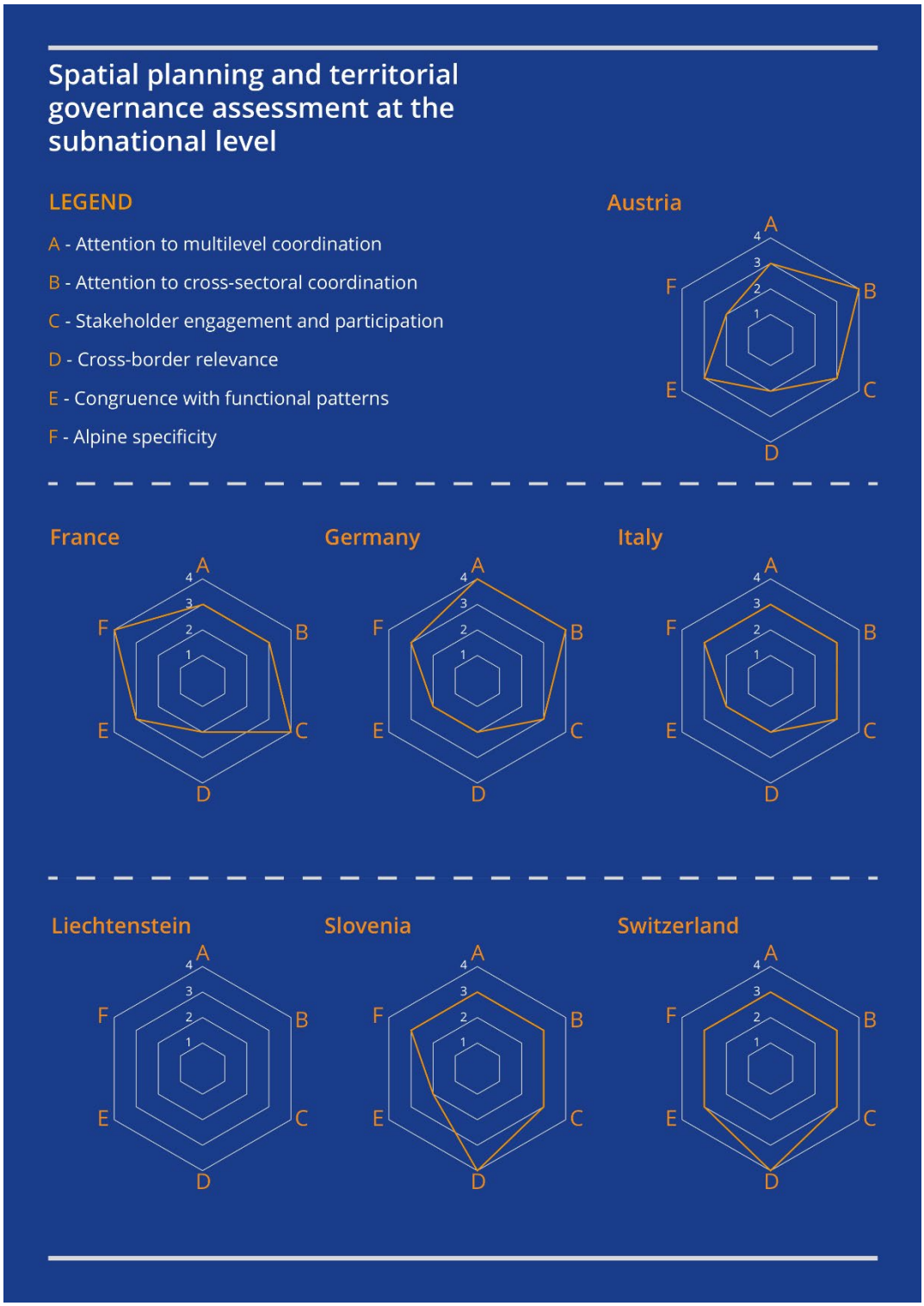
- **Fostering metro-mountain collaboration:** The *SMP* promotes a new vision of interdependence and collaboration between metropolitan, rural, and mountain areas. This "metro-mountain" approach encourages Alpine interface territories to build stronger ties with urban areas
- **Cross-border and inter-regional cooperation:** The *SMP* underscores the importance of strengthening cross-border cooperation with neighbouring French territories and collaboration with other European metropolitan areas facing similar challenges.
- **Innovative metro-mountain thinking:** The *SMP* introduces an innovative method for reimagining the "metro-mountain" relationship, which the Alpine interface territories could apply. This approach encourages new thinking about development incorporating urban and rural mountain dynamics.

See also: ESPON InTerAlp Scientific annex VII: Governance report for Italy

3.3.2 Spatial planning and territorial governance assessment at the subnational level

The spatial planning systems are assessed across six key categories, reflecting the degree of integration within the Alpine region and coordination across governance levels (Figure 3). Below is a comparative review of each category based on the characteristics and scoring in each country.

Figure 3
Spatial Planning and territorial governance assessment at the subnational level



Attention to multilevel coordination

France, Germany, and Switzerland demonstrate a high degree of multilevel coordination. In France, coordination is central to the SIMA and SRADDET frameworks, involving collaboration across regional councils, local authorities, and the *Comité du Massif for the Alps*, enabling coherent decision-making across governance levels. Germany's LEP in Bavaria ensures robust coordination through frequent updates, ensuring alignment with lower-level plans like the Alpenplan. Switzerland's Cantonal Structure Plans provide a structured framework for harmonizing federal, cantonal, and municipal objectives, ensuring cohesive spatial planning. Austria also exhibits strong multilevel coordination, though it is more regionally focused, with the LEP aligning provincial goals with federal guidelines but varying in its regional application. Italy has coordination mechanisms in place, such as the Regional Territorial Plans and Provincial Coordination Plans, though they primarily ensure compliance with regional guidelines rather than fostering comprehensive collaboration. Slovenia has formalized multilevel governance procedures but with a more top-down focus, with agreements between regions and the national level remaining central.

Attention to cross-sectoral coordination

Germany and Austria stand out for their cross-sectoral coordination. Bavaria's LEP aligns different sectoral policies, such as tourism, forestry, and environmental protection, within a spatial framework, while Austria's regional planning documents integrate energy, transport, and environmental concerns, enhancing regional cross-sectoral alignment. France's SRADDET and SIMA emphasize multi-sectoral coordination with specific commissions for spatial planning, mobility, and economic development, offering a strong cross-sectoral approach, though with residual sectoral divides. Switzerland's Cantonal Structure Plans are similarly cross-sectoral, particularly in managing public transport and environmental policies at the cantonal level. At the same time, Slovenia incorporates tourism and green infrastructure in its regional plans. Italy's cross-sectoral approach is applied more consistently at the metropolitan level, with Strategic Metropolitan Plans facilitating sectoral integration across urban and rural areas, though provincial coordination remains technical.

Stakeholders' engagement and participation

France achieves the highest engagement score due to its structured inclusion of institutional and non-institutional actors in Alpine spatial planning. The SIMA mandates participation from a variety of stakeholders, including economic actors and sustainability organizations, in shaping the Alpine Massif's strategic goals, a feature mirrored in the SCOT process. Switzerland and Austria show moderate levels of participation, with stakeholders involved mainly in consultative processes. Switzerland's New Regional Policy allows for public and stakeholder input in project presentation phases, while Austria's regional plans include consultations with municipal and regional actors but are limited in citizen engagement. Germany engages stakeholders at multiple stages in Bavaria's spatial planning, though with less direct public engagement. Italy has a structured yet formal engagement process, especially in Provincial Coordination Plans and Regional Plans, where public participation is often limited to consultation, though the Strategic Metropolitan Plan encourages more active involvement from stakeholders. Slovenia's engagement process is also formal, with public consultations on regional development programs mandated by law.

Cross-border relevance

Switzerland and France place significant emphasis on cross-border collaboration. Swiss supra-municipal plans, such as those for the Swiss French Geneva metropolitan area, explicitly consider cross-border issues, integrating them into metropolitan planning with France. France's SIMA and CIMA underscore the importance of international collaboration, particularly with Italy and Switzerland, and reference EU-funded projects like ALCOTRA for sustainable Alpine development. Slovenia also prioritizes cross-border cooperation within the EU cohesion framework, though its application is more regionally specific. Austria has a moderate level of cross-border focus, primarily through its Regional Develop-

ment Programs, which address cooperation with neighboring countries at a supra-municipal level. Germany's cross-border planning in Bavaria is limited to cross-border central places, such as Lindau-Bregenz, while Italy's focus on cross-border relevance is mostly present in metropolitan areas like Turin, with broader regional plans rarely implementing specific cross-border policies.

Congruence with functional patterns

France's SIMA and CIMA define Alpine-specific governance frameworks that transcend traditional administrative boundaries, promoting functional patterns aligned with the needs of the Alpine area, including ecological, economic, and social dynamics. This approach is also mirrored in France's SRADDET, which considers the integration of remote Alpine areas. Switzerland demonstrates congruence with functional patterns in its supra-municipal plans, particularly in metropolitan areas like Geneva, where policies adapt to cross-border economic and social flows. Austria shows functional congruence to an extent, with regional plans allowing for inter-municipal and cross-border cooperation, though these alignments vary by province. Germany's Alpine planning in Bavaria partially aligns with functional patterns through the Alpenplan, which divides the region into development, buffer, and quiet zones based on ecological requirements, but remains less adaptive across regional borders. Italy and Slovenia mention functional patterns, but their implementation is often limited to urban services rather than broader economic and environmental functions.

Alpine specificity

France scores the highest in Alpine specificity, with the SIMA, CIMA, and Regional Mountain Plans directly addressing Alpine challenges. These documents consider unique Alpine characteristics, such as ecosystem conservation and tourism, across multiple planning levels, from regional to local. Germany also has a high degree of Alpine specificity, as Bavaria's Alpenplan protects the region's environmental features with a zoning system tailored to Alpine topography. Switzerland similarly focuses on Alpine-specific challenges in its New Regional Policy, which targets mountain regions and promotes economic resilience, while Austria's LEPs in Alpine regions like Tyrol and Salzburg address local Alpine needs, though with regional variance. Italy's plans integrate the Alpine dimension more in specific regions like Piedmont and Trento, where dedicated strategies focus on mountain area development. Slovenia incorporates Alpine characteristics to a degree in its Regional Development Programs but with less focus compared to its Western European counterparts.

3.3.3 Challenges and Opportunities

In managing the complex and unique Alpine interface territories, spatial planning systems across Austria, France, Germany, Italy, Slovenia, and Switzerland face both challenges and opportunities. Each region's diverse governance structures and geographic needs create varied approaches to multilevel coordination, stakeholder engagement, and cross-border collaboration. As climate change, tourism pressures, and economic shifts reshape the Alpine region, strategic, integrated planning becomes essential for sustainable development. Below are key challenges and opportunities to consider for improving cohesion and resilience in Alpine spatial planning.

Challenges

- Inconsistent multilevel and cross-border coordination: Variability in governance and coordination mechanisms across Alpine regions creates challenges in implementing cohesive, cross-border strategies, especially where regional autonomy is high and disparities can become relevant.
- Limited stakeholder engagement in certain regions: While France and Switzerland engage a wide range of stakeholders, some regions rely on more formal and limited consultation processes, potentially missing valuable local insights for sustainable Alpine development.
- Fragmented cross-sectoral coordination: Sectoral silos remain, particularly at local levels, where areas such as transport, tourism, and environmental protection may lack integrated approaches, leading to potential inefficiencies in managing shared resources and infrastructure.

Opportunities

- Pan-Alpine Strategy through considering the set of planning documents, even though non-formally, building a cohesive (territorial) Alpine strategy could improve cross-border collaboration and resource sharing across the Alpine space, addressing shared challenges such as climate change and sustainable tourism.
- Enhanced functional and cultural identity in regional planning: Integrating Alpine cultural and functional identities in spatial plans (see the case of Turin's Metropolitana plan) can help promote a different territorial narration envisioning new territorial geographies.

3.4 Local Level

3.4.1 Relevant instruments and initiatives

Spatial planning and development documents across the Alpine interface territories demonstrate shared principles and distinct regional adaptations (Table 3.3). These documents primarily serve as municipal or inter-municipal frameworks for setting objectives, guiding development and addressing community needs.

Table 3.3
Relevant spatial planning tools at the local level

Level	Country	Name of the instrument (native language and English)	Nature of the document (i.e. strategy, coordination, programme, regulative)
LOCAL LEVEL	AT	***Örtliches Entwicklungskonzept*** (Local Dev. Concept)	Strategy
	FR	***Plan Local d'urbanisme intercomunal*-PLUI** (Inter-municipal Local Urbanism Plan) Grenoble Alpes Métropole	Coordination/regulative
		***Plan Local d'urbanisme* – PLU** (Local Urbanism Plan) **Briançon**	Coordination/regulative
		***Plan Local d'urbanisme intercomunal*-PLUI** (Inter-municipal Local Urbanism Plan) **Grand Annecy**	Coordination/regulative
		***Plan Local d'urbanisme Métropolitain*-PLUM** (Metropolitan Local Urbanism Plan) **Métropole Nice Côte d'Azur**	Coordination/regulative
		***Plan Local d'urbanisme intercomunal*-PLUI** (Inter-municipal Local Urbanism Plan) **Grand Chambéry**	Coordination/regulative
		Contrats de Transition Écologique (Ecological Transition Contracts)	Strategy/contract
		Stratégies de Développement Local (Local Development Strategies)	Strategy
	DE	***Flächennutzungsplan*** (Zoning plan)	Programme
		Bebauungsplan (Development plan)	Regulative
		Planfeststellungsverfahren (Planning approval procedure)	Regulative
		Landkreistag (District Council)	Coordination
		Bürgermeistertreffen (Mayor's meeting)	Coordination

Level	Country	Name of the instrument (native language and English)	Nature of the document (i.e. strategy, coordination, programme, regulative)
	IT	***Piano Strategico*** (Strategic Plan)	Strategy
		Piani di Sviluppo Locale (Local Development Plan)	Strategy
		Aree Strategiche SNAI (SNAI Area Strategies)	Strategy
	LI	**Verein Agglomeration Werdenberg-Liechtenstein**	Coordination
		Gemeinderichtplan (Local structure plan)	Strategy
		Specific plans such as ***Richtplan***, ***Überbauungsplan*** or the ***Gestaltungsplan***	Strategy
	SI	**Občinski prostorski plan** (Strategic Municipal Plan)	Strategy/coordination/ Regulative
		Občinski prostorski načrt (Municipal Spatial Plan)	Regulative
	CH	**Agglomeration Projects**	Coordination
		Piani speciali / plans spéciaux d'affectation, Gestaltungsplan / Sondernutzungs plan (Special land use plans)	Regulative
		Piani di utilizzo comunale / plan d'affectation communal / Nutzungsplan (Municipal Land use plan)	Regulative

Source: authors' own elaboration

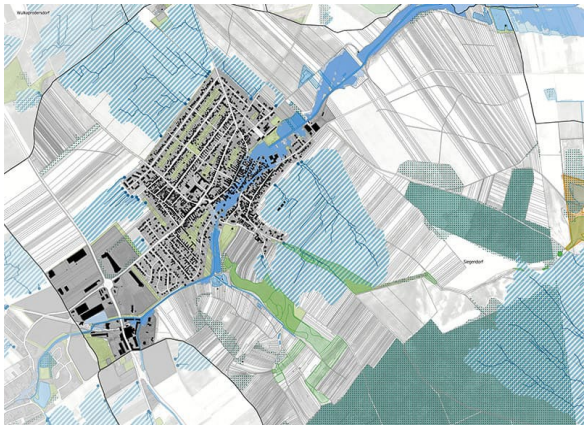
Despite varying names and specific regulations, such as Austria's Local Development Concept (LDC) (Box 9), France's Local Urbanism Plan (PLU), Germany's *Flächennutzungsplan*, Italy's *Piano Strategico*, Liechtenstein's Local Structure Plan, Slovenia's Strategic Municipal Spatial Plan, and Switzerland's Agglomeration Projects, these frameworks all integrate higher-level strategic goals set at regional and national levels, ensuring alignment across governance tiers.

Regarding adaptation to Alpine contexts, these planning documents universally recognise the need to account for unique Alpine factors such as geomorphology, natural hazards, and ecological sustainability. Austria's LDCs and France's PLUs, for example, emphasise local considerations like protecting against hydro-geological risks and ensuring sustainable land use within mountainous territories. Switzerland's Agglomeration Plans similarly address these factors, particularly in defining sustainable land use and coordinating mobility within mountain regions. Each document incorporates regional specifics, particularly when addressing local infrastructure and development in alpine zones, underscoring the commitment to community safety and sustainable resource management across mountainous areas.

