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Tagung der Alpenkonferenz
Réunion de la Conférence alpine
Sessione della Conferenza delle Alpi
Zasedanje Alpske konference

XV

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REPORT OF THE

Ad hoc Expert Group on Spatial Planning and Sustainable Development

on the 2016-2019 mandate

1. Overview of 2016-2019 mandate or relevant decision of the XIV Alpine Conference

Brief summary of the main activities according to the 2016-2019 mandate or relevant decision of the XIV Alpine Conference
• To co-operate between spatial planning authorities in order to facilitate the implementation of the Protocol on Spatial Planning and Sustainable Development • To implement the ministerial declaration on spatial planning in the Alps co-operation signed in 2016 after the High-Level Meeting on Spatial Planning • To define joint challenges and topics for spatial planning co-operation • To follow and steer the work done in the framework of the ESPON Targeted Analysis "Alps2050 – Common Spatial Perspectives for the Alpine Area. Towards a Common Vision" The Ad hoc Expert Group on Spatial Planning and Sustainable Development was chaired by Germany.

2. Meetings

Summary of the meetings
• 6 meetings in Berlin, Munich and Vienna from autumn 2016 to December 2018: o Berlin 30 November 2016 o Berlin 11 May 2016 o Berlin 21 November 2017, in combination with kick-off meeting for the ESPON Targeted Analysis "Alps2050" o Munich 22-23 Mai 2018, in combination with Alps2050 steering committee & stakeholder workshop o Vienna 16 October 2018, in combination with Alps2050 steering committee o Vienna 6 December 2018, in combination with Alps2050 steering committee

3. Activities carried out

Report on activities carried out (including meetings, conferences)
• Developing and drafting an application to the European Spatial Planning Observatory Network (ESPON) with a view to commissioning a study on spatial features, challenges and potentials of the Alps. • Submission of the application. • After the successful application: steering of the research project "Alps 2050" financed by ESPON and carried out by a consortium led by University Erlangen-Nürnberg. • Organisation of a workshop in Munich in May 2018 during which spatial development scenarios were discussed with stakeholders and spatial planning practitioners. • Wrap-up of the research project and first conclusions for future work.

4. Results and outputs

Description of main results and outputs achieved
• In the research project different scenarios for the future spatial development of the Alps were developed. These scenarios focus on settlement patterns, transport, public services, governance and environment. The scenarios are largely food for thought, to enable policy makers and administrations to develop paths of actions to achieve desired results in terms of a sustainable development of the Alps until 2050, making use of potentials while fully preserving the best possible environmental status. It is of paramount importance to look at the Alps as one common spatial system, which can only be developed jointly according to a common set of principles agreed to by all Alpine states. This needs cross-border co-operation and exchange between spatial and sectoral planners. A new governance approach will have to be developed accordingly. • The ad hoc Expert Group presented first proposals to the Permanent Committee for the development of such a governance approach.

5. Cooperation

Description of cooperation initiatives and activities with other Alpine Convention Thematic Working Bodies and other relevant bodies and processes (e.g. EUSALP)
• The research projects and its results were widely discussed with the observers to the Alpine Convention, with spatial planners and representatives of other sectors. There were also exchanges with the action groups of EUSALP. Discussions were also held with representatives of the Alpine Space Programme. The Alps 2050 project was presented at a joint meeting of AC, EUSALP and the Alpine Space Programme convened by the Austrian Presidency of the Council of the EU. The expert group also held a workshop on the project results at the EUSALP Annual Forum in Innsbruck in November 2018.

6. Attachments

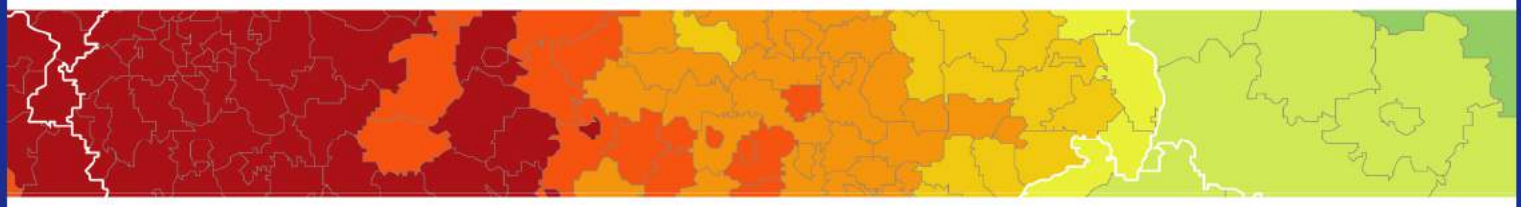
List of the documents attached to the report
1. ESPON: Alps2050 - Common spatial perspectives for the Alpine area. Towards a common vision: Final Report. 2. ESPON: The Alps 2050 Atlas: Alps2050 - Common spatial perspectives for the Alpine area. Towards a common vision. 3. ESPON: Alps2050 - Common spatial perspectives for the Alpine area. Towards a common vision: Scientific Annex. 4. ESPON: Alps2050 - Common spatial perspectives for the Alpine area. Towards a common vision: Executive Summary “Territorial Analyses”. 5. ESPON: Alps2050 - Common spatial perspectives for the Alpine area. Towards a common vision: Executive Summary “Vision Alps 2050”.

ESPON

EUROPEAN UNION

Co-financed by the European Regional Development Fund

Inspire policy making by territorial evidence



Alps2050

Common spatial perspectives for the Alpine area. Towards a common vision

Targeted Analysis

Final Report

21.11.2018

This targeted analyisis activity is conducted within the framework of the ESPON 2020 Cooperation Programme, partly financed by the European Regional Development Fund.

The ESPON EGTC is the Single Beneficiary of the ESPON 2020 Cooperation Programme. The Single Operation within the programme is implemented by the ESPON EGTC and co-financed by the European Regional Development Fund, the EU Member States and the Partner States, Iceland, Liechtenstein, Norway and Switzerland.

This delivery does not necessarily reflect the opinion of the members of the ESPON 2020 Monitoring Committee.

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Information on ESPON and its projects can be found on www.espon.eu.

The web site provides the possibility to download and examine the most recent documents produced by finalised and ongoing ESPON projects.

This delivery exists only in an electronic version.

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Alps2050
Common spatial perspectives for the Alpine area. Towards a common vision

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Abbreviations

AC	Alpine Convention
ARGE ALP	Arbeitsgemeinschaft Alpenländer (Working Group Alpine Countries)
ASP	Alpine Space Programme
CAP	Common Agricultural Policy
EC	European Commission
ESPON	European Territorial Observatory Network
EPO	European Patent Office
EU	European Union
EUSALP	EU Strategy for the Alpine Region
GDP	Gross Domestic Product
IBK	Internationale Bodenseekonferenz (International Lake Constance Conference)
LAU	Local Administrative Unit
MRS	Macroregional Strategy
NUTS	Nomenclature of Territorial Units for Statistics
PPS	Power Purchasing Standard
R&D	Research and Development
SGI	Services of General Interest
SME	Small and Medium-Sized Enterprise
TEN	Trans-European Transport Network
TCP	Territorial Cooperation Programme

1 The Alpine Region and the ESPON project Alps 2050

The Alpine region is a specific geographical space, embodying spectacular landscape features, a precious cultural heritage, a touristic destination of global importance, being simultaneously an overall prosperous region and an ecological hot spot – diverse, unique, and vulnerable. At the same time, the Alpine area is a space of important internal linkages and characterised by an increasing embeddedness in global networks: Being located in the heart of Europe, the region is hence part of the dynamic development of a globally integrated economy. Globalisation and the need for competitive economic activities is an important driving force for the Alpine region. Against this background, sustainable development of this sensible area is a particular challenge for regional policies. Balancing development opportunities and protection regimes is a fundamental challenge and a strategic requirement: maintaining prosperity and quality of life, ensuring innovation, managing settlement demand, responding to climate change, reducing fragmentation of ecosystems, and steering agricultural transformation are just some of the most important issues at stake in the political agenda.

Thinking towards the year 2050 means to advance more than three decades, which is a very long period of time in these dynamic days. If we cast our mind back three decades, we are in a time where the Schengen treaty was not enacted, the Eastern 'bloc' still existed, the Euro was not invented, climate change was not yet an issue and agricultural structures were much more traditional than they are today. Thinking towards 2050 cannot be done in a purely quantitative way as too many influencing factors are hardly to be predicted. At the same time, strategic spatial development has to draft future visions in order to provide 'orientation' for development action.

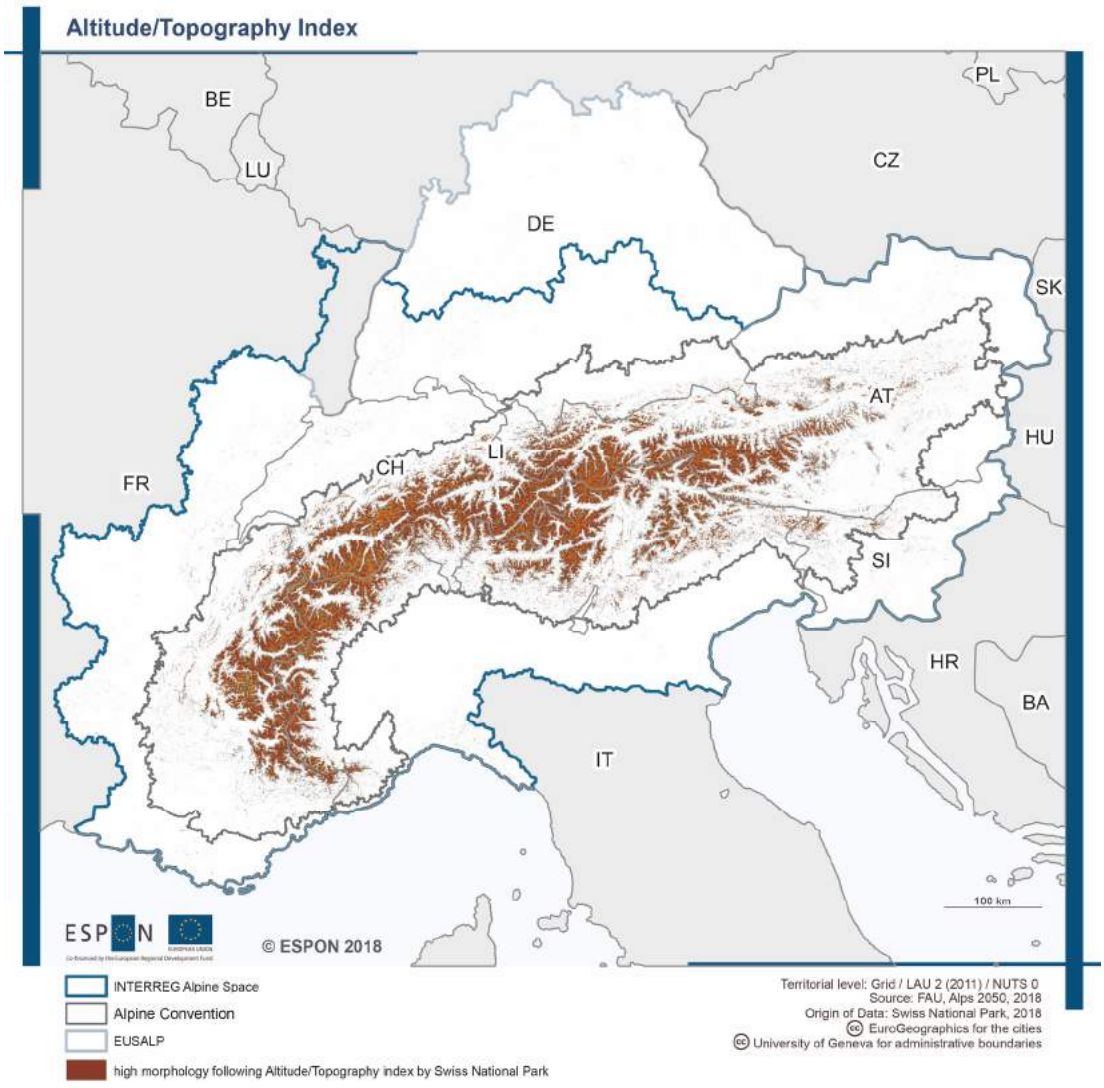
The ESPON project "Alps 2050 – Common spatial perspectives for the Alpine area. Towards a common vision" develops a common spatial development vision and a set of common spatial perspectives for the whole Alpine region. The project is based on territorial evidence and develops visions and perspectives in close interaction with stakeholders from the multi-level territorial governance system. The project aims at strengthening territorial cooperation and supporting sustainable development. The objective is not only to develop spatial perspectives and a vision for the Alpine area, but also to pave the way towards implementation in the complex multi-level governance system of the region and develop guidelines for a concerted multi-actor and sustainable territorial planning. These visions and evidences will lead to a more general sustainable territorial planning model, which could be transferred to other cooperation areas.

Map 1 shows the perimeters that are relevant for the Alps 2050 project, namely:

- The Alpine Convention (signed in 1991) whose perimeter has been aligned on municipal level based mainly on morphological arguments, i.e. that the perimeter marks the mountainous parts. In this report, this part will be named the Inner Alpine area.

- The INTERREG Alpine Space Programme started in 2000 and is now running in the fifth period 2014-20. Its perimeter goes far beyond the mountain area and also includes the surrounding metropoles and 'hinterland'.
- The macroregion EUSALP (launched only in 2016) is similar but not identical with the ASP space. The areas of the ASP and EUSALP perimeter that go beyond the Alpine Convention space will be named Pre-Alpine areas in this report. Its delimitation is based on the regional level.

This report presents the main findings of the project work. The full analyses can be found in respective annexes that complement and detail the report.



Map 1 The Alpine mountains and the Alps 2050 Perimeter

2 Current state of the Alpine area's territorial structure

2.1 Overview

The analysis of the territorial structure and development trends is mainly built on European and ESPON data sources, different tools of regional statistics show the complexity of the involved territories. Most data are available on NUTS 3 level, i.e. district level, in a few cases, municipal data (LAU 2) is available. Many results are commented more in detail in the Scientific Annex to this report and the Alps 2050 Atlas.

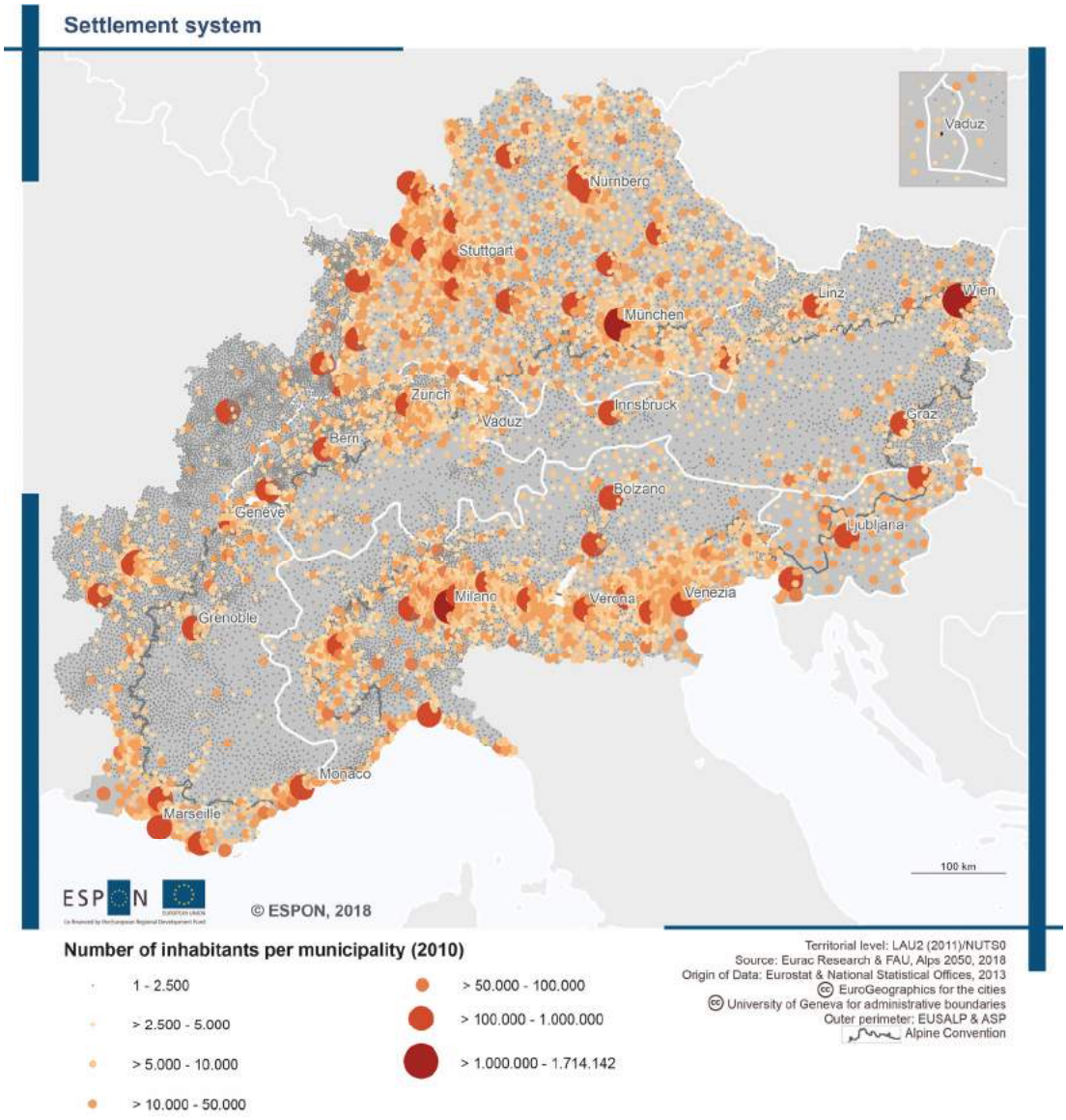
For the purpose of the Alps 2050 scenario building, we synthesise the findings along three main fields of spatial development: 1) the people and their territories, 2) the economy, 3) the environment. This will be complemented by the cross-cutting issue of 4) governance. After this analytical presentation, the future perspectives and scenario will also be developed along these three dimensions. Obviously, these dimensions are closely interwoven, they overlap and influence each other.

2.2 The people and their territories: Demography – settlement system – public services – transport

When we talk about the situation of the Alps 2050 region and their territories, we see a complex structure with many facets. To start with, the settlement system of the Alps 2050 perimeter displays one of those spatial structures where the morphological influence is most clearly visible. Map 2 shows the settlement system by presenting the size of municipalities, indicating the following spatial patterns:

- Within the Alpine Convention perimeter, the *size* of municipalities tends to be less high than beyond; and also the *number* of municipalities within a certain area tends to be lower in the mountainous area than in the pre-Alpine area.
- The map shows the importance of *valleys* for settlements, in particular the Inn valley (East of Innsbruck), the Rhine valley (North and South of Liechtenstein), the Isère valley (between Genève and Grenoble), the Sava and Soča valleys in Slovenia, the Po valley (from Milano Eastwards) etc.
- The map illustrates the relevance of different political and administrative contexts: The average size of municipalities – for example – is clearly larger in Slovenia than in France.
- The map clearly displays the importance of the Alpine morphology: the higher the mountains and narrower the valleys, the smaller the settlements.

Despite all the differences between national and regional contexts, there are obvious parallels in the settlement system – the relevance of the morphological structure in the Inner Alpine area, and the agglomeration ring all around the mountainous area. As macro-regional strategies are about common challenges and opportunities, the settlement system could be an obvious issue. It might be meaningful to debate transnational instruments for the development of settlement systems that support synergies across borders.

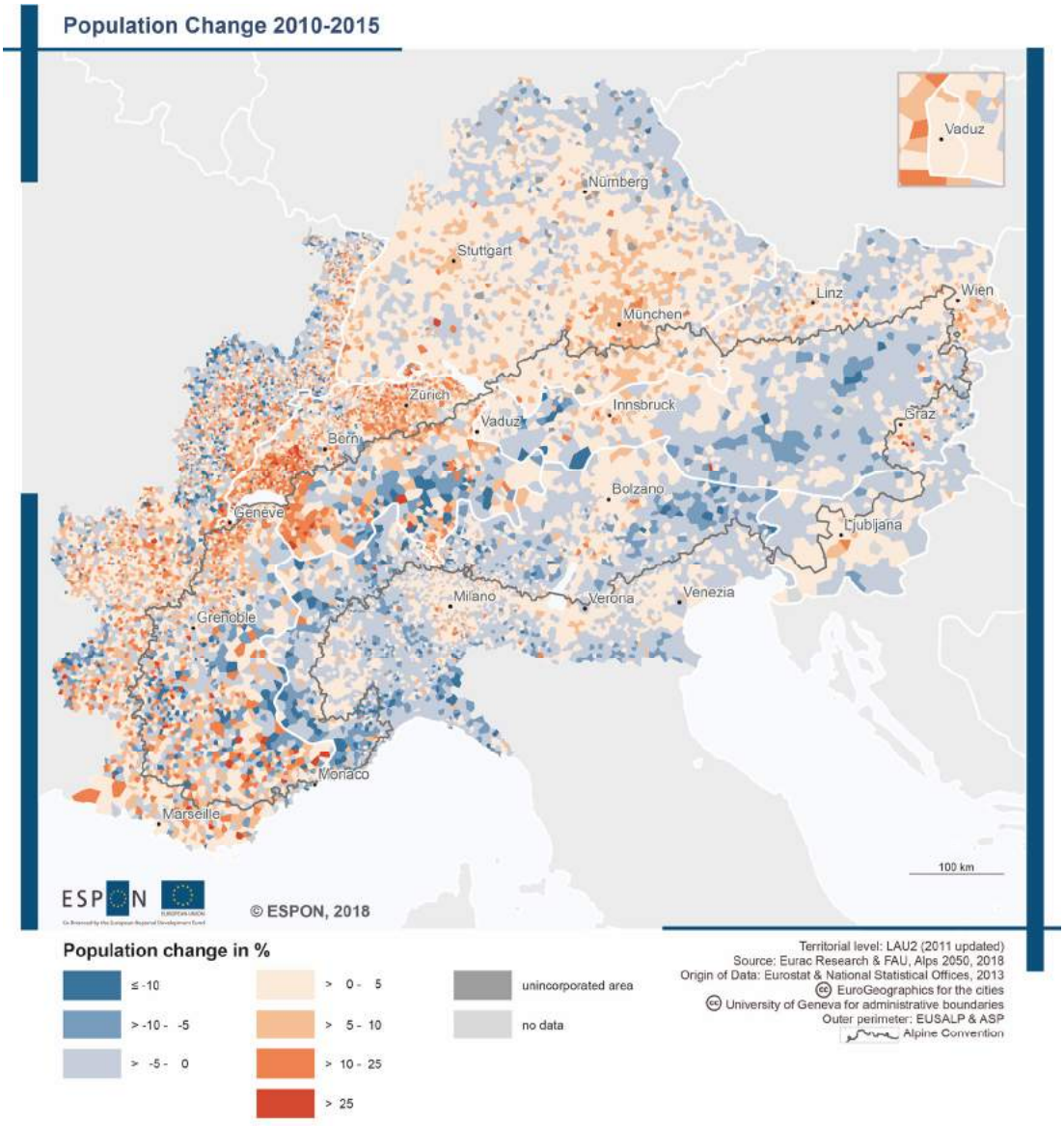


Map 2 Size of the municipalities (2010) as important facet of the settlement system

The demographic development within the Alps 2050 perimeter is as diverse as for the European territory (cf. Bausch et al. 2014, ESPON Demifer 2010, Alpine Convention 2015[1]) – the Annexes show a series of facets. Different from the overarching settlement system, the morphology plays a less important role. Map 3 shows the demographic trend for the period 2010-15: The overall picture clearly underpins the core influence of the degree of urbanisation: Metropolises and larger cities are almost always the centre of growth trends, whereas the patterns in the rural areas are much more diverse. For example, the South Tyrol area is demographically developing more positively than the Belluno province. The observed trends are significantly different between the Alpine countries, e.g. along the French-Italian and the German-Swiss borders.

[1] for the bibliographic information see scientific annex

Again, the importance of transport corridors is clearly perceptible – the Inn Valley, the High Rhine Valley and most of all the Brenner corridor are well visible.



Map 3 Demographic development on the municipal level

The demographic trends do not primarily reproduce the differences between mountainous and non-mountainous regions. Instead, the diversity of rural development parts and the large scale influence of metropolitan 'growth poles' leads to a much more complex picture. This complexity is even increased by the combination of diverse and overlapping in- and out-flows of migrants which produce a highly diversified situation for all parts of the Alpine space (Gretter et al. 2017). Many demographic indicators refer to these patterns, highlighting the increase of bi-directional (and circuit) migratory flows, negative natural trends, significance of specific age groups and gender differences in migration movements, length and frequency of movements etc.: Still,

metropolitan places tend to show the most positive values whereas rural patterns are more diverse.

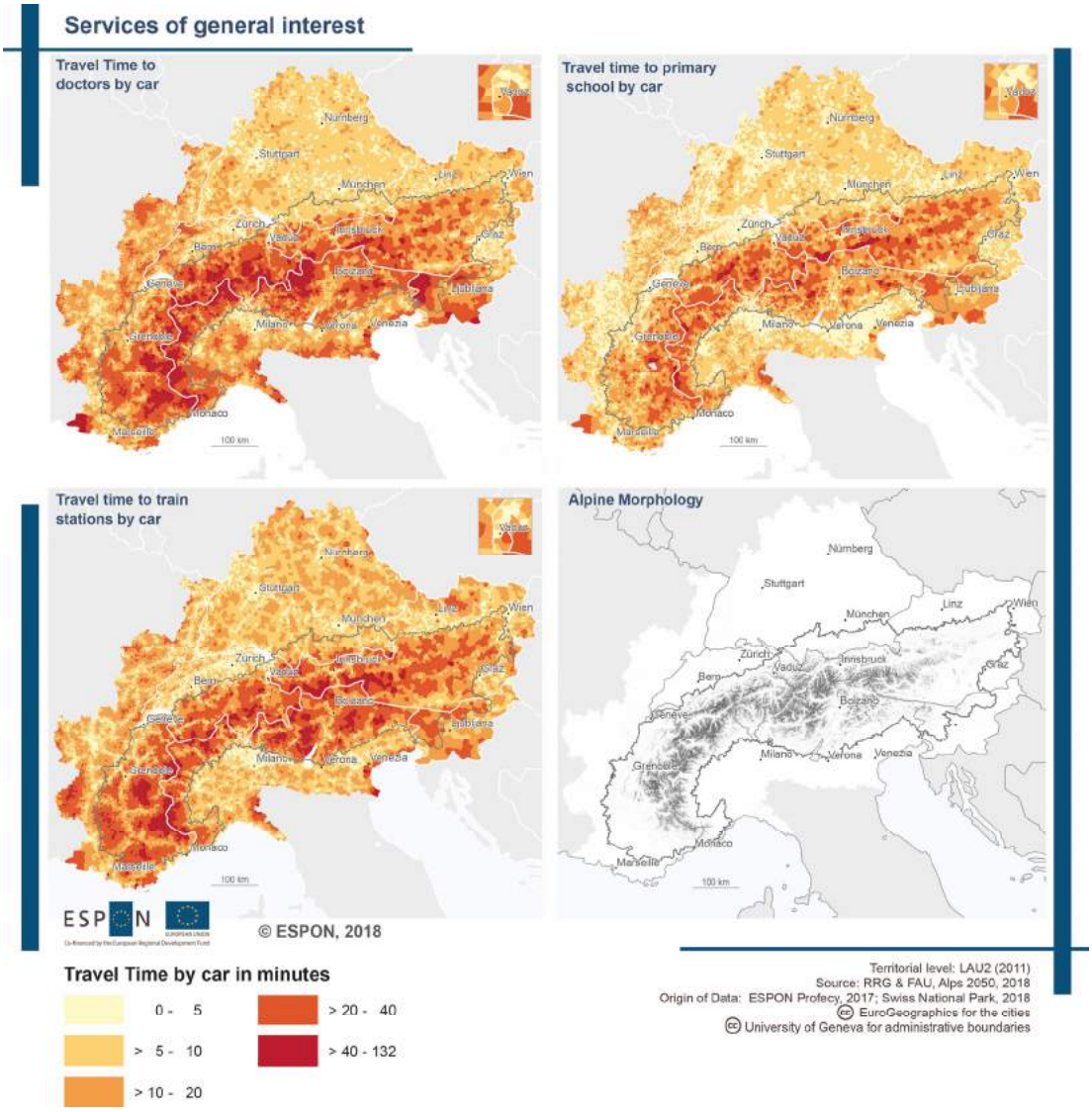
From the normative side, the following arguments apply:

- In the long run, the trend of metropolisation can lead to polarisation. At the same time, positive development trends in some mountainous, rural regions show that there can be opposite trends. Political action addressing the territorial potentials (of all types of spaces) can make a difference – place based approaches for tourism and economic innovation are just prominent key issues in this context.
- If demographic growth and loss trends would continue like they have developed in recent years, the settlement system would change fundamentally, blurring the differences between inner- and pre-Alpine areas.
- Demographic growth as well as loss can mean challenges for the maintenance of public services, financial systems, and cultural dynamics. Moreover, settlement growth is coming along with increasing environmental pressure.

Map 4 shows the accessibility to so-called services of general interests (SGI), namely to doctors, primary schools and train stations. The indicator was developed in the ESPON project PROFECY (cf. ESPON PROFECY 2017). This indicator represents different aspects: It shows both the density of the services and at the same time the accessibility of the services through the road network. To a large extent, both aspects are the result of population density and economic development of the regions.

The overall picture shows that the morphology matters: the inner-Alpine perimeter shows clearly lower values of accessibility than the pre-Alpine and more urbanized areas. The difference is not marginal – the average time needed can differ by a factor of 10 between pre- and inner-Alpine regions. The picture is similar for the accessibility to all three selected service types, but there are differences: The accessibility to primary schools is polarized between inner- and pre-Alpine areas. The train stations are – for good reasons – orientated along the valleys. The accessibility to doctors is worse than that for the other services. From a normative side, the following arguments have to be considered:

- On the one hand, the accessibility of SGI is the basis for a good quality of life, and in the long run, a poor accessibility to these services will lead to demographic problems due to outmigration and low levels of in-migration.
- On the other hand, it is a characteristic of rural and mountainous places that accessibility and services density is lower than in urban contexts. An identical supply level of services cannot be the objective, but at least a reasonable or acceptable level has to be achieved. This is closely linked to the development of the settlement system. For scattered settlements it is more difficult to provide SGI in an appropriate time.
- Moreover, the technological development (digitalisation) offers new options of SGI provision – medical care via internet, online courses for learning, online communication tools and many more economic, social and cultural applications. The most relevant questions are how much a society is willing to invest in these services, what the benefits of these technological changes are, and to what extent shifts in infrastructure installations and use are accepted.



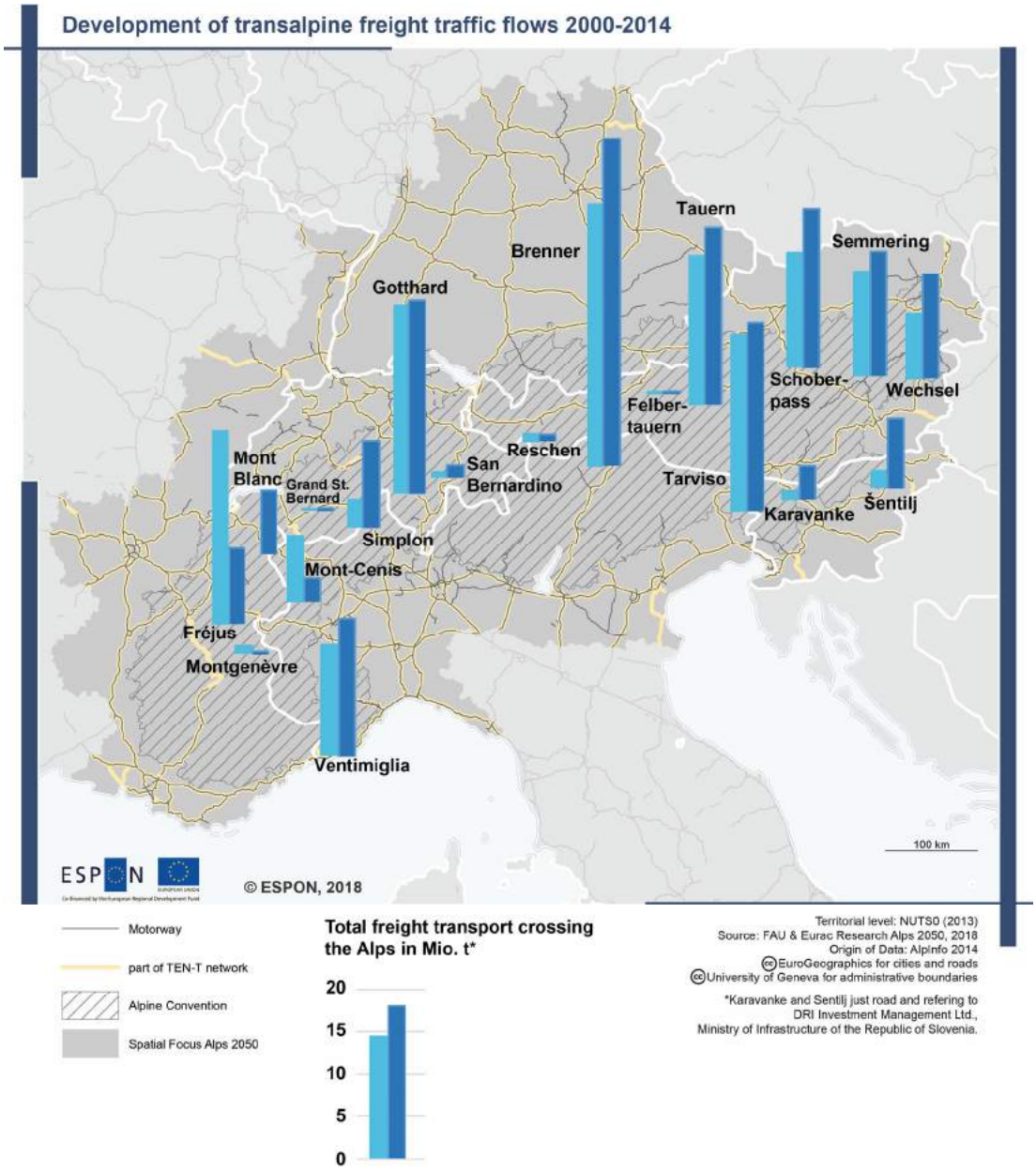
Map 4 Services of general interest

With regard to **transport services**, the contrast between mountainous and pre-Alpine areas still plays a substantial role – with the determining topic of transit traffic and its unequal consequences: corridors of pan-European importance play a major role on all political levels whilst environmental damage is mainly experienced in the transit areas.

Fehler! Verweisquelle konnte nicht gefunden werden. provides the visualisation of the uneven increase of transalpine freight traffic. The amount of transported net tons per year has grown at almost all transit corridors, but to a different degree.

This simple indicator introduces to more complex political debates like the call for the 'multi-modal' use of transport infrastructure, the task of balancing extra- and intraregional accessibility needs, the alignment of toll systems, and potential limits to mobility growth.

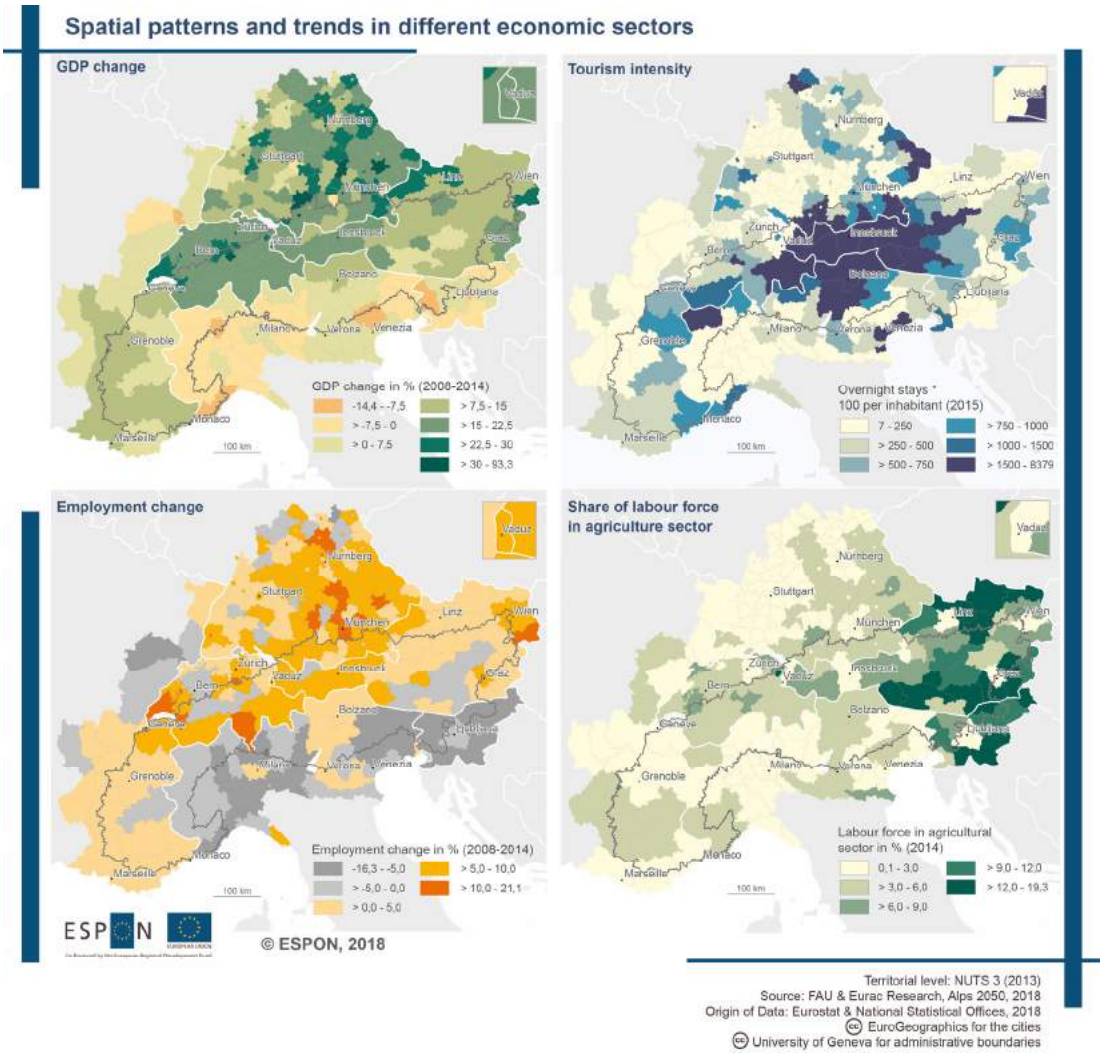
In parallel to freigtht transport, passenger transport is a challenge for sustainable management: (intra-)regional accessibility and transit flows demand for smart strategies, including in particular multi-modal regimes.