Box 9
Local Development Concepts), Austria

Örtliches Entwicklungskonzept (Local Development Concepts), Austria

Strategy



Example of Örtliches Entwicklungskonzept. Source: Örtliches Entwicklungskonzept Siegendorf

In Austria, the Local Development Concept (LDC) is the municipalities' main strategic plan that outlines spatial development objectives for the short term, medium term, and long term. This instrument forms binding specification for the preparation of the zoning plans and the building plans of the municipality. The municipal development concept presents and determines community development perspectives and their spatial consequences. Due to its eminently local nature, this instrument has a rather scarce cross-border relevance and follows the boundaries of the municipality they concern. Its relevance for Alpine interface territories varies largely, depending on the location and type of municipality: generally, as part of the baseline assessments in preparing an LDC, alpine-specific aspects need to be considered in Alpine municipalities. What are the benefits of *Local Development Concepts* for Alpine interface territories?

- **Tailored development and hazard management:** *LDCs* provide municipalities with strategic plans that take into account the specific geographical and environmental constraints of Alpine regions. This ensures that development is both locally appropriate and resilient to natural risks.
- **Cross-sectoral coordination and alignment with broader plans:** Although *LDCs* focus on local needs, they are required to align with regional and national plans. This promotes cross-sectoral coordination, helping Alpine municipalities integrate larger-scale sustainable development initiatives into their local strategies.
- **Long-term sustainable planning:** *LDCs* serve as the foundation for zoning and building but also promote long-term balancing growth vital for the sustainable future of Alpine regions.

See also: ESPON InTerAlp Scientific annex IV: Governance report for Austria

However, there are also significant differences in the cross-border relevance and scope of these documents. For instance, France's PLU includes notable cross-border elements, such as the *Plan Intégré Transfrontalier* (PIT), which fosters collaboration between municipalities in France and Italy, offering a unique model of cross-border cooperation among Alpine territories. This level of international integration is less prominent in Austria's LDCs and Germany's zoning plans, which focus on municipal and national borders without extending to cross-border Alpine contexts. The collaborative frameworks present in some countries, such as France's inter-municipal PLUI and Switzerland's Agglomeration Projects, are designed to encourage coordination among municipalities, which supports integrated approaches to Alpine challenges that require cross-sectoral collaboration. An example of the implementation of Switzerland's Agglomeration Projects is offered by the case of Verein Agglomeration Werdenberg-Liechtenstein, which operates at a cross-border level (Box 10).

Box 10
Verein Agglomeration Werdenberg-Liechtenstein

Verein Agglomeration Werdenberg-Liechtenstein

2009 – Coordination

Buchs-Vaduz cycle and pedestrian bridge. Source: Agglomeration Werdenberg-Liechtenstein

Between the Alvier and the Liechtenstein Alps, the Werdenberg-Liechtenstein agglomeration stretches over a length of around 30 kilometres in the Rhine Valley. Large agglomerations have a leading role as service centres since they perform specific functions in their sector for other regions and medium and large centres. Founded in 2009 according to the Swiss Law, the Werdenberg-Liechtenstein Agglomeration Association is an example of the cross-border strategy aimed at addressing the constantly growing challenges in this strongly networked region. The members of the Association are the six Werdenberg and eleven Liechtenstein municipalities, the municipality of Sargans as well as the canton of St. Gallen and the Principality of Liechtenstein, while the city of Feldkirch is also involved in the decisions as an observer. The purpose of the Association is to strengthen cooperation, joint development of future perspectives, and implementation for the agglomeration, as well as the efficient fulfilment of public tasks. In addition, the Werdenberg-Liechtenstein agglomeration programme aims at a greater coordination of cross-sectoral transport and settlement within the functional area of Werdenberg-Liechtenstein and was adopted by the Swiss Parliament in 2014 and 2019.

What are the benefits of the *Verein Agglomeration Werdenberg* for Alpine interface territories?

- **Enhanced cross-border cooperation:** The Werdenberg-Liechtenstein Agglomeration Association is an exemplary model of cross-border collaboration, involving multiple municipalities from both Switzerland and Liechtenstein. Alpine interface territories can benefit from similar cooperative frameworks to address shared challenges that extend beyond national borders, improving governance and coordination.
- **Territorial strategy for joint development:** The association's focus on developing joint future perspectives and strategies highlights the importance of a unified approach to regional development. Alpine interface territories can leverage such strategies to harmonize their growth plans, ensuring cohesive development that benefits the entire region, rather than isolated municipalities.
- **Functional area management:** By addressing key regional issues such as transport, settlement planning, and landscape management within a functional area framework, the association ensures that decisions are aligned with the needs of the entire region. The Alpine interface territories can adopt this approach to manage interconnected landscapes and resources efficiently, promoting sustainable development.
- **Strengthened public service delivery:** The association’s focus on the efficient fulfilment of public tasks demonstrates how collaboration can improve the delivery of public services across regions. Alpine interface territories can adopt similar methods to enhance service provision and address regional challenges collectively.

See also: ESPON InTerAlp Scientific annex VIII: Governance report for Liechtenstein

Each of these planning documents ultimately plays an important role in balancing the pressures of development with the conservation needs of the Alpine environment. The shared focus across countries on preserving ecological integrity, fostering sustainable growth, and adapting to environmental risks highlights a regional commitment to ensuring the long-term viability of these unique landscapes. Through tailored approaches to land use, cross-municipal cooperation, and integrated ecological and social goals, the documents collectively illustrate a nuanced approach to managing Alpine territories while recognising each country's distinct social, economic, and environmental priorities. Finally, territorial governance is also promoted by instruments that only partially deal with spatial planning. The mayor's meetings offer a good example of how to encourage a more open and transparent territorial governance model across (Box 11).

Box 11
Mayor's meetings, Germany

Bürgermeistertreffen (Mayors' meeting), Germany

Coordination

The *Bürgermeistertreffen* (Mayors' Meeting) is an event in Bavaria (Germany) that brings together mayors from various Bavarian municipalities to discuss local challenges, advocate for their communities, and collaborate with representatives from the Bavarian Parliament. It provides a platform for mayors to raise awareness of current issues affecting their regions and to network with other local leaders and state officials. Through thematic panel discussions, local and regional delegates engage in intensive exchanges of ideas and best practices, tackling a wide range of topics such as urban development, infrastructure, environmental protection, and social services. The meeting emphasizes the importance of multi-level governance, cooperation between local and state entities, and the development of joint solutions for regional issues. For the Alpine interface territories, which often span multiple countries and are home to unique environmental and economic conditions, adopting a similar approach could help address complex, cross-border issues more effectively.

What are the benefits of the *Bürgermeistertreffen* for Alpine interface territories?

- **Enhanced cross-border and regional cooperation:** The *Bürgermeistertreffen* promotes collaboration between municipalities, which can inspire stronger cross-border cooperation between Alpine interface territories and neighbouring regions like France, Switzerland, and Austria. This can lead to joint solutions for shared challenges such as tourism management, infrastructure, and environmental conservation.
- **Advocacy for local concerns and stronger local-regional relationships:** The meeting provides a platform for local leaders to bring their concerns directly to higher-level authorities. Alpine interface territories can adopt this model to ensure their specific challenges—such as seasonal tourism and environmental preservation—are heard in national or regional policy discussions. Additionally, it fosters stronger cooperation between local governments and regional-level authorities, helping to align local needs with broader regional or national strategies.
- **Sharing best practices and solutions for sustainable development**: By facilitating the exchange of ideas and strategies among municipalities, the *Bürgermeistertreffen* can help Alpine interface territories learn from other regions' experiences in sustainable development, infrastructure planning, and community services, ensuring a balance between economic growth and environmental protection.
- **Collective problem-solving for complex regional issues:** Alpine interface territories can benefit from a similar platform to tackle shared issues such as climate change adaptation, cross-border environmental protection, and sustainable tourism strategies.

See also: ESPON InTerAlp Scientific annex VI: Governance report for Germany

3.4.2 Challenges and opportunities

At the local level, a variety of spatial planning and development strategies emerge. For cross-border regions, these result in diverse administrative and governance structures, creating challenges and opportunities for achieving cohesive and sustainable regional development. Each country within the Alpine region has developed specific planning documents and frameworks to address local development needs, often focusing on balancing economic progress with environmental preservation.

These documents share a common commitment to multilevel governance and strategic alignment with national and EU objectives. However, challenges persist, including limited cross-border integration, balancing development pressures with conservation imperatives, and fostering effective stakeholder participation. Yet, these same regions hold significant potential: through strengthened cross-border cooperation, enhanced multilevel planning, and active community engagement, Alpine territories can work towards a unified approach that respects both the ecological integrity and the socio-economic vitality of the Alps. Such a comparative assessment provides insights into the shared challenges and unique opportunities that Alpine interface territories might face in their pursuit of sustainable development and regional resilience.

Challenges

- Cross-border coordination: Administrative discrepancies hinder cohesive regional development across Alpine interface territories, with many local plans focusing primarily on the territory within the respective national borders. Overall, cross-border cooperation at the local level is inconsistent across Alpine interface territories. While some regions (e.g., France and Italy via the Plan Intégré Transfrontalier) have established mechanisms for local cross-border planning, many Alpine municipalities primarily focus on their national frameworks, limiting the scope for collaborative cross-border initiatives.
- Stakeholder participation and integration: Divergent stakeholder priorities and limited cross-sectoral integration in planning documents can prevent cohesive strategies, especially in complex Alpine interface areas.
- Overall, local governance frameworks do not yet seem to align well with the functional realities of Alpine interface territories. Functional patterns, such as commuting and shared tourist destinations, often transcend municipal boundaries, yet local plans are frequently restricted to administrative perimeters. This misalignment complicates inter-municipal cooperation and can reduce the effectiveness of local plans in addressing issues like transport connectivity, housing, and ecological conservation. Inspiring practices such as Switzerland's Agglomeration Projects are still not widely adopted at the local level across the Alpine region.

Opportunities

- Strengthening cross-border cooperation: Expanding frameworks like France's PIT across other Alpine regions could enhance regional cohesion and resource-sharing, promoting sustainable infrastructure and ecological initiatives. The Agglomeration projects can offer a good example of how to frame potential cooperation in the sector of spatial planning in cross-border areas, but not only.
- Leveraging multilevel governance: Aligning local, regional, and national goals can pool resources and improve policy coherence, fostering resilience and sustainable economic development in Alpine territories. The case of the Mayor Meetings can be mutated in other contexts that require a more open and transparent decision-making process.
- Fostering stakeholder engagement: Encouraging participatory planning allows communities to co-create solutions specific to Alpine needs, strengthening local ownership and adaptability to environmental and economic challenges.
- Local governance structures in the Alpine region should increasingly incorporating Alpine-specific factors from an inter-municipal perspective. To jointly handle issues as natural hazard management, climate adaptation, and eco-friendly tourism from a functional (and cross-border) perspective may contribute to promote a more sustainable and inclusive development of the Alpine interface territories. Positive examples are the Austrian Local Development Concepts, emphasizing the need to tackle hydrogeological risks, and inter-municipal plans in France and Switzerland, that integrate sustainable land use for mountainous landscapes

4 Sectoral planning

4.1 Transport

4.1.1 Relevant instruments and initiatives

The transport strategies of the countries under investigation reveal a complex and nuanced approach to managing mobility in the Alpine regions. These areas face unique challenges, from rugged topography and fragile ecosystems to the need for seasonal and cross-border accessibility. Each country's transport policy reflects its unique administrative structure, environmental priorities, and economic considerations, leading to shared themes and distinct national approaches (Table 4.1). This comparison shows how each country addresses sustainable mobility, regional accessibility, and transnational cooperation in response to the intricate geography and socio-economic conditions of the Alpine interface territories.

Table 4.1
Relevant transport planning tools

Sector	Level	Country	Name of the instrument (native language and English)	Nature of the document (i.e. strategy, coordination, programme, regulative)
TRANSPORT	NATIONAL	AT	***Mobilitätsmasterplan 2030*** *(Mobility Master Plan 2030)*	Strategy
		FR	***Schéma national des infrastructures de transport – SNIT*** (National transport infrastructure scheme)	Coordination
		DE	***Bundesverkehrswegeplan*** (2030 Federal Transport Infrastructure Plan)	Strategy/Programme
		IT	***Piano Generale dei Trasporti e della Logistica*** (General Plan for Transport and Logistics)	Coordination
		LI	***Mobilitätskonzept*** (Mobility Concept)	Strategy
		SI	***Strategija razvoja prometa Republike Slovenije Do leta 2030*** (Transport Development Strategy of the Republic of Slovenia Until 2030)	Strategy/Coordination
			Nacionalni program razvoja prometa v Republiki Sloveniji do leta 2030 (National Programme for the Development of Transport in the Republic of Slovenia until 2030)	Programme
			Nacionalni program razvoja infrastrukture slovenskih železnic (NPRSZI) (National Programme of the Slovenian Railway Infrastructure Development (NPSRID)	Programme
			Resolucija o Naciona-lnem programu izgradnje avtocest v Republiki Sloveniji (ReN-PIA) (National Motorway Construction Programme in the Republic of Slovenia (NMCP)	Programme
		CH	***Quadro d'orientamento / Cadre d'orientation UVEK-Orientierungsrahmen 2040*** (Guidance Framework 2040)	Strategy
			Piano settoriale dei trasporti/ Plan sectoriel transports/Sachplan Verkehr (Transport sectoral plan)	Regulative

Sector	Level	Country	Name of the instrument (native language and English)	Nature of the document (i.e. strategy, coordination, programme, regulative)
	SUBNATIONAL	AT	n.a.	-
		FR	***Schéma Regional d'Aménagement, de Développement durable e d'Égalité de Territoires – SRADDET*** (Regional Plan for Planning Sustainable Development and Territorial Equality)	Strategy/Coordination
		DE	n.a.	-
		IT	***Piano Regionale della Mobilità e dei Trasporti* (PRMT)** (Regional Mobility and Transport Plan ***Piano Urbano della Mobilità Sostenibile*** (Sustainable Urban Mobility Plan at Metropolitan Level)	Strategy/Vision Strategy/Programme
		LI	**Transport Expert Group of the Region Sarganserland-Werdenberg**	Committee
		SI	n.a.	-
		CH	n.a.	-
	LOCAL	AT	**Local mobility concepts**	Strategy/Coordination
		FR	***Plan de Mobilité Rurale*** (Rural Mobility Plan)	Strategy/coordination
			Plan global de déplacements – PGD (Global mobility plan) ***Plan de déplacements urbains – PDU*** (Urban Transport Plan)	Coordination Strategic/Programme
		DE	n.a.	-
		IT	***Piano Urbano della Mobilità Sostenibile*** (Local Sustainable Urban Mobility Plan)	Strategic/Programme
		LI	n.a	-
		SI	n.a.	-
		CH	***Programma Traffico d'Agglomerato / Programme en faveur du trafic d'agglomération / Programm Agglomerationsverkehr*** (Agglomeration Traffic Program)	Programme

Source: authors' own elaboration

Transport strategies adopted by Alpine countries showcase a shared commitment to addressing the unique challenges of Alpine interface territories while reflecting each country's specific governance structures, policy priorities, and regional contexts. These strategies aim to balance environmental protection, regional connectivity, and sustainable mobility, all of which are essential for this ecologically sensitive and geographically complex region. An important topic across these strategies is their emphasis on sustainability. In Austria, the *Mobilitätsmasterplan 2030* serves as a strategic framework that promotes eco-mobility by emphasising modes of transport that minimise environmental impact, such as walking, cycling, and public transit. Similarly, Slovenia's *Strategija razvoja prometa Republike Slovenije Do leta 2030* (Box 12) takes a holistic approach by integrating spatial development policies with transport planning. This strategy explicitly aims to promote sustainable mobility while limiting the use of private motor vehicles, a goal that aligns closely with the needs of Alpine territories.

Moreover, France's *Schéma National des Infrastructures de Transport (SNIT)* outlines priorities for enhancing transport efficiency while reducing its ecological footprint, underscoring the need to protect sensitive Alpine ecosystems. These strategies reflect a common understanding that the Alpine region's natural landscape necessitates a careful balance between access and preservation. Regional accessibility is another shared priority, as the Alpine region often faces challenges of connectivity due to its rugged

terrain. France's *SRADDET Auvergne Rhône-Alpes* emphasises the importance of improving access to remote Alpine areas, recognising that transport infrastructure is essential for reducing territorial inequalities and supporting local development. Italy's *Piano Urbano della Mobilità Sostenibile (SUMP)* similarly highlights the importance of strengthening connections between municipalities, particularly in regions where seasonal tourism creates unique transport demands. While sustainability and accessibility are common goals, the methods and frameworks for achieving them vary significantly among the countries. Austria's *Mobilitätsmasterplan 2030*, for instance, employs a backcasting approach, focusing on reducing future transport demand by promoting systemic changes in mobility behaviour and infrastructure. This contrasts with Germany's *Bundesverkehrswegeplan* (FTIP 2030), which takes a forward-looking, project-based approach, prioritising infrastructure projects with the greatest regional and national impact. Switzerland, on the other hand, adopts a flexible framework with its *Orientierungsrahmen 2040*, which allows for adjustments in response to evolving social, technological, and environmental conditions.

Italy's decentralised approach provides another perspective on how transport policies can be tailored to Alpine challenges. The *Piano Generale dei Trasporti e della Logistica* delegates significant responsibility to regions, enabling localised strategies that address specific needs. For example, the *Sustainable Mobility Plan for the Agenda 21 LAKES Area* demonstrates how inter-municipal collaboration can create integrated solutions for public mobility, particularly in areas characterised by fragile ecosystems and high tourism demand. This approach is similar to Slovenia's national strategy, which integrates transport with spatial planning to address local development potential while ensuring environmental protection. Switzerland's *Programma Traffico d'Agglomerato* is an example of how financial mechanisms can support regional and cross-border mobility solutions. By co-financing urban and regional transport projects, indeed, Switzerland has enabled cities and agglomerations to address transport challenges comprehensively, fostering intermodal solutions that reduce environmental impacts while enhancing connectivity. This model of coordinated investment could provide valuable insights for other Alpine regions, where financial and administrative constraints often hinder large-scale mobility initiatives.

Box 12

Transport Development Strategy of the Republic of Slovenia until 2030, Slovenia

Strategija razvoja prometa Republike Slovenije Do leta 2030 (Transport Development Strategy of the Republic of Slovenia Until 2030), Slovenia

2015 – Strategy, Coordination

Source: Transport Development Strategy of the Republic of Slovenia Until 2030.

Slovenia introduced a system of comprehensive planning of transport and transport infrastructure development based on a harmonised vision, surpassing the system of planning development in this field based on the incomplete solutions and unrelated measures defined by strategic documents until recently. An integrated transport strategy is the key tool of the new approach to transport planning. It aims to solve transport-related challenges of municipalities, thus helping them achieve their key development potentials. It is oriented towards promoting walking, cycling, public passenger transport and other alternative forms of sustainable mobility while limiting private motorized vehicle traffic. The Strategy is the first document to deal with the transport system in a comprehensive manner, thus enabling greater synergies in achieving the objectives of transport and spatial policies of the state and of other policies, and greater control of the impact of transport on the environment and the economy.

What are the benefits of the *Transport Development Strategy* for Alpine interface territories?

- **Promotion of sustainable mobility:** The strategy emphasizes walking, cycling, public transport, and other alternative forms of sustainable mobility, which is particularly relevant for Alpine areas where preserving natural landscapes and reducing environmental impacts is crucial. This can help reduce traffic congestion and pollution in these sensitive regions.
- **Comprehensive approach to transport planning:** By addressing transport systems in a holistic manner, the strategy enables better integration of transport with other regional development policies, such as spatial planning and environmental protection. This can lead to more coordinated and efficient transport solutions that align with the unique needs of Alpine territories.
- **Support for local development potential**: The strategy helps municipalities solve transport-related challenges, allowing them to unlock their full development potential. For Alpine territories, improved transport infrastructure can enhance connectivity, boosting local tourism, economic activities, and access to services while maintaining environmental sustainability.
- **Environmental and economic synergies:** The strategy's focus on reducing the environmental impact of transport is highly beneficial for Alpine areas, where ecosystems are fragile. Additionally, better transport systems can stimulate the local economy by facilitating movement and access, while safeguarding the natural environment, which is a key asset for these regions.

See also: ESPON InTerAlp Scientific annex IX: Governance report for Slovenia

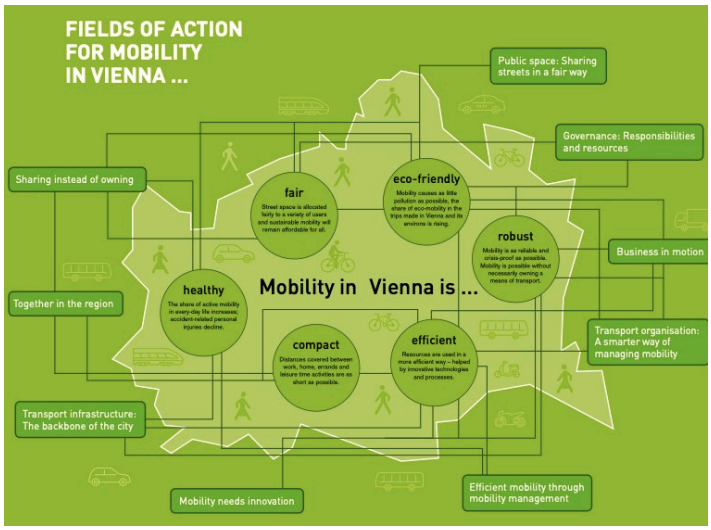
The cross-border cooperation is a particularly critical topic in the Alpine context, where national borders intersect frequently, and transport networks must serve both local and transnational needs. French initiatives like the Lyon-Turin high-speed rail project emphasize the strategic importance of international rail links, as well as Italy's transport policies prioritize key Alpine corridors such as the Brenner and Simplon tunnels. Switzerland and Liechtenstein also highlight the importance of collaboration, and they do so through initiatives such as the *Transport Expert Group of the Region Sarganserland-Werdenberg*, which fosters cooperation and coordination between municipalities, transport operators, and regional governments to address shared challenges beyond administrative borders. Local and municipal strategies play a vital role in implementing these broader frameworks. Local Mobility Concepts in Austria (see Box 13), for example, integrates local mobility with regional strategies, ensuring alignment between urban planning and transport goals.

Furthermore, Italy's *Sustainable Urban Mobility Plan* (see Box 14) framework mandates long-term, encouraging collaboration and sustainable infrastructure development. In the Alpine context, these localized efforts are essential for addressing the specific challenges of mountainous areas, such as limited accessibility, seasonal variations in transport demand, and the need for eco-friendly mobility solutions. These transport strategies are not just technical frameworks, but they also represent valuable instruments and initiatives to address the complex socio-economic and environmental challenges of the Alpine interface. The region's unique geography, indeed, demands a careful balance between accessibility and conservation, which is formally reflected in the adherence to the Alpine Convention's transport protocol as well as in the implementation of policies focused on minimising the impact of transport on sensitive ecosystems.

Box 13
Local Mobility Concepts, Austria

Local Mobility Concepts, Austria

Strategy, Coordination



Thematic Concept STEP 2025. Source: Urban Mobility Plan Vienna

In Austria, strategic transport governance and planning at the local level, such as the Vienna Urban Mobility Plan (*Wiener Fachkonzept Mobilität*), serves as a model of sustainable urban mobility planning, meeting Europe's SUMP (Sustainable Urban Mobility Plan) requirements. It reflects a consistent implementation of the city's vision, as enshrined in the Urban Development Plan STEP 2025. This vision emphasizes the importance of close coordination and cooperation in transport and spatial planning across the entire Eastern Region. For the first time, the plan includes a regional mobility strategy that was developed in collaboration with the provinces of Burgenland, Vienna, and Lower Austria, forming a strong basis for both local and regional mobility measures. This collaborative approach is particularly relevant for Alpine interface territories, where cross-municipal cooperation and regional integration are key to addressing transport challenges in mountainous and rural areas. For Alpine territories, which often face unique transport challenges due to geographic constraints, such inclusive planning can ensure that local needs and concerns are addressed while aligning with broader regional strategies.

What are the benefits of *Local Mobility Concepts* for Alpine interface territories?

- **Regional coordination and integrated planning:** Similar to how the Vienna Urban Mobility Plan promotes coordination between Vienna, Lower Austria, and Burgenland, Alpine territories can benefit from regional cooperation. By aligning mobility plans with broader spatial development goals, Alpine municipalities can ensure that mobility solutions are integrated with land-use planning, environmental conservation, and economic development strategies.
- **Sustainable mobility solutions for sensitive areas:** The Vienna plan's focus on sustainable mobility—promoting walking, cycling, and public transportation—can directly benefit the Alpine interface territories. Given the environmental sensitivity of the Alps, Local Mobility Concepts in these regions can prioritize low-impact, eco-friendly transport solutions.
- **Tailored mobility for Alpine conditions:** Local Mobility Concepts can focus on enhancing public transport in remote or mountainous areas, managing seasonal tourism traffic, and promoting transport modes suitable for the Alpine geography, such as cable cars or electric vehicles, to ensure both practicality and sustainability.

See also: ESPON InTerAlp Scientific annex IV: Governance report for Austria

Box 14
Sustainable Urban Mobility Plan, Italy

Piano Urbano della Mobilità Sostenibile (Sustainable Urban Mobility Plan), Italy

Strategy, Programme

Scheme of the cycle network: project hypothesis no. 1. Source: PUMS Agenda21 Lakes

In Italy, local governments play a crucial role in implementing policies and programmes designed at higher administrative levels, particularly in the transport sector. While local authorities may not have direct control over setting transport policies, they are integral in collaborating to achieve specific objectives within these frameworks. This dynamic is reflected in the legislative guidelines for Sustainable Urban Mobility Plans (SUMP). According to these guidelines, municipalities with populations exceeding 100,000 are required to draft and implement a SUMP. These plans are not standalone but are interwoven with other sectoral policies and must be designed for a 10-year time frame, with mandatory reviews every five years. An exemplary case of inter-municipal collaboration is the Sustainable Mobility Plan for the Agenda 21 LAKES Area, where 16 municipalities jointly developed an integrated mobility plan. This initiative demonstrates how local units can come together to address public mobility and transportation issues in a cohesive and coordinated manner, aiming for sustainable outcomes.

What are the benefits of *SUMP* for Alpine interface territories?

- **Improved coordination across municipalities:** The Alpine regions can benefit from the framework of SUMPs by fostering stronger collaboration between municipalities, leading to cohesive transport networks that work across borders and regions.
- **Long-term infrastructure development:** With the mandatory 10-year time frame for SUMPs, Alpine regions can plan for the long-term sustainability of their infrastructure, ensuring that it evolves with changing environmental conditions and population dynamics.
- **Promotion of active mobility:** The integration of Cycling Mobility Plans into the SUMPs offers an opportunity to promote cycling as a viable and sustainable mode of transport, which is especially valuable for promoting eco-tourism and reducing vehicle traffic in sensitive mountain areas.
- **Sustainable mobility in fragile environments:** The Alps are a sensitive ecological zone, making sustainable transport planning essential. The integration of SUMPs, Cycling Mobility Plans, and General Urban Traffic Plans would help ensure that mobility solutions are not only functional but also environmentally friendly, aligning with the conservation goals of the Alpine region

See also: ESPON InTerAlp Scientific annex VII: Governance report for Italy

4.1.2 Transport governance and planning assessment

The comparative analysis of Alpine integratedness in transport planning systems examines the alignment and adaptability of national and regional transport policies within the complex socio-environmental context of the Alpine region like transport planning challenges, from safeguarding ecological sensitivity and fostering sustainable mobility to addressing the needs of transnational corridors and cross-border connectivity (Figure 4). This analysis assesses each country's transport planning based on six dimensions that are crucial for understanding how well domestic policies align with the integrated planning needs of the Alps. By examining the strengths and weaknesses in each country's approach, this analysis highlights the degree of integratedness in addressing Alpine-specific needs, drawing attention to both best practices and areas requiring improvement. Figure 4 provides a comparison across countries, identifying areas of improvement for enhancing sustainable and integrated transport governance in the Alpine space.

Attention to multilevel coordination

In assessing multilevel coordination across the Alpine region, Germany scores the highest, with a cohesive multilevel structure that aligns federal and state (*Länder*) policies in the Alpine region, demonstrating strong coordination between governance levels. Austria and Liechtenstein also show relatively high levels of coordination, evidenced by Austria's adherence to both national and European standards and Liechtenstein's integrated approach through its Mobility Concept 2030. Switzerland follows closely, with national and cantonal guidelines that emphasize alignment, though supranational frameworks receive less emphasis than in Austria. Conversely, France, Italy, and Slovenia have lower scores, highlighting a fragmented approach. France struggles with clear alignment, particularly between national and local levels, leading to inconsistent implementation. Italy faces similar challenges due to regional autonomy, with regional plans diverging significantly from national strategies. Slovenia, with a centralized approach, involves sub-national levels only minimally, focusing primarily on national directives and participation in European projects.

Attention to cross-sectoral coordination

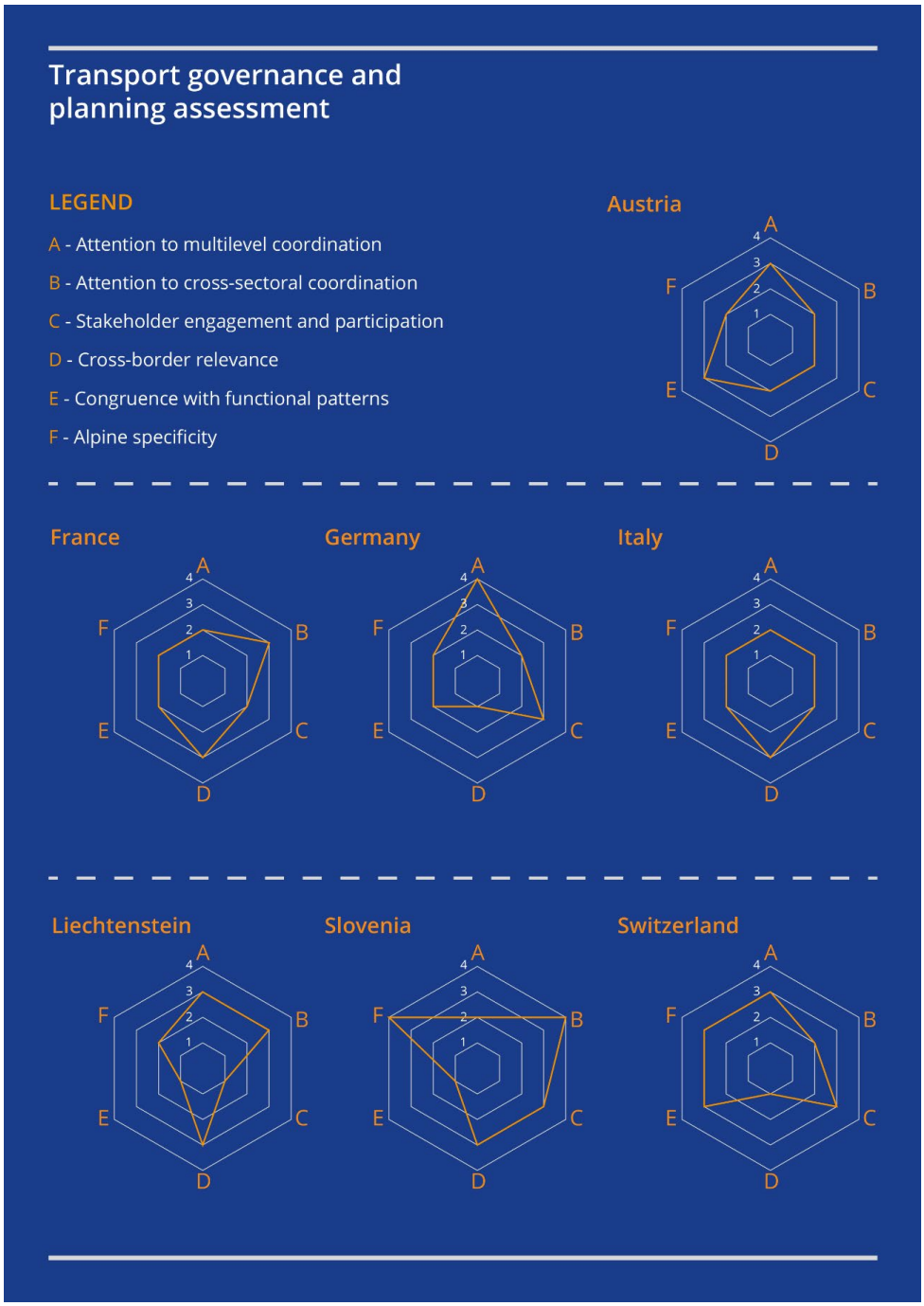
Attention to cross-sectoral coordination varies significantly among countries, reflecting differing priorities for integrating transport with other policy domains. Slovenia stands out with the highest score, incorporating environmental, social, and economic dimensions at a strategic level, supported by strong practical implementation across policy areas. France also scores high, particularly at the regional level, where SRADDET plans promote comprehensive integration of transport, social, environmental, and economic concerns, creating a cohesive framework for sustainable mobility. Liechtenstein's approach aligns closely with its Mobility Concept 2030, which integrates transport with spatial development and sustainability strategies, indicating substantial cross-sectoral coordination. In Austria, cross-sectoral efforts focus on climate policies, but coordination with other sectors remains limited. Germany, with a moderate score, addresses some environmental concerns but lacks full integration across sectors, particularly in high-traffic Alpine areas. Italy's score reflects recent advances in integrating transport with logistics, environmental protection, and energy, but the effectiveness of cross-sectoral strategies varies widely across regions. Switzerland's low score highlights limited cross-sectoral integration, with few references beyond environmental impacts within its transport plans.