Map 5 Development of transalpine freight traffic

2.3 The economy: sectors – labour markets – innovation

From a more general European perspective, the economic performance of the Alpine region is rather strong. Most indicators, including GDP per capita, are above European average. Map 6 shows the spatial patterns and trends for different economic sectors.



Map 6 Spatial patterns and trends in different economic sectors

This map compilation illustrates the diversity of spatial patterns and trends across Alpine regions:

- On the left hand side, we see two maps with spatial patterns of a **North-South divide**: the trends in employment and in GDP (economic strength) have developed much more positive on the Northern side of the Alps 2050 space than on the Southern side. This refers to the post 2008 economic crisis that (most regions of) Germany, Switzerland, Liechtenstein and Austria mastered quicker and with less frictions than the Italian and Slovenian regions. Innovation patterns (EPO data) are not displayed here, but show a similar North-South divide.
- The map on tourism intensity based on overnight stays (upper right hand side) shows a '**central-peripheral pattern**': the gradient goes from the (inner-Alpine) centre to the (pre-

Alpine) 'periphery' of the Alps 2050 space. We can observe that the relative importance of the tourism economy is very high in the inner Alpine areas (comprising destinations like Graubünden, Tyrol, Southern Tyrol etc.). This shows the role of the Alpine massif as a touristic hot spot with much economic potential and also the potential to threat sustainable development pathways on the local level.

- The map on the lower right hand side shows an **East-West gradient** of an economic feature: The share of labour in the agricultural sector is the highest in the Eastern Austrian and in the Slovenian regions (in both cases relevant for all regions except capital regions). The relatively high values in Slovenia can partly be explained by the traditional importance and still high appreciation of the agricultural sector; the Austrian values can, amongst others, be explained with specifically high pluriactivity levels and a particular high political appreciation of the rural, agricultural sector.

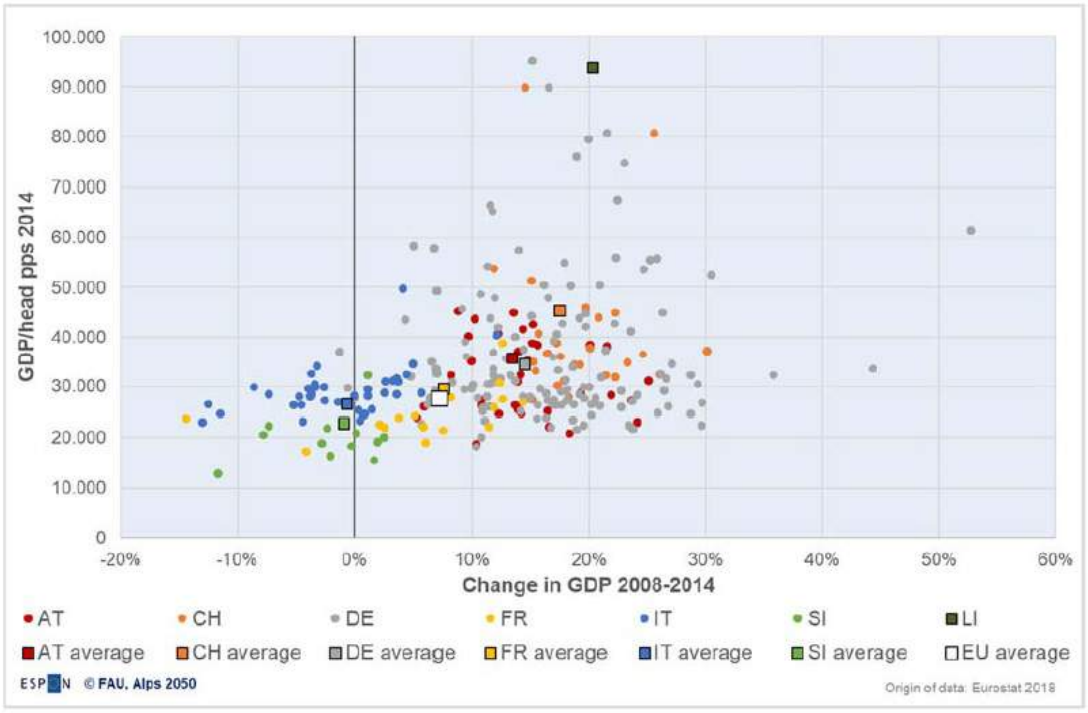


Fig. 1 National differences in economic performance

Moreover, Fig. 1 underscores the high relevance of **national differences**. The NUTS3 regions of each country make up a kind of a 'cloud' that can immediately be differentiated from other countries. The high variability within the 'clouds' of Switzerland and Germany can be related to the small size of the NUTS3 regions in these countries. However, the overall picture is clear: The fragmentation argument – postulating the high importance of national contexts – is applicable, at least on the NUTS3 level. In other words: Belonging to a specific nation-state determines the economic level and path to a high extent. The question, if a region is situated in the inner-Alpine or pre-Alpine area (i.e. AC or EUSALP) seems much less decisive.

Beyond the four sectoral patterns shown in Map 6, two more general findings can be summarised:

- Regional development is not *determined* by its morphology: Territories higher above sea level do not necessarily perform worse than those at a lower height.
- The data do not reveal a urban-rural *antagonism*: Metropolitan regions tend to perform with more positive values, but there are very successful rural regions, too.

Against this background, one can conclude that the Alpine regional development is not necessarily 'handicapped' by its specific territorial structure. Of course, spatial development is influenced by morphological differences and by the urbanisation intensity. However, there is no determinism and political decisions can make the difference, exploit specific territorial potentials (tourism, specific agricultural economies, traditional handcraft, energy production) and overcome challenges (transport policy).

Reflecting on differences between regions raises the questions if those differences call for political action, in particular in form of cohesion policy on the transnational scale, or have to be accepted as variance in regional performances. As explained in more detail in the annex, the Alps 2050 perimeter comprises very different territories. The range comprises NUTS 3 regions with values below 20.000 power purchasing standards (pps) per inhabitant up to regions with more than 80.000. Other economic or demographic indicators show similar divergences. This is not surprising, as very strong urban economies (Zürich, Ingolstadt, Liechtenstein,) and some places in severe structural problems (in particular on the Italian and French side) are part of the Alps 2050 territory. At the same time, even if the overall level of disparities has slightly increased during recent years, it is relatively modest, if compared to other spaces in Europe (e.g. Danube region).

Even if there is no harmonised regional statistics data available on green or alternative economies, the debate is intense (UBA 2015, Alpine Convention 2017): The respective concepts comprise low-carbon economy, quality of life approaches, post-grwoth agricultural perspectives etc. From a normative point of view – and with regard to the scenario building – the following questions arise:

- How to ensure the targeting of sustainable development goals within the future Alps 2050 visions? What *kind* of economic performance is preferred, i.e. what sectors are most preferable, what kind of growth is the objective? How can endogenous potentials be used?
- How can the current strength of the economic performance be maintained and ensured? This is a particularly important question in view of the current digitalisation trend and the recent questioning of the globalisation paradigm.
- What does economic *cohesion* mean in respect to the Alps 2050 area, i.e. how far should harmonization of regional performance go, and which scale should be used as reference base?

2.4 The environment: Environmental Protection – ecological connectivity – ecosystem services

Responding to the multiple challenges and threats of the Alpine environment is not trivial. It particularly refers to respect the societal demand for well-being and development and, simultaneously, to safeguard an ecologically functioning system. The Alpine Convention contributes to balancing these demands, and the EU environmental policy offers a series of instruments (for the EU member states) in order to support ecological objectives.

Map 7 provides an overview of the existing protected areas in the Alps 2050 area as example for the concrete instruments of environmental policies. As there is no standardized regime of protected areas, a series of sources has been brought together in this map:

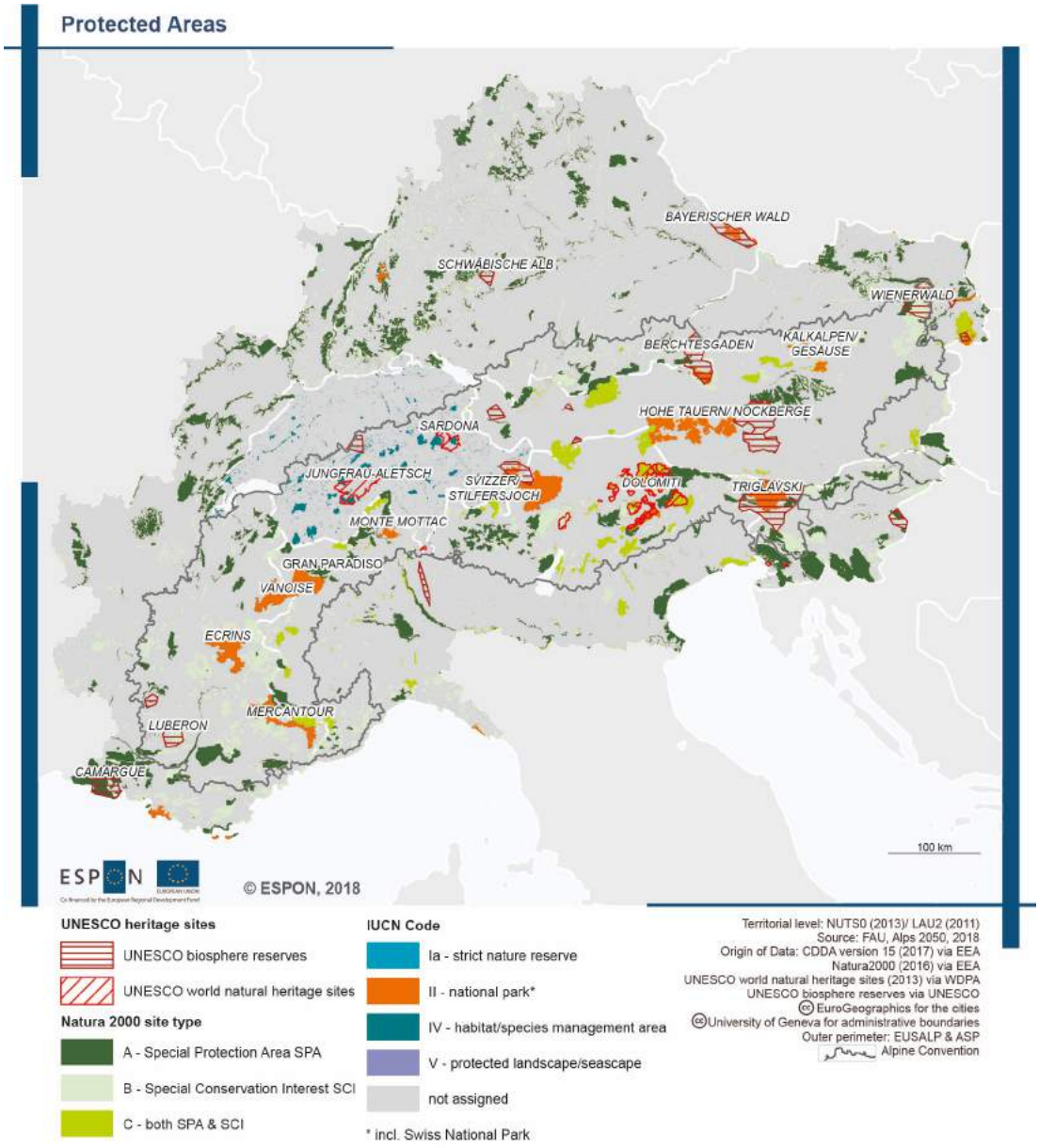
- Within the EU, the Natura 2000 network shows those sites that are protected due to the habitats directive (Special Conversation Interest SCI) and the directive on the conservation on wild birds (Special Protection Area SPA).
- On global level, the UNESCO offers the protection formats of natural heritage sites and Biosphere Reserves
- Switzerland is (as non EU-member) not included in the Natura 2000 network (but of the Emerald Network of Areas of Special Conservation Interest, launched by the Council of Europe). The map shows the IUCN codes Ia and IV which follow similar protection purposes as the Natura 2000 network. As a global NGO the IUCN (International Union for Conservation of Nature) is an umbrella organization that also involves many governmental ministries. The IUCN classification helps to make regional and national protection regimes comparable. This is complemented with the Swiss National Park.

Obviously, many famous mountain massifs are object to national park regimes and/or UNESCO protection (e.g. Dolomites, Triglav). However, the share of protected spaces is not necessarily higher in the Alpine Convention area than in lowlands.

In the map, we see clear differences between national protection regimes. For example, national parks are much more frequently enacted in AT, FR and IT, whereas DE and CH have less national parks which are relatively small in size. Another difference between Alpine countries is the varied implementation path of the EU protection directives that display very different average sizes of protection areas within these countries (going up to 37% protection area in SI). Even if a series of cross-border protection initiatives exists (e.g. Naturpark Nagelfluhkette between Austria and Germany), the potential of cross-border formats is certainly not yet exploited.

In recent years, the question of ecological connectivity came high on the political agenda. The key idea is to ensure sufficiently large functional ecological systems by – ideally – connecting in a way that flora and fauna can inter-exchange. Area protection is just one element of this more comprehensive approach. Against this background, ecological connectivity is hindered

by continued construction activities and settlement dynamics that cut across ecological networks and, particularly in hitherto unaffected areas.



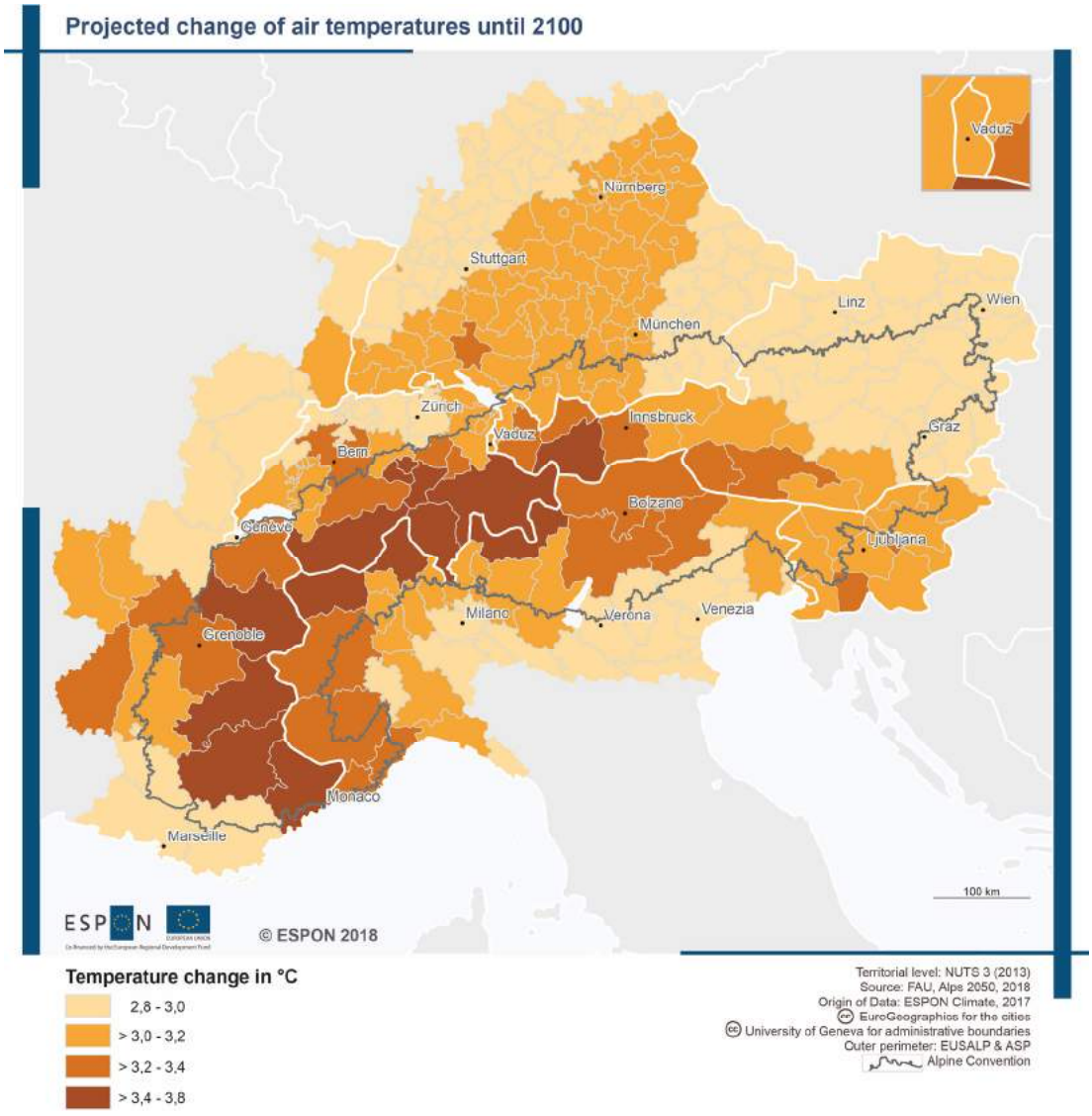
Map 7 Protected areas in the Alps 2050 perimeter

Map 8 shows the projected changes in annual mean temperature. The changes of the (air) temperature in the Alps 2050 perimeter show the following patterns and characteristics:

- There are higher increases in annual mean temperature in the inner-Alpine areas than in the area of the spaces beyond the mountain topography; this is one of the maps that displays a strong correlation with the morphological picture of the Alps: the higher the mountains, the stronger the increase of temperature (even if the relatively lower temperature rise in the pre-Alpine areas means already considerable adaptation challenges).

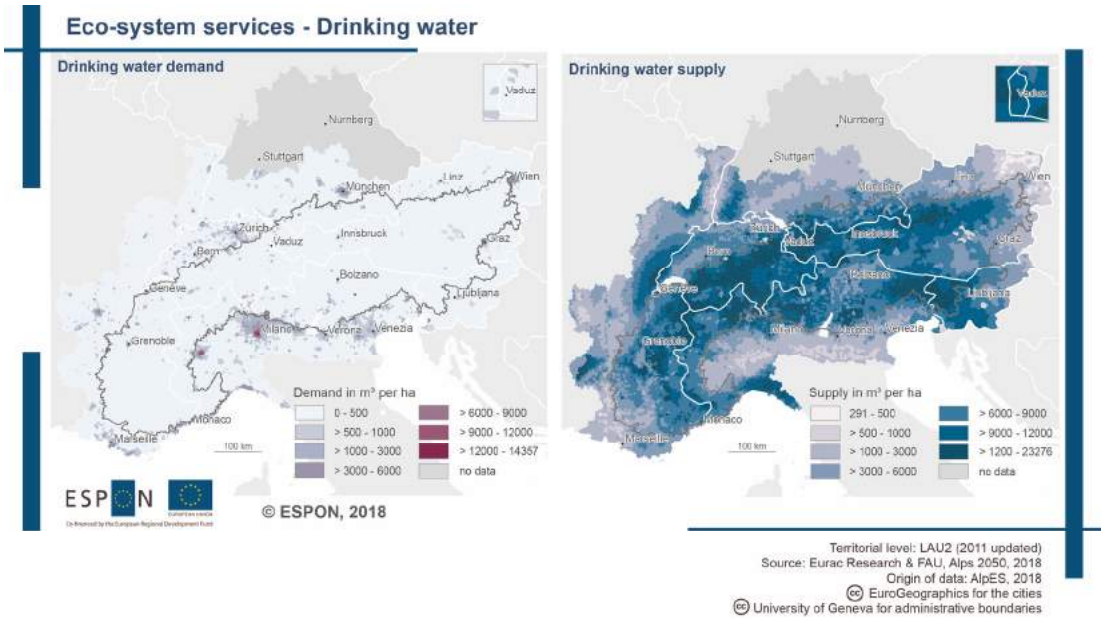
- In particular, the Southern side of the Alpine mountain range is characterized by the highest changes in annual mean temperature, in particular in the Western Alps. This observation shows that in particular the French-Italian, Swiss-Italian and Austrian-Italian border regions are those Alpine regions which are most severely affected by climate change.

The relevance of rising temperatures and climate change impacts is not limited to national contexts. Obviously, the change of annual mean temperature is representing a common challenge for mountain areas and especially of Alpine regions on the Southern side of the mountain range. Consequently, dealing with climate change impacts expressed through rising temperatures, increase of natural hazards, precipitation changes etc. calls for transnational policies and measures.



Map 8 Projected change in air temperature

Generally speaking, the ecological functions of the Alpine region have an importance that goes far beyond its perimeters. Questions of biodiversity change, as addressed with the protection and connectivity policies, are just one example. This leads to the question of 'services' of diverse kinds that the Alpine region provides for other regions beyond. The concept of eco-system services reflects on the benefits that humans gain from the natural environment in daily life. They are built on functioning eco-systems like forest, grassland, or aquatic eco systems, and they are important in terms of drinking water or leisure supply. Map 9 illustrates the drastic difference in the supply-and-demand-relation through the example of drinking water.



Map 9 Ecosystem services: drinking water demand and supply

Drinking water demand is very much linked to urbanized and metropolitan areas, i.e. the settlement system. The spatial structure of settlement areas shows a very punctual structure surrounding the core mountainous area of the Alps. The demand for drinking water linked to Alpine sources is not limited to the Alps 2050 perimeter but goes far beyond. Contrary to that, the supply structure is heavily linked to the morphological structure. This is a typical picture for ecosystem-services regimes – supply and demand show contrary spatial structures (see a similar spatial distribution for the example of leisure supply and demand in the Atlas).

If we summarise and simplify the findings, we can formulate the following postulates with regard to the ecological dimension:

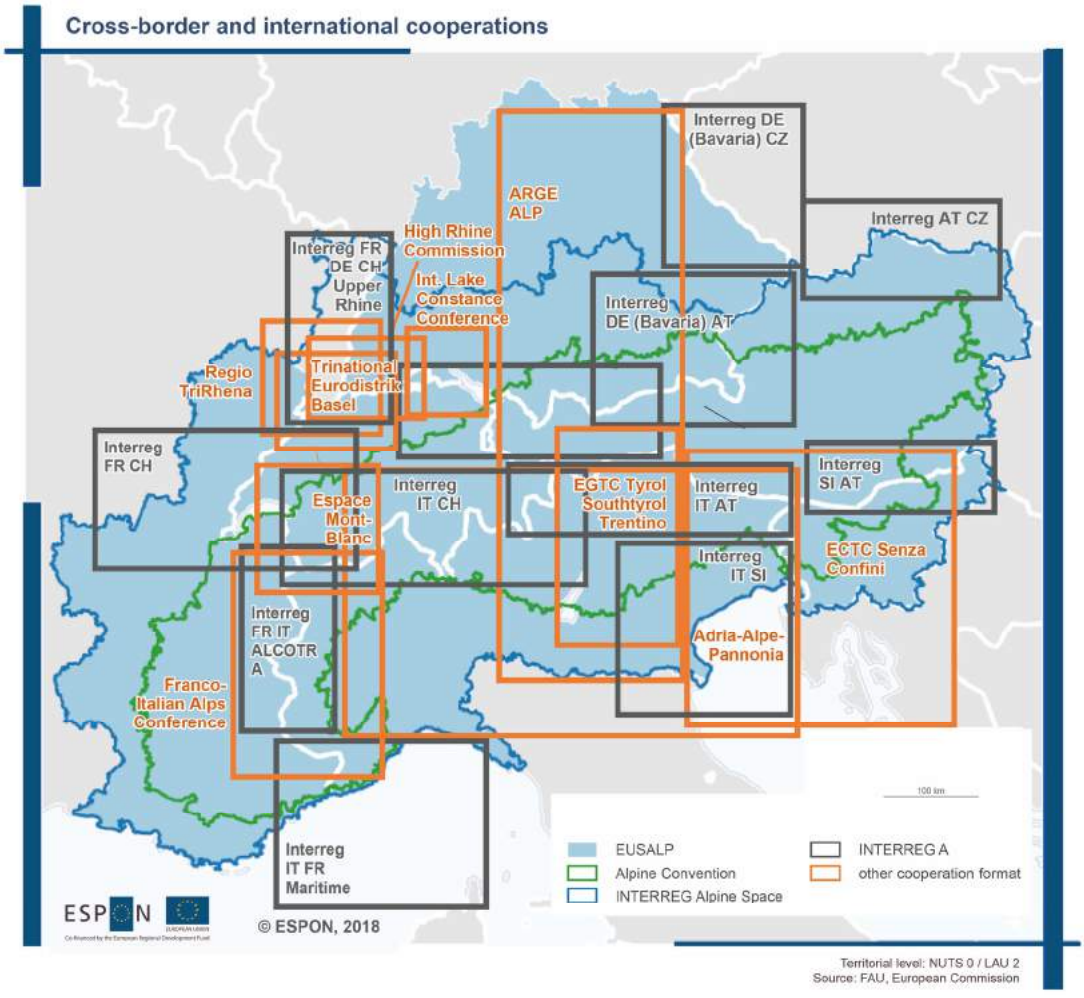
- **Vulnerability**: The Inner-Alpine parts are more concerned by climate change, soil sealing along the valleys. Ecological fragmentation is a key concern due to the function of the Alps as a biological hotspot. Moderating the demands of protection and development is the key political challenge.

- **Supply-demand relations**: The more urbanised areas play an important role by demanding and using ecosystem services, in particular with regard to water, leisure supply (including second homes), tourism demand, but also clean air, ecological benefits etc.

2.5 The governance: Actors and institutions

2.5.1 The transnational and European scale

From the governance perspective, the Alpine region is remarkable as it is the 'contact zone' of several nation states and, at the same time, of different administrative and political systems. Despite this political complexity (or maybe because of it?), territorial cooperation looks back on a remarkable tradition and diversity. Map 10 shows most of the cooperation formats on the cross-border level (for the transnational tools, see Atlas).



Map 10 Cross-border and international cooperation in the Alpine area

The high number of cooperation formats might be because of the low correlation of national borders with cultural differences like language, regional belonging, historic relationships etc.

One might differentiate the cooperation formats that rely on the intergovernmental logic and that go mostly back to those years before the start of the EU cooperation programmes. Some of them started with a rather sectoral focus (water, environment) and developed towards a more general and integrated perspective of regional development. The Lake Constance Conference and the High Rhine Commission are examples for the first wave of cooperations. Others had a more general focus and allow 'high politics' on the regional level. ARGE ALP is the most prominent example. Many of the younger cooperation formats can also be traced back to EU policies. This is in particular true for the small scale Euregios along many borders whose main focus lies in the implementation of cross-border cooperation programmes (INTERREG A). Some also refer to the transnational cooperation programmes (INTERREG B). More recently, the regions of Tyrol, Southern Tyrol and Trentino have gone a step further and established stronger institutionalized cooperation by founding a European Grouping of Territorial Cooperation (EGTC), similar to the process of the ECTC Senza Confini. The Alpine Convention, the EUSALP and the Alpine Space Programme are the represented here as underlying structures that can 'frame' cooperation activities.

There are few regions in Europe that show a comparable institutional diversity, and density of cooperation frameworks, perhaps with the exception of the Baltic Sea region.

2.5.2 The domestic scale

The institutional setting is not only complex in the cross-border, international context but also on the domestic level (for details see the Atlas). Simplifying to a high degree, we can summarise the situation as shown in Map 11. Two dimensions play a very important role:

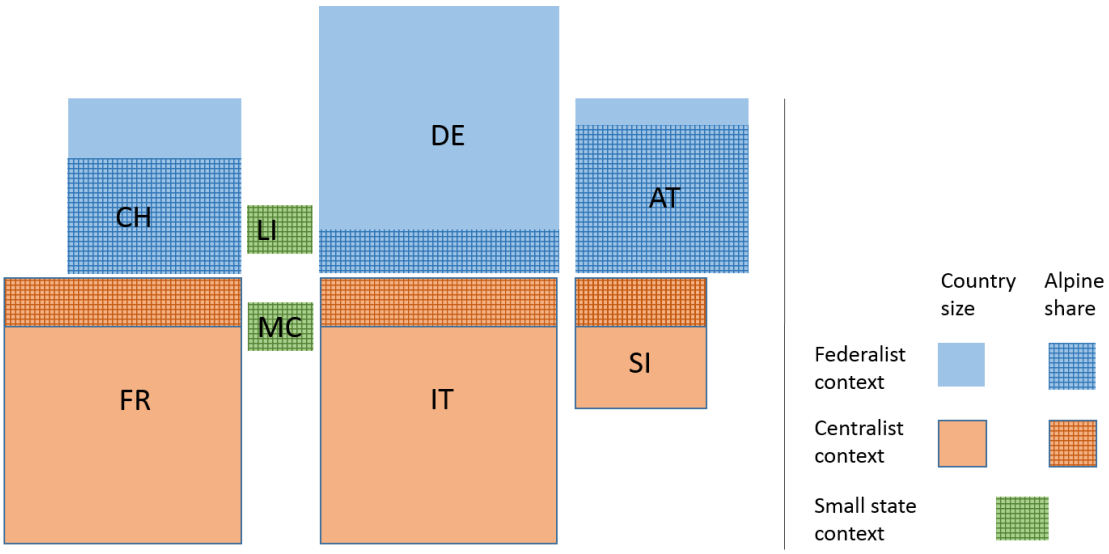
Firstly, the country size and the share of the mountainous areas within the national territory make a difference. For example, Austria only has few areas that are not part of the morphological Alps, and this is one explanation why the Alpine policy is seen as almost synonymous with (large parts of) rural policy, and ranks high on the Agenda; the situation is different in countries like France or Germany where the Alpine area is just one kind of territory amongst others.

Secondly, the politico-administrative context matters ('planning cultures'). The following characteristic contexts might be differentiated, even if this presentation tends to be simplifying and subdued to changes:

- '**Centralist context**': Countries with a centralised political system locate the most powerful institutions on the national level, even if regional authorities have their word to say. In the Alpine case, the respective countries are very different: France has undertaken considerable efforts to strengthen the regional level. – Italy is a centralist country but is different in particular with regard to the autonomous regions which have considerable mandates. The regional institutions can be very active with regard to development programmes and regional planning. – Slovenia does not have a political regional level and, thus, remains a centralist country with a high relevance of the local level. The comparably young political system comes along with ongoing institutional

reforms. – All in all, centralist countries can be very efficient in implementing political actions; at the same time, it can be hard for them to address the complexity 'on the ground'.

- '**Federalist context**': The Alpine region involves three federalist countries with a powerful regional level. Even if the differences between the countries are large – Swiss cantons and German or Austrian federal states (Bundeslaender) are hard to compare – the general multi-level governance shows parallels. The regional mandates help to develop place-based approaches and they help to involve the appropriate stakeholders and actors. At the same time, coordinating political action can be quite a challenge.
- '**Small state context**': The particularity of small states is the reduced complexity in institutional matters – the national and the local level are sufficient, without regional levels in between. The small number of experts and responsible people in certain matters is characteristic and so are the very personal linkages between the people involved, in particular when compared with larger countries. The European and cross-border dimension is of crucial importance as the functional interdependencies with the neighbouring states are very intense. Political action can be very flexible, due to the relatively small number of actors involved, and this might facilitate niche politics that lead to over-average prosperity, but also the 'critical mass' challenge might be severe.

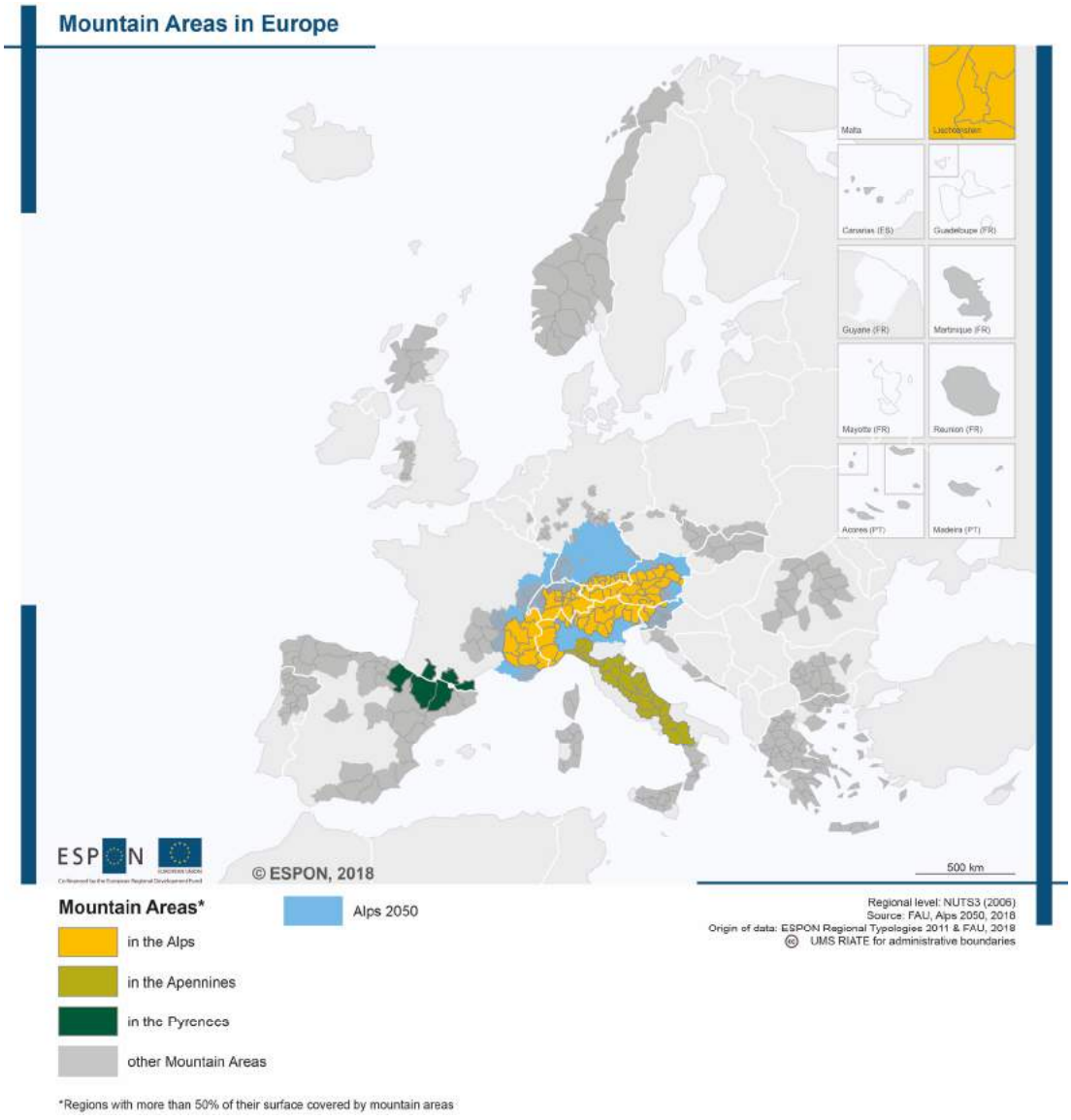


Map 11 Institutional mapping of the domestic contexts: country size, Alpine share, and political context

2.6 The European perspective on mountains

The Alpine region probably is the most prominent mountain region in Europe in a series of (high) mountain regions throughout Europe. Mountain regions are considered to be areas where cohesion policy legislation has to pay particular attention as they face specific natural characteristics (Art. 174 of the Treaty on the Functioning of the European Union), and developing place based strategies is an important basis. This is of particular importance as the macroregional level is expected to address so-called "common geographical challenges and potential" (COM 2014).

It is an interesting question to what extent the various mountainous regions are comparable and what their specific characteristics are. These questions are not really in the focus of the ESPON Alps 2050 project, but it seems very inspiring to at least shed a brief light on this aspect.



Map 12 The European perspective on mountain regions following the ESPON Typologies project

The ESPON programme has developed a typology of territories that comprises also the category ‘mountains’ (Dijkstra & Poelman 2011). The category is used for all NUTS 3 regions that show clear mountainous characteristic in morphological terms. From this perspective, the Alps are defined in a more morphological term that is pretty close to the Alpine Convention perimeter (cp. Map 12). Other scientific approaches are more elaborated (e.g. Drexler et al. 2016 based on EEA 2010) but cannot easily be adopted to NUTS 3 regional statistics.

If we compare the Alpine region with two further mountain regions with considerable size and height – the Pyrenees and the Apennine – the picture is the following: The diagram (Fig. 2) shows that the Alpine region is economically the strongest mountain area which is also more densely populated than the Pyrenees. However, the population density is even higher in the Apennine region, due to the presence of Firenze and some other city regions and also the less extreme morphology. The Alps 2050 area, going beyond the morphological Alps and comprising some of the most metropolitan areas European wide, shows maximum values in both dimensions. It is interesting to note that the Alpine region values (in the narrow sense) are very close to the EU average values of GDP and population density, and the transnational perimeter of the Alps 2050 space shows clearly values above EU average.