Stakeholders' engagement and participation

When it comes to stakeholders' engagement and participation, Slovenia, Germany, and Switzerland receive relatively high scores, reflecting a stronger culture of participatory governance. Slovenia, influenced by European projects, emphasizes stakeholder inclusion, particularly at local levels, fostering a collaborative planning culture. Germany's tradition of participatory governance supports moderate engagement, with room for improvement in integrating local and regional voices in Alpine regions. Switzerland also achieves a similar level of engagement, with agglomeration traffic programs that encourage public input, especially at local levels. In contrast, Austria and France score lower, reflecting limited

non-institutional participation. Austria involves some stakeholder groups beyond government representatives, though the extent is more moderate. While promoting institutional involvement, France restricts engagement specifically for transport planning, limiting input from broader stakeholder groups. Italy's participation level varies significantly by region and planning instrument, with SUMPs demonstrating more stakeholder inclusion, while the General Plan for Transport and Logistics includes limited engagement. Liechtenstein, scoring the lowest, lacks substantial evidence of active stakeholder participation, reflecting a top-down planning approach primarily involving governmental actors.

Figure 4
Transport governance and planning assessment



Source: authors' own elaboration

Cross-border relevance

Cross-border relevance is especially prominent in France, Italy, and Liechtenstein. France emphasises cross-border relevance in its national and regional plans, promoting sustainable connections with neighbouring countries. Italy focuses on cross-border integration at the regional level, where plans focus on alignment with transnational networks, albeit sometimes lacking specificity in national-level documents. Liechtenstein, with strong cross-border interests, collaborates closely with Switzerland through the Werdenberg-Liechtenstein Agglomeration Association. Austria's shows an intent to foster cross-border connections, especially through coordination with supranational bodies, though it is less comprehensive than France or Italy. Slovenia's national strategies reflect cross-border priorities through participation in cross-border programs like ASP and SI-AT, which are primarily implemented at local levels. In contrast, Germany and Switzerland, indicating less attention to cross-border relevance in transport plans. Despite high cross-border mobility in the region, Germany's low score suggests challenges in aligning policies with neighbours like Austria and Switzerland.

Congruence with functional patterns

In congruence with the dimension of functional patterns, Austria and Switzerland demonstrate a strong alignment with functional territorial dynamics. Austria's transport planning aligns well with mobility needs, often transcending administrative boundaries, while Switzerland promotes collaborative approaches among municipalities through agglomeration traffic programs. In France, the functional patterns are evident in inter-municipal cooperation initiatives like the *Plan de Mobilité Rurale*. Germany, Italy, and Slovenia lack consistent attention to functional mobility patterns. Germany's low score implies a disconnect between mobility needs, such as commuting and tourism flows, and current planning strategies in the Alpine region. Italy's focus on functional patterns is sporadic, with some regional initiatives like Turin's "metropoli montana" aligning with these patterns, though this attention does not extend to national-level plans. Slovenia addresses functional patterns indirectly through sustainable mobility efforts, although specific integration guidelines are limited. Liechtenstein's lowest score reflects an approach that does not strongly consider functional patterns, focusing on centralized, rather than needs-based, planning.

Alpine specificity

Finally, Alpine Specificity in transport planning highlights considerable variation, with Slovenia achieving the highest score by specifically addressing transport planning for the Julian Alps, demonstrating a dedicated focus on Alpine challenges. Austria's approach is somewhat Alpine-focused, primarily through national adherence to the Alpine Convention's transport protocol, though lower administrative levels show limited attention. France's score reflects a general lack of focus on Alpine-specific needs, with limited emphasis on the unique requirements of the Alpine space beyond some key infrastructure projects. Germany's low score suggests a generalized approach that overlooks the distinct challenges of the Alps, with minimal consideration for the region's specific needs. Italy's national and regional policies address Alpine specificity to some extent, though pragmatic implementation is often lacking. While aware of Alpine dynamics, Liechtenstein does not emphasize specific Alpine measures, indicating a more generalized approach to transport planning.

4.1.3 Challenges and Opportunities

In analysing Alpine transport planning systems within interface territories, certain recurring challenges and opportunities become clear. These can reveal areas where integration and coordination can improve, as well as strengths that could serve as models for other Alpine regions. Below are three key challenges and three corresponding opportunities to foster a more cohesive and sustainable transport planning approach for the Alpine region.

Challenges

- Fragmented multilevel coordination: In countries like France, Italy, and Slovenia, transport planning suffers from fragmented coordination across governance levels, leading to inconsistent policy implementation and misalignment between national and regional priorities. This lack of a cohesive multilevel framework hampers effective decision-making in Alpine transport.
- Inadequate cross-sectoral integration: Limited integration of transport planning with other critical sectors—such as environmental, tourism, and economic policies—is a barrier in countries like Austria, Germany, and Switzerland. This restricts the potential for holistic solutions to address the complex needs of Alpine regions, particularly in balancing environmental protection with economic development.
- Low stakeholder engagement in transport planning: Countries like Austria, France, and Liechtenstein demonstrate limited engagement of non-institutional stakeholders, such as local communities and private entities. This limits the effectiveness of transport policies, as local insights and needs are often not adequately represented in decision-making processes.

Opportunities

- Modelling effective multilevel coordination: Germany and Austria offer strong examples of multilevel coordination, aligning national and regional transport priorities through clear frameworks and communication channels. Expanding such models across the Alpine region could foster more integrated governance, enhancing consistency and cooperation in transport policy.
- Leveraging cross-sectoral synergies: Slovenia and France effectively integrate transport planning with environmental, social, and economic policies, creating comprehensive frameworks that address Alpine challenges such as sustainable tourism and ecological conservation. Adopting these cross-sectoral approaches more widely could improve the balance between mobility needs and environmental protection in Alpine interface territories.
- Expanding stakeholder participation models: Slovenia and Switzerland emphasize participatory planning, particularly at the local level, allowing for more adaptive and community-responsive transport policies. Implementing similar practices across Alpine regions could yield policies that are better suited to local contexts and more responsive to Alpine-specific needs, fostering a more inclusive governance culture.

4.2 Energy

4.2.1 Relevant instruments and initiatives

The energy and climate documents analysed illustrate a cohesive yet uniquely tailored approach to managing energy and environmental challenges, particularly within the Alpine territories. These national strategies (Table 4.2) reflect shared principles aligned with European Union climate goals and international agreements like the Paris Agreement, focusing on achieving energy efficiency, decarbonisation, and social equity. Yet, these approaches also vary significantly due to each country's socio-political structures, regional specificities, and legal frameworks, shaping the way each country addresses both the opportunities and constraints presented by their shared Alpine geography.

Table 4.2
Relevant energy planning tools

Sector	Level	Country	Name of the instrument (native language and English)	Nature of the document
ENERGY	NATIONAL	AT	***Klima- und Energiestrategie*** (Climate and Energy Strategy)	Strategy
		FR	***Plan national intégré énergie-climat – PNIEC*** (Integrated national energy-climate plan)	Strategy/Coordination
		DE	***Energiewende*** (Energy Transition Policy)	Strategy/Vision
			Erneuerbare-Energien-Gesetz, EEG (Renewable Energy Law)	Strategy/Coordination
			Nationaler Energie- und Klimaplan (National Energy and Climate Plan – NECP)	Strategy
		IT	***Strategia Nazionale di adattamento ai cambiamenti climatici (SNACC)*** (National strategy for adaptation to climate change)	Strategy
		LI	***Energiestrategie 2030/Energievision 2050*** (Energy Strategy 2030/Vision 2050)	Strategy/Vision
			Klimastrategie Liechtenstein 2050 (Climate Strategy Lichtenstein 2050)	Strategy/Vision
		SI	***Celostni nacionalni energetski in podnebni načrt*** (The Integrated National Energy and Climate Plan)	Strategy/ Vision/ Coordination/ Regulation
		CH	***Strategia Energetica / Stratégie énergétique / Energy Strategy 2050*** (Energy strategy 2050)	Strategy
	SUBNATIONAL	AT	**Climate and Energy Strategies of the Länder**	Strategy
		FR	***Schéma Regional d'Aménagement, de Développement durable e d'Égalité de Territoires – SRADDET*** (Regional Plan for Planning Sustainable Development and Territorial Equality)	Strategy/Coordination
			Plan de Protection de l'Atmosphère – PPA (Atmosphere Protection Plan)	Regulative
		DE	***Bayerns Energiezukunft mitgestalten***	Strategy/Programme
			Regionalplan	Strategy/Coordination/ Regulative
		IT	***Piani Regionali per l'Energia*** (Regional Energy Plans)	Strategy

Sector	Level	Country	Name of the instrument (native language and English)	Nature of the document
			Piano d'azione Provinciale per l'energia sostenibile (Provincial Sustainable Energy Action Plan)	Strategy
		LI	**Expert Group 'Energy'**	Committee
		SI	n.a.	
		CH	***Piano energetico e climatico cantonale / Plan cantonal énergie et climat / Kantonaler Energie- und Klimaplan*** (Cantonal energy and climate plan)	Strategy/Coordination
	LOCAL	AT	***Städtische Energieeffizienz Programm 2030*** (Urban Energy Efficiency Programme 2030)	Programme/Strategy
		FR	***Plan climat-air-énergie territorial – PCAET*** (Territorial climate-air-energy plan)	Strategy/Coordination/ Regulative
		DE	**Energy community**	Strategy/Coordination/ Programme
		IT	***Piano d'Azione per l'Energia Sostenibile e il Clima (PAES)*** (Sustainable Energy and Climate Action Plan)	Strategy
			Comunità Energetiche Sostenibili (Renewable Energy Communities)	Coordination
		LI	***Energiestadt-Land*** (Energy City label)	Programme
		SI	***Lokalni Energetski Koncept*** (Local Energy Concept)	Strategy/Regulation
		CH	***SvizzeraEnergia per i Comuni / SuisseEnergie pour les communes / EnergieSchweiz für Gemeinden*** (SwissEnergy for municipalities)	Programme

Source: authors' own elaboration

The different energy and climate policy documents from Alpine countries offer a complex yet complementary framework of policy approaches to addressing energy and environmental challenges in Alpine interface territories. These policies are committed to international and European goals, such as the Paris Agreement and EU climate targets while tailoring their implementation to the specific needs of their unique Alpine contexts. Despite their shared objectives, the approaches diverge significantly, reflecting differences in governance systems, socio-political structures, and regional particularities. These differences also allow to highlight best practices that can be useful to inspire different ways of addressing the environmental and socio-economic challenges of the Alpine region. The long-term visions embedded in each country's strategy indicate a shared awareness of the cumulative impacts of climate change and the necessity of setting actionable goals well beyond 2030. Austria's *Klima- und Energiestrategie* (#Mission2030) and France's *Plan National Intégré Énergie-Climat* (PNIEC), for example, reflect clear commitments to EU directives, with a focus on reducing greenhouse gas emissions, improving energy efficiency, and increasing renewable energy use. *Slovenia's Celostni nacionalni energetski in podnebni načrt* (NECP) and Switzerland's Energy Strategy 2050 similarly prioritise these goals, demonstrating a shared recognition of the need to address climate change locally and globally. Sectoral integration is crucial for Alpine countries, where energy and environmental policies must account for the delicate balance of economic growth, land use, and ecosystem preservation within the mountainous and often vulnerable landscapes.

Long-term planning is especially critical for the Alpine region, where specific environmental vulnerabilities—such as fluctuating water availability impacting hydropower, biodiversity preservation, and land use conflicts—demand adaptive strategies that span multiple sectors. France's PACA region, for example, highlights the need to diversify renewable sources beyond hydropower to include wind, biomass, and geothermal energy due to changing climate conditions and potential water scarcity. This sectoral

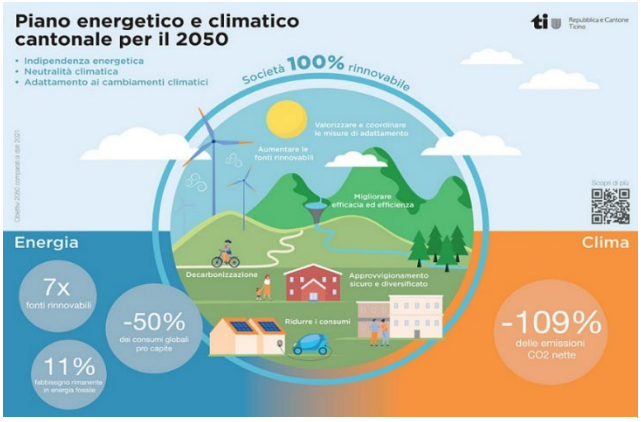
interdependence also emphasises the importance of flexible yet robust policy frameworks adapting to new scientific findings, emerging technologies, and evolving environmental conditions. Regional adaptation is a critical factor in these documents, as each Alpine country identifies and responds to its specific regional energy needs. Austria's integrated spatial and energy planning in Styria illustrates how municipal-level initiatives can serve as role models for regional energy transitions, while France's *Schéma Régional d'Aménagement, de Développement Durable et d'Égalité des Territoires* (SRADDET) allows regions like Auvergne Rhône-Alpes and PACA to adapt policies to their local contexts. This regional adaptability is particularly critical in the Alpine regions, where diverse topographies and climatic conditions demand flexible and context-sensitive approaches. The emphasis on regional frameworks underscores the importance of respecting local variations in resource availability, energy demand, and economic activity, enabling these regions to leverage their strengths in hydropower, biomass, or geothermal energy to support local and national goals. France and Italy have similarly regionalised frameworks but with unique adaptations. For example, France's PCAET policies mandate climate and energy plans for all municipalities with populations over 20,000, ensuring that all areas contribute to the climate transition while respecting local characteristics. Italy's Regional Environmental Energy Plans, such as the Piedmont and Liguria plans, further emphasise local interventions that complement regional economic activities like agritourism and wood supply chains. These regional-specific frameworks highlight the role of tailored regulatory structures in achieving climate goals while allowing local economies to thrive.

Legal and regulatory frameworks vary across countries, with some adopting highly structured national policies and others emphasising regional autonomy. Switzerland's Cantonal Energy and Climate Plan (PECC) (Box 15) offers an exemplary model of harmonising national goals with local implementation. By coordinating energy policies across cantons through the Model Energy Regulations of the Cantons (MuKEn), Switzerland ensures a consistent yet flexible approach to energy efficiency and climate resilience. This method suits the Alpine region, where harmonised cross-border cooperation is vital for managing shared resources. The PECC's integration of economic, social, and environmental goals reflects a balanced approach that ensures energy policy aligns with the region's ecological fragility and the needs of its communities.

Box 15
Cantonal energy and climate plan, Switzerland

Piano energetico e climatico cantonale / Plan cantonal énergie et climat / Kantonaler Energie- und Klimaplan (Cantonal Energy and Climate Plan), Switzerland

Strategy, Coordination



PEEC infographic. Source: Piano energetico e climatico cantonale (PECC), Strategia 2022

In Switzerland, cantons coordinate energy policies through the Conference of Cantonal Energy Directors using tools like the Model Energy Regulations of the Cantons to harmonise legislation, particularly in the building sector. The Cantonal Energy and Climate Plan (PECC) integrates economic, social, and environmental objectives, aiming for a coordinated and adaptable energy policy that can respond to both current and future challenges, including extreme events like energy crises or climate impacts. The PECC proposes concrete measures across the energy supply chain, with a strong focus on climate adaptation. The harmonised approach helps balance development with environmental protection, ensuring long-term sustainability.

What are the benefits of *PECC* for Alpine interface territories?

- **Cross-border cooperation:** The PECC promotes harmonised energy and climate policies across cantons. By ensuring consistent regulations and goals, the PECC facilitates cross-border cooperation, helping neighbouring Alpine communities work together on shared energy and environmental challenges, such as managing water resources, reducing emissions, and developing renewable energy sources that benefit the entire region.
- **Functional approach to sustainable development:** The PECC's integration of economic, social, and environmental goals reflects a functional approach tailored to the needs of the Alpine region. This approach addresses the interconnectedness of transport, energy, and land use, which is critical in mountainous areas where infrastructure and resources are limited. The focus on energy efficiency and renewable energy sources ensures that local needs are met in a way that respects the environmental fragility of the Alpine ecosystem.
- **Alpine specificity:** The PECC's emphasis on climate resilience and adaptation directly addresses the specific challenges faced by the Alpine territories, such as glacial melting, increased flooding, and rising temperatures. The plan's long-term strategic vision ensures that energy infrastructure and climate policies are robust enough to protect both the natural environment and the livelihoods of those who depend on it, especially in tourism, agriculture, and local industries.

See also: ESPON InTerAlp Scientific annex X: Governance report for Switzerland

Despite these shared principles, the policies also highlight significant differences in governance and implementation. Germany's structured legal frameworks, such as the EEG and the Federal Climate Protection Act, stand in contrast to the more decentralised approaches of Switzerland and Austria, where

guidelines are set nationally, but the execution is largely left to the regions and cantons, allowing for policies that resonate with regional energy landscapes. Austria's climate and energy strategies in Styria and Vienna showcase this flexible approach, where municipal-level strategy can be as influential as national directives in achieving the overall energy transition. In Switzerland, energy policy is largely driven at the cantonal level, allowing for greater regional flexibility. These varying approaches illustrate the importance of tailoring governance structures to fit national and regional contexts.

A distinctive feature which characterises some of these strategies is the focus on local and community-based energy solutions, which are particularly emphasised in countries with a tradition of community engagement in energy matters. Germany, for example, has pioneered energy cooperatives as a pathway for communities to invest in and benefit from renewable energy projects. Through the *Erneuerbare-Energien-Gesetz* (EEG) (Box 16) and *Energiewende* policies, Germany has set up financial incentives that empower local entities to invest in wind, solar, and biomass projects, effectively creating an ecosystem that values citizen participation and provides socio-economic benefits Similarly, Italy's *Comunità Energetiche Sostenibili* and Slovenia's *Local Energy Concept (LEK)* (Box 17) promote localised, citizen-driven solutions. These approaches are particularly relevant in the Alpine context, where small-scale, decentralised energy systems are often more feasible and environmentally sustainable than large-scale infrastructure.

Localised energy strategies also include financial mechanisms and incentive structures to facilitate regional and municipal energy independence. Switzerland's Energy Strategy 2050 emphasises support at the cantonal level, where cantonal energy plans are harmonised through the Model Energy Regulations of the Cantons (MuKEn). These regulatory frameworks streamline the deployment of renewable energy infrastructure, ensuring that energy policies align with local needs, geographic constraints, and economic conditions. Such community-based approaches demonstrate the potential of collective action in advancing climate goals while ensuring that local communities can shape and benefit from sustainable development.

The Alpine specificity of these policies is particularly noteworthy. Indeed, policies such as France's SRADDET in the PACA region explicitly address the unique challenges affecting the Alpine region, such as the impacts of climate change, by emphasising the need to diversify renewable energy sources beyond hydropower, given the risks posed by changing water availability. Similarly, Liechtenstein's Energy Strategy 2030 integrates long-term climate resilience into its energy planning, with measures to reduce energy demand and preserve the Alpine ecosystem.

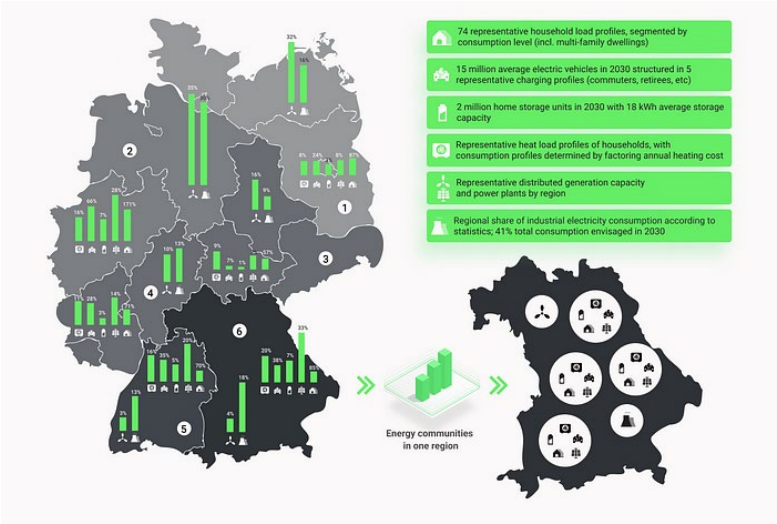
The strategic documents adopted by each country play a relevant role in addressing the unique challenges of the Alpine interface territories, which are particularly susceptible to the impacts of climate change. Alpine regions face distinct challenges, including limited land availability, water resource fluctuations, high biodiversity, and competing land use demands, all within an ecosystem that is sensitive to both natural and anthropogenic impacts. These documents not only guide national and regional actions but also create a framework for cross-border collaboration, recognising that the Alpine area's geography and environmental pressures are shared concerns that transcend political boundaries.

By incorporating regional-specific measures, community-driven initiatives, and legally binding commitments, these documents address the urgent need for sustainable, resilient energy systems tailored to the unique characteristics of the Alpine landscape. Furthermore, these strategies emphasise the importance of multi-level governance—from national to local—allowing policies to be adapted to local conditions while ensuring coherence with broader EU objectives. In doing so, they lay the foundation for a sustainable future for the Alpine regions, where energy, economic growth, and environmental preservation coexist within a comprehensive, long-term vision for climate resilience. The commitment shown in these strategic frameworks demonstrates the important role of coordinated policy in protecting the Alpine environment and sustaining its communities in the face of evolving climate and energy challenges.

Box 16
Energy communities, Germany

Energy communities, Germany

2000 – Strategy, Coordination, Programme



Grid Singularity Simulation Configuration of Germany 2030 Energy Market (map showing energy asset type, share and distribution based on German government forecasts and FIT calculations). Source: A Vision of a Decentralised Energy Market

Within the European Union, Germany is considered one of the pioneer countries in the field of renewable energy communities. Between 2000 and 2016, operations attributable to energy communities accounted for 42% of the connected renewable electricity capacity in this timeframe. German citizens' initiatives take different legal forms: civil law companies (Gesellschaft bürgerlichen Rechts), limited liability companies (GmbH Kommanditgesellschaft) or registered cooperative societies (eingetragene Genossenschaften, eG). However, due to their flexibility and membership facilities, the development of city projects is mainly based on cooperative societies. The clarity of the German regulatory framework applied to renewable energies, combined with the stability of support mechanisms and access to preferential financing rates through the public bank Kreditanstalt für Wiederaufbau (Kf W), contributes to the creation of an ecosystem of increasingly professionalised actors serving the citizens' agenda.

What are the benefits of *Energy Communities* for Alpine interface territories?

- **Empowerment and tailored solutions:** Energy communities allow Alpine residents to actively participate in renewable energy production, using local resources such as solar, wind, or biomass. This decentralized approach is especially beneficial in the Alpine region, where unique geographic conditions call for customized, small-scale renewable projects like hydropower or solar on difficult terrains, boosting local energy independence and environmental sustainability.
- **Cross-border cooperation and local development:** The cooperative model encourages collaboration between municipalities across the Alpine territories, enabling shared management of resources and projects that transcend borders. This strengthens both regional integration and energy self-sufficiency while fostering local economic development through job creation and retained profits, which stay within the community.
- **Regulatory and financial support:** Just as Germany's energy communities benefit from clear regulatory frameworks and access to preferential financing, the Alpine territories can leverage similar support mechanisms. Access to public financing and technical guides helps streamline the setup of energy communities, ensuring they are economically viable and well-structured.

See also: ESPON InTerAlp Scientific annex VI: Governance report for Germany

Box 17
Local Energy Concept, Slovenia

Lokalni Energetski Koncept (Local Energy Concept), Slovenia

2000 – Strategy, Regulative

LEK Celje. Source: Energy Renovation and Management in the Municipality of Celje

The Slovenian Municipal or Local Energy Policy is based on a strategic document called Local Energy Concept (*lokalni energetski concept - LEK*), which is the most important tool for planning a long-term local energy policy strategy because it encompasses ways in which local communities can tailor solutions for efficient, economic, and environmentally friendly energy services in homes, businesses and public institutions. Based on LEK, the spatial and economic development of the local community is planned, as well as the development of local energy utilities, the efficient use of energy and its saving, the use of renewable energy sources, and the improvement of air quality in the local community. The objectives and measures defined in LEK must be in accordance with the Energy Concept of Slovenia (EKS) and other action plans and operational programs for the supply and use of energy.

What are the benefits of the *Local Energy Concept* for Alpine interface territories?

- **Tailored local solutions:** The LEK emphasises customizing energy services for local needs, making it particularly relevant to the diverse and unique conditions in the Alpine territories. With its focus on efficient, economical, and environmentally friendly energy solutions, the LEK can guide Alpine municipalities in creating strategies that address the specific challenges of remote, mountainous areas where traditional energy infrastructure may be less feasible.
- **Alignment with national and EU policies:** By ensuring that local energy policies align with national frameworks like the Energy Concept of Slovenia (EKS) and broader EU goals, the LEK provides a structured approach that can harmonise energy initiatives across borders in the Alpine region. This coordination is key for cross-border projects and integrated energy systems in the Alpine interface territories.
- **Long-term strategic planning:** The LEK's role in planning local communities' spatial and economic development fits well with the Alpine region's need for long-term, sustainable growth. Its methodical approach can help Alpine municipalities develop infrastructure that balances energy needs with environmental preservation, crucial for maintaining the region's ecological integrity.

See also: ESPON InTerAlp Scientific annex IX: Governance report for Slovenia

4.2.2 Energy governance and planning assessment

The comparative analysis concerning energy policy approaches across Alpine interface territories reveals how energy policies integrate across governance levels, align with local functional needs, and consider mountainous areas' specific environmental and climatic sensitivities (Figure 5). Given the Alpine region's unique demands for energy sustainability and resilience, this analysis highlights essential areas for policy improvement, such as fostering greater multilevel and cross-border coordination, enhancing stakeholder engagement, and strengthening focus on Alpine-specific priorities. By examining each dimension in detail, this assessment provides insights into the strengths and gaps in existing energy policies, identifying strategic pathways for a more cohesive, sustainable energy governance framework tailored to the Alpine context.

Attention to multilevel coordination

In multilevel coordination, Germany has the highest level of integration, reflecting its well-integrated energy governance structure, which operates from national guidelines down to the municipal level, ensuring comprehensive policy application. France, Switzerland, and Slovenia are the countries that exhibit more moderate coordination. France's governance follows a vertical model where local authorities implement top-down strategies with some horizontal coordination, while Switzerland uses cantonal governance to manage energy policy with coordination through national programmes. Slovenia has a similar structure, with local authorities implementing national investments but showing less engagement across different governance levels. Austria and Italy have relatively limited multilevel coordination, where Austria relies more on local enforcement of national policies without robust integration across governance tiers. Italy's approach is similarly fragmented, with primary governance at the national and local levels and minimal subnational involvement. Finally, Liechtenstein is the country that pays the least attention to multilevel coordination, as its policies are generally focused on a single governance level with limited vertical or horizontal integration.

Attention to cross-sectoral coordination

Cross-sectoral coordination is highest in Austria, Germany, and Slovenia, indicating strong integration of energy policies with other sectors, particularly climate and social policies in Austria, as well as environmental impact assessments in Slovenia for energy projects. Germany's energy communities exemplifies energy, environmental conservation, and regional planning coordination. France follows with a more moderate cross-sectoral alignment, integrating regional climate plans within broader regional development frameworks. Switzerland and Italy have more limited coordination in the energy policy sector; Switzerland's cross-sectoral integration is modest, focusing mainly on building and mobility at the local level, while Italy's coordination is primarily limited to Sustainable Energy and Climate Action Plans at the municipal level. Finally, Liechtenstein has minimal cross-sectoral coordination, with energy policies developed in isolation from other relevant sectors.

Stakeholders' engagement and participation

Germany, Slovenia, and Switzerland are the countries under investigation demonstrating a relatively strong stakeholder engagement in energy governance. Germany involves a range of local and regional stakeholders, mainly through agreements at the local level, while Switzerland's SwissEnergy programme includes partnerships with the business sector and environmental organisations, fostering inclusive participation. Slovenia's engagement is evident in transnational cooperation projects, although citizen participation during the planning phase is limited. Austria and Italy exhibit moderate levels of stakeholder involvement, engaging stakeholders in specific initiatives such as the smart city framework in Austria and mainly at the local level in Italy, especially in forming energy communities. France and Liechtenstein have minimal stakeholder engagement, with limited provisions for broader involvement beyond the public sector in Liechtenstein and limited citizen participation in France.

Cross-border relevance

Liechtenstein scores highest on cross-border relevance, reflecting a significant emphasis on cross-border energy coordination, especially in collaboration within the Sarganserland-Werdenberg region. Austria, Germany, Switzerland, and Slovenia show moderate levels of cross-border relevance: Austria has some cross-border considerations, particularly between provinces and at the municipal level, while Germany faces challenges in coordinating with its Alpine neighbours, such as Austria and Switzerland. Switzerland's energy planning considers cross-border interactions with an eye to future energy market integration. In contrast, Slovenia's cross-border relevance is indirect, with implications for transnational cooperation through broader national strategies. Finally, Italy and France have limited cross-border features in their energy governance, with little evidence of direct cross-border integration in their energy policies.

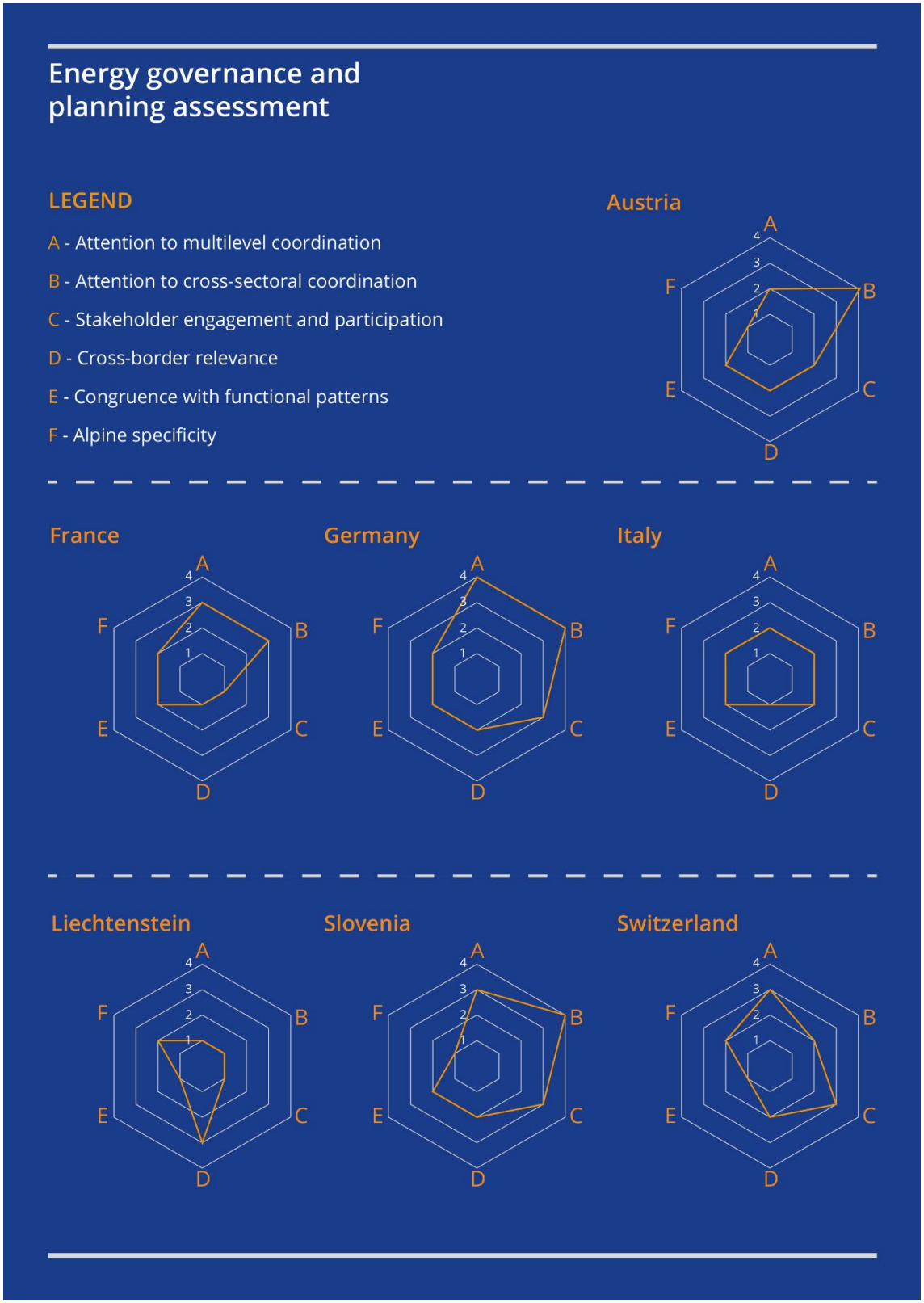
Congruence with functional patterns

Concerning the congruence with functional patterns, in Germany, France, Austria, and Italy, it is possible to find a moderate alignment with functional patterns in energy planning. Germany and Austria align their energy policies relatively well with local demands and distribution needs, primarily through energy communities, although there are occasional mismatches with Alpine-specific consumption patterns. France and Italy show some degree of alignment at the local level, especially through initiatives like France's EPCIs and Italy's energy communities. Switzerland and Slovenia, on the other hand, demonstrate a limited congruence with functional patterns in their energy policies, with Switzerland's energy policies generally lacking specific adaptations to meet localised energy demand in the Alpine region. Liechtenstein also shows minimal congruence with functional patterns, focusing on general rather than region-specific energy distribution.