This picture can be seen as positive, as the socio-demographic situation shows rather high values, but it is not easy to draw conclusions at that point:

- This prominent position of the Alpine space underlines how much the European and Alpine levels are interlinked and influence each other.
- The Alpine region certainly is a strong and successful region that will have to undertake considerable efforts to keep this position and to exploit socio-economic potentials.
- At the same time, economic growth, settlement development, and multiple land-use demands challenge the sustainability of the Alpine development. The region has the potential to pave the way towards a smart, sustainable development and to be a role-model for mountainous and non-mountainous transnational spaces in this regards.

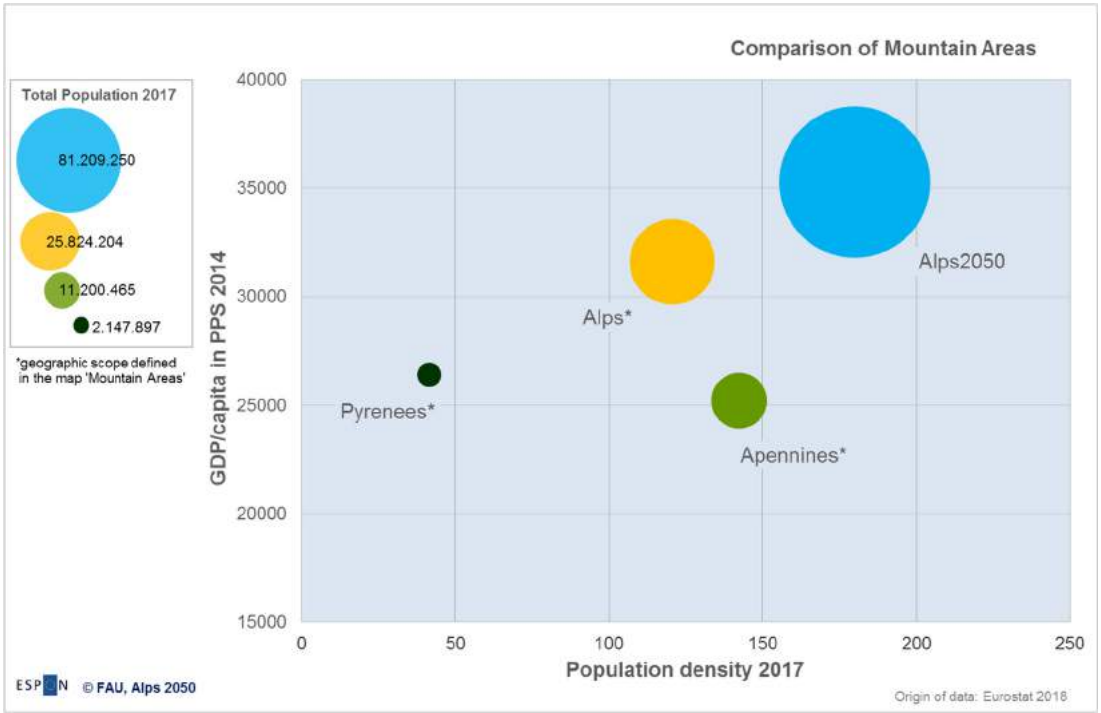


Fig. 2 Comparing mountainous regions in Europe (ESPON Typologies and the Alps 2050 region).

3 Spatial perspectives for the Alpine area and the Alps2050 vision

3.1 How to analyse the future

When reflecting on the development of the Alpine region up to the year 2050, we tend to leave solid scientific ground. The further in the future the references of prognostics and scenarios are, the larger becomes the uncertainty (Hopkins & Zapata 2007). This is true for all kinds of future related research, but in particular for territorial development as the multiplicity of influences and causalities increases uncertainty and complexity. This is certainly a challenge for the Alps 2050 project, aiming to anticipate more than three decades. The project does not claim to *forecast* or *predict* the future, but it aims to develop scenarios that facilitate or fuel political debates and that have the potential to give developments a 'direction' (Fürst 2012). These scenarios, however, are not purely qualitative assumptions, but they are based on territorial evidence and ex-post analyses of long-term past developments.

The following elements are part of the scenario development (cp. Fig. 3):

- The **territorial analyses,** which are the basis of the project, are summarized in the chapters above and are complemented by the annexes to this report.
- The **participatory elements,** in particular the Delphi study and the workshop conducted in May 2018, are described in more detail below and in the scientific annex.
- The **political documents**, which describe the political context, are explained below.

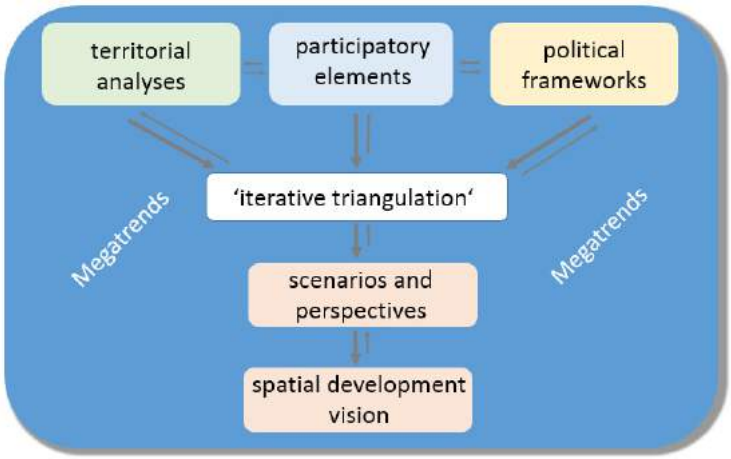


Fig. 3 Elements for the development of spatial perspectives, visions and guidelines

These elements are rather Alpine specific and aim to be as precise and territorially specific as possible. At the same time, the Alps 2050 region is embedded in large scale dynamics and contexts that must not be overseen. These are addressed as global and general 'megatrends' that potentially influence the trends and dynamics within the Alpine context.

Starting from the rich basis of information, opinions, ideas, and documents, scenarios have to condense the main characteristics and priorities in the process of iterative triangulation, i.e. by combining the arguments in a hermeneutic way.

3.2 Driving forces and (mega-) trends

The driving forces of the spatial development in the Alps 2050 region are in the first instance the same as for other regions: political and societal decisions, economic dynamics and the environmental context comprise the main impulses for development. Within these dimensions, Alpine specific aspects play an important role:

- **Environmental context:** The environmental context matters in many respects. In particular, morphology matters with regard to climate change, the provision of drinking water, the patterns of the settlement and transport systems, the tourism patterns etc. At the same time, morphological contexts do not determine choices and outcomes: Contemporary trends in economy and demography, which are less bound to the natural context, shows this very clearly (see cartographic representations above, Map 3, Map 6).
- **Political and societal decisions**: As territorial development is not predefined and determined it is largely the result of political decisions and societal claims. This is very obvious for the economic development paths that are predominantly characterized by national politics, for the different demographic trends of rural (and urban) areas that reveal a great variety of possible development paths and for many more facets of spatial development.
- **Economy**: The economic development is very diverse in the Alps 2050 perimeter. Touristic destinations are strongly linked to the natural (and cultural) context; the situation in agricultural structures is strongly influenced by domestic policies and increasingly by CAP effects and global implications; and, in general, many economic sectors are embedded in an innovative and globalized dynamic, trespassing the boundaries of the Alpine area (at whatever definition used). Sectoral perspectives are differing very much: an integrated spatial perspective seems an urgent necessity.

These driving forces have to be understood in the context of **mega-trends** that underlie European spatial development, but – again – often show particular forms in the Alpine region.

- **Globalisation and Europeanisation**: Historically, the Alpine region is characterised by many borders. There has never been an Alpine state or a united political institution. For a long time, the (mountainous) fringes and peripheries of larger states met in the Alpine mountains. This is why the European integration process – within the EU or with close EU interaction in the case of Switzerland and Liechtenstein – makes a real difference for the political functioning. The current debate on the border controls for example at the Brenner Pass illustrates the sensitivity of these questions. In parallel, all Alpine states are strongly involved in globalisation processes. The high prosperity of large parts of the Alpine region can only be explained by the economically successful role in globalisation processes. The ambitions of the Chinese Silk Road Economic Belt and the paradigmatic shifts in US trade policies are just two contemporary developments. The current political dynamic questions the postulates of an ‘ever closer European Union’ and of a

globalisation dynamic as it was prevailing in recent decades. It does make a difference, if European and global integration remain important flagships of European policies or if we will witness a renationalisation or fragmentation of political dynamics. The Alpine region has strongly profited from the integration processes, and, would severely suffer a fall-back. This is true for political reactions to climate change as to economic policies or tourism development.

- **Demographic change and migration**: As shown in the territorial analyses, the demographic development in the Alpine region is very diverse. In the long run, urban and metropolitan regions tend to show more positive trends, but many rural areas also show a positive demographic balance. Specific for the Alpine region are the trend for second homes and for amenity migration, even if quantitative data is not available in a standardised form. The megatrends in migration dynamics certainly will influence the Alpine spatial development, too: The ongoing societal differentiation and the diversification of lifestyles change migration patterns. Residential mobility is supposed to grow, focussing on places of dynamic labour markets and those of a high quality of living. From the Alpine perspective, this is a chance for economic development and can, at the same time, be a challenge for rural cultures that have to adapt to new dynamics. Beyond this predominantly domestic and the European dynamics, the international migration dynamic post-2015 is a European wide challenge. It remains to be seen how persisting global migration pressures will bring new challenges in particular to the rural spaces.
  In parallel, demographic change is a challenge for Europe and for the Alpine region. As shown in the territorial analyses, in some regions outmigration and ageing are an increasing challenge that is actually very difficult to mitigate. However, large-scale migration movements and international migration have already affected rural mountain areas and will contribute to future demographic trends as well. Adaptation strategies on how to deal with societal and cultural implications are of major importance.
- **Environmental change:** Climate change is a paradigmatic development that already now hits the Alpine region more severely than others. The sensitive mountain regions have to fulfil the role of forerunners with regard to climate change adaption: Disaster risk management, touristic adaption strategies, new energy concepts are just some keywords in this context. – Biodiversity changes have to be addressed via planning approaches, and sectoral environmental concerns raise huge long-term challenges with regard to core natural resources (water quantity and quality; air quality, noise etc.). These aspects have to be addressed in an integrated approach and ask for long-term place-based strategies.
- **Technological changes and digitalisation**: The implications of new technological options and the digital transformation are manifold, comprising all spheres of economic and societal life. Smart farming or home offices at ‘amenity places’ are two catchwords that illustrate the relevance and potential chances for the mountainous regions of digital transformation. Peripheral areas can profit from supply via drones, education and medical provision can change fundamentally due to online tools. Beyond this, focussing on the pre-Alpine areas with the traditionally high innovative capacity, the digitalisation trend means an opportunity for new markets and innovative paths. However, uptake of new technological tools requires social adaption and an appraisal of ecological and social threats and benefits as well.

3.3 The transnational political context

The political context is certainly as complex as the territorial structure, as shown in the governance analyses above (cp. chapter 2.5) - domestic, cross-border and transnational

processes and patterns, often characterised by a multitude of soft and hard instruments, lead to a high complexity and sometimes to conflicts of objectives.

EUSALP Objectives (Action Groups AG)	**Alpine Convention Protocols** (Working Bodies)	**INTERREG Alpine Space priorities** (Specific objectives SO)
Economic activities and innovation		
Growth / innovation	**Prot. Mountain farming** **Prot. Mountain forests** **Prot. Tourism**	**Innovative Alpine Space**
economic development (AG2)		
research & innovation (AG1)		Innovation (SO1.1)
Labour market, education, training (AG3)		
	Mountain Agriculture Platform	
	Sustainable Tourism Working Group	
	Green Economy Advisory Board	
Environment and ecocology		
Environment	**Prot. Spatial planning and sustainable development** **Prot. Nature protection and landscape conservation** **Prot. Energy** **Prot. Soil conservation**	**Low Carbon Alpine Space** **Liveable Alpine Space**
	Alpine Climate Board	
	Ad-hoc Expert Group on Spatial Planning	
Energy (AG8)		Low carbon policy instruments (SO2.1)
Green infrastructure (AG7)	Ecological Network Platform Mountain Forests Working Group	Ecological connectivity (SO3.2)
Resources (AG6)	Water Management in the Alps Platform	Cultural and natural heritage (SO3.1)
Risk governance (AG8)	Natural Hazards Platform - PLANALP	
	Large Carnivores, Wild Ungulates and Society Platform - WISO	
Accessibilty and services of general interest		
Connectivity [and society]	**Prot. Transport**	
Mobility (AG4)	Transport Working Group	Low carbon mobility and transport (SO2.2)
accessibility (AG5)		Services of general interest (SO1.2)
Governance	**Governance**	**Well-Governed Alpine Space**
	Macro-regional strategy for the Alps Working Group	

Table 1 Priorities of EUSALP, Alpine Convention and the INTERREG Alpine Space programme (sources: webpages of the mentioned institutions)

Table 1 illustrates this for the examples of the EUSALP, AC and ASP. It shows the overall objectives that are anchored in the key documents and the more implementation oriented institutional dynamics (action groups, working bodies, specific programme objectives).

This overview shows parallels in the ambitions to achieve sustainable development and one should mention that many of the activities have transversal ambitions and aims. At the same time, the table gives an idea of the multitude of discussions, concepts and instruments that lie behind the institutional settings. The link between the Alpine Convention and the EUSALP is in a phase of concretization (e.g. AC being and observer of the EUSALP and co-leader of and action group, and the invitation of the AC to EUSALP Action Groups to participate in the appropriate thematic working bodies of the AC). For the coming years, better aligning the concepts and forums seems to be more than plausible.

3.4 The participatory process

The perspectives and the scenarios are also based on participatory elements which are described more in detail in the scientific annex. Two elements are of major importance:

Delphi survey: A very efficient method to link analytical and normative questions during the research process is the Delphi method. For the Alps 2050 project, an online based two round Delphi was conducted (to record assessment and adjusted perspectives of respondents), this includes both textual and cartographic elements. Specifically, the project implements a so called policy Delphi study, i.e. a Delphi study that identifies and concretises political options for the future. The outcomes are an important pillar of the cartographic and textual Alps 2050 visions.

The selection of the Delphi experts followed the following criteria, a) *expertise* and b) an *institutional* balance and c) *geographical* balance. The expertise has both an institutional dimension (political mandate to contribute to the process) and a personal dimension (working experience on a relevant field for the Alpine development).

The first survey was initiated and invitations were sent out at the end of March 2018 to more than 100 experts that represent the above introduced governance setting which led to 52 responses. The second survey was conducted in July/August 2018 and discussed results from the first round and worked towards political options.

Those elements from the participants' response are part of the visions and scenarios that were important arguments throughout the two survey rounds. This is for the key elements of the scenario descriptions and also for most political milestones.

Workshop: The second key element of the participatory process was a stakeholder workshop on May, 23rd, in Munich, hosted by the Bavarian Ministry for the Environment. About 25 experts were present, including members of the Alps 2050 research consortium and the Steering Committee as well as further experts of the Alpine spatial environment.

This event took place between the first and the second round of the Delphi study and comprised two main elements: In the morning, the interim analytical results of the Alps 2050 project were presented and discussed. In the afternoon, four thematic stations reflected on the following topics, before a final plenary reflection concluded the workshop:

- Thematic orientations and perspectives of the Alpine spatial development towards 2050
- The role of EU funding post 2020, including cross-border tools
- National and regional planning tools in the Alpine context
- The relationship between the EUSALP and the Alpine Convention

The workshop did – at that stage – not aim to produce a concrete roadmap and political agenda, but rather served exploratory purposes. It was the objective of this workshop to better understand ongoing political discussions within the multi-level governance system and to link the analytical results to these political options.

All in all, the output of both the Delphi survey and the workshop served as a) access to information about the political process, b) the generation of ideas and arguments for future options, and c) to generate a clear picture of the future options for the Alps 2050 region.

3.5 Scenarios for the Alpine region

3.5.1 Different views on the Alps

With regard to the future development of the Alpine region, we differentiate one status quo scenario that carries forward existing patterns and trends, and three contrasting scenarios that reflect the differences in priorities and political world view. Fig. 4 shows very condensed graphic illustrations and the following descriptions summarise the fundamental characteristics of these scenarios. These scenarios are the result mainly of the Delphi survey (first round).

They differ from each other with regard to the spatial focus and fundamental political priorities. The following brief descriptions will be further detailed.

Fig. 4 Different perspectives on the Alpine region, from left to right: The scenarios 'status quo', 'protected Alps', 'functional area', 'European core'

Scenario 1 – Status quo

The status quo (or trend) scenario assumes that the hitherto dominant trends will be carried forward. Development paths are mainly based on national, domestic politics that lead to complex spatial patterns. The overall positive trend in economic development continues. However, this comes along with only limited success in achieving sustainable development and strategic spatial development. Dispersed spatial trends in demography and settlement development lead to dispersed developments, blurring the spatial structure of mountainous and non-mountainous regions and the urban-rural relations.

Scenario 2 – Protected Alps

The second perspective underlines the necessity to protect the inner-Alpine mountainous areas. The Alpine mountains are a precious and vulnerable natural and cultural heritage. Touristic demand, transport needs, settlement growth and other human activities have put this region under high pressure. Protection regimes as initiated by the Alpine Convention are more than necessary and are further strengthened. The dynamic of the 'metropolitan ring' surrounding the Alps will be organised in a way that does not question sustainable development within the Alps (e.g. with regard to settlement sprawl, transport emissions).

Scenario 3 – Functional space

The scenario that describes the Alpine region as one 'functional space' underlines the necessity to improve linkages between the different subregions. Towards the year 2050, the relationship between mountainous inner-Alpine and the more urbanised pre-Alpine parts will be strengthened, and in parallel the cross-border relations will be addressed more intensively. This has to be seen against the background that the territorial structure of the Alpine region is complex: The numerous borders between the Alpine countries have been frictions for a long time. Moreover, the Alpine region has important relations to adjacent regions (in terms of ecology, transport etc.). Smart spatial development strategies overcome existing frictions with innovative political agreements and with adequate infrastructure investments. Removing barriers and enhancing functional links is of key importance (e.g. for labour markets, budget organisation, public services).

Scenario 4 – European core

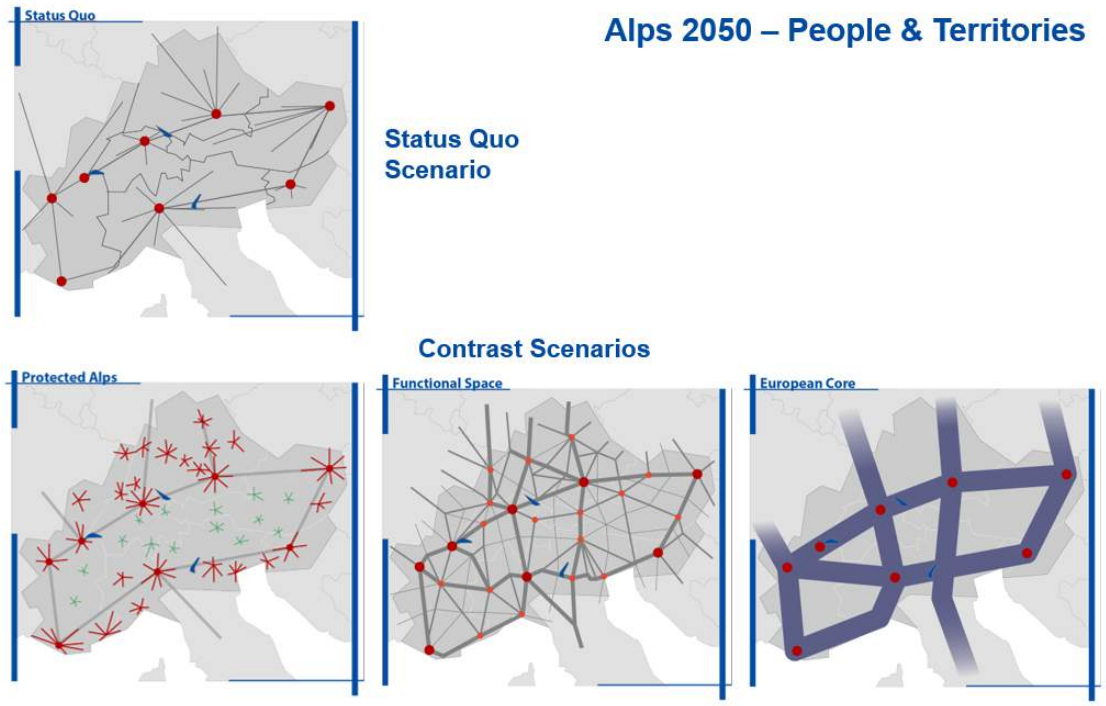
The Alpine region is one of the most successful economic spaces in Europe and one of the most attractive touristic destinations worldwide. Moreover, the position in the centre of Europe causes the need for transit flows to ensure European economic prospering. It is of major importance to build on this strong basis. The metropolitan 'hubs' and the major corridors are the basis of successful spatial development. Attracting skilled labour force and entrepreneurial

investments is as important as to ensuring good transport and economic flows on the Alpine and European level (e.g. with regard to transport and ICT infrastructure).

The following perspectives concretise the general scenarios. The systematic is to combine the general scenarios (status quo, protected Alps, functional space and European core) with the three dimensions that were already introduced in the early chapters of this report, namely 'the people and their territories', 'the economy', and 'the environment'. They are all based on arguments from the participatory elements and they can all be linked to trends of the territorial analyses. However, both the visual elements and the textual descriptions are very condensed, simplifying and, in that, certainly provoking. It is important to note that they are not intended to be spatial planning concepts but visions that show the range of competing priorities and their implications.

3.5.2 Perspective I: different views on 'the people and their territories'

The first perspective shows different priorities with regard to those features that describe and characterise spatial structures of the territories and the conditions of living for the inhabitants. This comprises in particular the demographic development, the settlement system, the (access to) services of general interest and transport infrastructure. Map 13 visualises the different scenarios in a very condensed way and differentiates one status-quo- and the three contrast scenarios as introduced above.



Map 13 The 'people/territories' perspective on the Alps 2050 space

Scenario 1 – Status quo

The status quo (or trend) scenario carries forward the development trends of recent years towards the year 2050. This comprises the following facets:

- The **demographic development** tends to be stronger in the metropolitan areas than beyond. The rural areas show a broad range of development paths, including areas of demographic change with strong outmigration and ageing as well as prospering developments. Along the valleys and in many accessible areas, urbanisation processes are strong.
- The **settlement and transport system** as well as the services of **general interest** are organised in a predominantly national way and the differences tend to increase. As a consequence, national differences between settlement systems are strong and there are hardly any transnational tools to address this topic. The advantage might be seen in the diversity of ideas and development paths. At the same time, complementarities cannot easily be exploited, and instead, cross-border bottlenecks remain relevant. The differences between more urbanised pre-Alpine and the mountainous inner-Alpine areas are reducing, mainly due to the urbanisation process in parts of the mountainous regions.
- The **governance setting** is predominantly based on a variety of soft instruments on the cross-border and transnational system; most binding tools and budgets are located on the domestic level.

Scenario 2 – Protected Alps

The scenario 'Protected Alps' assumes that the ecological role of the Alpine mountain area is pushed much higher on the political agenda and comes along with much stronger implementation regimes.

- With regard to **settlement** systems, this means to limit growth dynamics within the Alpine Convention perimeter in order to avoid further soil sealing and ecological disconnection trends. Construction activities and touristic infrastructure erection are strictly restricted and, in the most sensitive areas, forbidden. The large cities and metropolises surrounding the Alps are organised in a way that does not question sustainable development within the Alps, i.e. their impact on the near mountainous areas will be limited.
- The **demographic development** is characterised by stability as out migration is a less dominant trend in mountainous regions as here, local (endogenous) potentials are valorised intensively. At the same time, strong demographic growth is politically not supported in order to avoid further soil sealing and urbanisation processes.
- **Services of general interest** are mainly built on existing infrastructure, also in order to safeguard the traditional cultural context and the rural settlement structure. This is complemented with the possibilities of digitalisation in order to improve qualities without fostering local traffic or construction activities.
- The **transport** system is consequently transformed into a sustainable regime, including prohibition of certain transport modes (low-traffic-/traffic-free-zones on different scales), transnational toll regimes and a consequent organisation of multi-modal systems. Traffic within the mountainous parts is reduced, and existing infrastructure are managed with all facilities of the digitalisation era.

- The **governance** system has a focus on binding instruments, both in spatial planning and in sectoral policies. The different domestic approaches are aligned and embedded in European frameworks.

Scenario 3 – Functional space

The third scenario pursues the development of the Alps2050 region as a coherent functional region and overcomes barriers and frictions. More concretely speaking, this comprises the following aspects:

- The border effects are mitigated, allowing stronger functional linkages within the **settlement system** on the transnational scale. The relationship between mountainous inner-Alpine parts and the more urbanised pre-Alpine parts will be strengthened as well as those across poltical and administrative borders: functional linkages will be organised in a way that safeguards fairness and compensation between the different territories.
- **Services of general interest** will be organised in a way that allows good living conditions in all parts of the region with defined service areas. Digitalisation measures will help, but also investment in offers and accessibility helps.
- **Transport policy** plays a key role in this regard, differentiating diverse scales of accessibility (overcoming intra-regional bottlenecks, optimising transit flows). Multimodality is the key principle when developing the transport system.
- The **demographic development** continues to show complex patterns. Depending on the success of regional and local development paths and policies, prospering areas and spaces of structural change are often neighbouring. Still, the particular character of mountainous areas is maintained as urbanisation processes are limited by planning tools.
- The **governance** system prioritises networked approaches within the multi-level system. It is important to link domestic, international, and European cooperation forms. Moreover, it is important to develop the linkages between financial support and 'soft' instruments of regional development on the one hand and binding tools on the other hand. The existing cooperation formats will be aligned and consolidated in order to achieve a higher efficiency.

Scenario 4 – European core

The fourth scenario underlines the importance of the role that the Alps play as the 'European core': So far, the settlement and transport system is characterised by national specificities and local or regional needs. Transnational and European interests are anchored – amongst others – in the TEN policy, but implementation processes are rather slow and spatially not comprehensive (e.g. connecting lines for transit tunnels). Moreover, the economic policies are largely focussed on national interests. Towards the year 2050, the European perspective is considered in a much more systematic way and allows to adopt to the needs of a globalised economy and an integrated European market.

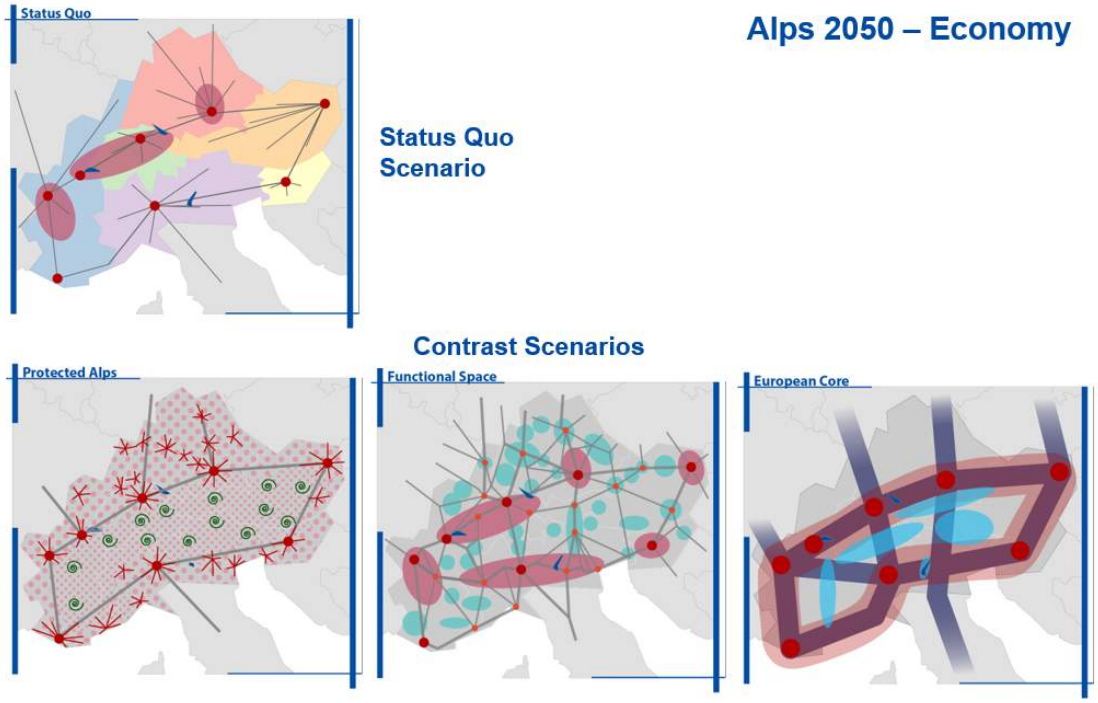
- The **settlement system** is part of the European urban network: Some large cities ensure the 'hub quality' in a sense that ensures gateway and headquarter functions. Accessible and well connected places host important players. Given the high European importance

of the large corridors in terms of transport volume (Brenner, Gotthard), they are developed as important development axes, not only for transport but in a multi-sectoral way.

- The **transport** infrastructure will be optimised in a way that further reduces transaction costs. A transnational and European transport policy helps to complement the existing small-scale approaches.
- With regard to **demographic development**, it is crucial to attract a sufficient number of highly skilled persons that allow future economic prospering. It is crucial to position and develop the Alpine region as an attractive place for in-migration, including amenity migration and with regard to multi-local life-styles. This requests a good accessibility and high standard in **services of general interest**, in particular in the most attractive landscape areas. This is a precondition for an innovative economy, in particular in times of demographic change.
- The **governance** focusses on links between European and domestic tools, aiming at a higher efficiency of development processes.

3.5.3 Perspective II: different views on 'the economy'

The second perspective focuses on the economic future, including all sectors like high tech R&D, tourism or agriculture. Map 15 shows condensed illustrations with regard to the status quo and the three contrast scenarios.



Map 14 Economic perspectives on the Alps 2050 space

Scenario 1 – Status quo

In the Alpine region, economic activity is – overall speaking – successful. The status-quo scenario towards 2050 shows an ongoing economic performance above European average which is leading to an overall prosperity within the Alps 2050 perimeter.

The internal differentiation is strong between the national regimes, between North and South, and between metropolitan and many non-metropolitan spaces. The status quo development shows the amplification of internal differences. The increasing differences on all spatial levels can be seen as a diversity that fuels productive competition; at the same time, growing differences lead to disparities. The existing main growth poles (Northern Switzerland, Upper Bavaria, Lyon/Grenoble) continue to expand their leading roles.

Scenario 2 – Protected Alps

Economic activity and policy has to consider the existing challenges that call for efficient production modes, post-growth approaches and the focus on endogenous potentials. From a spatial perspective, two economic areas have to be differentiated:

- The inner-Alpine and mountainous parts do not exceed their limits of growth which would endanger the cultural and natural heritage and sustainable development options. Soil sealing will largely be stopped, emissions reduced, transport flows limited etc. – against this background, economic growth will be rather limited. Instead, the potentials that exist in the field of biological and small-scale farming, soft tourism, sustainable use of local resources etc. will be exploited – the overall focus lies on regional value chain regimes and a green economy. In parallel, eco-system service provision must be seen as a delivery to pre-Alpine regions which can be an important economic perspective in the sense that these services are paid for. This leads to the preservation of landscape qualities, regional value changes and cultural contexts. Innovation dynamics have to focus on the greening of the economy and increasing efficiency.
- The pre-Alpine and rather urbanised areas continue to ensure the large scale supply with goods and services. However, sustainability has its role to play in these areas, too, as the innovative capacity will be shifted towards process improvements: inventing more efficient and climate friendly production regimes is a major task.

Scenario 3 – Functional space

The scenario of a joint functional space puts in the forefront the development of a transnational economic space. In this economic space, economic activity has to balance a) the focus on endogenous potential and cultural heritage on the one hand and b) the focus on competitive and innovative development in a globalised economy on the other hand. Innovation is a major driver for economic and spatial development. Innovation means technological invention that provides a competitive advantage in economic dynamic and that leads to attractive labour

markets and prosperity. Moreover, process innovation is an important driver for small and medium-sized entersprises (SME) firms that is of particular importance in many rural regions of the Alpine space. Innovation has to be seen as a comprehensive challenge that also refers to social innovation. The following principles are of major importance:

- Reducing transaction costs where helpful (removal of cross-border barriers)
- Building on existing regional innovation systems and innovation cultures, link them in a productive way
- Develop regional business clusters that rely on appropriate infrastructure contexts including education, real estate markets, and transport
- Support specialised intermunicipal cooperation axes that develop distinctive strategies
- Profiting from metropolitan functions that are already in place
- Building on efficacy (smart growth), considering the potentials of a greener economy
- Fostering labour force mobility on the intra-regional scale

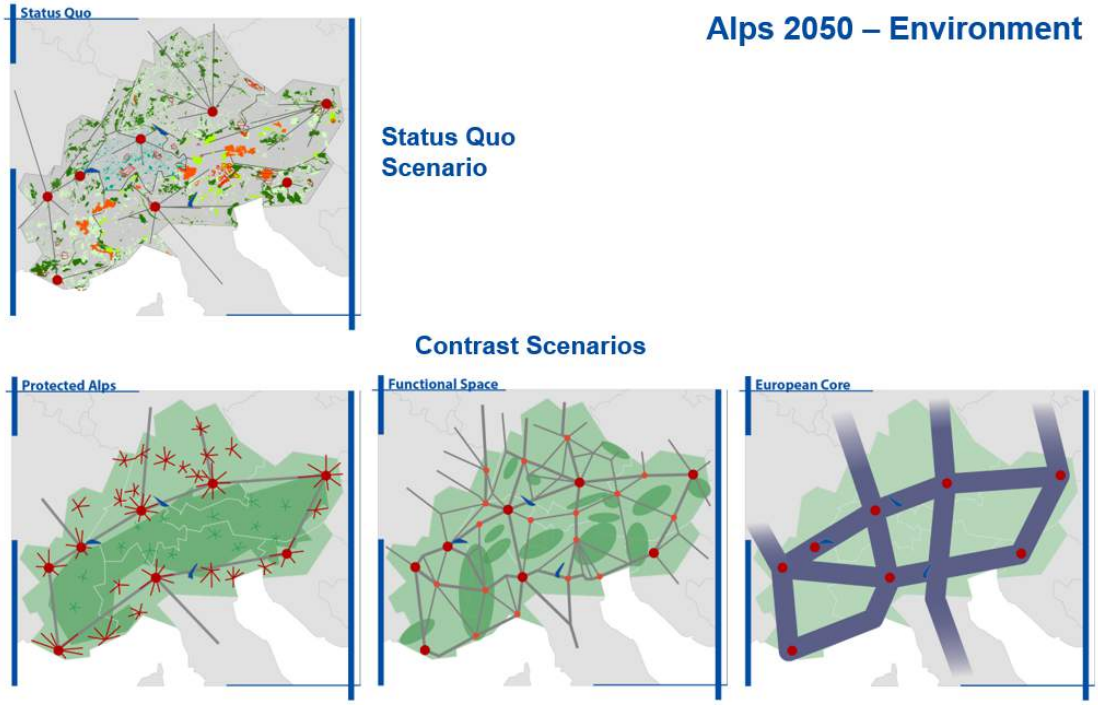
Scenario 4 – European core

The economic success of the Alps 2050 region over the recent decades shows the overall potential of this space. The central position in Europe and the productive competition of strong regions and states has led to a remarkable success. Further developing the strengths means to support the unique assets (e.g. Alpine tourism) and overcome remaining bottlenecks (in particular in the transport sector). From an economic perspective, the following issues will be addressed:

- A transnational economic policy supports the reduction of **transaction costs** in production and services. The already strong Alpine metropolitan ring will be positioned as a hub of the global economy. The rural spaces profit in terms of spill over effects.
- The structural change in the **agricultural** sector will (only) be steered where there is either an important role for tourism (typical Alpine landscapes) or where there is a competitive agricultural sector in place (fruit, wine in Southern parts, grassland in Northern parts).
- The **touristic** sector copes with a dynamic environment, including new clients due to climate change and geopolitical conflicts in other touristic destinations.
- As mentioned earlier, the Alpine region will be positioned in a stronger way as an **attractive living and working place** for the innovative and skilled labour force on a global scale. Developing the Alpine settlement system into this direction is an important part of economic policy, too.

3.5.4 Perspective III: different views on ‘the environment’

The last perspective focusses on the environmental future. Map 15 shows graphic sketches, again with regard to the status quo and the three contrast scenarios.



Map 15 Views on the environment

Scenario 2 – Protected Alps

The scenario of the 'Protected Alps' focusses on the maintenance of the natural and, at the same time, of the cultural heritage. In the Alpine regions, both dimensions are very much intertwined.

On the transnational scale, a differentiated protection regime has to be established and fostered. Generally speaking, the transnational perspective is of high importance as it allows to harmonise existing differences and to bridge cross-border gaps in protection regimes. This is in particular true for the following dimensions:

- **Area protection** and tools for ecological connectivity have to complement each other, and they have to function on a scale sensitive base, considering the European natural heritage and regional pressures. The protection regimes will be accompanied with implementation tools and sanctioning mechanisms.
- **Ecological connectivity** is a major objective, responding to soil sealing processes in particular in the vulnerable, mountainous regions. Connectivity can be insured by smart conceptions of area protection and by a systematic implementation of spatial planning objectives and also by sectoral biodiversity policies.
- **Climate** change adaption is a cross-cutting priority in spatial development, including mobility, housing, and tourism issues. Managing and reducing natural risks is a major concern in this context.
- At the same time, **energy** issues are high on the agenda: using regional sources is self-evident for the Alpine region. At the same time, limiting energy export to metropolitan regions, is an important issue in order to not overburden the mountainous regions.