Alpine specificity

The analysis showed that France, Germany, Italy, and Liechtenstein have a moderate but limited consideration of Alpine-specific issues in the energy policy sector. France and Germany acknowledge the need to address environmental challenges in mountainous regions, with France emphasising the potential for renewable energy sources like hydroelectric power and wood energy and Germany considering some unique geographical aspects. Italy's Alpine focus is seen in local initiatives that promote energy efficiency in mountain areas, including subsidies and community-based approaches. Liechtenstein references Alpine specificity in its Climate Strategy 2050, highlighting climate change challenges in the region, though concrete policy integration remains limited. Switzerland incorporates some Alpine specificity in its national energy strategy, addressing environmental impacts and the unique challenges associated with energy use in the Alpine region but with only moderate attention to detailed Alpine integration. Austria and Slovenia, finally, show minimal attention to Alpine-specific considerations in their energy policies, mentioning Alpine-relevant issues only generically within broader renewable energy discussions.

Figure 5 // Energy governance and planning assessment



4.2.3 Challenges and opportunities

In assessing energy governance across the Alpine interface territories, some major challenges and significant opportunities as well emerge.

Challenges

- Fragmented multilevel and cross-border coordination: The fragmentation in multilevel coordination (notably in Italy, Austria, and Liechtenstein) and limited cross-border energy collaboration in the Alpine region create barriers to cohesive energy policy implementation. This inconsistency limits the potential for shared infrastructure, resource optimization, and aligned policies necessary for managing energy across complex borders and sensitive mountain environments.
- Limited cross-sectoral and stakeholder engagement: Many countries (including Liechtenstein, Italy, and France) display limited cross-sectoral integration and minimal stakeholder engagement, especially beyond the public sector. This isolation hinders a holistic approach to energy governance, preventing the effective incorporation of local needs, environmental concerns, and regional economic considerations that are essential in Alpine areas.
- Insufficient focus on Alpine-specific energy policies: Most countries lack policies tailored to the Alpine region's distinct needs, such as renewable energy potential and climate sensitivity. Without a dedicated Alpine-specific focus, energy strategies risk overlooking essential environmental and climatic factors, reducing their efficacy in addressing the vulnerabilities and potential of these mountainous territories.

Opportunities

- Enhancing cross-border and regional energy collaboration: The existing cross-border collaboration in Switzerland and Liechtenstein presents a model for expanding Alpine-wide partnerships on energy infrastructure, resource sharing, and policy alignment. Developing such frameworks can address the region's shared energy challenges, making energy systems more resilient, efficient, and cohesive across borders.
- Leveraging renewable energy potential in Alpine areas: The Alpine region holds unique renewable energy opportunities, including hydroelectric, wood, and solar energy adapted for mountainous terrain. By fostering policies that encourage the development of low-impact renewables, countries can promote sustainable energy sources that protect fragile Alpine ecosystems.
- Adapting energy policies to climate change impacts in Alpine regions: With Alpine ecosystems particularly vulnerable to climate change, targeted energy policies that address seasonal variations and ecological protection can significantly enhance regional climate resilience. Expanding policies integrating climate adaptation for energy use in Alpine contexts (e.g., in Switzerland and France) can help mitigate environmental impacts while securing energy needs.

Effective energy governance in the Alpine region requires integrated multilevel frameworks that connect national, regional, and local governance. Countries like Germany and Switzerland demonstrate strong multilevel coordination, but others, particularly Italy and Liechtenstein, could benefit from policies encouraging more robust alignment across governance levels. Additionally, increased cross-border collaboration—building on Switzerland and Liechtenstein's existing models—can foster shared resource management and policy harmonisation, which is essential in a region with shared environmental and infrastructural challenges.

As seen in Austria and Slovenia, a cross-sectoral approach to energy policy supports the integration of climate, social, and economic priorities, creating comprehensive energy solutions that meet the region's diverse needs. Expanding this approach across all Alpine territories can better address the multifaceted impacts of energy policies, particularly by incorporating environmental protection, tourism, and local economic considerations. Furthermore, increased stakeholder engagement, exemplified by

Germany and Switzerland, allows for a more inclusive governance process that aligns policies with local needs, fosters community support and encourages innovation.

The Alpine region's unique environmental and climatic conditions demand energy policies tailored to its specific characteristics, such as renewable energy potential and climate vulnerability. While Switzerland, France, and Germany include some Alpine-specific considerations, other countries, like Austria and Slovenia, could strengthen this focus. Policymakers should prioritise renewable energy projects suited to mountainous terrains (e.g., hydroelectric and wood energy) and develop adaptive strategies to address climate impacts on Alpine ecosystems. This targeted approach will ensure that energy policies contribute to sustainability and resilience in the face of climate change.

4.3 Water

4.3.1 Relevant instruments and initiatives

The comparative analysis of both the common elements and the distinctive strategies embedded in national and regional policies for water management highlights the different approaches that the countries under investigation have concerning the management of their hydrological and ecological landscapes. Given the everyday challenges of pollution control, sustainable resource use, flood prevention, and adaptation to climate change, each country has implemented a range of regulatory frameworks and operational plans that reflect their specific administrative structures, environmental conditions, and socio-political priorities. (Table 4.3) Notably, the Alpine region's unique topography and biodiversity have shaped these water management strategies, fostering policies that balance local and national needs, often extending to cross-border collaborations. This comparative analysis brings forward the commonalities and differences in these approaches, especially concerning governance structures, objectives, management levels, regional focuses, and emphasis on sustainability and climate resilience.

Table 4.3
Relevant water planning tools

Sector	Level	Country	Name of the instrument (native language and English)	Nature of the document (i.e. strategy, coordination, programme, regulative)
WATER	NATIONAL	AT	***Nationaler Gewässerbewirtschaftungsplan 2021 (NGP)*** (National Water Management Plan)	Strategy
		FR	***Plan d'action pour une gestion résiliente et concertée de l'eau*** (action plan for resilient and concerted water management)	Strategy/Coordination
		DE	***Wasserhaushaltsgesetz, WHG*** (Water Resources Act)	Programme/Regulative
			Wasserrahmenrichtlinie, WRRL (Water Framework Directive)	Programme
		IT	***Piano nazionale di interventi infrastrutturali e per la sicurezza del settore idrico*** (National plan for infrastructural interventions and for the safety of the water sector)	Coordination
		LI	***Klimastrategie Liechtenstein 2050*** (Climate Strategy Lichtenstein 2050)	Strategy/Vision

Sector	Level	Country	Name of the instrument (native language and English)	Nature of the document (i.e. strategy, coordination, programme, regulative)
		SI	***Nacionalni program varstva okolja 2020–2030 (ReNPVO20-30)*** (National Environmental Action Programme 2020–2030 (ReNPVO20-30)	Programme
			Načrt upravljanja voda (Water Management Plan)	Regulative
			Nacionalni program varstva okolja (National Environmental Protection Programme)	Programme
			Danube Water Programme	Programme
		CH	***Gestione a scala di bacino / Gestion par bassin versant / Einzugsgebietsmanagement*** (Watershed Management)	Strategy
	SUBNATIONAL	AT	n.a.	-
		FR	***Schéma Directeur d'Aménagement et de gestion des eaux – SDAGE*** (Water development and management directive Scheme)	Strategy/Coordination
			Schéma d'Aménagement et de gestion des eaux– SAGE (Water development and management Scheme)	Coordination
		DE	***Wasserzukunft Bayern 2050*** (Water future Bavaria 2050)	Coordination
			Wasserpakt Bayern –Gewässerschutz in der Landwirtschaft (Water protection in agriculture)	Coordination
			Gewässer-Nachbarschaften (Water neighbourhoods)	Coordination
			Regionalplan	Strategy/Coordination/Regulative
		IT	***Piano di bacino distrettuale*** (District Basin Plan, each district specifies the name of the plan)	Regulative
			Piano di tutela delle acque (Water Protection Plan)	Strategy/Programme
		LI	**Expert Group 'Environment'**	Committee
		SI	n.a	-
	LOCAL	CH	**Water management programmes**	Regulative
		AT	***Gefahrenzonenpläne*** (Hazard zone plan)	Regulative
		FR	***Contrats de Bassin/Lac/ Rivière*** (Lake/Basin/River contracts)	Programme/Coordination
		DE	n.a	-
		IT	***Contratti di fiume/lago/zone umide*** (River/Lake/Wetlands Contracts)	Programme/Coordination
		LI	n.a	-
		SI	n.a.	-

Sector	Level	Country	Name of the instrument (native language and English)	Nature of the document (i.e. strategy, coordination, programme, regulative)
		CH	Local pilot projects (i.e., ***Eau en Ville; Ville Éponge***, etc.)	Project

Source: authors' own elaboration

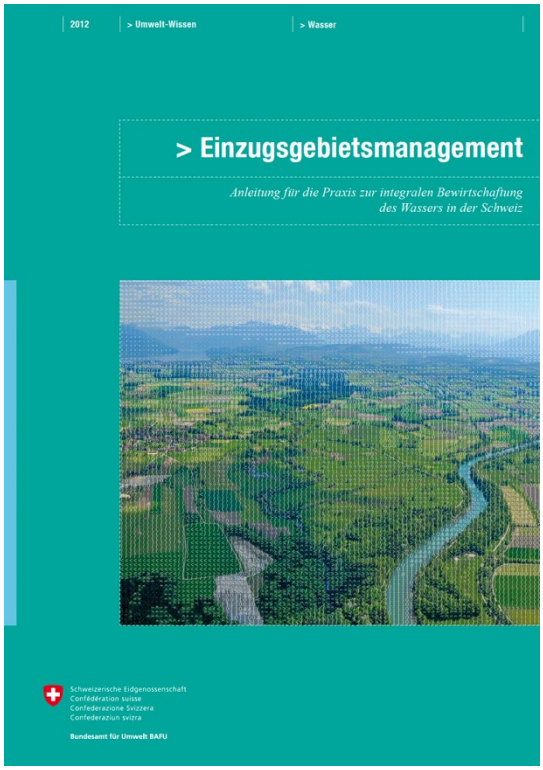
The water management policies of Alpine interface territories reveal a blend of shared principles and distinct approaches shaped by geographical, cultural, and administrative factors. Across Alpine countries, there is a clear emphasis on the sustainable use of water resources, ecological preservation, and adaptation to climate change. However, the governance structures and implementation mechanisms vary significantly, reflecting each country's unique characteristics and priorities.

A key commonality is recognising the Alpine region as an area requiring tailored strategies to address its ecological sensitivity, hydrological complexity, and cross-border nature. All countries align their water policies with overarching international frameworks like the EU Water Framework Directive, ensuring coherence with broader European environmental goals. Yet, the methods by which these frameworks are implemented highlight significant differences. Austria's National Water Management Plan 2021 (NGP), for example, focuses on achieving specific ecological and chemical targets through coordinated national policies and local initiatives such as hazard zone plans, which address the risks posed by torrents in Alpine regions. Similarly, France employs a basin-centric governance model, exemplified by the *Schéma Directeur d'Aménagement et de Gestion des Eaux* (SDAGE), which coordinates water management efforts across large river basins like Rhône-Méditerranée, integrating sub-basin tools such as SAGE to ensure localised implementation. Italy, through district basin plans and regional river contracts, allows a high level of local involvement in river and lake management, prioritising Alpine territories with proactive, region-specific strategies that engage local and regional authorities across administrative boundaries. Switzerland's Watershed Management Strategy (Box 18) stands out for its integrated, intersectoral approach, emphasising long-term planning and continuous monitoring. This cyclical management model fosters regional coordination and cross-border collaboration, as seen in its involvement in international programmes like Rhine 2020. Liechtenstein similarly integrates water management within its Climate Strategy 2050, focusing on water efficiency and conservation as part of its broader sustainability goals. Slovenia, through its National Environmental Action Programme 2020–2030 (ReNPVO20-30), aligns water management with biodiversity conservation and sustainable development goals, placing a strong emphasis on compliance with EU standards and cross-border cooperation.

Box 18
Watershed management, Switzerland

Gestione a scala di bacino / Gestion par bassin versant / Einzugsgebietsmanagement (Watershed Management), Switzerland

2013 – Strategy



Practical guide to integrated water management in Switzerland. Source: Einzugsgebietsmanagement

Switzerland established key principles for water management based on the watershed management model, which promotes an integrated, intersectoral approach to managing water resources within a catchment area. This method emphasizes long-term goals and follows a cyclical process of planning, implementation, and monitoring. It relies on clearly defined leadership, regulated funding, participatory action, and continuous oversight of river systems to ensure efficient, well-targeted water management. The watershed management approach is particularly relevant to the Alpine interface territories, where water resources are shared across multiple regions and countries. This model encourages regional coordination and transparent balancing of interests, addressing both conservation needs and user demands, which is crucial in the Alpine region where water is critical for hydropower, agriculture, tourism, and ecosystem health. Additionally, Switzerland's collaboration with riparian states on transboundary water management programmes, like the "Rhine 2020" initiative, is directly applicable to the Alpine territories.

What are the benefits of *Watershed Management* for Alpine interface territories?

- **Cross-border coordination and conflict resolution:** Watershed management fosters cooperation across political and administrative boundaries, which is essential in the Alpine region where water resources are shared by multiple countries. This approach ensures that competing interests—such as hydropower, agriculture, and tourism—are balanced through transparent, regional coordination, reducing conflicts and promoting efficient water use.
- **Integrated resource management and ecosystem protection:** By considering all sectors—environmental, industrial, agricultural, and community—the watershed model promotes sustainable water management. This is particularly beneficial in the Alpine region, where water resources are critical to diverse needs, and where protecting sensitive ecosystems is key to maintaining biodiversity and supporting sustainable tourism.
- **Alignment with international frameworks:** The approach helps Alpine territories align with international standards like the EU Water Framework Directive, facilitating better cross-border collaboration and ensuring local practices fit into broader European water management strategies.

See also: ESPON InTerAlp Scientific annex X: Governance report for Switzerland

Germany's approach to water governance, governed by the Water Resources Act (WHG) and the Water Framework Directive (WRRL), is similarly decentralised, allowing for significant regional autonomy. Bavaria's Water Neighbourhoods (*Gewässer-Nachbarschaften*) (Box 19) initiative provides a platform for municipalities to share knowledge and best practices, focusing on the sustainable maintenance of smaller watercourses, which are vital for local Alpine ecosystems. Italy, on the other hand, operates through a combination of national and regional initiatives, with District Basin Plans serving as a cornerstone for integrating flood prevention, pollution control, and ecological restoration. Similarly, *Contratti di Fiume/Lago/Zone Umide* (River, Lake, and Wetland Contracts) (Box 20) in Italy are an example of voluntary agreements that transcend administrative boundaries to promote holistic water management, particularly in ecologically sensitive Alpine areas.

Liechtenstein, in contrast, focuses its water policies within a compact, centralised framework aligned with climate adaptation, as seen in its Climate Strategy 2050. This includes commitments to water efficiency, conservation, and resilience, ensuring that water management aligns with local needs and broader international goals for sustainable development. Slovenia, guided by its National Environmental Action Programme, emphasises harmonization with EU directives and intersectoral coordination, recognising the importance of the Alpine region's cross-border water resources and aligning policies with its Danube Water Programme commitments.

Despite these differences, there is a unifying acknowledgement of the need to address the impacts of climate change on water resources. Indeed, all countries have embedded climate resilience into their water policies, whether through a focus on reducing hydromorphological stressors such as in Austria or introducing ecological planning like in France's *Plan d'action pour une gestion résiliente et concertée de l'eau*, or yet Italy's efforts to combat the retreat of Alpine glaciers and declining precipitation. Furthermore, Switzerland's watershed management principles, which promote conservation and sustainable use, and Liechtenstein's initiatives to enhance water efficiency further illustrate the shared commitment to adaptation and sustainability.

To sum up, while the water management policies across Alpine interface territories share foundational goals and address common challenges, their implementation diversity reflects each country's distinct administrative and ecological contexts. This blend of shared principles and tailored approaches not only underscores the complexity of managing the Alpine region's water resources but also highlights the potential for cross-border learning and collaboration, mainly through best practices like Switzerland's watershed management, Bavaria's Water Neighbourhoods, and Italy's River and Lake Contracts. These examples demonstrate how varied governance structures can still converge on the shared objective of sustainable and adaptive water management.

Box 19
Water neighbourhoods, Bavaria (Germany)

Gewässer-Nachbarschaften (Water neighbourhoods), Bavaria (Germany)

2011 – Coordination

Gewässer-Nachbarschaften Bayern. Source: Gewässer-Nachbarschaften Bayern. Foto credits: LPV Neumarkt i.d.OPf.

In Germany, water management is structured across levels under the Federal Water Act, aiming for the sustainable use of water resources and the protection of aquatic ecosystems. In Bavaria, a unique initiative known as Water Neighbourhoods (*Wasser-Nachbarschaften*) focuses on the local management of third-order water bodies, which are smaller watercourses under the care of municipalities. With around 90,000 km of these smaller streams and rivers, the Water Neighbourhoods provide a platform for collaboration and knowledge exchange between municipal actors responsible for watercourse maintenance.

Water Neighbourhoods aims to promote sustainable, economical, and ecologically compatible maintenance of these watercourses. The initiative does not replace the technical work of water management authorities but instead addresses the practical concerns of local managers. Through regular Neighbourhood Meetings, participants share experiences and best practices, ensuring that small water bodies are managed in a way that balances ecological protection with economic efficiency. The Bavarian State Office for the Environment (LfU) has coordinated these efforts since 2011, fostering a cooperative approach to watercourse maintenance.

What are the benefits of *Water neighbourhoods* for Alpine interface territories?

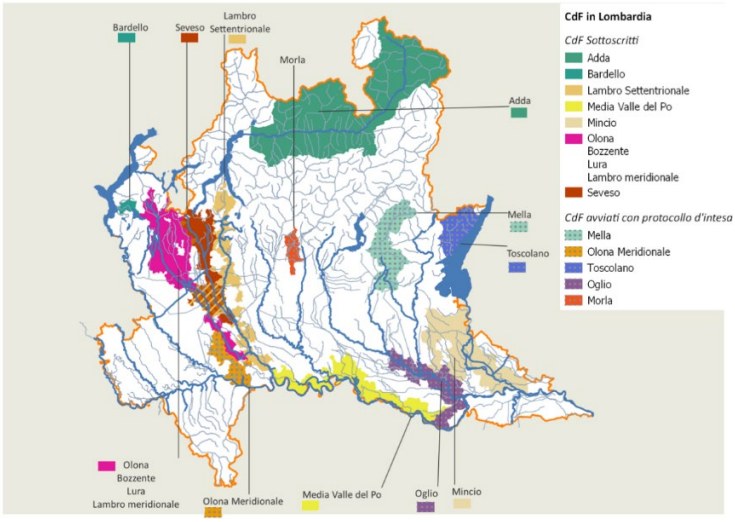
- **Cross-border cooperation:** The Alpine region spans multiple countries, and many water bodies flow across national borders. Water Neighbourhoods promote collaboration between local municipalities, helping to coordinate water management efforts across political boundaries. This cross-border cooperation is essential for managing shared resources like rivers and streams that traverse the Alps.
- **Sustainable water management:** The focus of Water Neighbourhoods on ecologically compatible and sustainable maintenance aligns perfectly with the environmental needs of the Alpine region. The Alps are home to sensitive ecosystems that depend on careful water management, and adopting a neighbourhood-style approach would ensure watercourses are maintained in an environmentally friendly manner.
- **Knowledge sharing and expertise:** The regular meetings and exchange of best practices fostered by Water Neighbourhoods provide a platform for local actors to share experiences and solutions. This is especially valuable in the Alpine territories, where unique geographical challenges require innovative water management strategies. Municipalities can learn from each other, enhancing their ability to manage water resources effectively.

See also: ESPON InTerAlp Scientific annex VI: Governance report for Germany

Box 20
River/Lake/Wetlands Contracts, Italy

Contratti di fiume/lago/zone umide (River/Lake/Wetlands Contracts), Italy

since 2006 – Contract



Olona - Bozzente - Lura - Southern Lambro meridionale River Contract. Source: https://www.contrattidifiume.it/it/contratti-di-fiume/olona-bozzente-lura-lambro-meridionale/

The "Contratti di Fiume" (River Contracts), "Contratti di Lago" (Lake Contracts), and "Contratti di Zone Umide" (Wetland Area Contracts) in Italy are voluntary agreements aimed at the strategic and negotiated planning of water management, signed between public and private actors that define cooperation activities for the protection and management of specific water bodies. These initiatives bring together stakeholders responsible for water use, spatial planning, and environmental protection to promote sustainable water resource management and enhance river, lake, and wetland territories. For instance, the Piedmont region stands out with the highest number of river contracts (13), as well as one lake contract and one wetland area contract. The flexibility of these agreements allows territories to operate independently of their administrative boundaries, enabling a more holistic approach to water management. An example of this is the Olona - Bozzente - Lura - Southern Lambro River Contract, which integrates the ecological significance of the river with the broader goals of sustainability, natural conservation, and water management. One notable initiative under this contract is *'I LAGHI IN BICICLETTA'* (Lakes by Bicycle), which promotes environmental quality alongside sustainable mobility, highlighting how these contracts can combine ecological preservation with practical, community-driven projects.

What are the benefits of *River/Lake/Wetlands Contracts* for Alpine interface territories?

- **Cross-border and regional cooperation:** In the Alpine region, where rivers, lakes, and wetlands often span multiple countries, cross-border agreements (such as the Roia/Roya French-Italian Transboundary River Contract) can promote coordinated water management, benefiting all involved territories by addressing shared environmental and water resource challenges.
- **Integrated water management:** The contracts foster a holistic approach to water management that incorporates ecological preservation, spatial planning, and hydraulic risk prevention. This is particularly important for the Alpine region, where fragile ecosystems and mountainous terrain require careful management to prevent issues like flooding, erosion, and biodiversity loss. Integrated planning can protect these vital ecosystems while supporting local development.
- **Flexibility across administrative boundaries:** The flexibility of these contracts allows them to operate independently of strict administrative borders, which is ideal for the Alpine territories, where ecological zones and water bodies often overlap various municipalities and regions.

See also: ESPON InTerAlp Scientific annex VII: Governance report for Italy

4.3.2 Water governance and planning assessment

As shared water resources and the impacts of climate change demand coordinated efforts, understanding each country's stance on multilevel coordination, cross-sectoral alignment, stakeholder engagement, cross-border relevance, functional patterns, and Alpine specificity is crucial. This analysis identifies patterns of governance and coordination, clustering the countries based on similarities and differences in their water policies. By highlighting the distinct strategies employed across the Alpine region, this assessment provides valuable insights into the strengths and gaps within each nation's water governance approach, offering a foundation for enhancing cooperative and sustainable water management across the Alpine territories (Figure 6).

Attention to multilevel coordination

The degree of multilevel coordination varies across the Alpine countries, with Germany, Italy, and Austria receiving the highest scores, reflecting relatively robust integration of national, regional, and local levels. Germany demonstrates a structured approach, engaging multiple levels of government to align national policies with regional needs, particularly concerning shared Alpine water resources. Italy shows similar strength, with coordination efforts extending from the national level to supra-regional and inter-municipal tiers, integrating both public and private stakeholders. Austria also achieves adequate alignment, particularly at subnational levels, where policies are adapted to reflect national water governance objectives. France and Slovenia have some multilevel coordination efforts, but their frameworks are less consistent across administrative tiers. France's Local Water Commission includes local and regional authorities. Switzerland and Liechtenstein, with the lowest scores, exhibit minimal multilevel coordination, reflecting cantonal dominance in Switzerland and limited emphasis on multi-tiered governance in Liechtenstein.

Attention to cross-sectoral coordination

Cross-sectoral coordination is limited across most Alpine countries. Slovenia, Germany, and Italy are the only countries which exhibit some cross-sectoral integration, primarily at the inter-municipal or regional level, where water policies are adapted to address agricultural, forestry, and tourism needs. Italy's inter-municipal contracts, for instance, emphasize multi-sectoral approaches in local contexts. France, with a similar moderate score, shows isolated cross-sectoral efforts, mainly at the regional level, where water management overlaps with environmental protection. Switzerland's policies reflect a limited cross-sectoral approach, with some international collaboration at the federal level showing cross-sectoral management, though this is not consistent within national boundaries. Finally, Austria and Liechtenstein show minimal integration of water policies with other sectors. Austria's water governance has isolated instances of alignment with climate change policies, but these are limited in scope. Liechtenstein's policies lack a cross-sectoral approach entirely, focusing narrowly on water-specific needs without coordinating with other sectors.

Stakeholders' engagement and participation

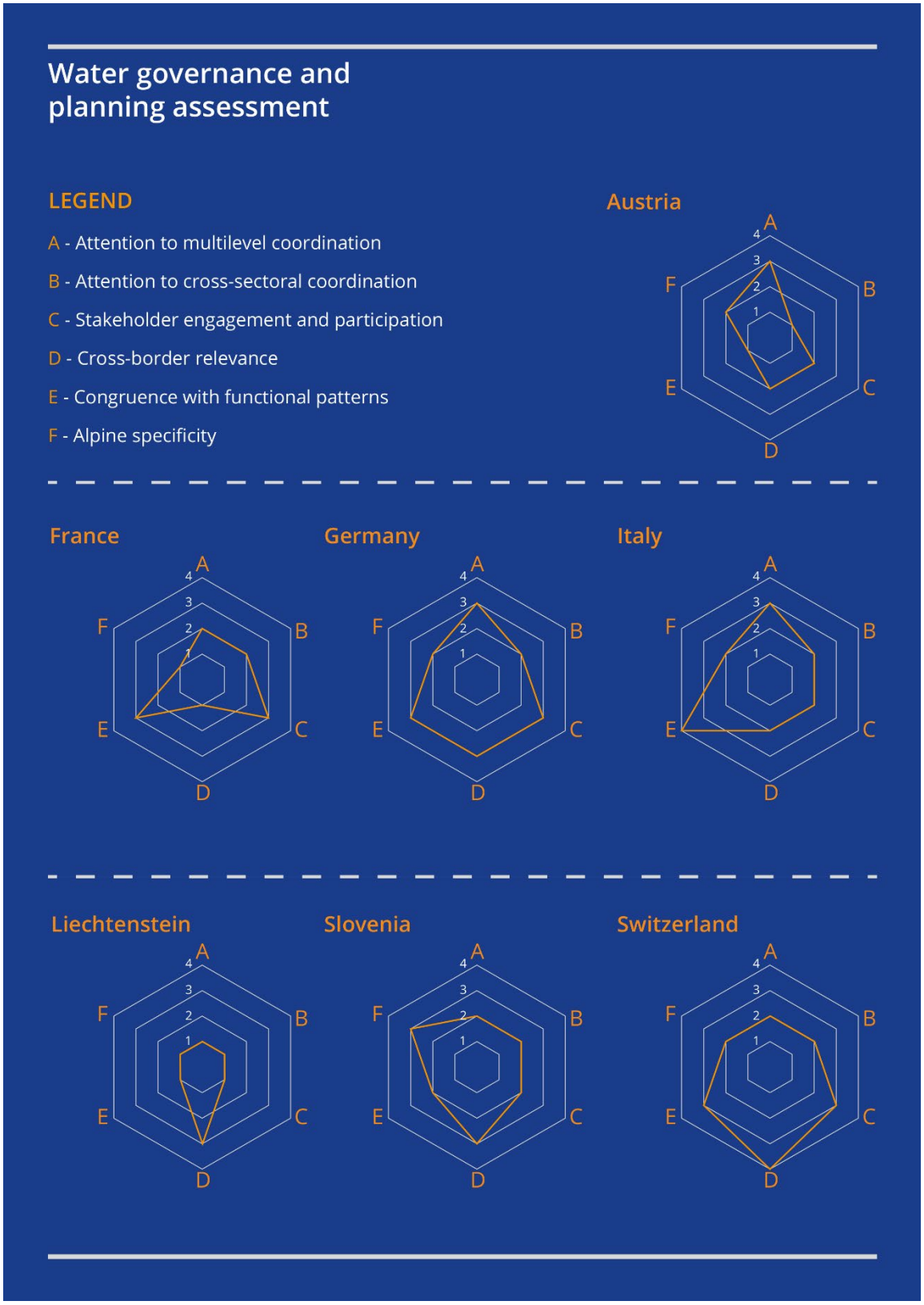
The extent of stakeholder engagement is more variable, with France, Germany, and Switzerland manifesting the highest interest, reflecting substantial involvement of various stakeholders. Bavaria's strong engagement at the regional level, particularly through Water Neighbourhoods, includes local citizens, environmental organizations, and industries, which facilitates community buy-in and local knowledge sharing. Switzerland's approach, focused on cantonal-led initiatives, also encourages broad stakeholder participation, integrating farmers, industries, and the public into water management processes. France achieves similar engagement, incorporating stakeholders through regional frameworks like SDAGE and local contracts, which foster local-level collaboration. Austria and Italy, with slightly lower scores, involve stakeholders at specific levels, particularly in projects like Austria's IRIS initiative, which integrates public and private knowledge, and Italy's inter-municipal level, which engages non-institutional actors for specific contracts. Ultimately, Slovenia and Liechtenstein have limited practical

stakeholder involvement, focusing primarily on institutional stakeholders without active local or community-based engagement.

Cross-border relevance

Cross-border coordination is crucial in Alpine water management, given the transboundary nature of many resources, but scores reflect varying emphasis on this. Switzerland, in particular, exemplifies strong cross-border relevance, actively participating in transboundary water management and river basin coordination with neighbouring countries, both at the federal and cantonal levels. Slovenia and Liechtenstein also prioritize cross-border collaboration, especially within the context of bilateral and multilateral commissions like the Alpine Conventions. Moreover, although Germany recognizes the importance of cross-border relevance, the country faces challenges in aligning its policies with Alpine neighbours, despite significant collaboration at the Lander level for shared water resources. Austria and Italy, with a medium interest in cross-border coordination, show some notable efforts, such as Austria's Danube projects engaging neighbouring states within the catchment area, or the French-Italian river contract. Finally, France is the country which apparently engages the lowest in cross-border water governance, focusing instead on localized water management projects with limited transnational coordination.

Figure 6
Water governance and planning assessment



Congruence with functional patterns

Functional alignment makes sure that the management of water resources is based on natural ecological boundaries rather than administrative borders. Italy's water governance is strongly congruent with ecological patterns, using supra-regional district basins to define governance areas based on natural water flows, which ensures policies are environmentally aligned. Germany and Switzerland also show high congruence, integrating functional patterns at the Lander or cantonal level and using watershed-based management for river basins, which aligns governance with natural geographies. France, with a more moderate level of functionality, shows some functional alignment through Local Water Commissions and water authorities that manage resources within local ecological limits. Slovenia's national-level policies emphasize functional patterns, although they are less evident at local levels, resulting in a mid-range score. Austria, Liechtenstein, and France show the least functional congruence, as water policies do not consistently align with ecological patterns, and administrative boundaries often determine management approaches, reducing efficiency in managing shared resources.

Alpine Specificity

Addressing Alpine-specific needs, such as seasonal variability, glacier retreat, and water scarcity, is critical for sustainable water management in this context. Slovenia demonstrates substantial Alpine specificity in its water governance, incorporating Alpine needs into projects and agreements within the Alpine Convention and the Danube Basin frameworks. Austria also shows significant Alpine specificity, with targeted policies for Alpine torrents and streams, aligning governance to local Alpine features. Germany and Switzerland, scoring moderately, also incorporate Alpine-specific considerations, addressing seasonal water issues and ecological challenges in high-altitude regions, though both could deepen their focus on these unique needs. Italy also includes Alpine-specific elements, especially in supra-regional district basin plans, although these are not exclusively focused on the Alps. Finally, France and Liechtenstein demonstrate minimal attention to Alpine-specific water challenges: in particular, French policies do not explicitly address Alpine water needs, and Liechtenstein's water governance lacks distinctive measures for managing the unique conditions of the Alpine territory, leaving a gap in addressing regional water issues.

4.3.3 Challenges and opportunities

Shared water resources are vital for local communities and ecosystems, yet they are increasingly stressed by factors such as climate change, seasonal variability, tourism demands, and agricultural needs. Effective water management in the Alpine region requires a coordinated approach that crosses national borders, aligns with natural ecological patterns, and integrates input from multiple levels of government, diverse sectors, and stakeholders. However, each Alpine country approaches these challenges from different policy, governance, and administrative perspectives, making cohesive water governance across the region a challenging but essential goal.

By comparing each country's approach, the comparative analysis highlights the varying degrees of integratedness in Alpine water governance, identifying areas where policies align well with regional needs and where gaps persist. Understanding these differences is key to identifying best practices, potential synergies, and areas for improvement across the Alpine countries.