- The main instruments are rooted in **spatial planning** regimes that combine the domestic (national, regional) systems with a transnational, Alpine wide basis.

Scenario 3 – Functional space

The scenario of the 'functional linkages' space focusses on place based approaches that overcome bottlenecks and develop synergies as well as complementarity. By doing so, regionally bound potentials and paths are generally seen as unique potentials on which future development can build on. The environmental perspective follows the following postulates:

- **Instrumental side**: There is already a multiplicity of tools in place that support a responsible ecological development, even if the efficiency is limited. Aligning and consolidating these instruments is of high importance.
- **Ecosystem services**: The inner-Alpine region provides a series of services that are linked to the unique natural quality. These range from leisure facilities and drinking water supply to biodiversity functions. That kind of relation between inner- and outer-Alpine regions has to be structured in a systematic way, including financial compensation mechanisms.
- Natural **protected areas** have to be seen as functional areas as they often have an intermunicipal, transregional, or transnational character. The reinforcement of ecological connectivity between natural parks and the introduction of new connections is important.

Scenario 4 – European core

Generally speaking, the Alpine region has an important role to play for Europe, also with regard to the natural dimension. The 'European core' scenario focusses on the function of the Alpine environment for Europe. These are most prominent with regard to the following issues:

- **Landscape**, tourism and leisure: The unique and attractive landscape and natural capital has to be safeguarded and developed for touristic and leisure use. Sustainable development also means that future tourists can still enjoy the beauty of the Alps and the cultural landscape.
- **Biodiversity**: In times of biodiversity loss, the Alpine region has an important role to play for the whole continent. Large scale area protection has to be safeguarded where other land use demand is not conflicting in a too fundamental way.
- **Climate and energy**: drinking water resources, energy supply and energy storage are major functions that the Alps have to fulfil in times of climate change. Providing these tasks – also for other European regions, will be compensated financially.
- **Instrumental view:** It is important to organise the environmental functions of the Alps in an efficient manner. This means to assign functions to those spaces where conflicts of interest are not expected to be fundamental. For example, biodiversity and protection objectives should be assigned, if possible, to those regions where competing land use needs are not too pressing. As a result, large scale zoning is an important tool.

After the presentation of these contrast scenarios in their sectoral differentiation the question arises if there can be *one* vision for the Alpine region. Before we go one step further into this direction we have a look into the instrumental tool-box for implementation.

3.6 Policy measures in the context of transnational cooperation

Independent from the question which scenario is to be favoured, there are certain tools that influence the sectoral domains and the spatial development. Table 2 gives an overview on the most relevant options. In the latter columns, the crosses indicate to what extent the tools 'fit' the different perspectives introduced above. Obviously, it depends on the concrete formulation of the proposed tools if they fit more or less to one or the other approach. Still, the indicative assignment shows different possible implementation options.

relevance for scenarios / Exemplary measures	Protected Alps	Functional region	European core
I. 'People and territories'			
- Corridor development schemes (involving transport, ICT, settlement development)	+	+++	+++
- Spatial development as explicit priority (action group, priority) also in EUSALP and ASP	+	+++	+
- binding measure catalogue for the removal of border-barriers, in particular with regard to transport infrastructure, juridical barriers	+	+++	++
- Binding planning tools for multi-modalisation	+++	++	+
- Transnational toll system	+++	++	++
- …			
II. 'Economy'		++	++
- Transnational economic policy programme	+	+++	++
- Labour mobility enhancement	+	+++	+++
- Soft tourism support programmes (cp. Bergsteiger-Dörfer)	+++	++	+
- Mountain agriculture policy exchange / joint support regime for mountain farming	+	+++	+
- …			
III. Environment			
- Organising eco-system services Alpine wide, linking pre-Alpine and inner-Alpine areas	++	+++	+
- Organising eco-system services on European scale (water, biodiversity etc.)	+	++	+++
- Protecting Alpine eco-system services from high metropolitan demand	+++	++	+
- Climate adaptation program	+++	++	+
- …			

Table 2 Exemplary policy options on the transnational level depending on the favored scenario

The policy options cannot be fully detailed at this point of time – depending on the political priorities, the concretisations might look very different. However, some explanatory remarks shed light on possible activities:

- **People & territories:** Activities in the field of spatial development comprise measures of soft strategic character, like the formulation of a leitmotiv where this project can be a step stone. Monitoring the spatial development is a technical and soft instrument at the same time. Some measures are of 'harder' instrumental quality: the corridor development schemes or the measure catalogue for the removal of cross-border obstacles are instruments of – rather soft – spatial planning and development. This leads to the question on institutionalisation: adding spatial development as an explicit task of the EUSALP and the ASP could be an option.
- **Economy**: Given the strength of economic mandates on the domestic level, the tools with regard to economic development will have to be rather soft – including aspects like labour mobility programmes or the further development of programmes like '*Bergsteigerdörfer',* initiated by the Alpine Convention, as a model how the Protocol on Tourism can be implemented on a local level by supporting soft tourism in Alpine villages. It is obvious that the protected-Alps-scenario prioritises the latter idea much more than the European-core-scenario, and vice versa for the labour mobility programme.
- **Environment**: The examples of the environmental section shows which implications the different scenarios have on the instrumental side: The Alpine-protection-scenario prioritises measures to limit strong demands from outside the Alps; the functional-area-scenario focusses on trans-Alpine flows, and the European-core-scenario prioritises the large scale interrelations.

4 Alps 2050 vision

4.1 One vision? Controversies and common ground

The last chapters have elaborated a series of perspectives, scenarios and options for the development of the Alps 2050 space that are contrasting and show differences in priorities, assessments, and fundamental beliefs. Defining *one* vision for the whole area is challenging, as political controversies will continue to matter also in future. However, beyond all controversy and the possible trade-offs, there is common ground, and many of the complemantary arguments in the scenarios can be combined in political processes, at least in the long run. Firstly, it is a key objective to ensure a good quality of life in the region for the inhabitants as well as for the incoming population. Secondly, it is important to develop fruitful and good relations between the different kinds of territories in order to maintain or improve the functionality of the whole region and the functions of the subregions.

Against the background of the territorial analyses and the stakeholders' input, one can approach the future Alpine development with two key principles:

- The Alpine region is a space of multifaceted diversity that partly lacks coherence, linkages and strategic orientation: The relations between urban and rural spaces, between mountainous and pre-Alpine territories, and along the manifold national borders are not yet elaborated. Addressing this challenge means to *better link* the different spaces, to bridge gaps and to define roles throughout the multi-level governance system. Defining relations between territories can mean to organise financial compensation schemes with regard to eco-system services, a transnational toll-system, economic policy measures etc.
- The Alpine region is facing considerable challenges of sustainable development. This is true with regard to the environmental dimension (climate change, urban sprawl, energy supply) and in parallel with regard to the social dimension (services of general interest, disparities) as in the economic dimension (structural change in agriculture and tourism, labour markets, competetivity). Addressing these challenges means to avoid trade-offs between these dimensions and, at the same time, to safeguard a long-term perspective. One key element to address sustainable development is *innovation* in the comprehensive sense. This can mean very different things (and still leaves ample opportunity for political concretisation): investment in technical R&D, pilot projects on digitalisation of SGI in peripheral mountain regions, social cooperatives in the field of tourism or renewable energies, etc.

Strategic spatial development has to be ambitious, including the formulation of localised objectives in territorial development. Taking up the main elements of the analytical and participatory elements introduced above, the following sections propose basic elements towards a spatial development process on the transnational scale, aiming to achieve a more sustainable development in a better linked functional region. Fig. 5 illustrates that the focus on spatial development takes into account other sectoral policies (economic, environmental, transport policy etc.) without fully covering the sectoral views as they cannot be fully reflected on in this report. The following sections formulate important principles and visualise possible ways of concretisation. It is obvious that the details have to be object of a political process, built

on the principles of participation and subsidiarity. From that perspective, the following sections and maps have to be regarded as a ‘working document’ that have to be developed further ‘on the ground’.

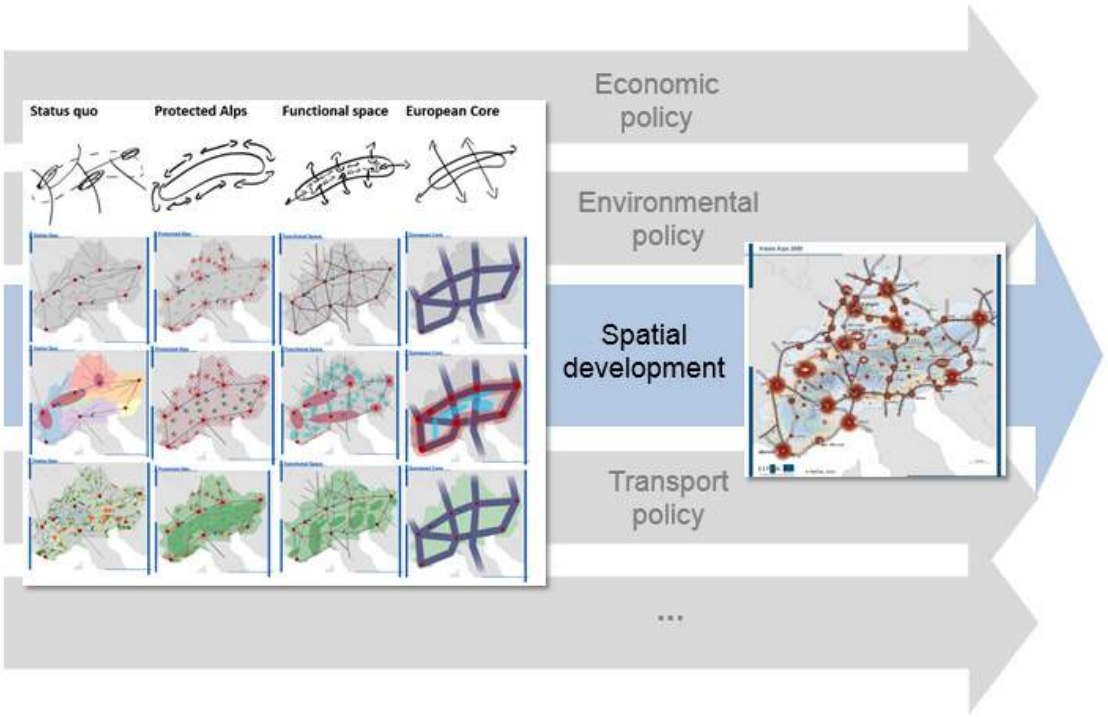


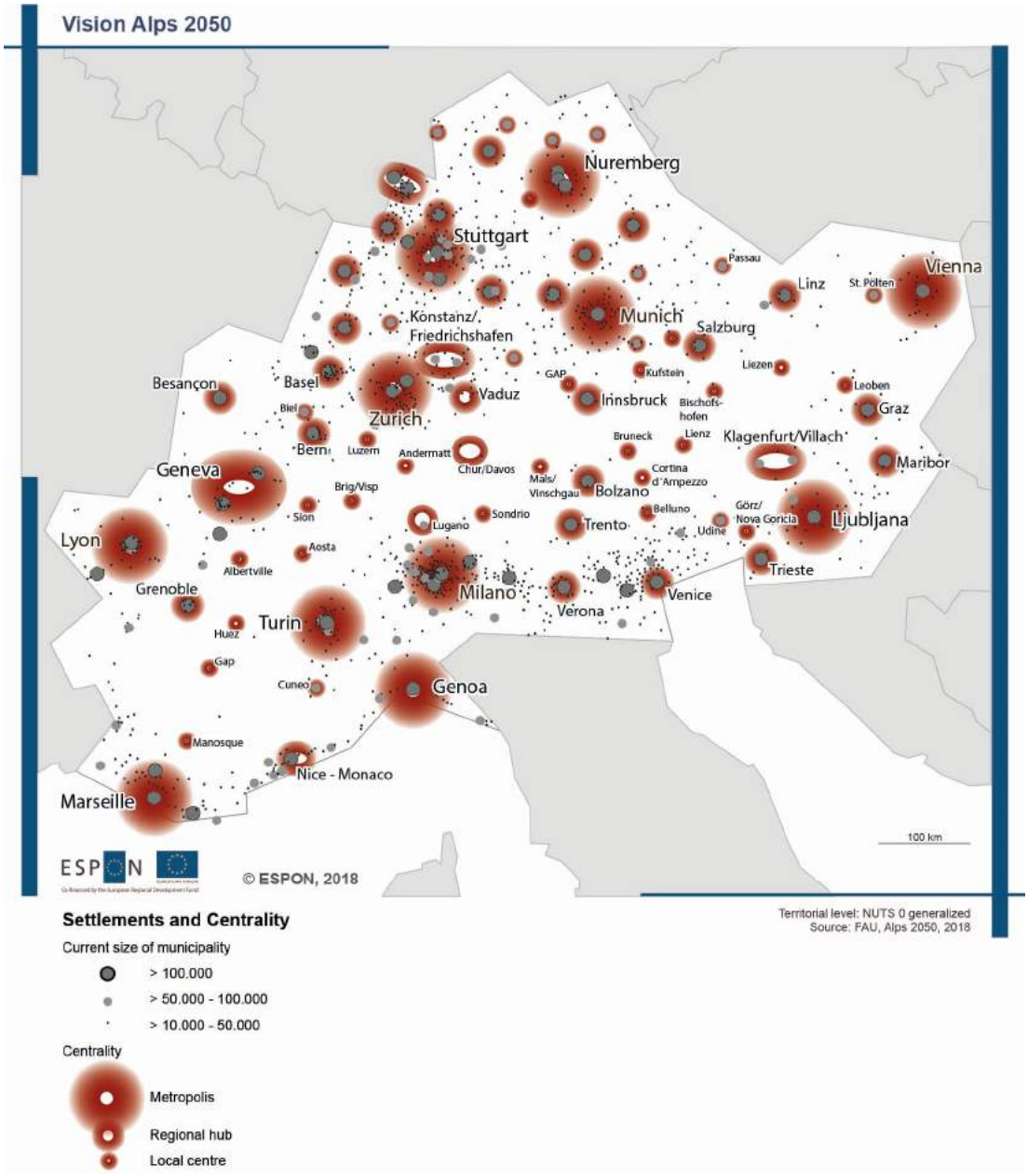
Fig. 5 From debate to development – the role of spatial development

4.2 An Alpine spatial development vision

4.2.1 Settlements and functional systems

Currently, the settlement system of the Alpine region is characterised by mainly national and regional policy regimes. However, the main challenges are the same in all involved countries: Processes of metropolisation put large cities under pressure whereas many regions of rural and mountainous character are confronted with demographic and structural changes. Providing adequate services of public interest is a challenge in both kinds of territories. Frictions along the many national borders in the Alpine region aggravate the anyway challenging situation. Moreover, the increasing share of older people shows that the challenges will grow in the coming years, even if the economic situation remains positive and skilled labour in-migration would continue.

The aim is to achieve a spatial development that ensures a good and comparable quality of life for all inhabitants and an efficient organisation of services of public interest. Urban and rural areas as well as mountainous and non-mountainous settlements have to be linked in a (more) sustainable way.



Map 16 The settlement system of the Alps 2050 vision

Map 16 combines two aspects: Firstly, it shows the current size of the larger settlements, differentiating three size groups (> 100,000; 50,000 – 100,000, and 10-50,000 inhabitants). This map illustrates the differences between the pre-Alpine areas with the far higher degree of urbanisation and the inner-Alpine areas with less and much smaller cities. Secondly, the map indicates the function of the cities for the surrounding area, i.e. its centrality. It is important to note that a) central spaces are no geographical points but nuclei for regional development that perform as rather soft spaces in practice. The definition of development areas has also to define risk zones that are less appropriate for settlement development due to climate change (flooding, landslides etc.). The map proposes three levels of centrality:

- **Metropolises**: The metropolitan cities are characterised by a central role on the transnational scale. They host economic headquarter and innovation functions and large scale political decision-making, with an excellent embeddedness into the globalized economy. They serve as gateways for many incoming professionals from other regions. In general, they have high numbers of inhabitants.
- **Regional hubs**: Regional hubs host important functions in economy and policy for the larger region. The settlement size can vary largely depending on the context (rather more than 100.000 in pre-Alpine and often far less in mountainous regions). It is important to safeguard a critical mass of high ranking R&D infrastructure, a complete offer of services of public interest and the potential for development without affecting rural spaces nearby ('decentral centrality'), in particular as strong suburbanisation processes are already going on. In exemplary cases, the positioning of two cities as one regional hub illustrates that 'division of labour' can help to provide the most fitting basis.
- **Local centres** have a high importance for rural spaces, in particular with regard to services of public interest and for economic incentives. In the mountains, some of these centres have less than 10,000 inhabitants and still provide important functions for their catchment area.

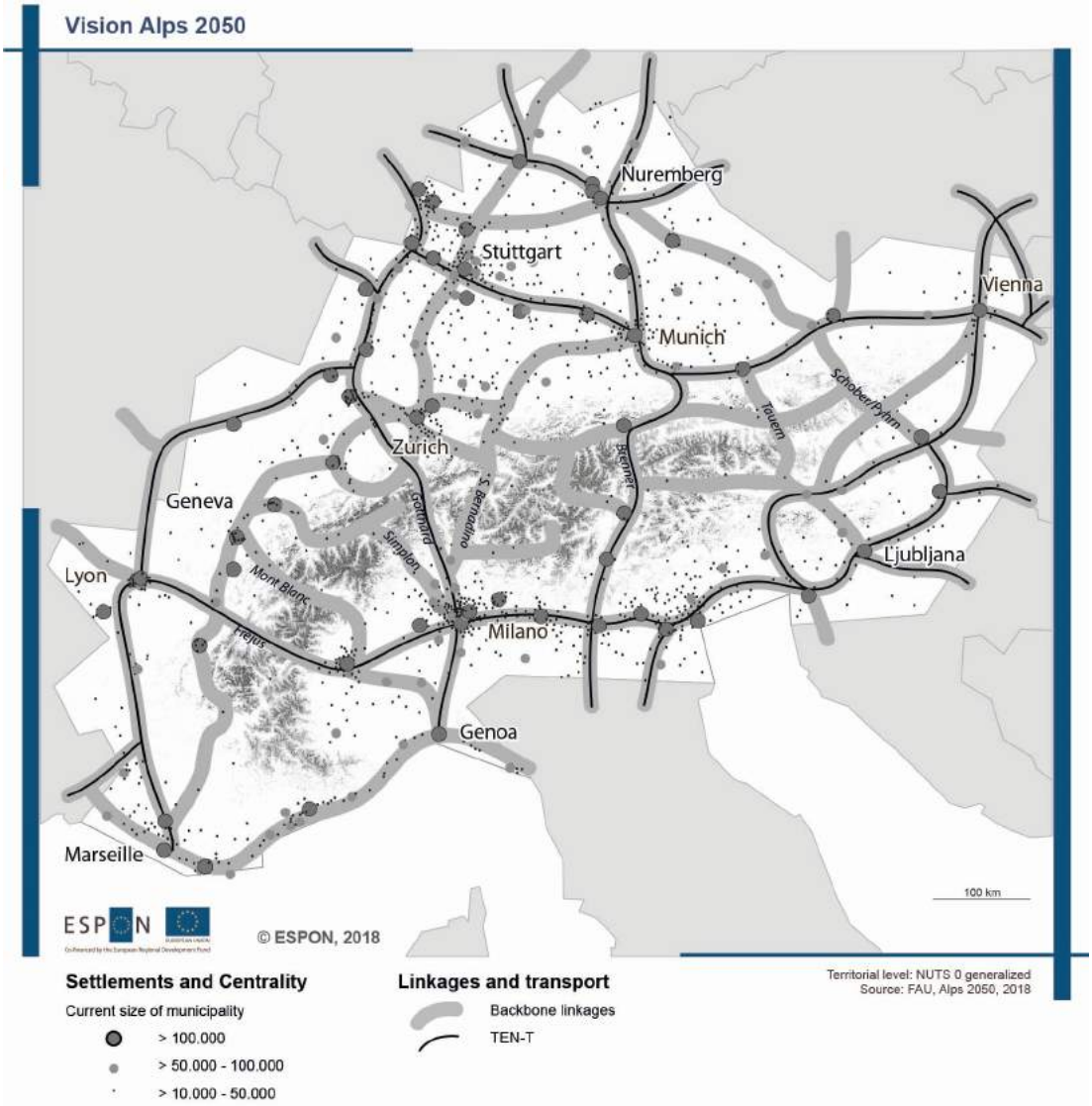
Political action: The organisation of settlement systems is a domestic policy field, following the principle of subsidiarity. Still, the following political activities on the transnational scale can improve the situation:

- Work towards a possible political definition of a common typology of settlement functions on the transnational level as proposed in our map. This may facilitate monitoring and exchange.
- An action plan on the removal of cross-border barriers would improve the organisation of public services across boundaries.

4.2.2 Linkages and transport

The spatial structure of the Alpine region is characterised by functional linkages on different scales that are based on axes and corridors, carrying major parts of transport flows, hosting main parts of the settlement system, and providing important services of general interest.

The challenges are manifold: growing transport quantities (in particular of freight and via road) aggravate current traffic problems which imply a significant economic and environmental burden and question the local quality of life. Non-action would mean almost permanent congestion situations, increasing noise and air pollution and a widely-shared sense of decreasing quality of life in large scale corridors. Already now, political conflicts along transit routes are serious (among national ministries and between subregional entities along the connecting routes and national decision-makers). It is obvious that improved coordination is needed, including both sectoral transport policy measures and integrated spatial coordination. At the same time, local accessibility remains a complex challenge in many mountainous parts.



Map 17 Linkages, corridors and the transport system of the Alps 2050 vision

The objective is to balance transnational mobility and accessibility on the one hand, and ecological quality and good local quality of life on the other. This can only be achieved by considerable efforts on the domestic level, but requires also increased attention at the transnational level. The new infrastructure and the new modes of mobility lead to new geographies due to new accessibility patterns that fundamentally change regional development paths. – Map 17 differentiates the following elements:

- **Backbone linkages**: The (inter-) regional axes further strengthen the existing transport and settlement systems, taking into account the morphological structure (in particular along the valleys). It is important to concentrate growth dynamics along these lines in order to avoid sprawl and to ensure efficient spatial structures in the long run. They have an important role for intra-regional connectivity. In the mountainous areas, they represent the main valleys that are traditional development axes. These axes are important for settlement growth management, economic dynamics, and an efficient organisation of services of public interest.

- **TEN-T**: Many of the backbone linkages host the TEN-T infrastructure that are displayed in the map. It is important to implement the investment measures that were decided on the European and transnational level. Some of these large scale connections have a high transit relevance (North-South, but also East-West).
- **Major Alpine Passes/Tunnels**: The major Alpine passes or tunnels are displayed here mainly for the purpose of orientation and as important elements for regional dynamics.

Political Action: Towards the year 2050, the following actions have to be undertaken:

- **Sectoral level**: The TEN-T has to be completed, including connecting routes, completing a transnational accessibility regime. Moreover, enhancing multi-modality, combining in particular road and rail, is of high priority. A transnational toll policy might be an important element in this respect. In parallel, internal accessibility (passenger transport) has to be developed in a sustainable way.
- **Integrated spatial development**: Transport policy has to be closely interwoven with general spatial planning processes. There has to be a clear differentiation of transit flows of high quantities that have to be organised along few corridors that are capable to handle large flows in a way that does not harm environmental quality. On the other hand, accessibility on the regional and local level have to be closely linked to questions of the settlement system including services of general interest and to economic dynamics.

4.2.3 Territories

Spatial development in the Alpine region is challenging as manifold demands meet on a complex and vulnerable territory. The challenges on the transnational scale are manifold, but the relations between urban and rural as well as between inner-Alpine and pre-Alpine areas are often unclear: the political organisation of transport flows as well as eco-system services, the development of services of general interests and of economic activities is a complex task and has to consider its territorial dimension. Areas of long-standing SME innovative tradition, agricultural communities, hotspots of biodiversity and areas of structural transition meet on the ground. Detecting and developing their potential is the key task.

The objective is to achieve a sustainable spatial development process that goes beyond domestic regimes but that develops potentials on a cross-border and transnational scale. A common definition of priorities and complementaries facilitates a spatial development that addresses common challenges.

From the environmental side, this means all key principles of ecological development, including limitations to soil sealing and settlement sprawl, and ecological connectivity by means of and beyond protected areas. In particular, climate change mitigation and adaption measures are crucial. In order to address the much accelerated and particularly dangerous threat, the implications of climate change have to be addressed in particular on the Southern side of the Alps. Adaptation strategies comprise risk management, including mountain forest management, and water resources management. Measures of sustainable mobility, new construction modes and energy systems contribute to climate change mitigation.

From the economic side, endogenous potentials have to be developed in many respects. Regional innovation systems have to be further developed in those areas that have a high density of sectoral and cross-sectoral dynamics in innovation and business creation based on networks of firms and institutions embedded in regional economic paths. Generally, these dynamics can be found in both metropolitan spaces as well as in rural areas. The objective has also to be to reduce the North-South gradient in economic performance. In parallel, the agricultural sector will undergo further structural change. Given the high importance of this sector for the Alpine landscape and – indirectly – for demographic development, the settlement system etc., political support is important in order to maintain the functioning of this sector also in times of structural change. Within the touristic hotspots, an orientation towards sustainable modes of transport and activities is strongly supported. Beyond the touristic hotspots, the potentials of soft rural tourism will be exploited comprehensively.

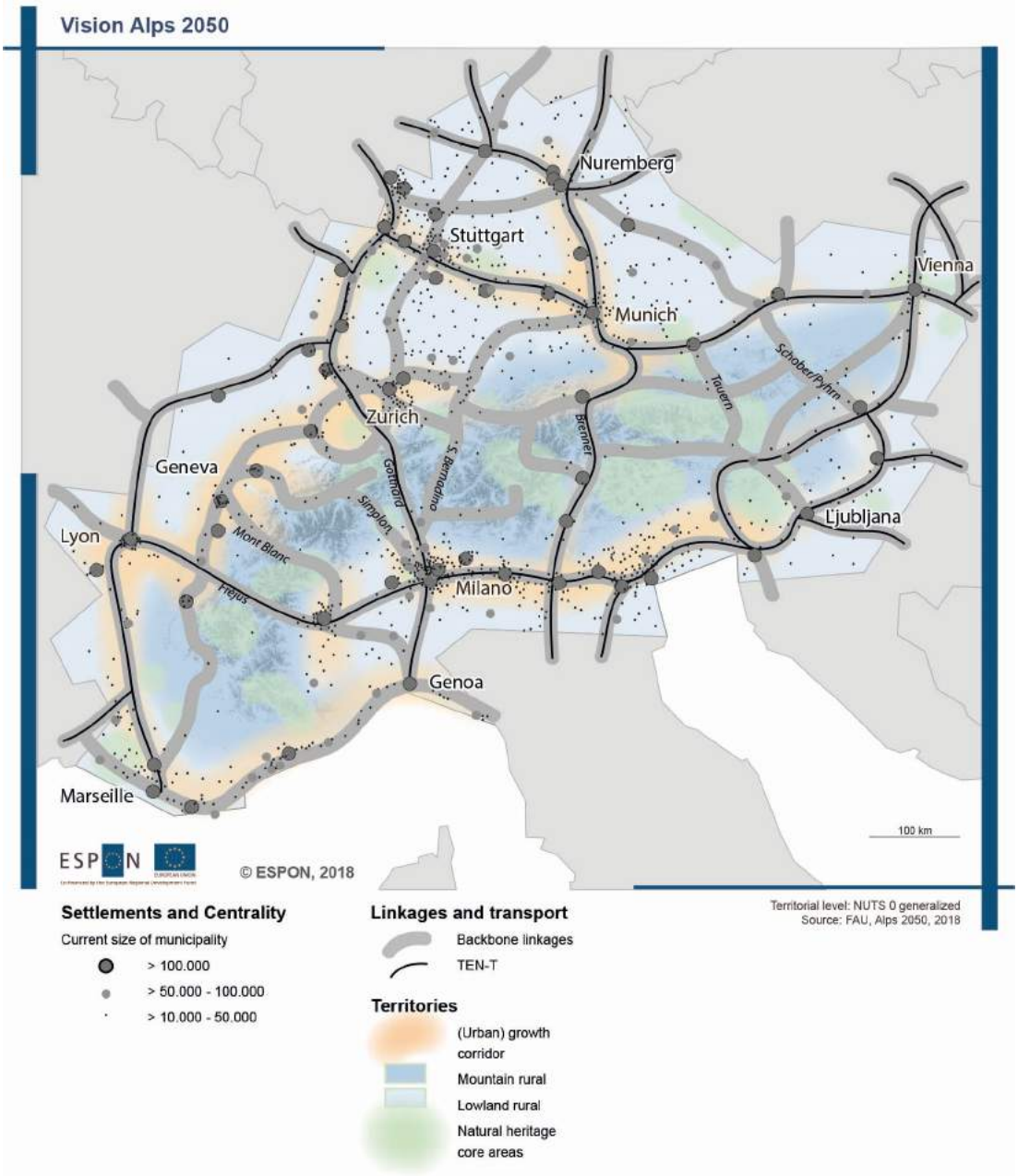
- **Innovation orientation**: in order to safeguard the relative economic strength of the region, and in order to enhance sustainability in economic activity, the focus will lie on innovation. This comprises technical R&D, economic post-growth models, pilot projects, social innovation etc.

Map 18 differentiates four general kinds of territories – not neglecting that spatial development on the ground has to go far beyond these more general categories.

- **(Urban) growth corridors** are very much linked to the above mentioned backbone linkages. Concentrating growth dynamics on these corridors is important in order to avoid settlement sprawl and in order to achieve an efficient spatial organisation. The spatial development should follow the principle of 'decentral concentration': growth has to be oriented on the existing settlement basis. Demographic development is supposed to be more dynamic in the already urbanized areas whereas rural areas in and beyond the mountains are supposed to be stable.
- **Mountain rural**: Due to the lower population density, the morphological context and the often less positive demographic situation, spatial organisation in these regions has to undertake considerable efforts with regard to the assurance of access to public services. From the economic perspective, smart innovations are of major importance that lead in the best case to rural innovation systems, potentially comprising technological, agricultural and touristic dynamics. In particular, regional opportunities along the backbone linkages, but also niche options beyond those areas should be seized and developed. At the same time, mountain areas are particular living spaces where the high quality of life has to be maintained, developed and often improved.
- **Lowland rural**: The category of rural areas beyond the mountains is very diverse and comprises different contexts in the demographic and economic sense. Developing endogenous potentials and developing fruitful linkages to the metropolises and other centres is the main task.
- **Natural heritage core areas**: Protected areas are one important aspect of environmentally sound development. The map is not meant to show the exact protection regimes but illustrates a spatial category that prioritizes action to protect and develop natural heritage, taking into account touristic potentials wherever reasonable (in the map based on existing UNESCO sites and national parks).

Political Action means in particular the following points:

- **Innovation focus**: Economic development strongly depends on innovation in technology, and, at the same time, adaptations in economic and social processes. Supporting innovation with R&D infrastructure, networking facilities on a transnational level have to be organised in a cross-border way where possible in order to develop endogenous potentials .
- **Cross-border protection regimes**: The hitherto established protection areas are predominately selected and restricted to national boundaries. Strengthening the cross-border dimension is very promising, considering the primary challenge of ecological connectivity.

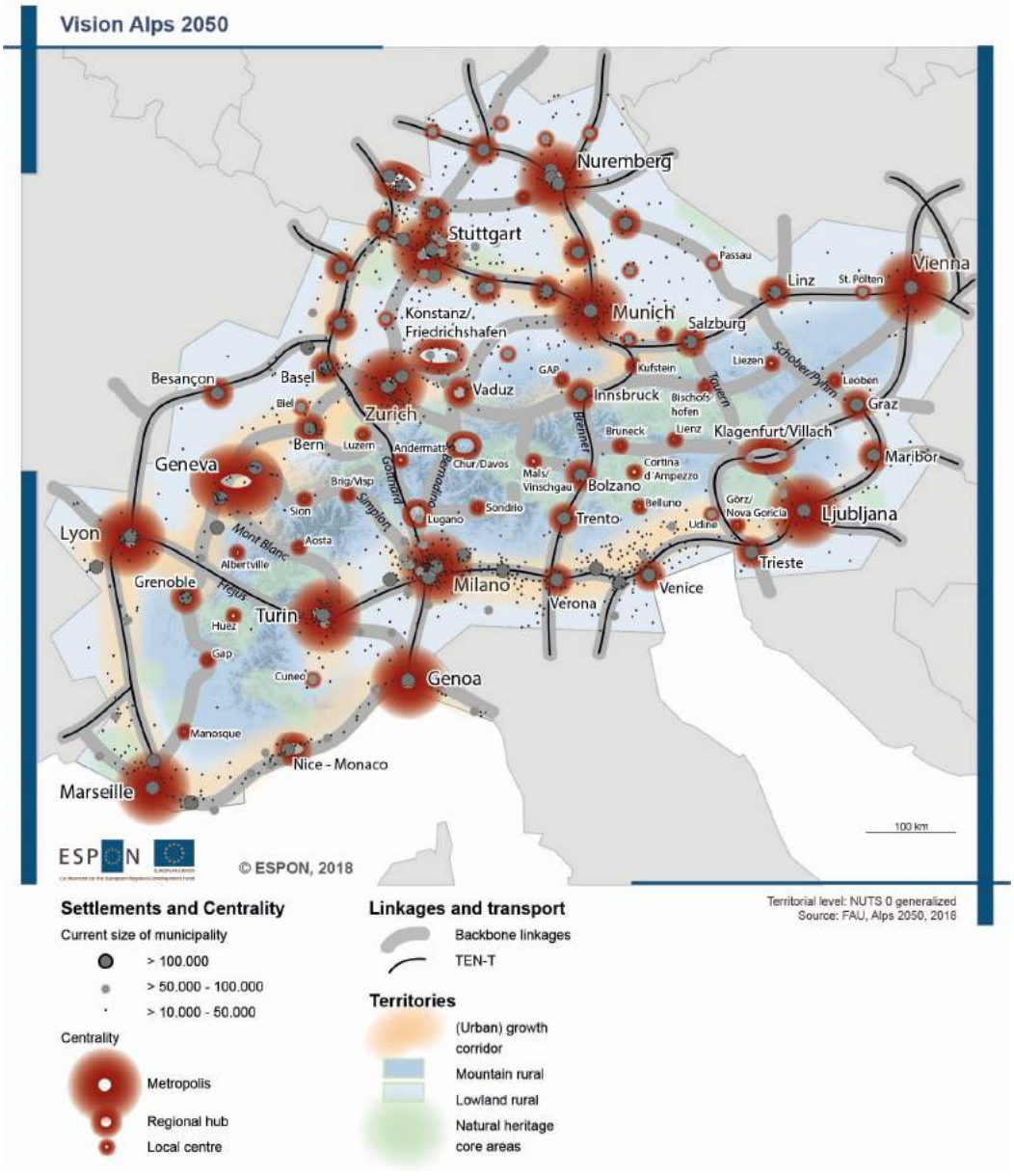


Map 18 The territorial structuring of the Alps 2050 vision

4.2.4 Synthesis

The **general objective** of the Alps 2050 vision is to achieve a balanced spatial development based on sustainability, safeguarding a good quality of life and an efficient management approach of governance. The political measures introduced in the sections above contribute to achieving this goal. Map 19 combines the different dimensions in a visual and simplified way.

The Alpine region is the 'contact zone' of different natural spaces and of regional and national regimes and cultures. Turning this diversity into capacity and creating a real transnational region is the objective. Achieving sustainable development demands to use the synergies and complementarities on the transnational level needs common action of the actors throughout the multi-level system, including sectoral policies and the cross-cutting spatial development perspective.



Map 19 Alps 2050 vision

4.3 Towards implementation

4.3.1 Juridical instruments and governance

The question is which transnational activities can be taken in order to work towards cohesive territorial development and sustainability (see also Table 2). With regard to juridical instruments, the scope is limited. On the European level, the mandates for spatial planning are rather weak, and this is also true for the transnational level. Against this background, soft tools of spatial development, including cooperation processes, strategy formulation processes, monitoring etc. play a key role. A series of INTERREG projects has often helped to initiate and foster these elements.

Certainly, spatial development cannot be based on soft instruments alone, but they have to be embedded in binding development strategies. At the moment, the binding elements are mostly located on the domestic level (e.g. spatial planning, transport system development) and on the European level (e.g. Habitats directive). The intergovernmental treaty of the Alpine Convention is binding among the Parties who have ratified it, including the Protocol on Spatial Planning and Sustainable Development. Against this background, *implementation* is an important topic: Formulating leitmotivs and objectives or establishing committees and seed money programmes is helpful in particular in consensual questions. In more controversial topics, implementation mechanisms have to come into play if political dynamics shall be kept. At the same time, over-institutionalisation and enhanced complexity should be avoided.

4.3.2 Governance

In parallel to the debate on the contents of territorial development, there is an ongoing discussion on the development of the governance setting. The underlying debate can be summarized in a very condensed way: Should the existing institutional structures be consolidated and concentrated or should the high number of cooperation formats be seen as a fruitful diversity (‘diversity vs. consolidation’). The common ground in this debate is that there has to be an efficient use of resources and that the institutions should be relevant in what they do. Taking up the above mentioned postulates of promoting *links* and *innovation*, the institutional links between existing governance formats would have to be further developed.

In particular if we take the call for more consequent approaches to soft spatial planning serious, the governance situation has to be further developed which is currently characterised by institutional density and long standing experience. Some experts from the Delphi survey and the Alps 2050 workshop call for *consolidation*, others see clear advantages in institutional *competition* that might be creative and fruitful. In any way, more *effective* settings are a consensual objective (cp. Table 1). A consequent reflection on mandates and division of labour amongst the involved institution is a minimum common denominator. The objective is to reduce overlaps, to concentrate on core issues and to cooperate in order to make better use of synergies.

4.3.3 Funding and discursive instruments

'Soft' instruments are of key importance for regional development in general and they are crucial in the transnational and European context, also due to a lacking strong political mandate on the supranational level. Soft instruments comprise *funding* opportunities and *discursive* instruments, i.e. instruments that serve political agenda setting, publicity, networking dynamic activity etc. Different from binding juridical instruments, the effects cannot be 'forced', but the long-term effects can be strong.

Funding in the Alpine region means the INTERREG Alpine Space Programme (ASP) and the different cross-border programmes; the financial volume is often higher in other European programmes that do not have an explicit territorial dimension. This comprises namely structural funds and sectoral budgets, in particular the agriculture and rural development funding, but also TEN support for the transport sector, Horizon programmes for research, LIFE for environmental policy etc. One has to add that funding remains a predominantly domestic topic and that national and regional governments hence have a decisive role on development trends

Funding on the transnational level is very much dependent on the EU level on the one hand as e.g. ERDF regulations can only be adopted to a transnational area in a limited way. At the same time, the domestic influence is large, due to domestic programming processes and co-funding conditions. But having said this, there is still scope for reorientations in the following directions that have been formulated in the Delphi study and the workshop activities of the Alps 2050 project:

- **Alignment**: Alignment means stronger links between programmes and easier combination of funding opportunities (multi-funds approach). This is of crucial importance due to the macro-regional three no's prohibiting new institutions, new regulations and in particular new budgets. Better linkages between the different strands of European Territorial Cooperation (ETC), between ETC and investment oriented funding (cohesion, agriculture, horizon etc.), and the combination with domestic funding is of key importance.
- **Innovative funding**: Reducing the high bureaucratic burden in European funding in general and in particular in cooperation is an ongoing challenge. Beyond this debate, many experts of the Alpine region call for more openness for innovative projects and experimental action that are currently impeded by formal requirements. This includes a more explicit focus on spatial development and goes beyond purely sectoral policy strands.
- **Inter-regional policy processes:** The existing platforms on the transnational level (in particular the EUSALP action groups and the Alpine Convention working bodies) are without a doubt a good basis for further political dynamic: Improve data availability, ensure public transparency, pave the way towards transnational action is the promising direction (as it has been done for the transport policy under the roof of the so-called 'Zürich process'). Developing such processes for labour market mobility, mountain agriculture support initiatives or ecological connectivity regimes are more than promising.

In practise, *discursive* tools are very much linked to financial instruments: Many programmes are supposed to work as seed money that lead to more permanent processes, dynamics and structures. Alparc, the Alpine network of protected areas, is a good example: it is a network structure – thus discursive instrument – that profits often from ASP funding instruments. There are a lot of success stories of 'soft' instruments in the Alpine region, often linked with very engaged (cross-border, transnational) expert communities.

If we take the postulate seriously, that the complex Alpine structure profits from activities that link different territories, their actors and institutions, this is almost a direct plea: Proceeding with the established INTERREG activities of exchange, learning and networking is a precondition for tailor-made territorial development. Maintaining and developing expert communities and fuelling innovation processes has to be based on these opportunities. This is also true in times of tight budgets and institutional reforms on European level.

On the European level, the ongoing processes towards the post 2020 period of regional policy and the multi-annual financial framework (MFF) are a dynamic background which is not easy to understand from outside the political fora. The most relevant recent documents comprise the Commission's Communication *"A new, modern Multiannual Financial Framework for a European"* from February 2018 (COM 2018a) and the Commission's draft regulation from May 2018, (COM 2018b), on the Multiannual Financial Framework (MFF) post 2020.

One of the important questions is to what extent and under which conditions the European Structural and Investment Funds shall continue to be available to all EU Member States, or if the policy should be limited to less developed regions and/or Member States. Large parts of the Alps 2050 perimeter can be regarded as economically strong, as described in more detail above. So the Alpine region is concerned by this question – the three scenarios drafted by the EC illustrate this clearly (COM 2018a: 11). At the same time, cohesion policy legislation has to pay particular attention to regions which are characterised by severe and permanent natural or demographic handicaps which is particularly true for mountain regions (Art. 174 of the Treaty on the Functioning of the European Union), and therefore the cohesion policy legislation has to make sure that the Alpine regions will have adequate funds in order to face their specific challenges.

Agriculture and rural development funds traditionally play an important role for the Alpine region, and the Commission's reflections refer to this by mentioning the necessary support for agricultural production in less profitable or mountainous regions, a focus on small and medium sized farms, investments in sustainable and resource efficient production systems and better coordination with rural development measures" (COM 2018a: 12). If unique landscapes, the balance of human and natural demands, culinary diversity etc. are important topics on the political agenda, CAP has a role to play within the Alps 2050 perimeter.

A good information base is an important basis for evidence informed policies. Despite a rich and performant diversity of scientific and consulting actors in the Alpine region, including the AC Reports on the state of the Alps, there are still gaps: If the potentials of *common challenges* are at the heart of transnational policies, the knowledge base has to be improved. There are good examples on the field of the traffic policy with regard to the transit theme (iMonitraf etc.), but few information beyond. This is true for economic and trade interlinkages, for labour market mobility, for eco-system services etc. (cp. the chapter on “proposal for further research” in the scientific annex).

5 Guidelines for setting up spatial perspectives in transnational cooperation areas

The Alpine region, certainly, is characterized by its unique landscape and the particular political setting. At the same time, many questions of the Alps 2050 project are typical for a transnational space: Balancing needs for development and protection in a diverse and complex territory is a fundamental question in European spatial development.

Fig. 6 illustrates in a simplified overview which elements are most relevant for setting up spatial perspectives on a transnational level. The first strand, the *territorial analysis*, is described in more detail in the scientific annex. Questions of indicator selection and data availability are in the foreground here. It is important to apply, firstly, a sectoral analysis that allows to achieve a differentiated understanding of spatial development of different indicators and interrelations. Wherever possible, a combination of ex-post, state-of-the-art analyses and projections are helpful. In order to achieve an integrated understanding of spatial development, indicator combinations like simple cartographic combinations or more complex cluster analysis are an important step. Synthetic representations (mapshots, clear wording) help to summarise the most important aspects.

Territorial analysis:	sectors	>	combinations	>	syntheses
Participatory involvement:	expert community	>	decision makers	>	broader public
Implementation perspective:	structures >		dynamics	>	visions

Fig. 6 Basic elements for setting up spatial perspectives

In parallel, *participatory elements* ensure a) the alignment of territorial insights with political agendas and b) the acceptance and relevance of the results for future development. Participation has to respect that those persons involved can contribute with their particular expertise and that their assessment and views will be taken into account for future discussions. This will in most cases have to be done on different levels: It seems reasonable to consider the expert community – typically high ranking officials from administrative institutions like ministries and implementing agencies – in the first place. In the next step, a more political circle should be involved, addressing decision makers from different levels and priorities. The question is if and when the involvement of the broader public is useful. Certainly, a transparent process is indispensable, but surveys and dissemination campaigns are only worthwhile if the questions are comprehensible and relevant to the broader public and if their assessment has a realistic chance of inclusion in concrete implementation. Due to the high complexity, the broad public might not always play a central role in participatory processes on the transnational level.

These three different strands can lead to more congruent or divergent results that have to be combined and aligned in a careful way. There is no easy technical implementation path for this. Instead, the process has to follow some basic principles, using scope for real transformations, namely:

- **Evidence base & transparency**: Territorial development can be described, understood and debated on the basis of the various relevant data bases. The Alps 2050 project illustrates the multifaceted information potentials and limitations. It is important to make use of it in an extensive way. At the same time, the data base tends to become complex and is not always straightforward and easy to interpret. This is why a transparent and reproducible approach and documentation is important.
- **Pragmatism & prioritisation**: Territorial development is multifaceted and complex, so a really 'complete' and 'holistic' analysis is hardly ever possible. Instead, it is important to set priorities and be pragmatic wherever further details do not lead to improved understandings – for example, it is not always necessary to have the most recent year for the data base, it is not always necessary to work on the smallest scale of observation (e.g. LAU2), and it is not always helpful to consider as many local strategy papers as available.
- **Openness & awareness**: In parallel to the complexity of analytical tasks, the sensitivity of political processes hasw to be taken seriously. It is important to remain open minded to divergent opinions, current agenda-setting processes and controversies etc. At the same time, it is important to formulate new impetus and ideas and to fuel the debate with slight provocations, where a fruitful political discussion can be expected.

In order to feed broad debates and for condensing the information, visual elements are crucial. It is a challenging process to bring together the different sources of information and lines of argument. Fig. 7 draws together the most important steps and elements for scenario mapping. One can differentiate four steps in the drafting process, and within each step, amongst the rich options, the most adequate choices have to be made.

With regard to the geostructure, it means to select which elements are needed to get an accessible picture without overloading it or without giving unintended biases (e.g. showing only national, but no regional borders). It is important to choose appropriate administrative units for comparing data.

Visualising the regional data shares many challenges with classical regional mapping – choosing indicators, time references, scales and perimeters is important here. Beyond this, indicator combinations or integration methods (e.g. cluster analysis) are methodological options here. The underlying 'philosophy' is relevant, in particular with regard to the focus on evidence through quantitative analysis (e.g. prognostics data) and qualitative data (assuming spatial implications of expected megatrends).

The implication of political options and priorities is a very open explorative process, demanding creativity and adaptation, and inclusion of institutional expectations, contexts and changes. The synthesis map(s) is/are designed according to multiple questions of cartographic 'language'. Again, the project's or strategy's context has to be taken into account.

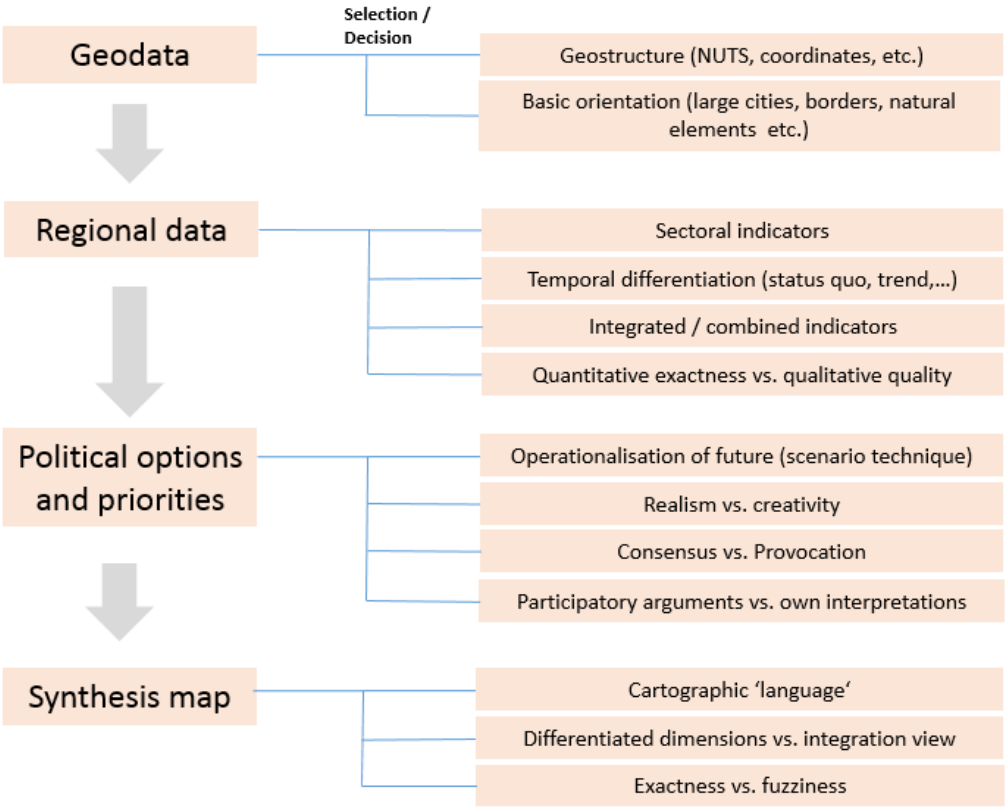
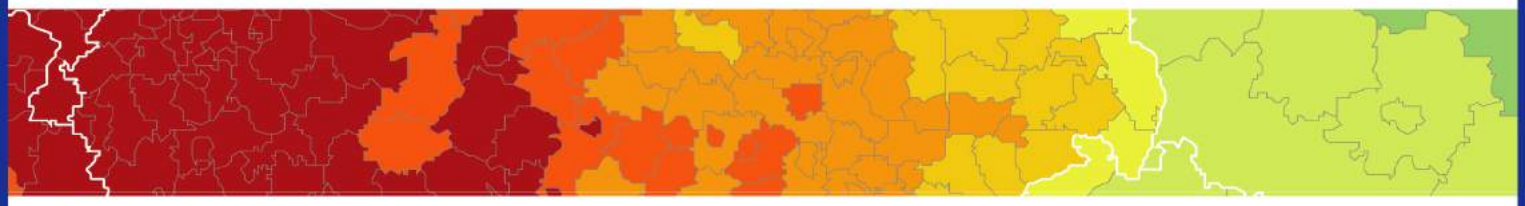


Fig. 7 Elements for drafting transnational perspectives and scenarios



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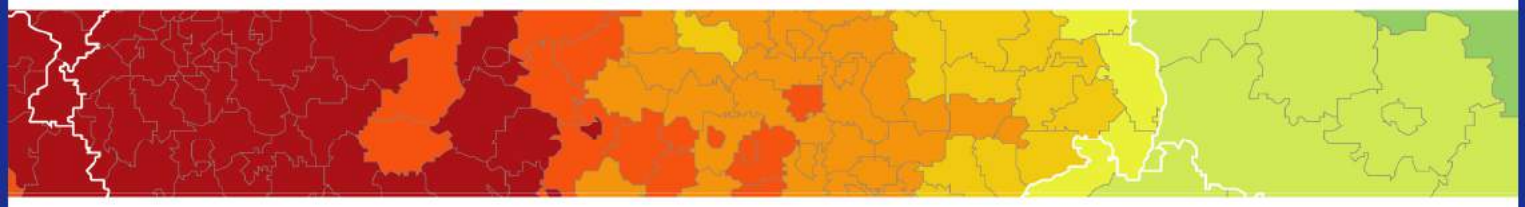

The Alps 2050 Atlas.

Alps2050
Common spatial perspectives for the Alpine area. Towards a common vision

Targeted Analysis

The ‘Alps 2050 Atlas’

Annex to the Final Report

21.11.2018

This targeted analyisis activity is conducted within the framework of the ESPON 2020 Cooperation Programme, partly financed by the European Regional Development Fund.

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This delivery does not necessarily reflect the opinion of the members of the ESPON 2020 Monitoring Committee.

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Alps2050
Common spatial perspectives for the Alpine area. Towards a common vision

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1 Introduction

1.1 The Alps 2050 Atlas

This atlas is part of the ESPON project Alps 2050 that develops spatial visions and perspectives for the Alpine region towards the year 2050. The spatial perimeter goes beyond the Alps in the morphological sense (which is mostly congruent with the Alpine Convention perimeter) but also considers the Territorial Cooperation Programme Alpine Space and the Macro-regional strategy EUSALP.

The Atlas brings together the relevant maps from the project that show structures, patterns and trends that contextualise the spatial development. Firstly, this atlas serves analytical purposes and gives background information for the Alps 2050 main report, and secondly, provides general visualisation, orientation and inspiration.

Obviously, the selected set of maps cannot cover all relevant themes in a perfectly balanced way. The availability of meaningful data that covers the transnational area adequately on selected territorial levels is clearly a limiting factor. But still, we think that visualising the existing data helps to fuel the debate on territorial development in the Alps.

The main impressions from the Atlas can be summarised in the following bullet points:

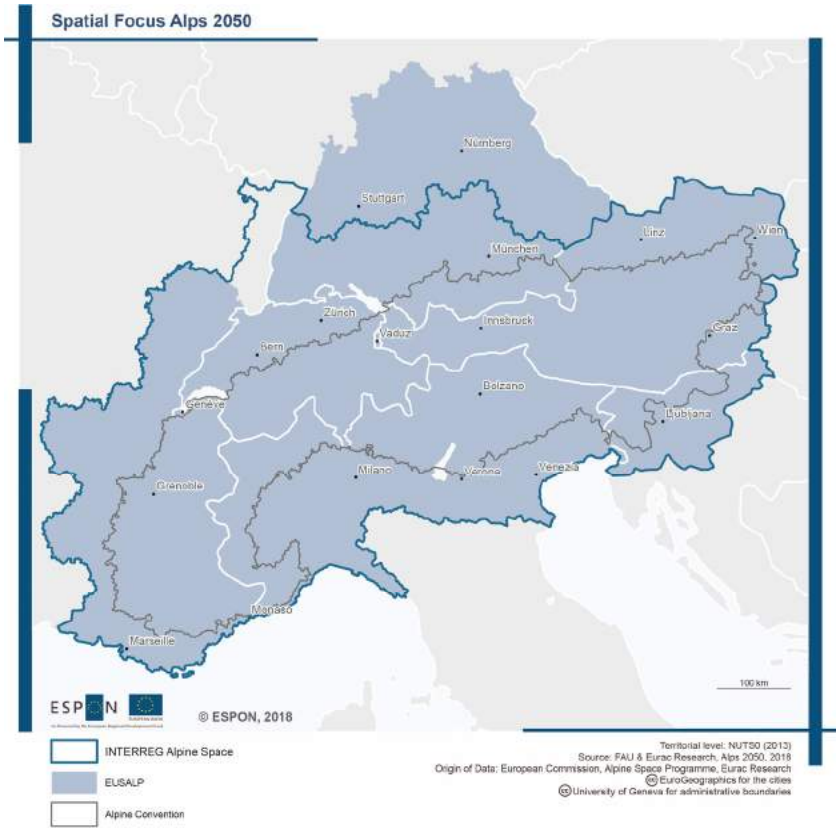
- Territorial development in the Alpine Region is characterised by **diversity and complexity**. Comparing the different thematic maps reveals very different pictures: Sometimes underlining the relevance of the morphological context, sometimes stressing the contrast between urban and rural areas, sometimes revealing differences between North and South or East and West.
- The complexity underlines the postulate of **contingency**: spatial development is not necessarily determined by mountains and morphology, but spatial development is a political process open for political struggles, societal debates and democratic decisions.
- Aiming at tailor made territorial strategies means to carefully consider this complexity on the ground, considering **parallels and differences**. From a transnational perspective, the parallels can be perceived as common challenges that stand in the heart of macro-regional strategy implementation. At the same time, regional and national differences can be a potential for diversity, best developed on political levels of the European multi-level system in subsidiarity.
- The Alpine region certainly is a very dynamic region offering multiple **opportunities** for future development without focussing solely on growth dynamic.

For those who like to refer to cartographic reflections on the Alps, we should mention here two other interesting works that are presenting indicators for the Alpine Convention perimeter, namely the 'Alpine convention Vademecum' (Alpine Convention 2010[1]) and 'The Alps in 25 maps' publication (Alpine Convention 2018 [2]).

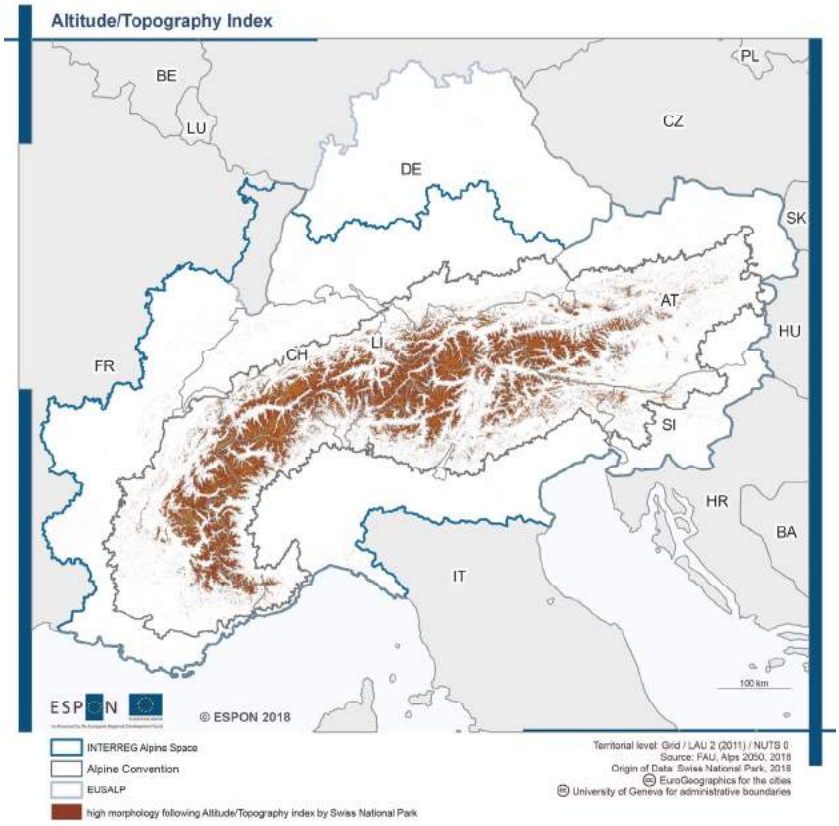
[1] http://www.alpconv.org/en/publications/alpine/Documents/Vademecum_web.pdf

[2] http://www.alpconv.org/en/publications/alpine/Documents/25maps.pdf

1.2 Spatial focus: Perimeters and topography



Map 1 Spatial focus and political perimeters of the Alps 2050 space



Map 2 The Alpine mountains in the Alps 2050 perimeter

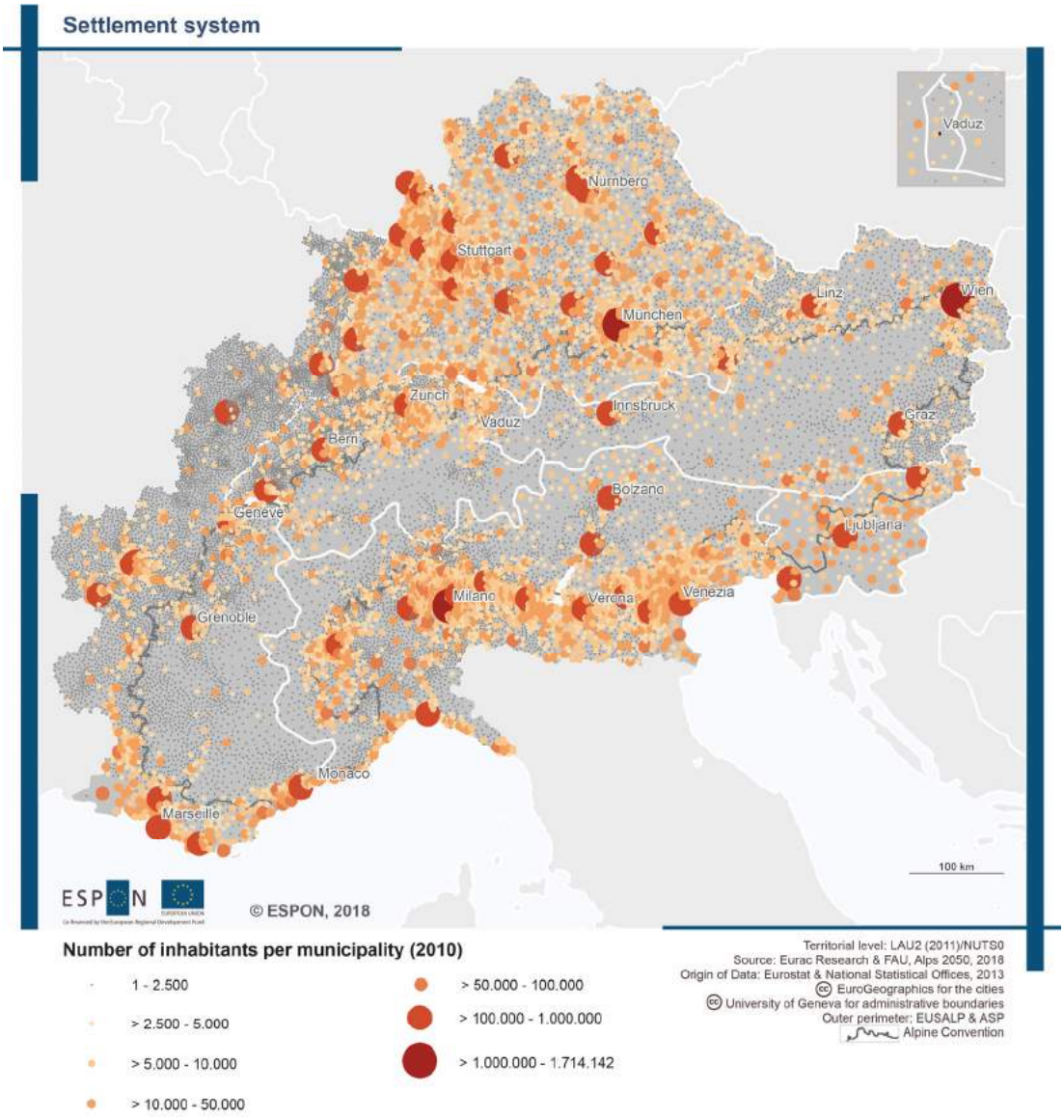
The maps (Map 1 and Map 2) show the perimeters that are relevant for the Alps 2050 project, namely

- The Alpine Convention's perimeter was aligned on municipal level mainly based on morphological arguments, i.e. that the perimeter marks the mountainous parts (signed in 1991).
- The INTERREG Alpine Space perimeter started in 2000 and is now running in the fifth period 2014-20. It goes beyond the mountains and also includes the surrounding metropoles and 'hinterland' which is similar but not identical with the EUSALP space.
- The macro-region EUSALP (launched only in 2016) is congruent with the current Alpine Space Programme perimeter with the exception of the Northern Bavarian and Baden-Württemberg parts in Germany and the Alsace region in France.

The perimeters are not trivial, in particular due to territorial reforms on the French side: Recent reforms have changed the political geography, and this will lead most probably to a larger territory in the Western EUSALP and Alpine Space. For the time being, the perimeter of the Alpine Space period 2014-20 (http://www.alpine-space.eu/about/the-programme/which-area-is-covered) and the EUSALP perimeter as defined in the official communication from the European Commission (COM 2015/366 final, p. 11) serve as the spatial focus of this ESPON project.

Moreover, Map 1 and Map 2 display the national borders of the states involved. The numerous national borders which can challenge a harmonious, cohesive and sustainable development.

2 Settlement system



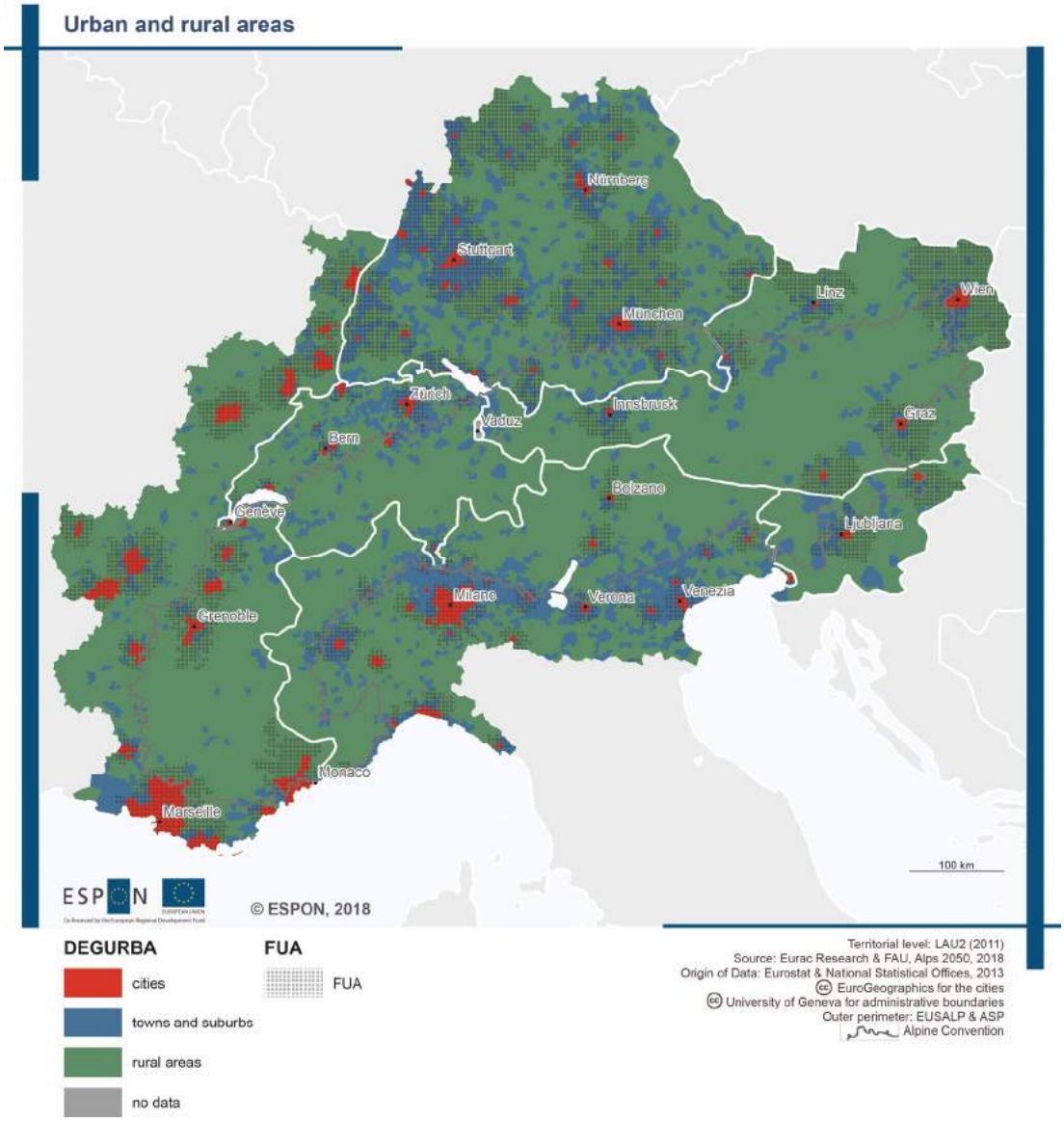
Map 3 Population size of municipalities

Indicator/Methodology: Map 3 shows the size of the municipalities in the year 2010. The number of inhabitants per community is assigned to one of the seven size categories, differentiated by size and colour of the symbols. – One has to stress that the administrative LAU area is not identical with physical settlement areas. The fact that municipality sizes are not harmonised has consequences for the interpretation of such maps: the larger the administrative municipality, the less exact is the impression of the settlement system: For example, the role of valleys is less visible and the impression of polycentricity can be misleading as dispersed settlements are part of just one formal municipality, as we can see in particular when comparing the French and Slovenian situation. In Slovenia the settlement pattern with around 6,000 settlements is much more dispersed than the map which is showing municipalities illustrates. Moreover, the different mandates on the municipal level have to considered – e.g. the *communauté de communes* in France or *Verwaltungsgemeinschaft* are very different forms of inter-municipal institutionalization.

Description: The settlement system of the Alps 2050 perimeter shows the following patterns and characteristics:

- Within the Alpine Convention perimeter, the *size* of municipalities tends to be much lower than beyond; and also the *number* of municipalities within a certain area tends to be lower in the mountainous area than in the pre-Alpine area.
- The map shows the importance of *valleys* for settlements, in particular the Inn valley (East of Innsbruck), the Rhine valley (North and South of Liechtenstein), the Isère valley (between Genève and Grenoble), the Sava and Soča valleys in Slovenia, the Po valley (from Milano eastwards) etc.
- The map illustrates the relevance of different political and administrative contexts: The average size of municipalities – for example – is clearly larger in Slovenia (96 km^2, 2018) than in France.
- The map clearly displays the importance of the Alpine morphology: the higher the mountains and narrower the valleys, the smaller the settlements.

Despite all the differences between national and regional contexts, there are obvious parallels in the settlement system – the relevance of the morphological structure in the Inner Alpine area, and the agglomeration ring all around the mountainous area. As macro-regional strategies are about common challenges and opportunities, the settlement system could be an obvious issue. It might be meaningful to debate transnational instruments for the development of settlement systems that support synergies across borders.



Map 4 Urban and rural areas following the DEGURBA approach

Indicator/Methodology: Map 4 shows the typology of the Commission's Directorates-General for Regional and Urban Policy, Agriculture and Rural Development, Eurostat and the Joint Research Centre (JRC) together with the OECD (http://ec.europa.eu/eurostat/web/degree-of-urbanisation/methodology). The so called DEGURBA methodology classifies Local Administrative Units level (LAU or communes) based on a combination of criteria of geographical contiguity and minimum population threshold applied to 1 km^2 population grid cells that are aggregated on LAU2-level as shown in the map for the Alps 2050 territory. The classification is elaborated as follows:

- **Cities** (alternate name: densely populated areas): At least 50% of the population lives in urban centres (with a high population density).
- **Towns and suburbs** (alternate name: intermediate density areas): At least 50% of the population lives in urban clusters and less than 50% of the population lives in urban centres.
- **Rural areas** (alternate name: thinly populated areas): At least 50% of the population lives in rural grid cells.

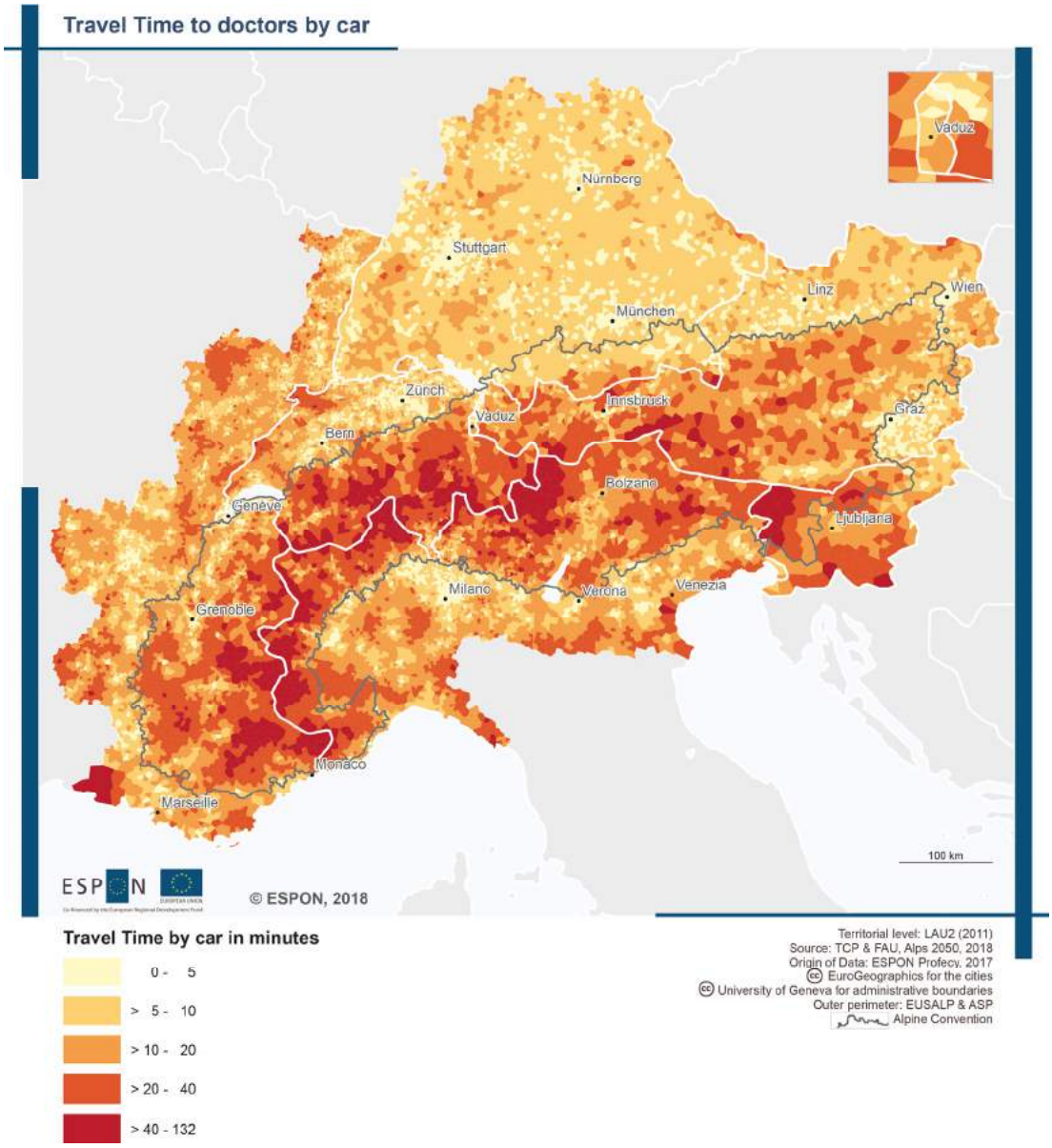
Description: Also this map shows differences between the largely rural inner-Alpine areas and the much more urbanised pre-Alpine areas. However, the picture is less dichotomic than the settlement system in the map before. In particular, the rural character of many regions beyond the mountainous parts is very clearly visible (e.g. French and Bavarian parts). It gets also clear that the Alps 2050 perimeter comprises a ring of metropolises of European relevance, surrounding the mountainous area.

The map shows the importance of spatial reflections on a fine scale: It does make sense to argue on the LAU or NUTS 3 level and not to refer to NUTS 2 too often which is, however, often the case when debating European spatial patterns.