Challenges

- Fragmented multilevel and cross-border coordination: Inconsistencies in coordination between national, regional, and local authorities—particularly in Switzerland, Liechtenstein, and France—hinder unified water management efforts. Fragmentation also appears in cross-border efforts, with minimal collaboration in countries like France and Austria, impacting the effective management of shared water resources across borders.
- Limited cross-sectoral integration: The separation of water governance from other related sectors, such as agriculture, energy, and tourism, is evident in Austria, Liechtenstein, and Switzerland, lead-

ing to siloed policies. This lack of integration can create resource conflicts and missed opportunities for holistic planning, particularly in the face of environmental challenges like seasonal variability and resource demands from tourism.

- Inconsistent stakeholder engagement: In many countries, particularly Slovenia and Liechtenstein, limited involvement of local communities, NGOs, and non-institutional actors restricts the flow of local knowledge and buy-in from affected communities. Without comprehensive stakeholder engagement, water governance risks being out of touch with local needs and lacking necessary public support for sustainable management practices.

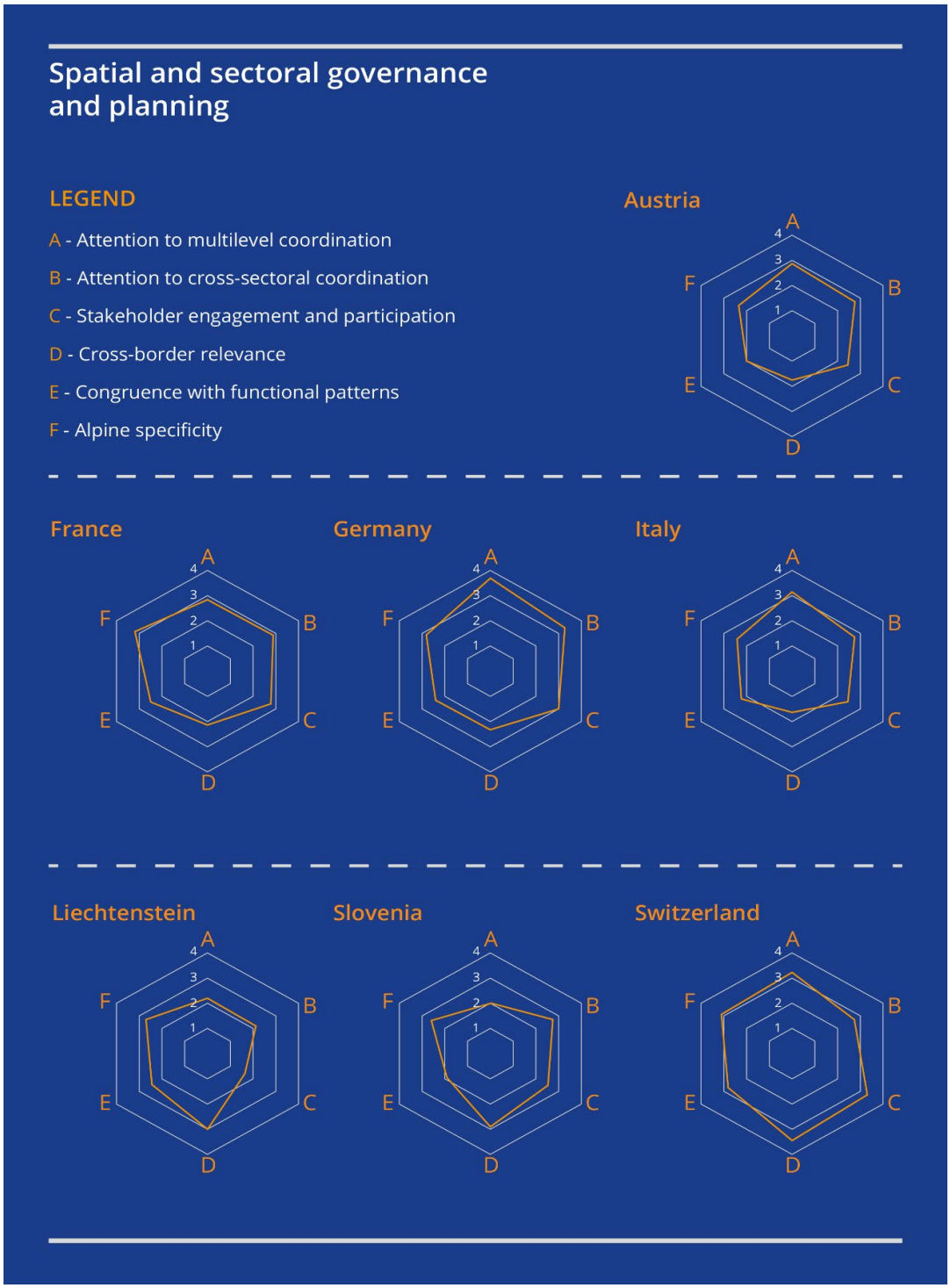
Opportunities

- Strengthening cross-border and multilevel coordination: Improving coordination across levels of government and between countries—drawing on examples from Germany, Italy, and Slovenia—could enhance the region's ability to manage water resources effectively. Establishing common frameworks and leveraging EU or Alpine Convention platforms could foster consistent policy application across the Alpine region.
- Expanding cross-sectoral collaboration: Aligning water policies with those of related sectors presents an opportunity for more comprehensive resource management, as seen in Germany and Italy's moderate cross-sectoral efforts. By coordinating with agriculture, climate, and tourism sectors, water governance can address interconnected resource needs, ensuring a more resilient approach to water scarcity and ecosystem health.
- Enhancing stakeholder engagement for localized solutions: Broadening stakeholder participation to include local communities, industries, and environmental groups, as observed in Germany and Switzerland, can improve adaptability and foster innovation. This approach encourages local ownership and resource pooling, making water governance more responsive to the specific needs and challenges within Alpine communities.

5 Spatial and sectoral governance in the Alpine region: Summary assessment

This concluding session presents an overall summary of the assessment of the spatial and sectoral governance of the Alpine region, with particular reference to its interface territories (Figure 7).

Figure 7
Spatial and sectoral governance in the Alpine region: overall assessment



After examining the overall performance of the different countries in relation to the six dimensions of Alpine integratedness that have underpinned the analysis, a number of takeaway points are presented for the reader's benefit.

5.1 Attention to multi-level coordination

Germany stands out in relation to the attention to multilevel coordination, featuring a solid and well-structured comprehensive, integrated territorial governance system. Federal, regional, and local governments collaborate effectively, ensuring policies are consistent and cohesive across levels. This integrated approach has proven especially effective in addressing Alpine governance challenges, where alignment across administrative tiers is essential for coherent spatial development strategies. In this light, Switzerland mirrors at least partly Germany's strength as a federal republic, constitutionally guaranteeing vertical and horizontal coordination. Swiss governance fosters the harmonisation of national directives while empowering lower-level entities to implement strategies tailored to local contexts. Examples include the effective role of cantonal governments in integrating national and municipal plans.

Italy also emphasises multi-level coordination, leveraging instruments like the *Strategia Nazionale per le Aree Interne* (SNAI), which bridges national, regional, and local levels. Regional and metropolitan institutions are important in aligning municipal goals with broader strategies. However, occasional gaps in mutual coordination can create inefficiencies. Austria and France demonstrate substantial but uneven attention to multi-level governance. Austria's federal system promotes vertical integration, but its hierarchical tendencies sometimes hinder mutual collaboration. France's focus on inter-municipal cooperation fosters synergies at local levels, yet cross-level integration is less consistent. On the other hand, Liechtenstein's governance shows limited emphasis on coordination beyond the national level, except in specific cases like transport planning. Slovenia's lack of a regional governance tier further hampers its ability to coordinate across scales, creating significant implementation challenges.

5.2 Attention to cross-sectoral coordination

When it comes to cross-sectoral coordination, Germany's system appears better suited to align key sectors like transportation, environment, and water management through a collaborative approach that ensures sustainable solutions to Alpine challenges, transcending traditional silos to address complex regional issues effectively. Thanks to the role played by tools like SRADDET, which streamlines sectoral policies into regional strategies, France's spatial governance system dedicates relatively high attention to multi-sectoral integration, notably in relation to climate, transport, and energy planning, promoting a unified approach to regional development.

Also, Austria, Italy, Slovenia, and Switzerland display moderate efforts in aligning policies across sectors. Austria and Italy integrate cross-cutting policies at regional levels, with Italy's PTRA serving as a notable example of linking spatial, infrastructural, and environmental strategies. Slovenia does particularly well in coordinating tourism, environment, and transportation policies, although its efforts are uneven at the local level. Switzerland demonstrates cross-sectoral integration in national and subnational planning, particularly with climate and transport policies, though sectoral instruments often operate in isolation. In Liechtenstein, the issue appears to be addressed less prominently, and while some subnational instruments incorporate cross-sectoral elements, national-level strategies rarely emphasise alignment across policy domains, leading to fragmented governance.

5.3 Stakeholders' engagement and participation

Switzerland is renowned for its participatory governance model, characterised by a longstanding tradition of public consultation and referendums. Almost all spatial planning processes include mechanisms for citizen involvement, ensuring that local voices shape policy decisions. This inclusivity extends to sectoral policies, which are regularly subjected to public input. Albeit to a lesser extent, also Germany emphasizes inclusivity and representation by engaging diverse stakeholders, including local communities, NGOs, and private enterprises, in Alpine governance. Such participation fosters legitimacy and acceptance, creating policies that reflect the interests of all affected groups.

France and Italy show more moderate levels of stakeholders' engagement, with strengths at specific levels. France's collaborative governance is particularly evident in Alpine instruments like SIMA and CIMA, as well as in water management. Italy emphasizes bottom-up approaches in local-level instruments like Local Development Plans and SNAI Area Strategies, involving communities in decision-making. However, both countries face limitations at higher governance levels, where top-down approaches dominate.

Austria fosters stakeholder engagement primarily at the subnational level. Participation is most evident in transport planning, while other sectors need more outreach beyond public institutions. Slovenia promotes stakeholder engagement in planning documents but struggles with citizen involvement, particularly in spatial governance. Finally, Liechtenstein shows rather low attention to the issue, and participation is often restricted to voluntary consultations in local-level planning.

5.4 Cross-border relevance

Switzerland's territorial governance system focuses on cross-border cooperation and interaction, leveraging initiatives like the Federal Agglomeration Policy and partnerships with neighbouring countries such as France, Germany, and Liechtenstein. These collaborations address shared challenges like water management in international catchment basins and coordinated urban development in cross-border agglomerations like AggloBasel. Also, Liechtenstein and Slovenia demonstrate strong engagement in transnational cooperation. Liechtenstein's Werdenberg-Liechtenstein Agglomeration Association exemplifies its commitment to joint development and public service delivery. Slovenia benefits from its active participation in European Alpine projects, although these efforts could be more evident at the local level.

On the other hand, Germany, France, Austria, and Italy show a less prominent cross-border focus. Germany participates in initiatives addressing environmental and infrastructural challenges in the Alps but needs comprehensive strategies on the matter. France and Austria emphasise cross-border cooperation nationally, but local implementation is only sometimes consistent. Italy's cross-border efforts could be more cohesive, with regional strategies offering limited concrete outcomes.

5.5 Congruence with functional patterns

Switzerland's territorial and sectoral governance system focuses on integrating functional patterns and dynamics. This mostly occurs through its Agglomeration Policy, which bridges administrative boundaries to address real-world geographic and economic patterns. Local instruments also consider the unique challenges of Alpine territories, promoting cooperation among adjacent areas. Also, France and Liechtenstein emphasise the relevance of functional logic in relation to specific contexts. France's Alps Massif Committee, basin authorities, and the activity of the LAGs reflect an awareness of functional living spaces. Liechtenstein's instruments align well with functional patterns, particularly in natural area management. Germany, Italy, Austria, and Slovenia display lower levels of alignment. Germany and Italy acknowledge functional territories in selected regional plans but often fail to incorporate this perspective comprehensively. Austria's focus on functional spaces is evident in transport planning but not in broader territorial governance frameworks. Slovenia addresses functional patterns in national strategies but struggles with their implementation at the lower levels.

5.6 Alpine specificity

Finally, when it comes to the assessment of the Alpine specificity of the analysed instruments and mechanisms, France and Switzerland seem to be best positioned. Switzerland integrates this focus across governance levels, particularly in transport policies and regional development plans. France demonstrates Alpine specificity through national policies and local measures tailored to unique territorial characteristics. Also, Germany and Liechtenstein prioritise Alpine issues, though their efforts are less comprehensive. Germany's policies address environmental and socio-economic challenges in the Alps, while Liechtenstein incorporates Alpine considerations in instruments like its Climate Strategy 2050.

Slovenia, Austria, and Italy exhibit a more moderate attention. Slovenia and Austria incorporate Alpine considerations selectively in transport and water management but lack overarching strategies. Italy's

regional plans touch on Alpine preservation, but national policies dilute their focus by treating the Alps as part of broader rural or mountainous areas.

5.7 Main takeaways

Drawing on the above assessment, as well as on the evidence included in the report, the following takeaway points have been formulated aimed at informing policymaking towards a strengthening of territorial and sectoral governance of the Alpine interface territories and, more in general, of the overall Alpine region.

- **Recognizing Alpine interface territories as a distinct spatial category.** The concept of Alpine interface territories needs to be consolidated in governance frameworks as a new, stand-alone spatial category bridging inner-Alpine and pre-Alpine areas. Their specific challenges—intense economic flows, environmental pressures, and dynamic socio-economic interdependencies—require governance and planning instruments that explicitly address their transitional nature.
- **Tailoring policy recommendations to the different territorial levels.** Policy interventions in Alpine interface territories must be tailored to the specific needs and governance capacities of four distinct territorial levels:

  (i) EU and Transnational Level**:** Strengthen macro-regional strategies and frameworks like EUSALP and the Alpine Convention to provide a common framework for collaboration. Policies should encourage cross-border project financing and coordination mechanisms addressing shared challenges like biodiversity loss, climate resilience, and sustainable mobility.
  (ii) National Level**:** Ensure that national policies align with EU-level strategies while addressing country-specific needs.
  (iii) Regional/Subnational Level**:** Subnational entities, such as French regions and Swiss cantons, should play a critical role in bridging national directives and local implementation. Encouraging initiatives like Switzerland's Agglomeration Policy enhances cross-regional functional coherence.
  (iv) Local Level**:** Empower local public actors to join forces and tailor policies to their unique territorial realities and to do so in coordination with other public and private actors

- **Promoting synergies between spatial and sectoral governance.** The alignment between spatial planning and sectoral policies in transport, energy, and water management is often underdeveloped. Integrating these domains can create synergies to address cross-cutting issues like climate adaptation, biodiversity preservation, and mobility in Alpine regions. Instruments such as integrated territorial strategies (e.g., PITER under ALCOTRA and SRADDET in France) should serve as blueprints for such efforts.
- **Strengthening transnational governance mechanisms.** While existing frameworks like the Alpine Convention and EUSALP provide broad platforms, they should evolve to represent Alpine interface territories more effectively. For example, creating specialised task forces or thematic groups focused on interface-specific challenges could ensure better-targeted interventions and enhance cross-border cooperation.
- **Leveraging EU-funded programmes more strategically.** Alpine interface territories, by their very nature, demand robust cross-border cooperation to address shared challenges and leverage synergies. In this light, European Territorial Cooperation initiatives need to target interface territories with tailored funding and project calls. Specific attention should be given to fostering pilot projects that test innovative governance models, particularly those addressing cross-sectoral integration and functional territorial approaches.
- **Enhancing policy adaptability and functional logics through experimentation.** Governance structures in Alpine interface territories should be more experimental, adopting adaptive, pilot-based approaches to policy design. For example, testing flexible governance arrangements in areas like water basin management or sustainable tourism can provide models for replication

across the region. More in general, functional linkages (e.g. shared labour markets, ecological networks, and transport systems) should be explicitly addressed in governance frameworks. Instruments like Switzerland's Agglomeration Policy offer a model for overcoming administrative fragmentation and fostering cooperation based on real-world interdependencies.

- **Expanding and valorising local leadership and participation.** While many Alpine governance structures emphasize top-down approaches, there is significant potential for empowering local actors. A possible way forward consists in enhancing the capacity of Local Action Groups (LAGs) in delivering Community-Led Local Development (CLLD), but also institutionalising local participation mechanisms to better align national strategies with community priorities. Switzerland's participatory governance model, but also Italy's SNAI, emphasize the importance of bottom-up planning through Local Action Groups, fostering collaboration among municipalities, citizens, and businesses.

6 List of annexes

This report is part of the ESPON InTerAlp Final report and includes the following annexes, published as separate items:

- Scientific annex III: Transnational and cross-border governance
- Scientific annex IV: Governance report for Austria
- Scientific annex V: Governance report for France
- Scientific annex VI: Governance report for Germany
- Scientific annex VII: Governance report for Italy
- Scientific annex VIII: Governance report for Liechtenstein
- Scientific annex IX: Governance report for Slovenia
- Scientific annex X: Governance report for Switzerland

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