3 Services of General Interest

The analysis of the accessibility of Services of General Interest were developed in the framework of the ESPON project PROFECY by TCP International and is described in detail in the PROFECY project report's annexes. PROFECY identified OpenStreetMap (OSM) as the major data source for locations of SGIs, partly amended by national data sources; the train stations were based on an internal project data base. The accessibility of SGIs was calculated as the car travel time from the centre of each grid cell (resolution 2.5x2.5 km) to the next facility, regardless if the grid area is inhabited or not. Depending on the SGI type, only facilities within the same country as the origin grid cell were considered as destinations (in case of public services such as schools and health care), or domestic facilities and facilities in the neighbouring country (in case of private services such as shops, cinemas and also for the train stations). Grid travel times were also aggregated to LAU2 level by averaging the travel times of all grid cells belonging to one LAU2 unit. The assignment of grid cells to LAU2 units was based upon the location of the centre of the grid cell.

In this methodology, the different size of municipalities matters. The larger the municipality, the more generalised is the cartographic picture that can hide small scale morphological contexts. The picture has to be relativized as very negative values often concern only few inhabitants. It makes sense to read this map in parallel to the population density map (Map 11) and the settlement system map (Map 3). Moreover, one might state that the Slovene situation might be better than indicated in the map, due to the relatively large size of the municipal territories.

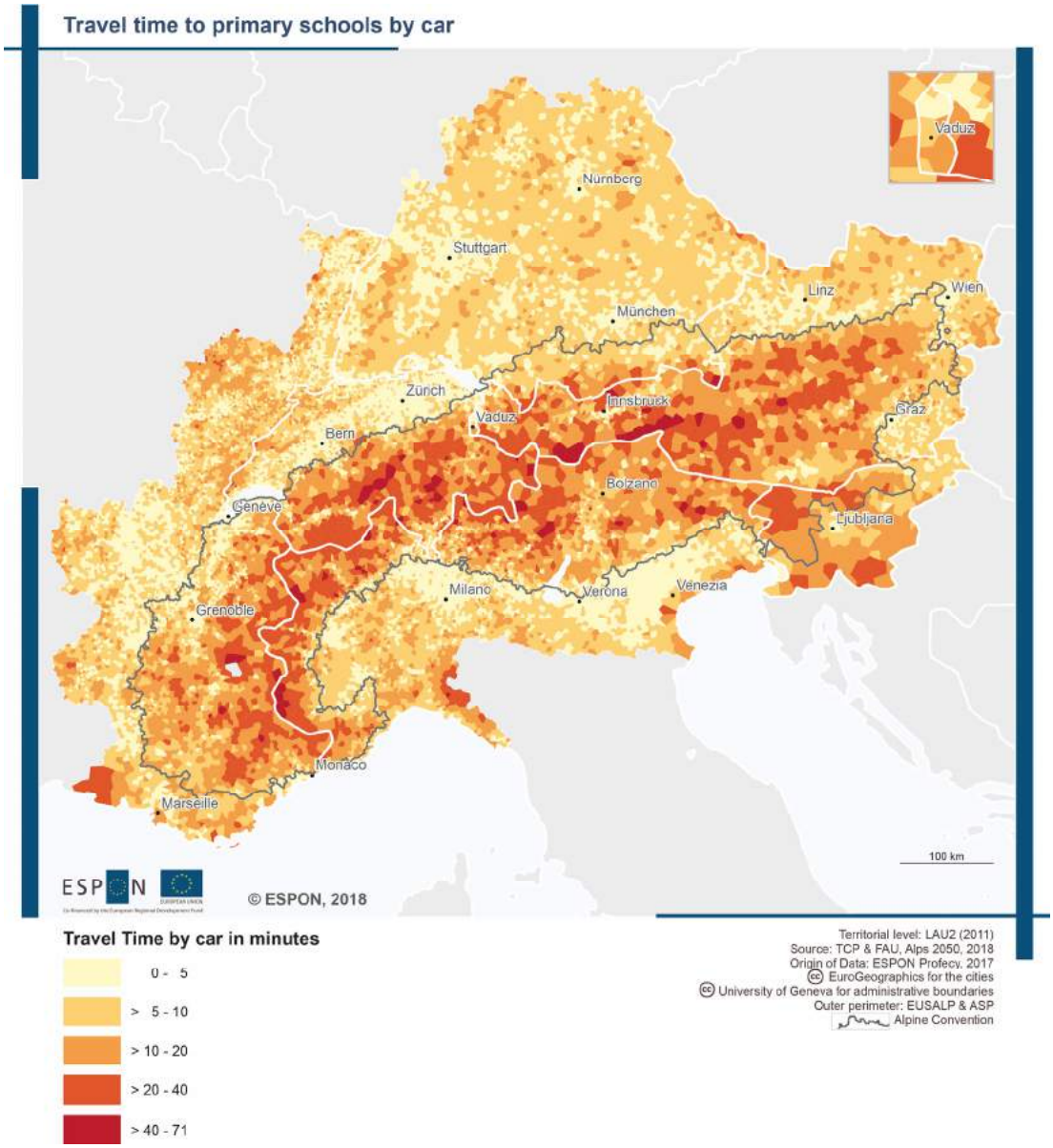


Map 5 Travel time to doctors by car

Indicator/Methodology: Map 5 is based on the calculation of travel time to general doctors by car. The darker the colour is, the more time it takes within the respective municipality to reach the next doctor. The calculation takes into account that the nearest doctor might be in a neighbouring municipality. The OSM data refer to the service facility “doctors” with the OSM type 2120.

Description: The overall picture very clearly shows the role of the morphology: The accessibility is much easier in pre-Alpine areas than in Alpine areas. This can obviously be explained by a) the lower population density in mountainous areas that lead to a lower density of medical services and b) to the difficulties to ensure a good technical accessibility in mountainous areas, due to expensive and complex infrastructure issues (tunnels, natural risks etc.). This situation can be observed almost independent from national affiliation, with the exception of Slovenia where in consequence of the big municipality size the picture is not that

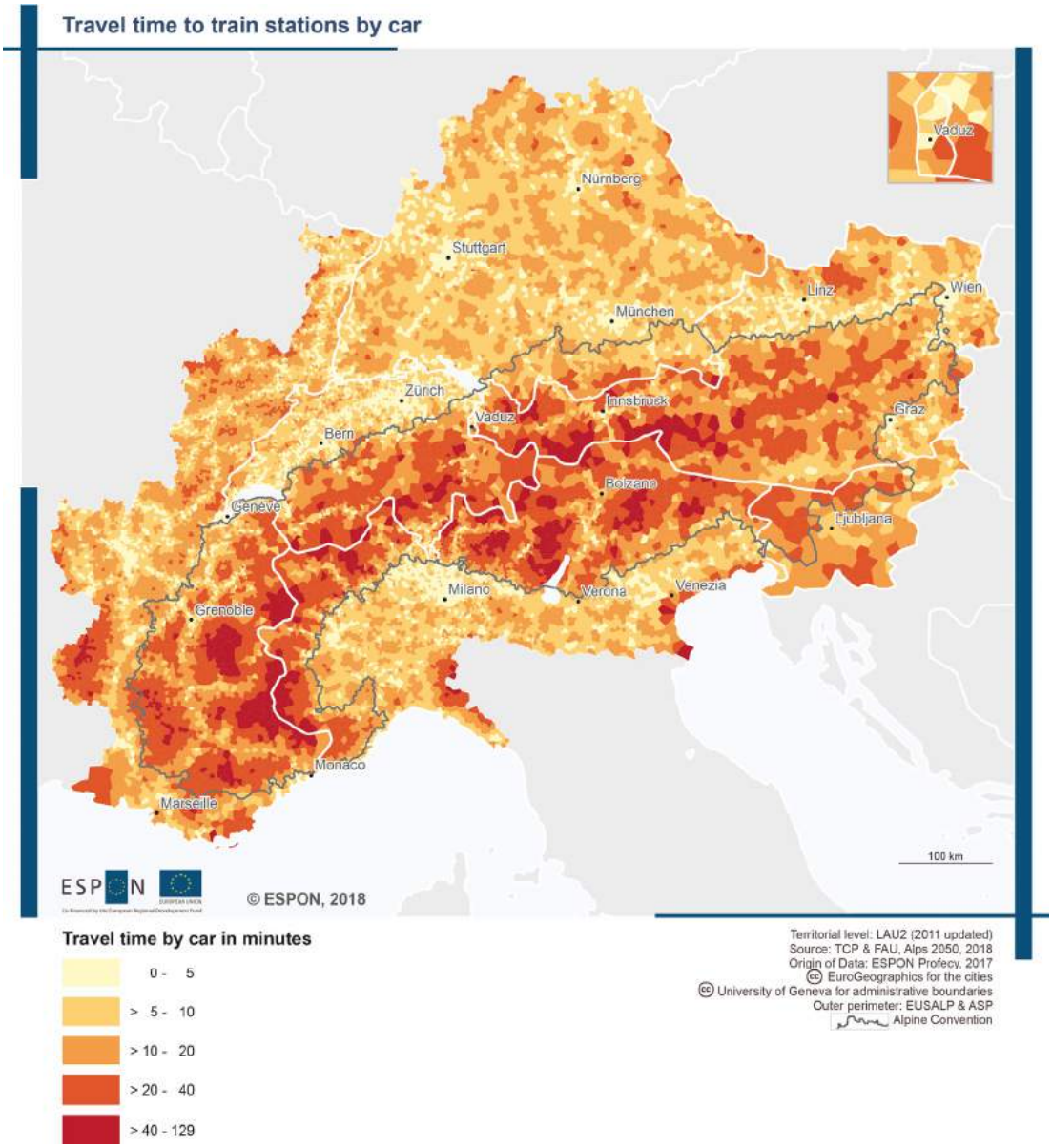
differentiated. Longer distances caused by the bigger municipality size lead to higher values for the whole municipality.



Map 6 Travel time to primary schools by car

Indicator/Methodology: Map 6 is based on the calculation of travel time to primary school by car. The map shows values for the municipality level (LAU) that are aggregated from grid data. The darker the colour is, the more time it takes within the respective municipality to reach the next primary school. The classification differentiating the seven categories is the same as for doctors. The calculation takes into account that the nearest primary school might be in a neighbouring municipality. The OSM data refer to the service facility “primary schools” with the OSM type 2082.

Description: The explanation is parallel to the accessibility of doctors – the overall picture very clearly shows the role of the morphology also in this case: The accessibility is much easier in pre-Alpine areas than in the mountainous areas. However, the picture is slightly 'brighter' (more yellow/orange colours). This means that the density of primary schools is higher than the density of doctors.



Map 7 Travel time to train stations by car

Indicator/Methodology: Also this data behind Map 7 were developed in the framework of the ESPON project PROFECY by RRG – the same information apply as for the two maps above: The map is based on the calculation of travel time to train stations by car. The map shows values for the municipality level (LAU) that are aggregated from grid data. The darker the colour

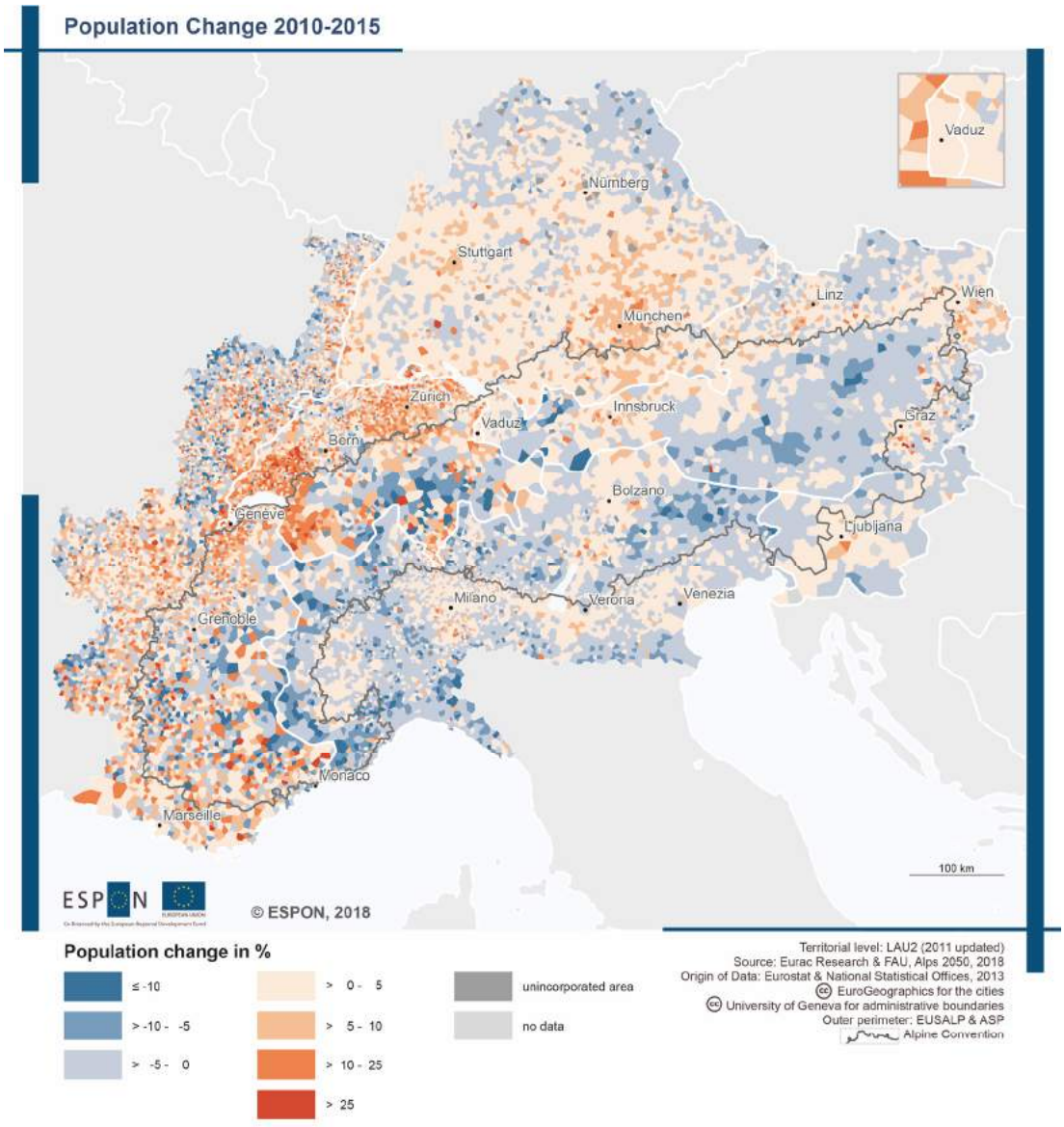
is, the more time it takes within the respective municipality to reach the next primary school. The calculation takes into account that the nearest train station might be in a neighbouring municipality. The classification of the data (legend) is the same in the two cases introduced above.

Description: In principle, most of the comments from the above introduced cases also apply in this case. However, there are two specific arguments:

- The spatial pattern shows more clearly the morphology, in particular the valleys that host the rail infrastructure
- The large net structure of train railway stations is less densely organised than primary schools and doctors.

4 Demography

4.1 Population change



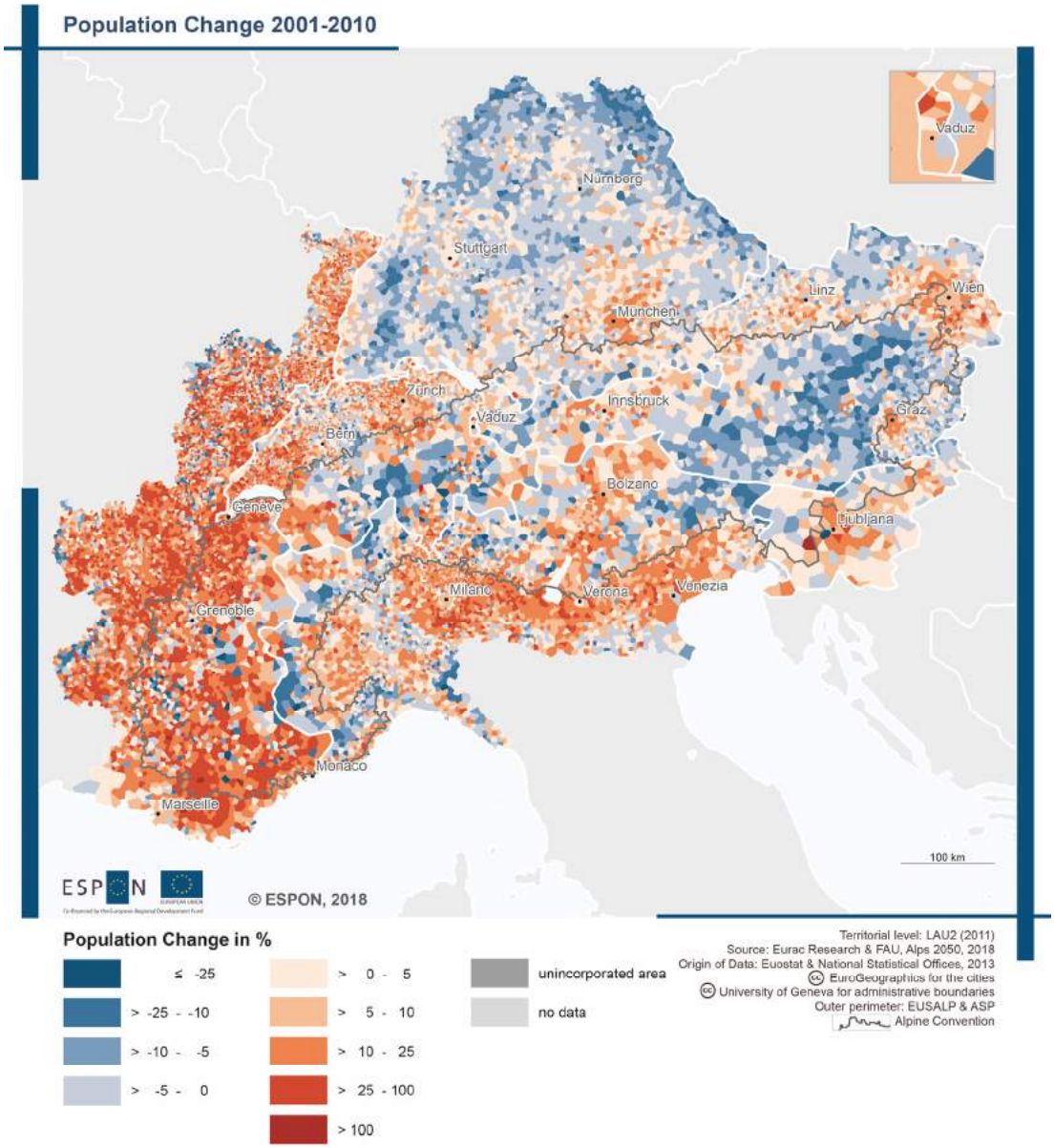
Map 8 Population change 2010-15 on municipal level

Indicator/Methodology: Map 8 shows the demographic trend between 2010 and 2015 on municipality level (LAU): Summarising the different demographic components of in-/outmigration over municipality borders as well as and childbirths and deaths, the overall demographic trend can be positive (considered as population growth) or negative (population loss): The darker the colour red is, the stronger is the overall positive trend; the darker the colour blue, the more negative is the trend. NB: The categories comprise different ranges of values (e.g. 0-5% and 25-100%), but they comprise a comparable number of cases.

Description: The overall picture clearly shows the important influence of the degree of urbanisation: In the observed period, metropolises and the larger cities are almost always the

centre of population increase, whereas the patterns in the rural areas are much more diverse: For example, the Southern Tyrol area is demographically developing much more positive then the Belluno region. The difference is large between the Alpine countries: The differences are obvious e.g. along the French-Italian and the German-Swiss side. Moreover, the particular development paths of corridors is obvious, in particular for the Inn Valley, the High Rhine Valley, Slovenian motorway cross and most of all the Brenner corridor.

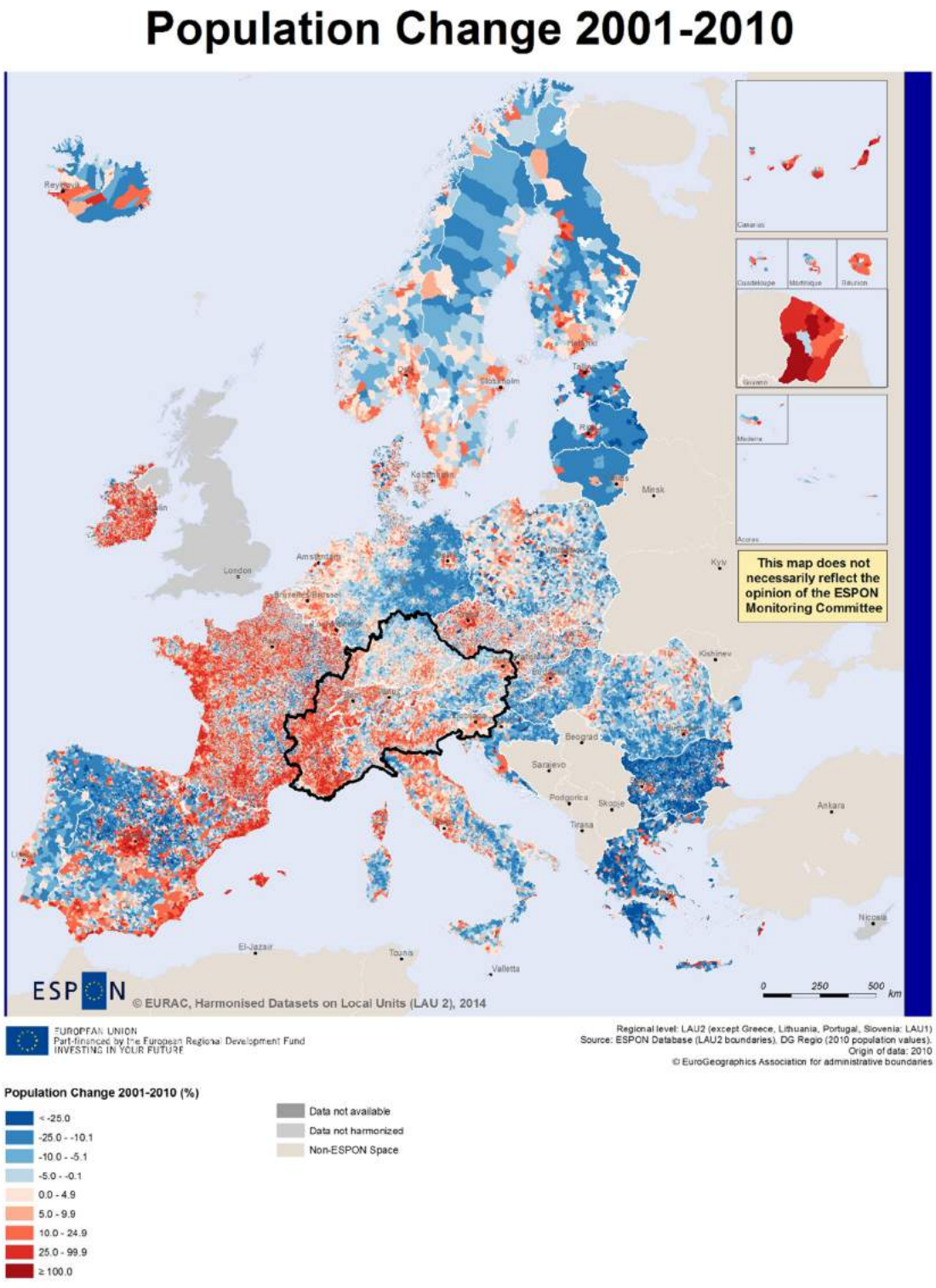
Different to the settlement system map, the picture does not primarily reproduce the differences between mountainous and non-mountainous regions. Instead, the diversity of rural spaces and the large scale influence of metropolitan 'growth poles' leads to a much more complex picture.



Map 9 Population change on municipal level 2001-2010

Indicator: The indicator in Map 9 is the same as in the map shown above, but refers to an earlier period of time, namely 2001-10.

Description: The general trends are similar to the more recent trends described above for the years 2010-2015. However, the overall development has recently been more positive in the German and Swiss regions. In contrary, the Po Valley in Italy shows very different and much more negative values. The patterns on the French side are now much more diverse than before. In Slovenia, the positive trend of population growth can be identified in the urban and suburban areas and along the motorway, while the mountainous, border and remote areas are clearly loosing population.



Map 10 The Alpine mountains and the Alps 2050 Perimeter

Indicator: see above, Map 9 (further information: http://regdev-blog.eurac.edu/wp-content/uploads/Demographic-change-Europe-Municipalities-map.jpg)

Description: Map 10 positions the demographic development of the Alpine regions on the European scale. The overall picture underlines the diversity of developments and the comparable positive trend. When negative trends are visible they show more small scale patterns than in other parts of Europe (e.g. Iberian Peninsula, South-Eastern Europe). As already mentioned above, the positive trend in metropolitan regions and the diversity of rural development parts is visible – and can also be found in many other European regions. The demographic development in the Alps, thus, mirrors the demographic trends that can be found European wide.

Table 1 Population change 2001-2015 comparing the inner- and pre-Alpine area

Population	*Change 2001-2015*	Change 2001-2010	Change 2010-2015
Alps 2050	*+ 7,8%*	+ 5,4%	+ 2,3%
Inner-Alpine (Alpine Convention)	*+ 7,8%*	+ 6,1%	+ 1,6%
Pre-Alpine	*+ 7,8%*	+ 5,2%	+ 2,5%

Indicator: Table 1 to Table 3 show the same indicator as Map 8 and Map 9 and refer to the period 2001-2015. The municipal data are summed up following different classifications:

- Table 1 differentiates between the inner-Alpine area (all municipalities that are part of the Alpine Convention area) and the pre-Alpine area (all municipalities that are part of the Alps 2050 and lie beyond the Alpine Convention perimeter) (cf. Map 1)
- Table 2 differentiates between urban areas, towns and suburbs, rural areas following the DEGURBA classification (cf. Map 4).
- Table 3 differentiates the municipalities that are part of the Alps 2050 space by national affiliation.

Description: In the period 2001-2015, the population change is positive and the growth rate is the same in all three spatial categories (all +7,8%). Also when differentiating the decades, the overall trend is positive for all areas. Between 2001 and 2010, the growth rate of the inner-Alpine area is higher than in the Alps 2050 space and in the pre-Alpine area. This is different between 2010 and 2015 – in this period the growth rate of the pre-Alpine area is higher than in the inner-Alpine area.

Table 2 Population change 2001-2015 comparing urban areas, towns and suburbs and rural areas based on the DEGURBA classification

Population	*Change 2001-2015*	Change 2001-2010	Change 2010-2015
Alps 2050	*+ 7,8%*	+ 5,4%	+ 2,3%
urban	*+ 8,1%*	+ 5,1%	+ 2,9%
towns and suburbs	*+ 8,2%*	+ 5,7%	+ 2,4%
rural	*+ 6,8%*	+ 5,2%	+ 1,5%

Description: Differentiating the Alps 2050 area following the DEGURBA classification, the population growth in urban areas and towns and suburbs between 2001 and 2015 is nearly the same. The growth rate in rural areas is also highly positive but lies under the growth rate of the urban areas. The same applies in the temporal differentiation.

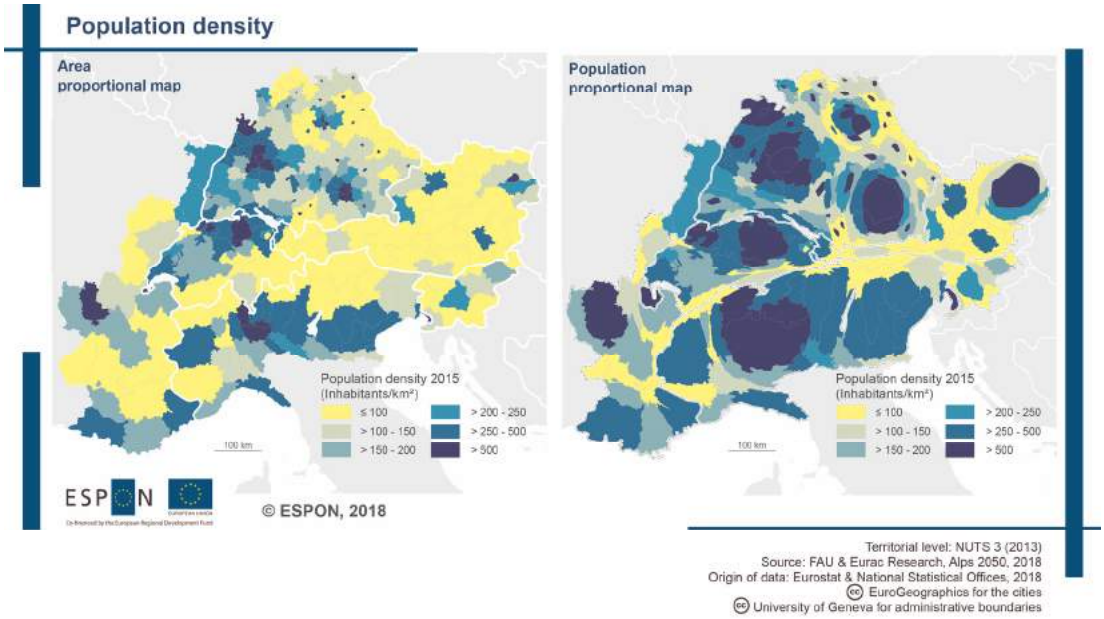
Table 3 Population change 2001-2015 of the Alps 2050 perimeter differentiated by national affiliation

Population	Change 2001-2015	Change 2001-2010	Change 2010-2015
Alps 2050	+ 7,8%	+ 5,4%	+ 2,3%
AT	+ 6,1%	+ 4,2%	+ 1,8%
CH	+ 15,5%	+ 8,4%	+ 6,6%
DE*	+ 3,5%	+ 0,1%	+ 3,3%
FR*	+ 12,1%	+ 9,3%	+ 2,5%
IT*	+ 8,1%	+ 8,1%	+ 0,1%
LI	+ 12,2%	+ 7,8%	+ 4,1%
SI	+ 4,8%	+ 4,2%	+ 0,6%

*parts that belong to the Alps2050 perimeter

Description: Differentiating the population change by national affiliation (Table 3), there are obviously more differences than in Table 1 and Table 2. In the period 2001-2015, the German parts and Slovenia show growth rates under 5 %, whilst Switzerland, the French parts and Liechtenstein lie clearly over 10 percent. Whereas the trends in Switzerland and Liechtenstein show high growth rates over periods, the German parts had nearly no change between 2001 and 2010 and show a crucial increase of the growth rate after 2010. In contrast, the French and the Italian parts as well as Slovenia show rather high growth rates between 2001 and 2010 and a decline of the rates after 2010.

4.2 Population density



Map 11 Population density – in area proportional mapping (left hand side) and population proportional mapping (right hand side)

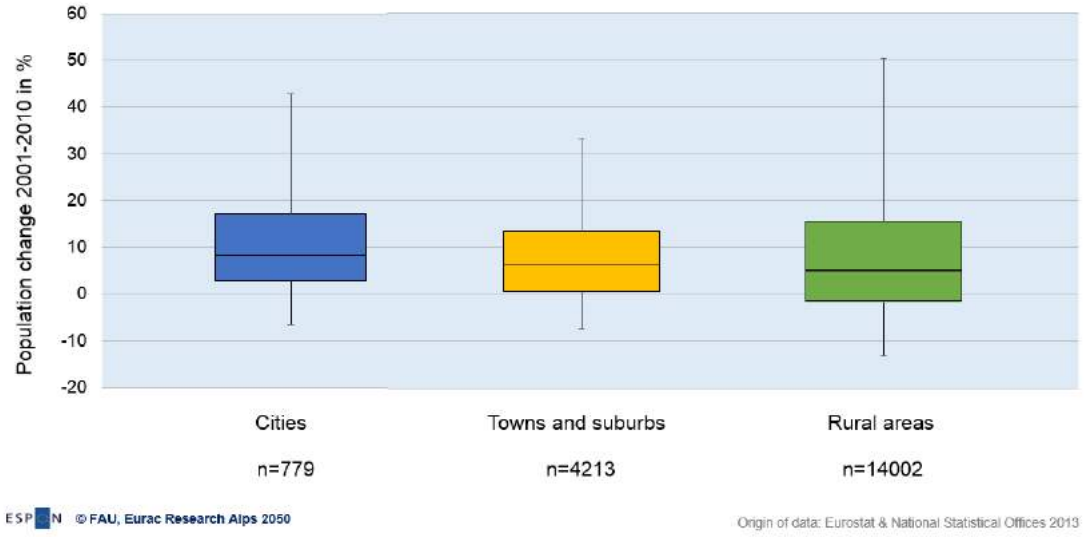
Indicator/Methodology: Map 11 shows the population density on the NUTS 3 level – on the left hand side proportional to the surface area (classical cartographic representation), on the right hand side a cartogram using the Gastner-Newman method. In the latter map, the size of the territories is relative to the population (number of inhabitants) of the territories.

Description/Interpretation: This cartographic tool underlines the large differences in demographic patterns within the Alps 2050 perimeter. The mountainous areas almost 'disappear' due to their low population density, the urbanised and metropolitan territories of the pre-Alpine space literally 'blow up'. The right hand map is somehow the caricature of the 'metropolitan view on the Alps'.

4.3 Population change and the urban-rural differentiationd

Indicator/Methodology: The visualisation of Map 12 and Fig. 1 are so-called box plots. This kind of visualisation differentiates the quartiles of the values of population change on municipality level for different spatial categorisations. For example, the blue box in Map 12 shows the second and third quartile of the population change values for the cities, and the line separating them shows the median value. The vertical line above shows the top quartile, the line below the quartile with the lowest values. The analyses are based on municipal level that are aggregated by different dimension. The main idea is to confront urban and rural spaces and inner- and pre-Alpine spaces.

The graphic is based on the same data as Map 9 (population change 2001-2010).



Map 12 Population change 2001-10 based on the DEGURBA classification, LAU 2 level

Description: Map 12 compares the population development in cities, towns/suburbs and rural areas (DEGURBA classification cf. Map 4). The population development is positive in (more than) three quartiles in the categories cities and towns/suburbs, a bit less in the rural municipalities. The range is much higher in rural areas than in the former two categories. The median shows the highest value for the city category (8,3%) and lower values for the suburban (6,3%) and rural (4,9%) communes.

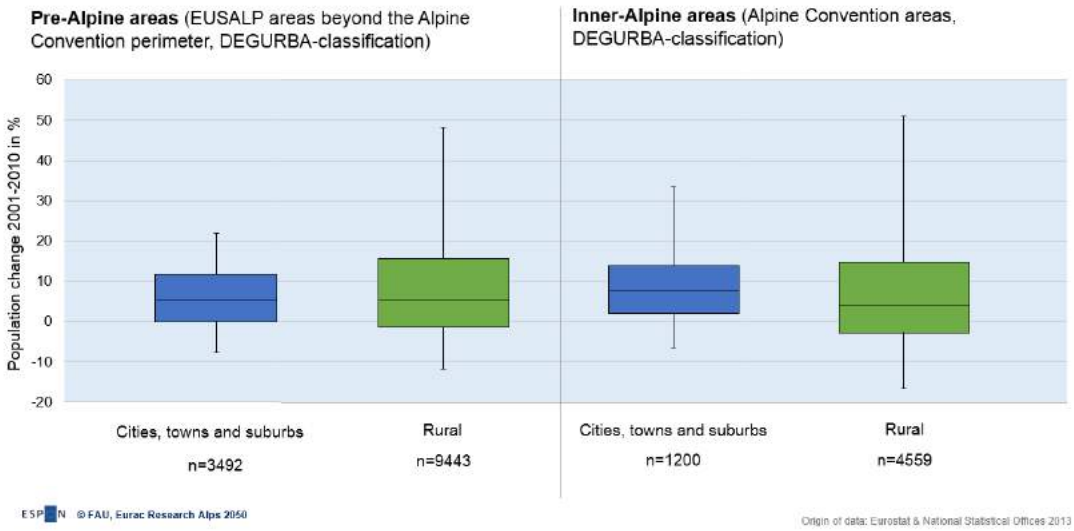
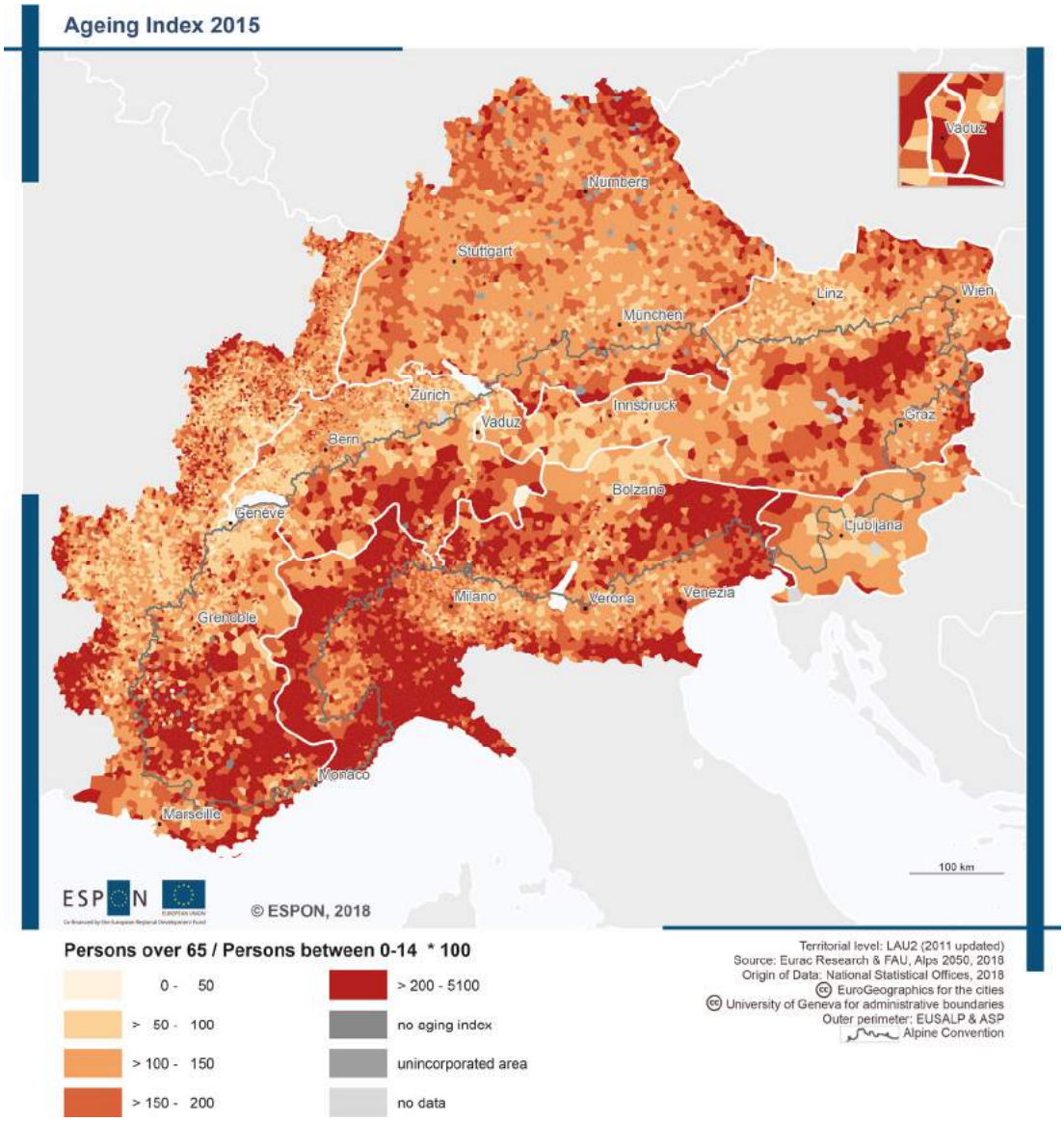


Fig. 1 Comparing urban and rural spaces – on the left hand side for the pre-Alpine areas, on the right hand side for the inner-Alpine areas

Description: Fig. 1 is more complex: firstly, the categories 'cities' and 'towns and suburbs' are merged and confronted to the rural category. On the left hand side, we see the values for the inner-Alpine, mountainous areas; on the right hand side the values for the pre-Alpine areas of the project perimeter. On both sides, we see the higher diversity of development in the rural areas, and the overall more positive development in the urban category. The urban development tends to be stronger in the inner-Alpine areas than in the pre-Alpine areas. This shows a slightly stronger trend of urbanisation in this space. The rural spaces are developing slightly more diverse and less positive in the inner-Alpine than in the pre-Alpine space.

4.4 Ageing Index



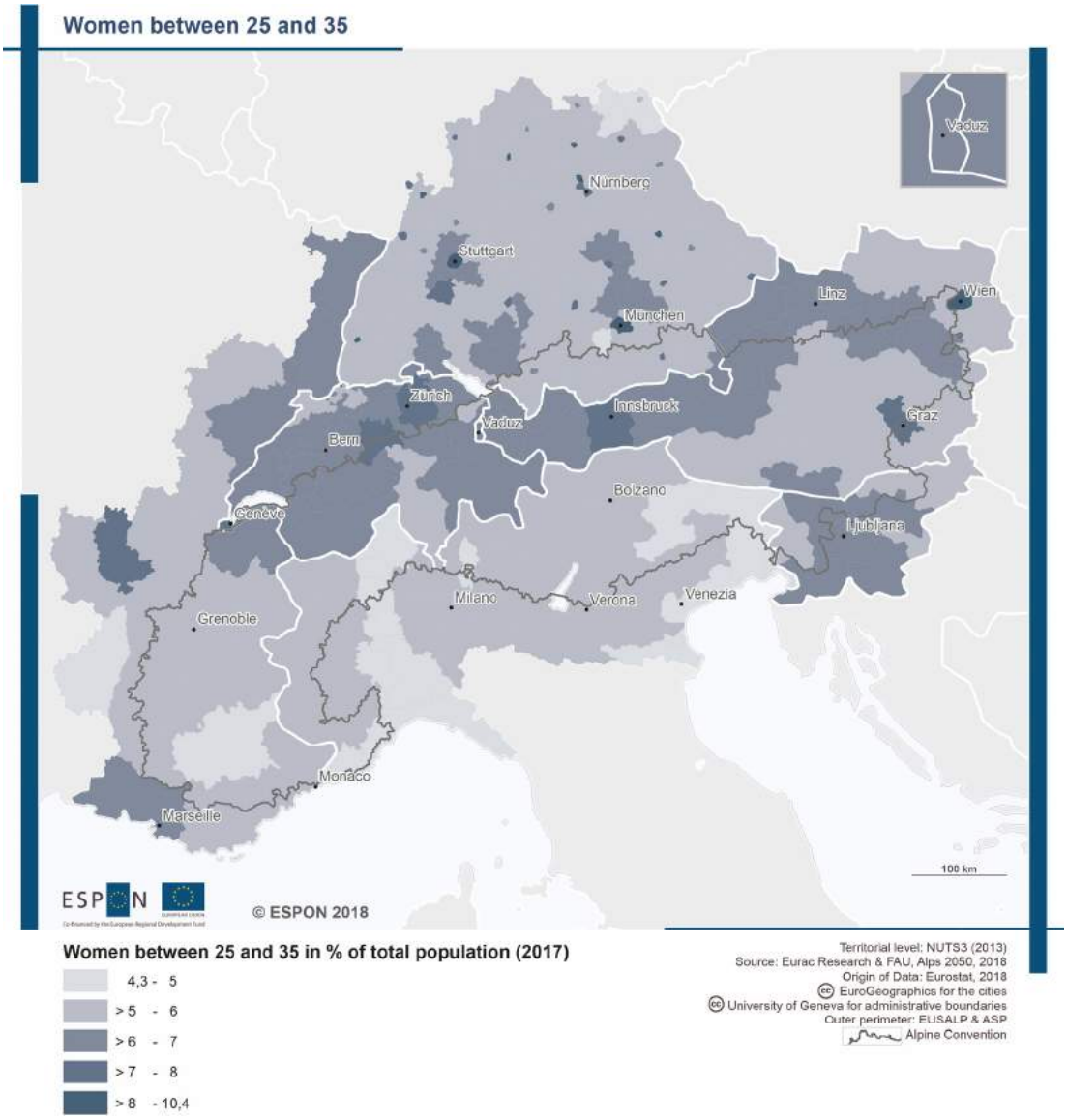
Map 13 Ageing index on municipal level

Indicator/Methodology: Map 13 shows the relation between the number of persons over 65 years and the number of persons under 14 years old on municipality level.

Description: The overall pattern is similar to the other demographic indicators, and this is not by chance: Those areas that have a strong immigration tends to be the 'younger' as young people are more mobile (migration due to education or career development reasons) and they have a higher probability to already have or get children. Those regions with the highest ageing index are in particular mountainous parts in almost all countries of the Alps 2050 perimeter, showing those regions that are not target regions of migration; also large parts of the Italian lowlands show a high ageing index. Urbanised regions and corridors tend to be younger, due to immigration (universities, labour market). If one takes this picture as an indicator for future

development options, many regions in Italy, Southern Switzerland, parts of France and Inner Austria can be regarded as under pressure.

4.5 Women between 25 and 35

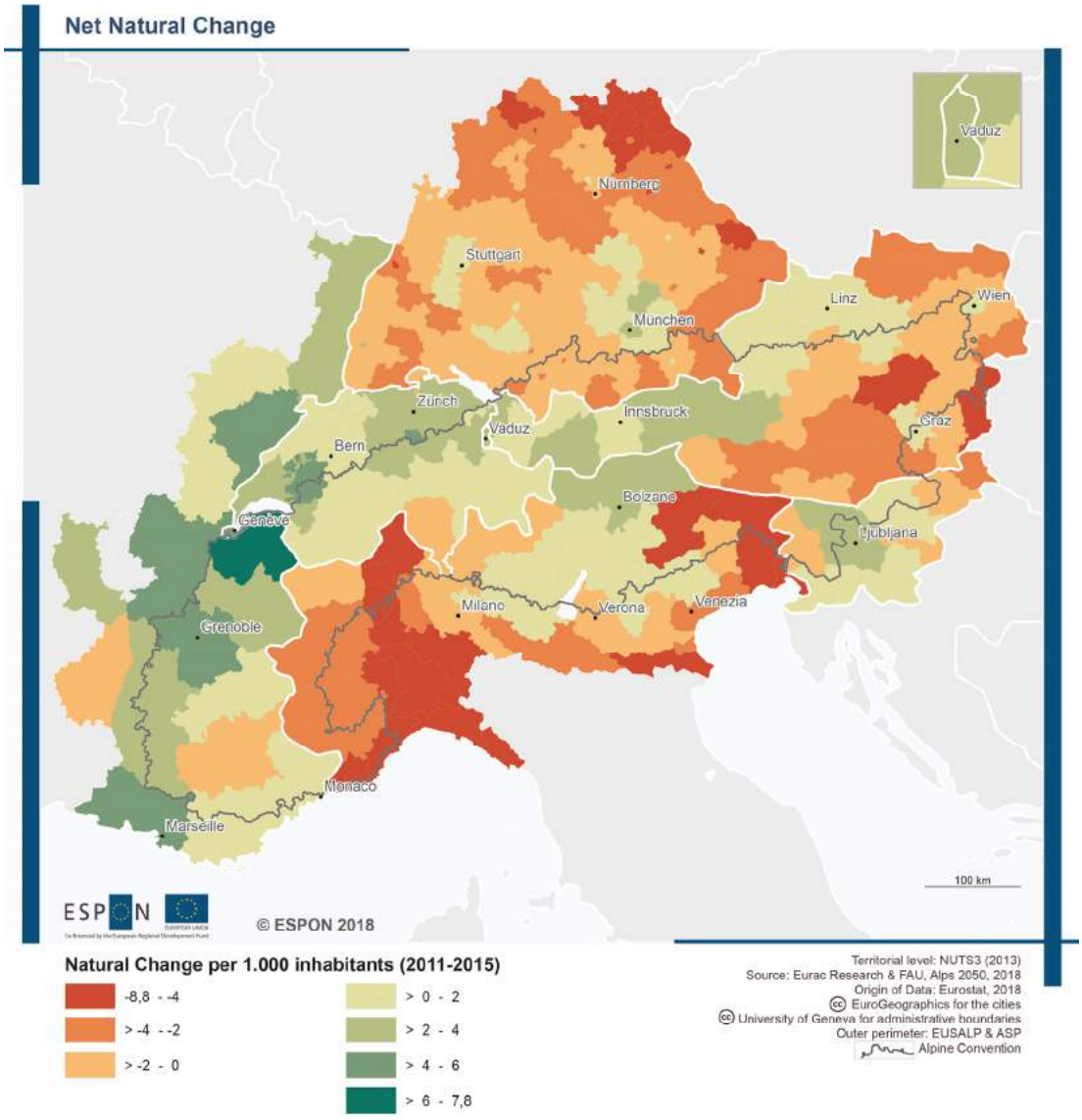


Map 14 Share of woman between 25 and 35 years old

Indicator/Methodology: Map 14 shows the share of female inhabitants in the age group between 25 and 35 on the NUTS 3 level. This indicator can be understood as a hint for the further demographic development: The over average share of this population group can be seen as indication for a positive natural demographic development in the coming years (number of births). This indicator is closely related with the demographic dynamic – the more immigration, the more women in the age group 25-35 years can be expected.

Description: The map shows that the highest values can be found in urban areas and in Switzerland, Northern Austria and large parts of Slovenia. On this spatial scale (NUTS3), the morphology seems not to play a dominant negative role. In most cases, the patterns reflect the degree of immigration in recent.

4.6 Natural change and migratory dynamics



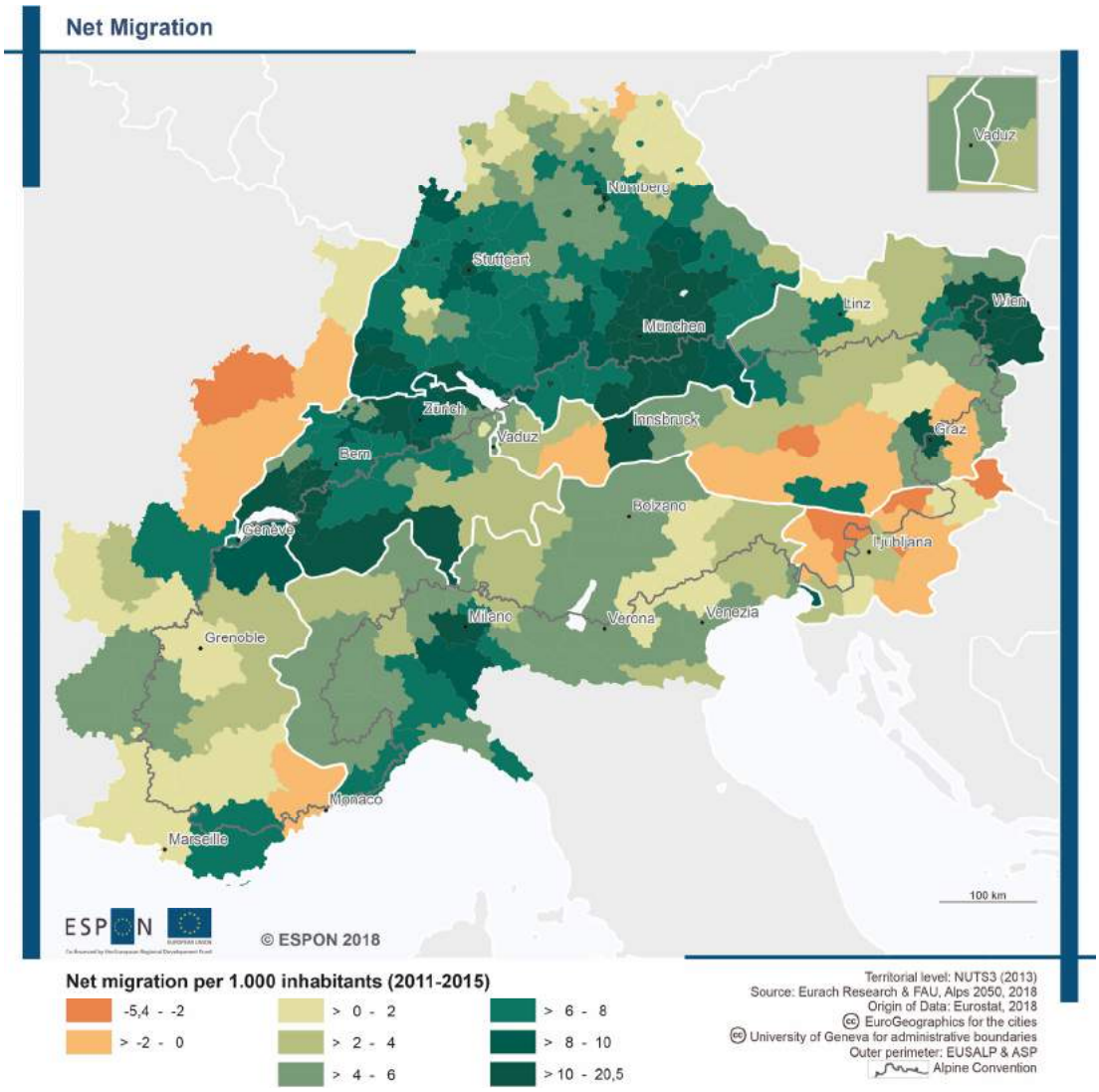
Map 15 Natural change 2011-2015

Indicator/Methodology: Map 15 shows the dynamic of the natural demographic development, which means the number of births minus the number of deaths without considering in- and outmigration (on the NUTS 3 level for 2015).

Description: The map clearly shows that many parts of the Alps 2050 perimeter are characterised by a negative natural change value – in most regions, the number of deaths is

higher than the number of births. Exceptions from this trend are many urbanised areas, Switzerland, large parts on the French side and Slovenia except some border regions. Germany, Italy and East/Southern Austria show rather negative values. Those areas that show negative natural values depend to a high extent on the migration dynamics. One should put this map into perspective with regard to the following aspects:

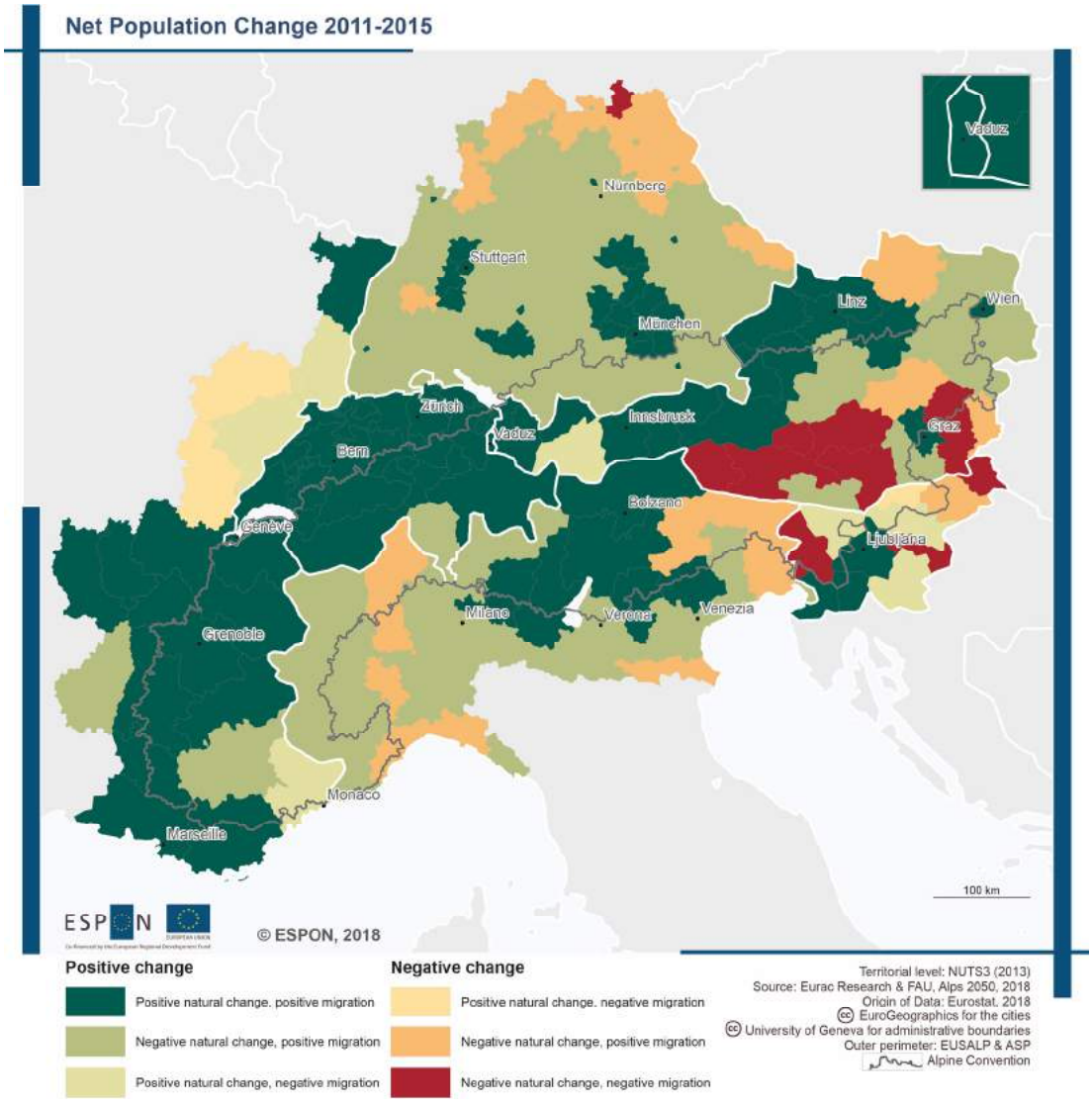
- In general terms, natural dynamics are less important in quantitative terms: on the NUTS 3 level, the number of migrating people is far higher than the number of births and deaths. This is true for Europe as a whole.
- As for all maps, also here applies the question of scale: The NUTS 3 level hides in many cases larger differences on municipality level.
- The patterns of this map are similar to those in the map women between 25 and 35, s. Map 14.



Map 16 Net migration per 1.000 inhabitants 2011-15

Indicator/Methodology: Map 16 shows the dynamic of the migration development, thus the number of people moving in and out crossing the 'borders' of NUTS 3 regions, i.e. leaving or entering the districts of the Alps 2050 regions without considering births and deaths (for 2015).

Description: This map underlines that the Alps 2050 region is – overall speaking – an attracting space as almost all NUTS3 regions show a positive migration balance. The overall picture shows a certain North-South divide, but the role of metropolitan spaces is more dominant. The asylum seeking people are not included in a comprehensive manner (2015 was the year of the most important inmigration but only few of these persons were statistically registered).

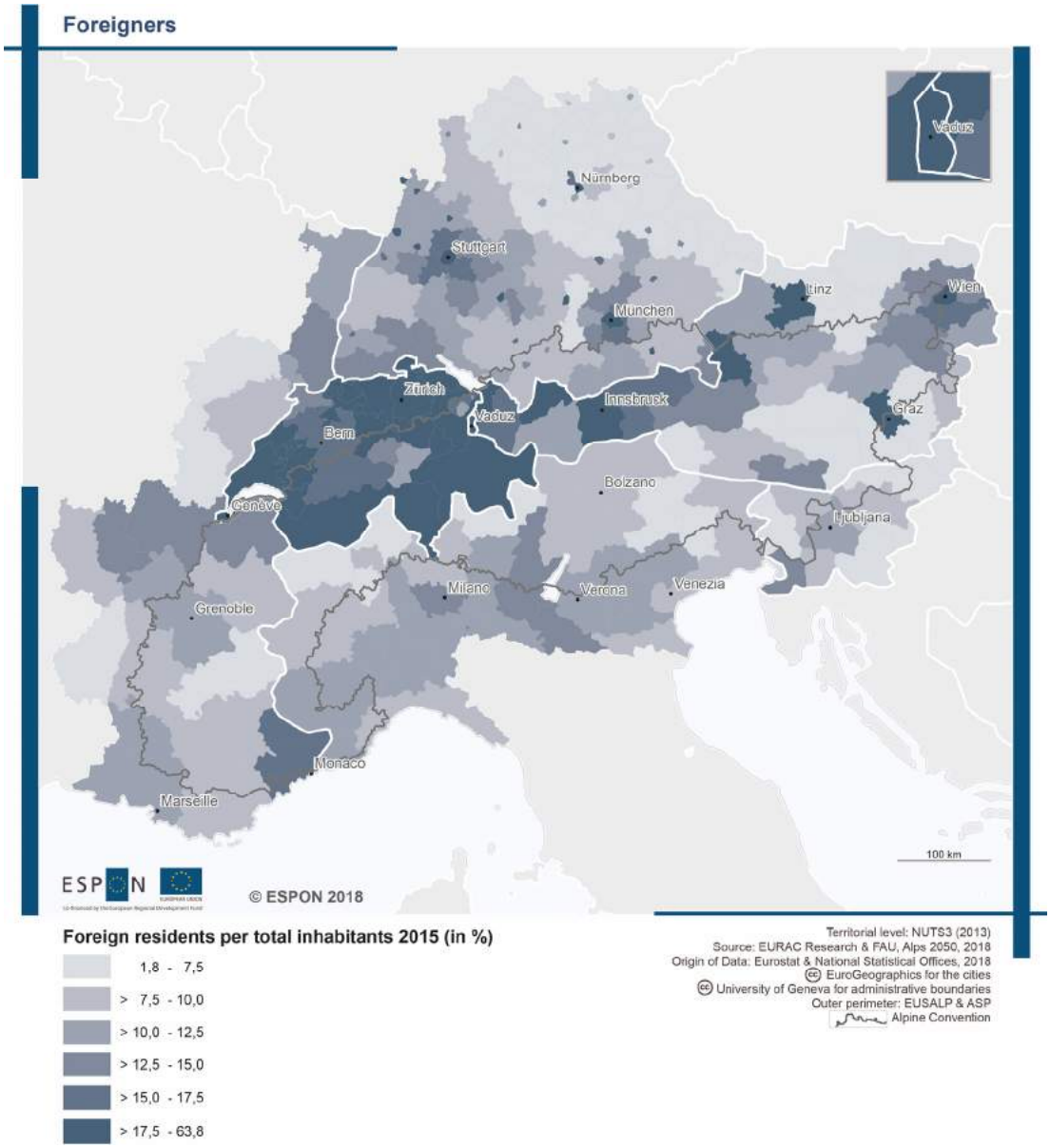


Map 17 Population change and the role of migration and natural change

Indicator/Methodology: Map 17 shows the population net change over the period 2011-15 on the NUTS 3 level. The green colours indicate absolute growth, the red colours absolute loss.

The colour intensity shows the different factors for the trend, i.e. if the growth/loss can be traced back to migration flows or to natural demographic development.

Description: The overall picture shows that the demographic development is very diverse over the Alps 2050 perimeter. Positive developments in both migration and natural development can be found in most metropolitan areas, along the Brenner corridor (Innsbruck-Verona) and in almost all NUTS 3 regions in Switzerland. In principle, this map brings together the two maps presented before, illustrating the natural net development and the migration net development, so the above formulated comments also apply here.



Map 18 Foreign residents

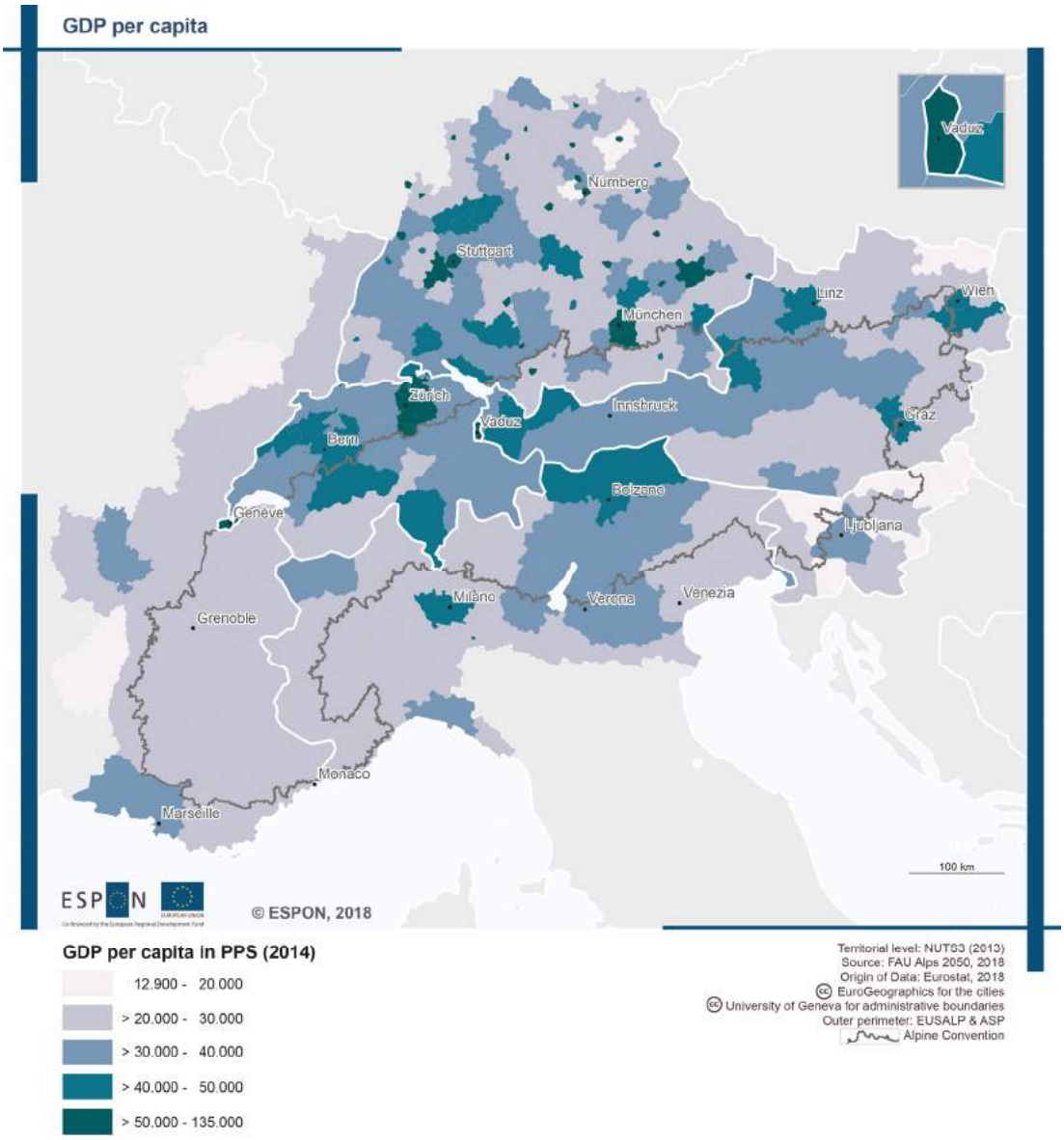
Indicator/Methodology: Map 18 shows the share of foreign residents for 2015 on the NUTS 3 level (defined by having a different nationality than the country of residence). The indicator comprises migrants from neighbouring Alpine countries as well as from any other international migration.

Description: Switzerland with its over-average economic growth in recent years (and decades) shows the highest share of international inhabitants, followed by the economically successful parts of (mostly Northern) Austria. The rate of foreigners on the German side is linked to the presence of the (automotive) industry where migrant workers play traditionally an important role. In Slovenia, the higher percentage in the coastal region is due to the economic orientation of this area (port, logistics and tourism) strongly attracting foreign labour working.

One has to keep in mind that naturalization conditions differ from one country to another (jus soli in France vs. more restrictive policies in Switzerland and Liechtenstein for instance), which partly influences the number of foreign residents.

5 Economy

5.1 Economic strength and disparities

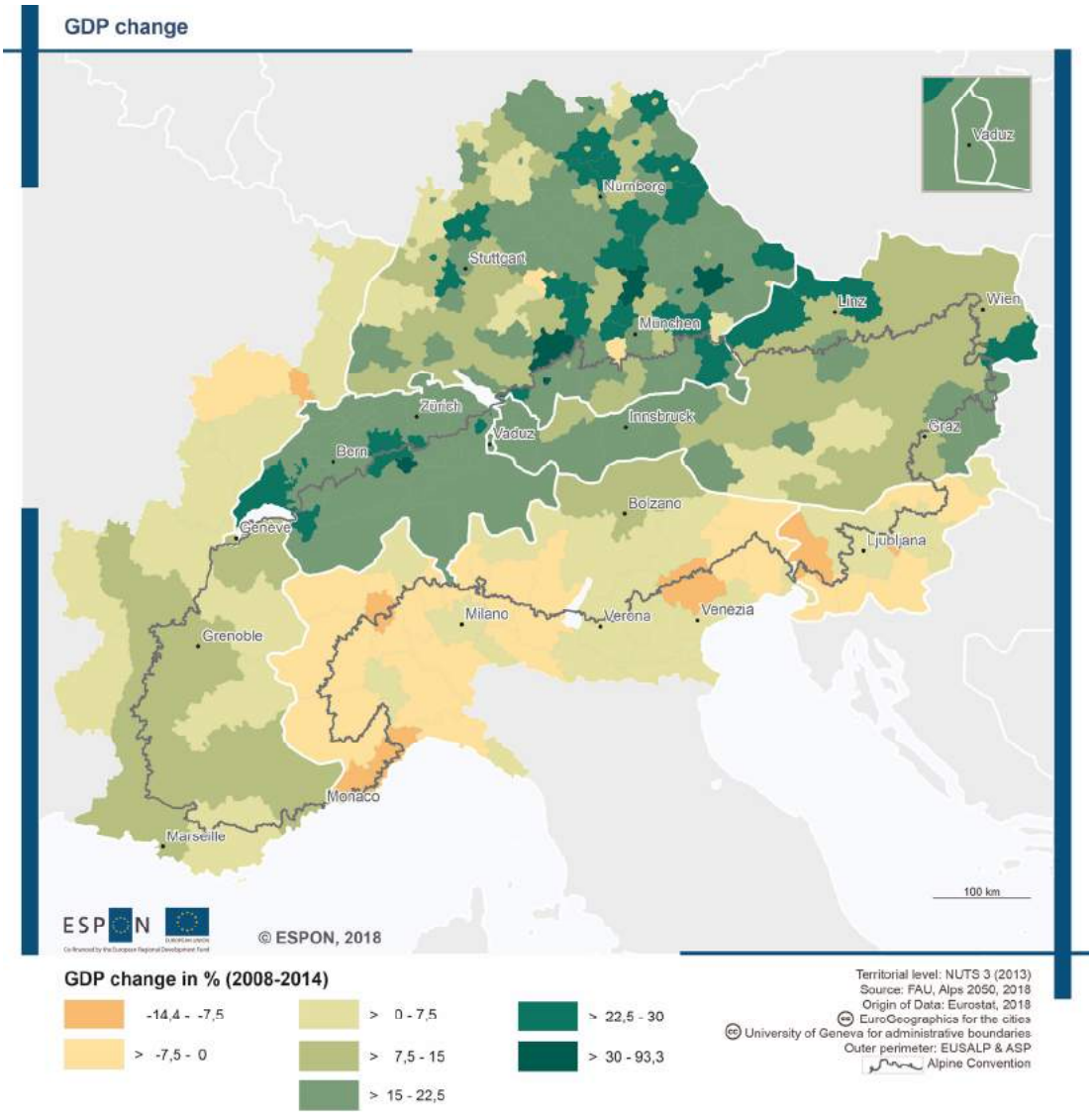


Map 19 Gross domestic product

Indicator/Methodology: The map shows the Gross Domestic Product (GDP) that describes the economic strength. The expression in power purchase standards (PPS) considers that the same nominal value of monetary units means different things in 'rich' and 'poor' regions. Both maps show values for the spatial level of NUTS 3**.** The values are calculated per inhabitant, not per worker which means enhanced values in small NUTS 3 regions (especially for the German "Kreisfreie Städte") due to commuting flows.

Description: The values are most positive in urbanised and metropolitan regions. Moreover, we see a certain North-South divide as regions in Germany, Switzerland and Austria are on a higher GDP per capita level than many regions on the Italian and French side. Slovenia displays

the important role of the Ljubljana region and the lag in the development of the Eastern Cohesion region.



Map 20 GDP change 2008-14

Indicator/Methodology: The map shows the change of the Gross Domestic Product (GDP) between the years 2008-14 and, thus, indicates the overall economic performance on regional level.

Description: The overall picture is in some parts similar to the map of the GDP level, which means that – in the period 2008-14, thus following the start of the economic crisis – economic North-South divide has increased. The already strong regions in Switzerland, Southern Germany and Northern Austria have performed better than most other regions. The same applies on the intraregional scale: The anyway positive position of the Grenoble – Marseille

corridor in France, of Southern Tyrol in Italia or of Ljubljana in Slovenia have even increased relative to their neighbouring regions.

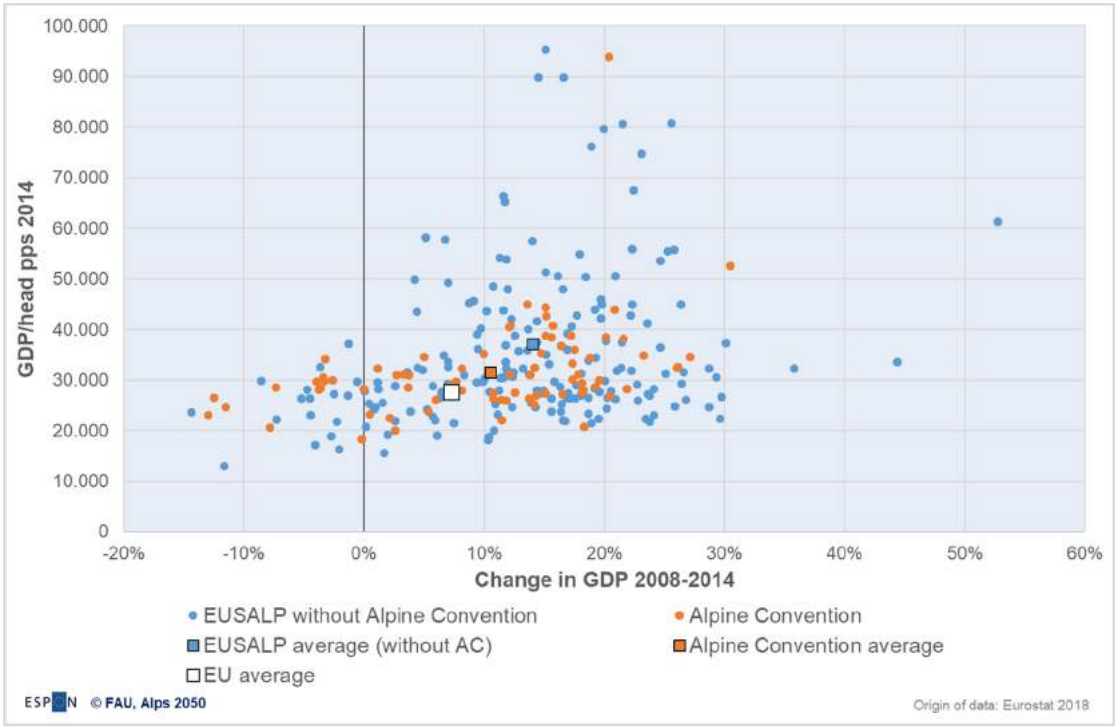


Fig. 2 Change in GDP on regional level – comparing pre- and inner-Alpine districts

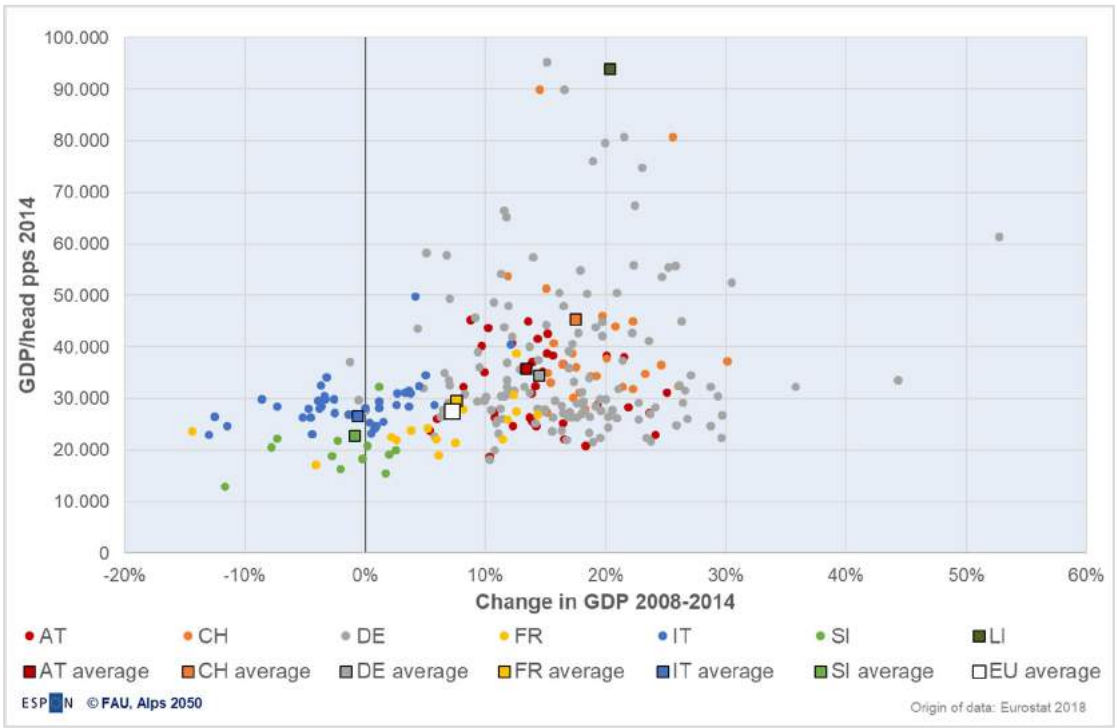


Fig. 3 Change in GDP on regional level – comparing districts of different national affiliation

Indicator/Methodology: The two scatter plots are based on the GDP indicator – on the y-axis the level of GDP per capita in pps and on the x-graph the change in GDP between 2008 and 2014.

The upper graph (Fig. 2) differentiates those NUTS3 regions being part of both the Alpine Convention *and* the EUSALP areas and those who are *not* part of the Alpine Convention but *only* of the EUSALP. The lower version of the graphic (Fig. 3) shows the performance of regions differentiated with regard to their *national* context.

Description: Fig. 2 shows that the EUSALP perimeter comprises many regions with a very strong economic performance, but also some pretty weak performing ones. Simplifying to a certain extent, the graph shows that economic diversity is larger within the EUSALP perimeter than it is within the AC perimeter. The AC regions are performing slightly weaker than the EUSALP ones. This can be explained via the lower presence of urban centres that lead to agglomeration effects. The major part of the cities is located outside of the Alpine Convention. One might interpret this as an argument for the 'hypsometric postulate' (inner-Alpine AC regions at "higher" altitudes develop slightly weaker than the 'lowland' EUSALP regions), but there are many exceptions. One has to admit that the picture would be different on a finer scale: Even within relatively prosperous (NUTS3) regions, certain villages and areas can be hit very hard by demographic and structural change (c.f. results of ESPON project PROFECY on Inner Peripheries; Noguera et al. 2017). Both the GDP level and trend are above EU average, and the non-mountainous EUSALP regions are ahead of the Alpine Convention regions.

The picture is much clearer in the lower graphic (Fig. 3): The NUTS3 regions of each country make up a kind of a 'cloud' that can immediately be differentiated from other countries. The high variability within the 'clouds' of Switzerland and Germany have to be seen relative to the small size of the NUTS3 regions in these countries. However, the overall picture is clear: The fragmentation argument – postulating the high importance of national contexts – is very true, at least on the NUTS3 level. In other words: The belonging to a certain nation-state determines the economic path to a high extent. The question, if a region is situated in the inner-Alpine or outer-Alpine area (i.e. AC or EUSALP), is less decisive.

Regional disparities

Table 4 Development of regional disparities 2008-14: variation coefficient of GDP per capita (pps) in % (NUTS 3)

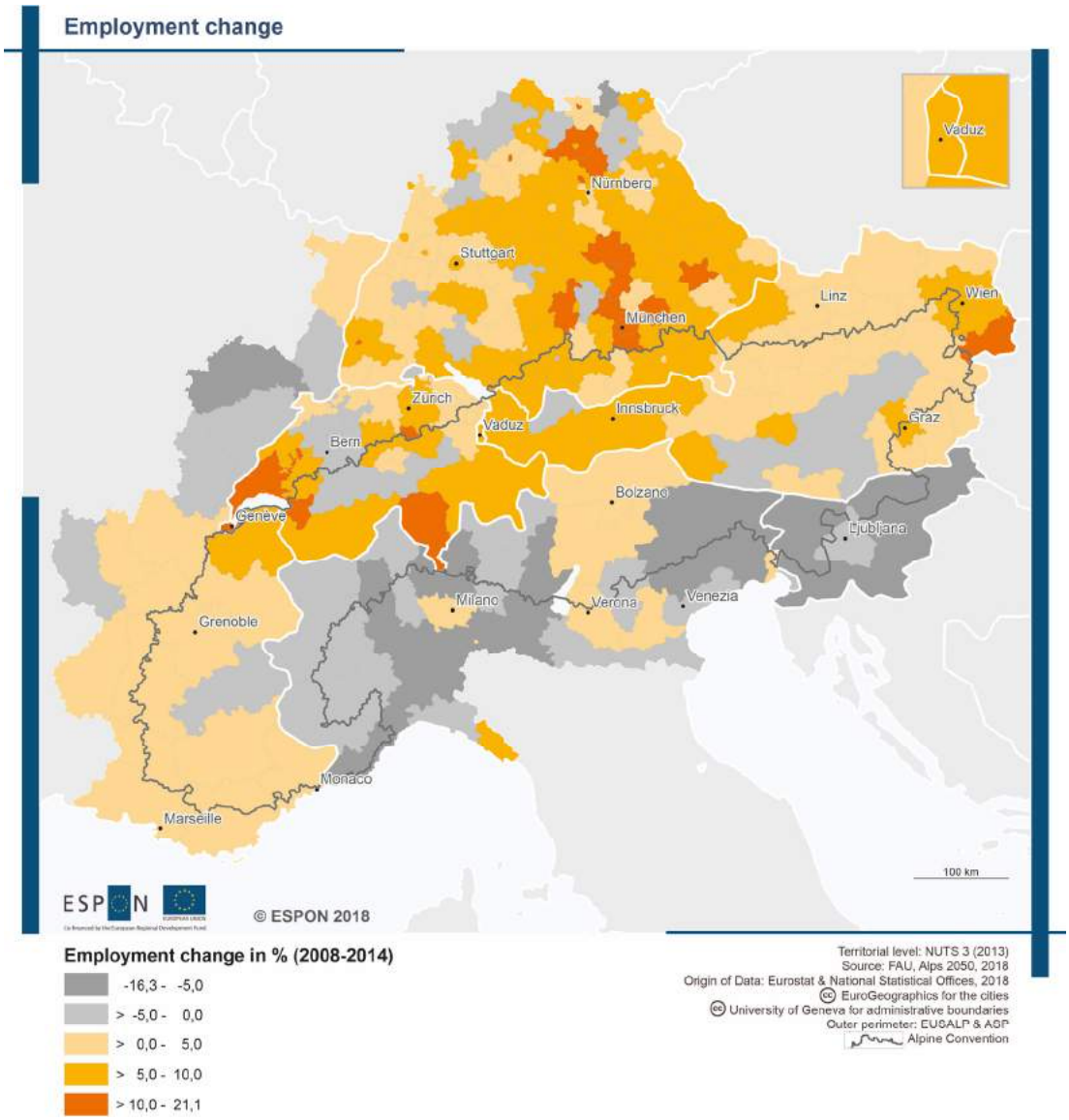
	2008	2014	Change
EU 28	53,31	56,05	+ 5,14%
ALPS2050	33,80	35,52	+ 5,09 %

Indicator/Methodology: Table 4 presents the values for the coefficient of variation of GDP per capita in PPS (in %), weighted by the population numbers on NUTS3 level. A decrease of the

coefficient of variation is equivalent to a reduction of disparities and vice versa. It allows to describe disparities of spaces of different sizes, development level and of different points of time (2008-14).

Description: The disparities are much higher on the EU than within the Alps 2050 space. This was to be expected as the area is much smaller and the economies involved are performing relatively smart (for more details see Map 19 and Map 20). It is interesting to note that the trend is similar: disparities increased in both spaces over the time 2008-2014 almost with the same changes, slightly different for the Alps 2050 perimeter.

5.2 Labour and employment

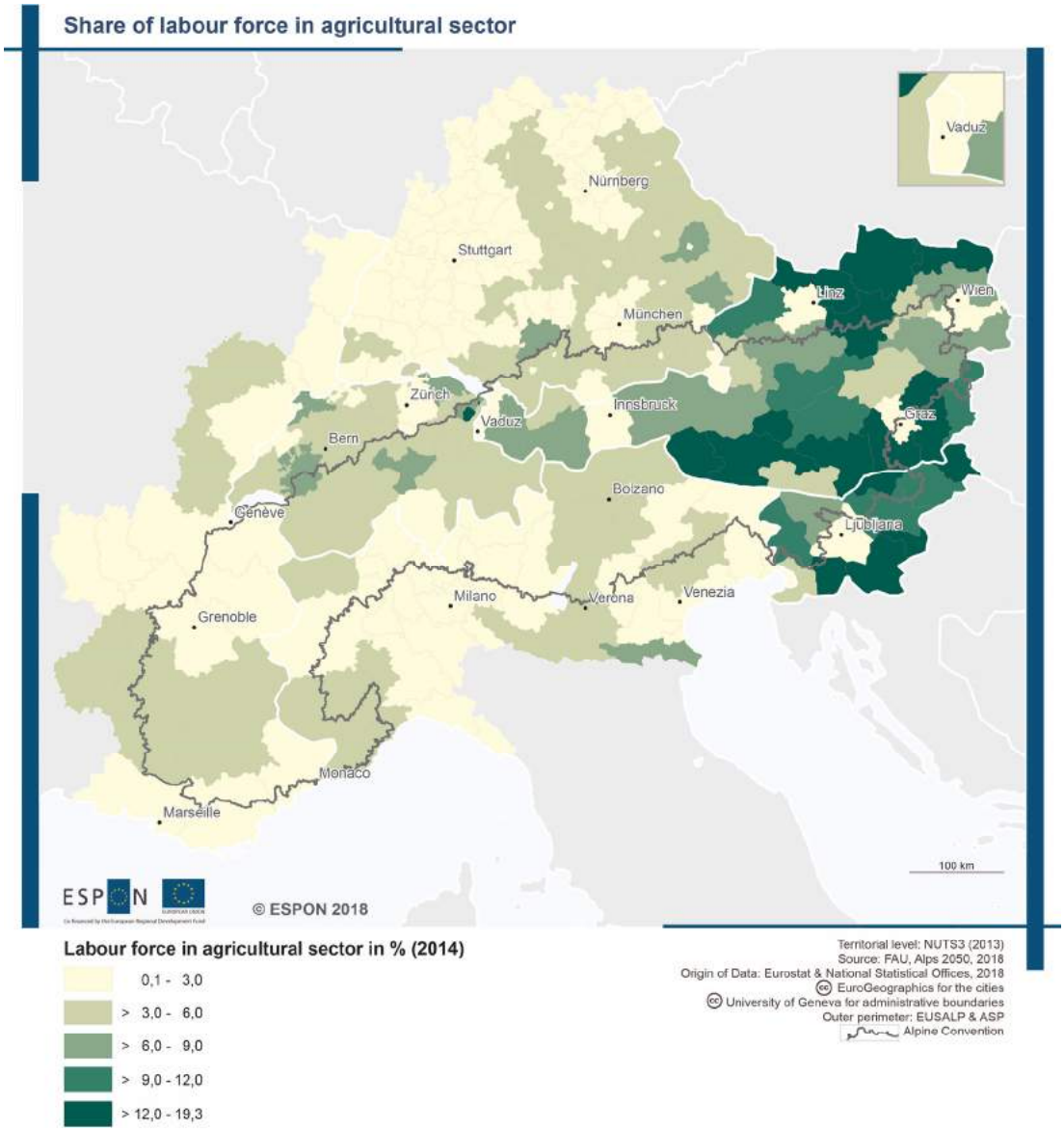


Map 21 Employment change

Indicator/Methodology: This indicator shows changes in employment for the period 2008-14.

It illustrates to what extent the number of working places of all sectors and branches have developed. Grey colours indicate negative trends, yellow/red colours indicate a positive development.

Description: The spatial pattern shows a pretty clear North-South divide. This picture confirms the patterns we observe with regard to economic development (GDP trend), demographic development (in particular migratory patterns) and patents. This confirms the interrelatedness of socio-economic development in these dimensions.



Map 22 Share of labour force in agricultural sector

Indicator/Methodology: The map shows the employees in the NACE sector 1, comprising agriculture, forestry, and fishery relative to all employees on the NUTS 3 level (in %). The data is provided by Eurostat and, thus, is harmonised on the European level (with the exception of Switzerland and Liechtenstein). In some countries (in particular in Austria, some concerns also in Slovenia and Italy), the Eurostat data contradicts domestic data due to different definitions (e.g. part-time working) and methodologies. This visualisation shows the share of all *persons* (employees) and not full-time equivalents which would show far lower values.

Description: The spatial pattern shows values over average for large parts of Slovenia and (Eastern) Austria. This pattern is not easy to explain: beyond the statistical complexity, the enhanced values for Austria could be explained with a high priority policy for rural and mountainous areas.

Indicator/methodology: The scatter plots of Fig. 4 and Fig. 5 visualise the *level* of agricultural employment on the y-axis and the *change* of the labour force in the agricultural sector for 2008-14. Each dot represents one NUTS 3 region; in the upper graph, we differentiate the inner Alpine regions ("Alpine Convention") and the pre-Alpine regions (EUSALP and Alsace without Alpine convention areas). In the lower scatter plot we differentiate the national affiliation – each colour represents one country affiliation.

Description: All in all, we see a diverse development spatial pattern. The scatter plot confirms the impression from the cartographic representation of Map 22 that the differences between inner-Alpine and pre-Alpine areas are not significant, in other words: the average values are very close between the inner and pre-Alpine space. However, the national affiliation does matter – the average values of the national level are clearly different. This shows the relevance of political decision-making (funding programmes, subsidies etc.).

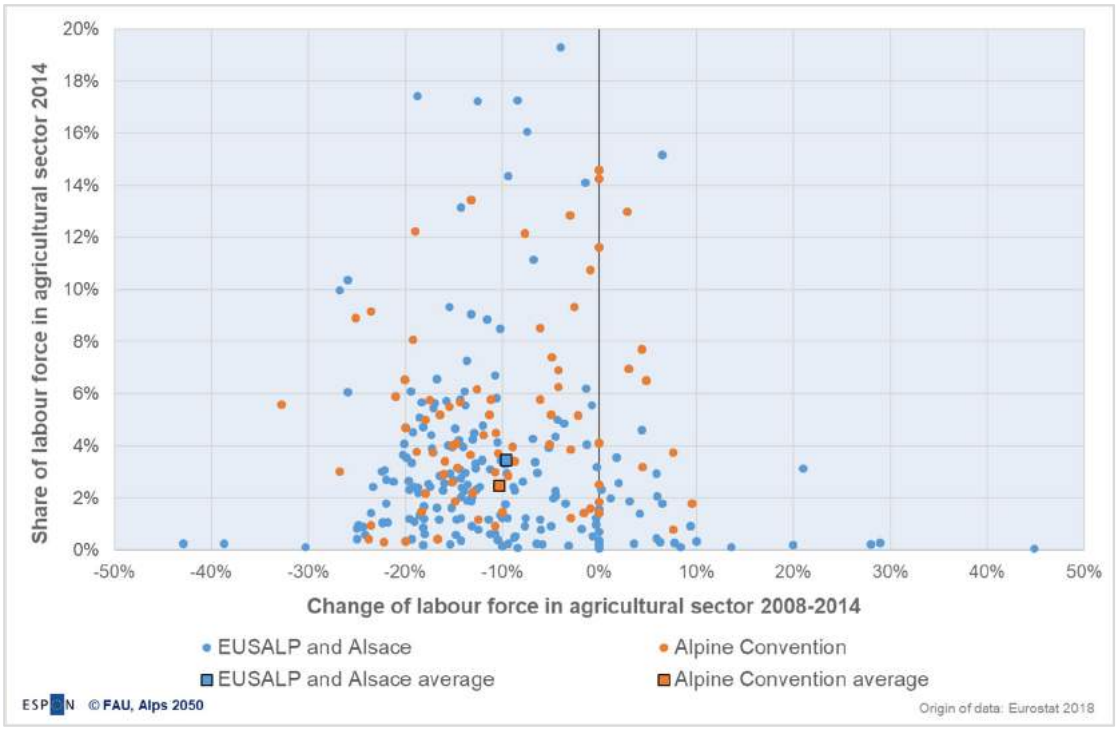


Fig. 4 *Change of labour force in the agricultural sector on regional level – comparing pre- and inner-Alpine districts*

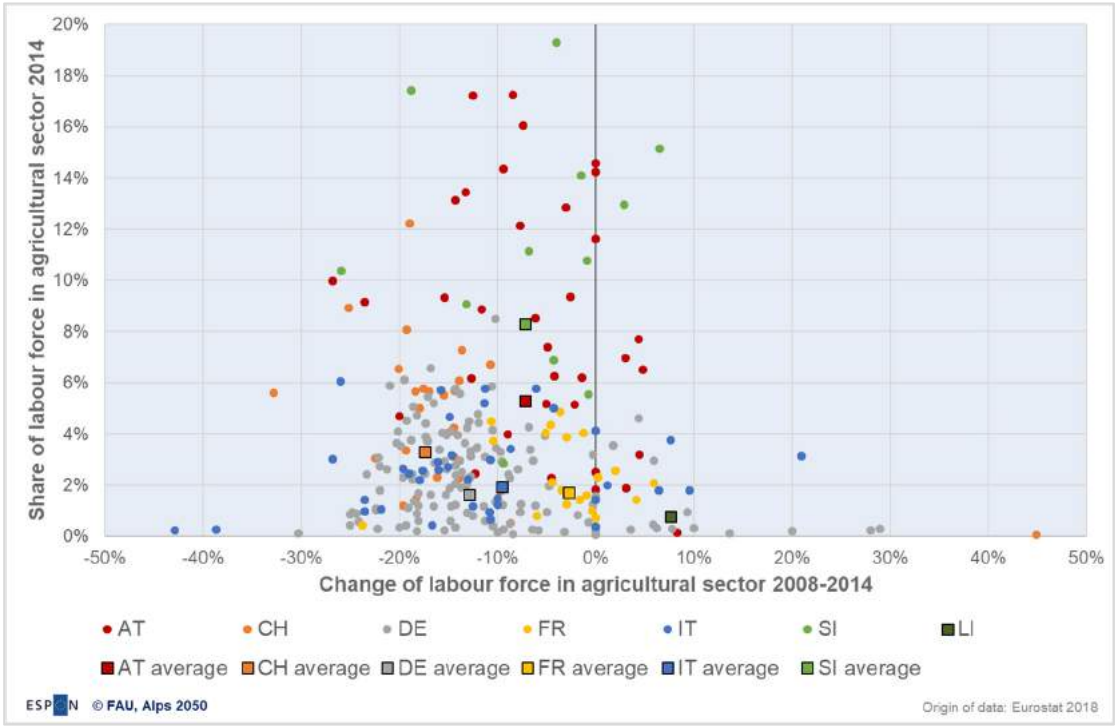
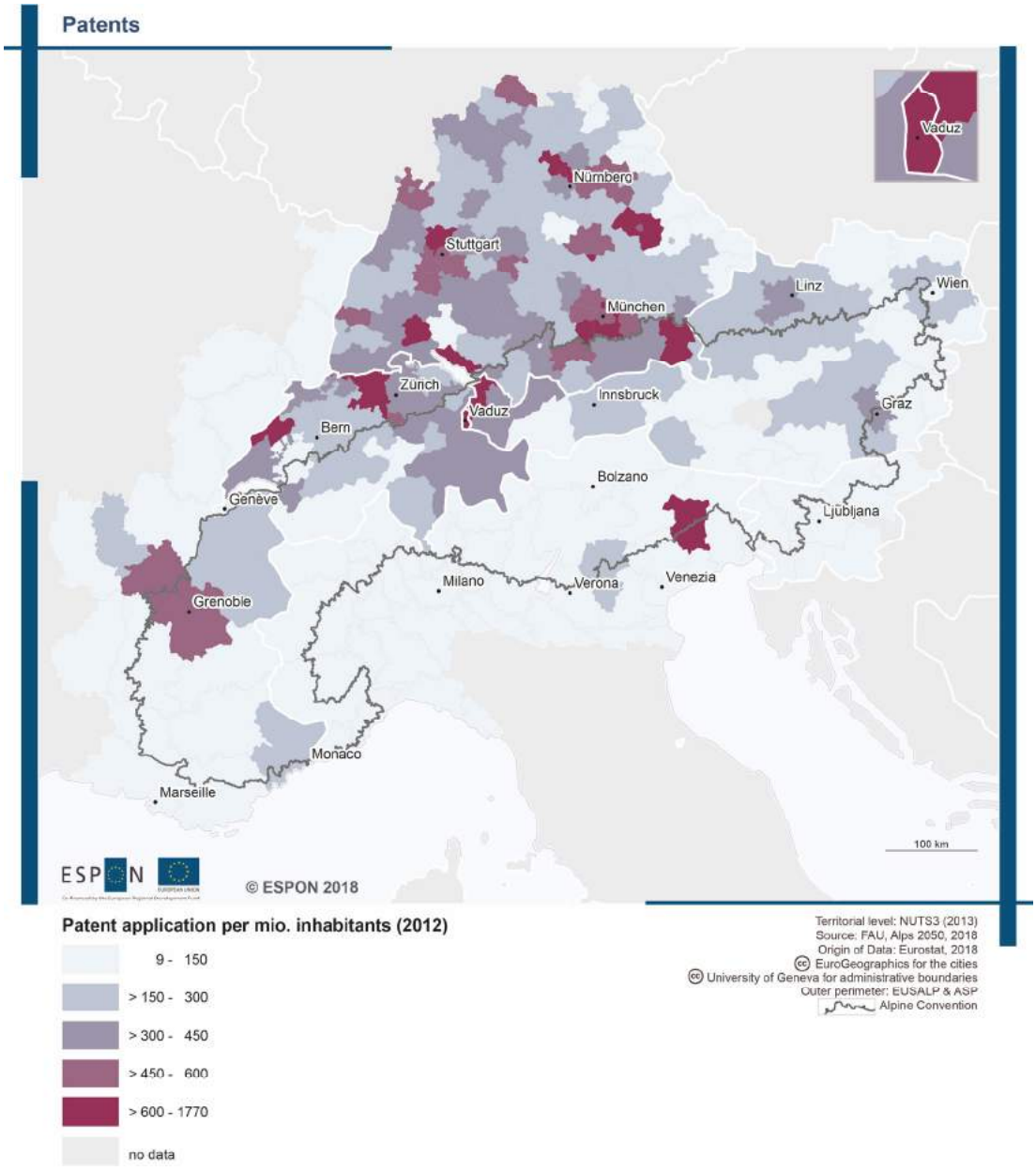


Fig. 5 *Change of labour force in agricultural sector on regional level – comparing districts of different national affiliation*

5.3 Innovation



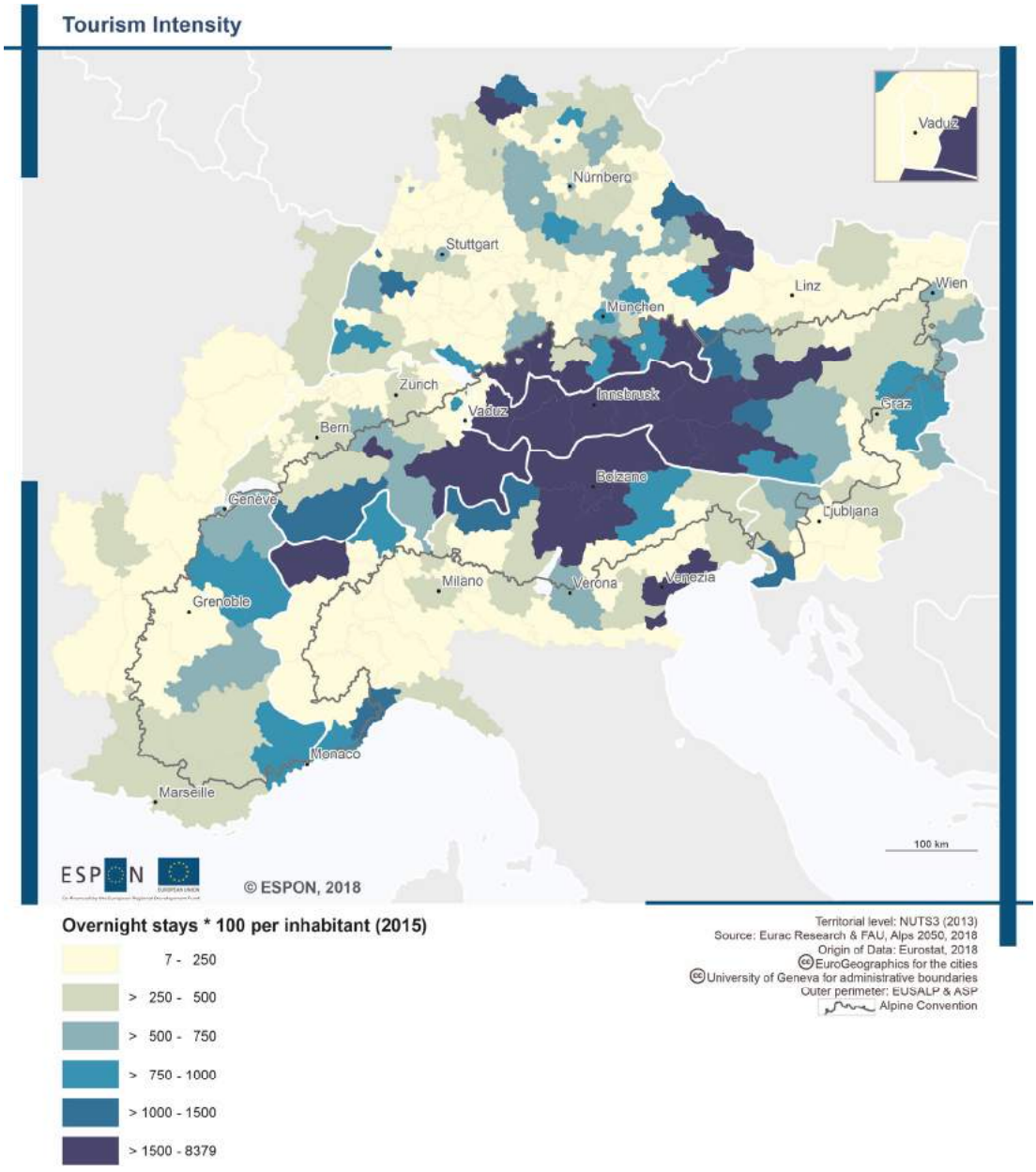
Map 23 Innovation: Patent application per mio. Inhabitants

Indicator/Methodology: The map visualises the indicator patent application per million inhabitants at the European Patent Office (EPO). This map shows very different values on the NUTS 3 level. The methodological debate on this indicator is complex: One might criticise the focus on technological innovations and, thus, the underestimation of process innovation, social innovation, management innovation etc. – at the same time, the number of EPO patents correlates strongly with socio-economic development and, thus, is an important hint.

Description: This map shows a pretty sharp North-South contrast within the Alps 2050 perimeter comprising values below 150 and above 600. There is a certain focus on metropolitan regions, but the national affiliation to Northern Alpine or Southern Alpine countries is important.

The Swiss and German economies tend to be over the average of patent applications, and so is Northern Austria and the Grenoble region; large parts of France, Italy and also Slovenia show low levels of patent application.

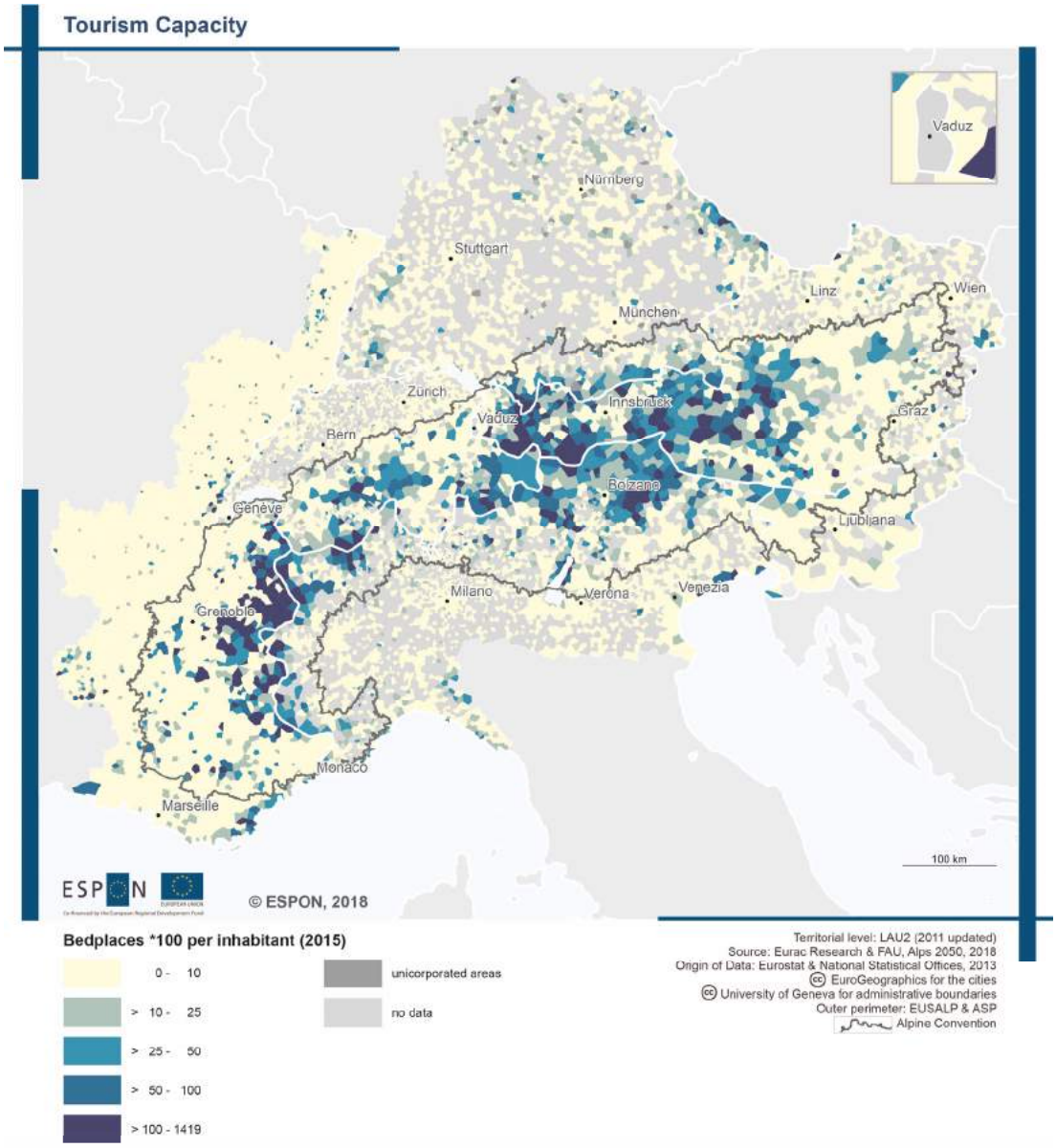
5.4 Tourism



Map 24 Tourism intensity: overnight stays per 100 inhabitants

Indicator/Methodology: The indicator tourism intensity is calculated on the NUTS 3 level and is based on the formula “overnight stays per year x 100 / population 2015”. This indicator shows the actual demand (and not only the infrastructure quantity as shown in the next map).

Description: The values are the highest in the central and Eastern parts of the Inner-Alpine area. This is due to the strong presence of the tourism sector and the relatively low population density. As a result, the relative economic importance is the highest in inner Alpine areas.



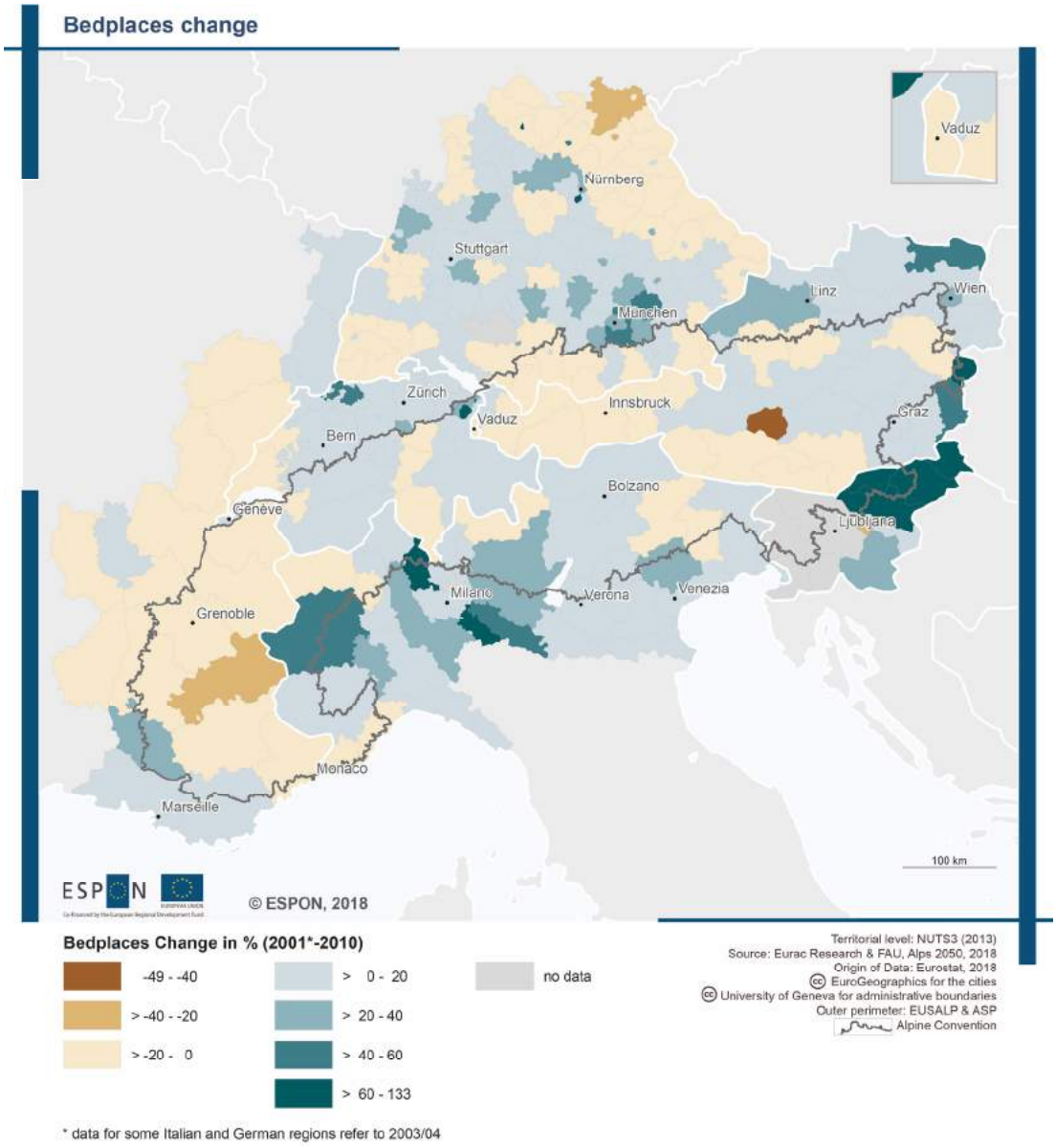
Map 25 Tourism capacity – bedplaces per 100 inhabitants

Indicator/Methodology: The indicator tourism capacity is calculated on LAU level and is based on the formula “bedplaces / inhabitants 2015”. This indicator shows the actual tourism infrastructure. The methodology counting bedplaces differs in the nation states so that the maps

shows bedplaces in hotels and similar establishments[3]. The large number of municipalities without data is due to data protection reasons.

Description: The overall patterns underline the findings described in the map Map 24. However, the finest spatial scale reveals large differences within one region – the skiing places on the French side or the Dolomites on the Italian side are very visible – and the local influence on tourism activities. In Slovenia apart from the tourism capacity in the Alpine part (Triglav national park area), the greener parts are mostly related to the spa centres based on the thermal water. The coastal towns have higher capacities in Slovenia, Italy and France.

[3] Data refer to "Hotels and similar establishments" without campsites. Slovenia and Austria: "permanent beds" (without extra beds or couches); Liechtenstein: Hotel industry ("Hotellerie") in Liechtenstein.; Switzerland: hotels and spa facilities; France: hostel beds, holiday residence, villages vacances (holiday village) and an estimated number of hotel beds (number of rooms x2); Austria: hotels and similar establishments, including commercial accommodations; Germany: Bavaria, bed places are excluding camping places; Baden-Württemberg: Hotels, Hotel garnis, guest houses and hostelry



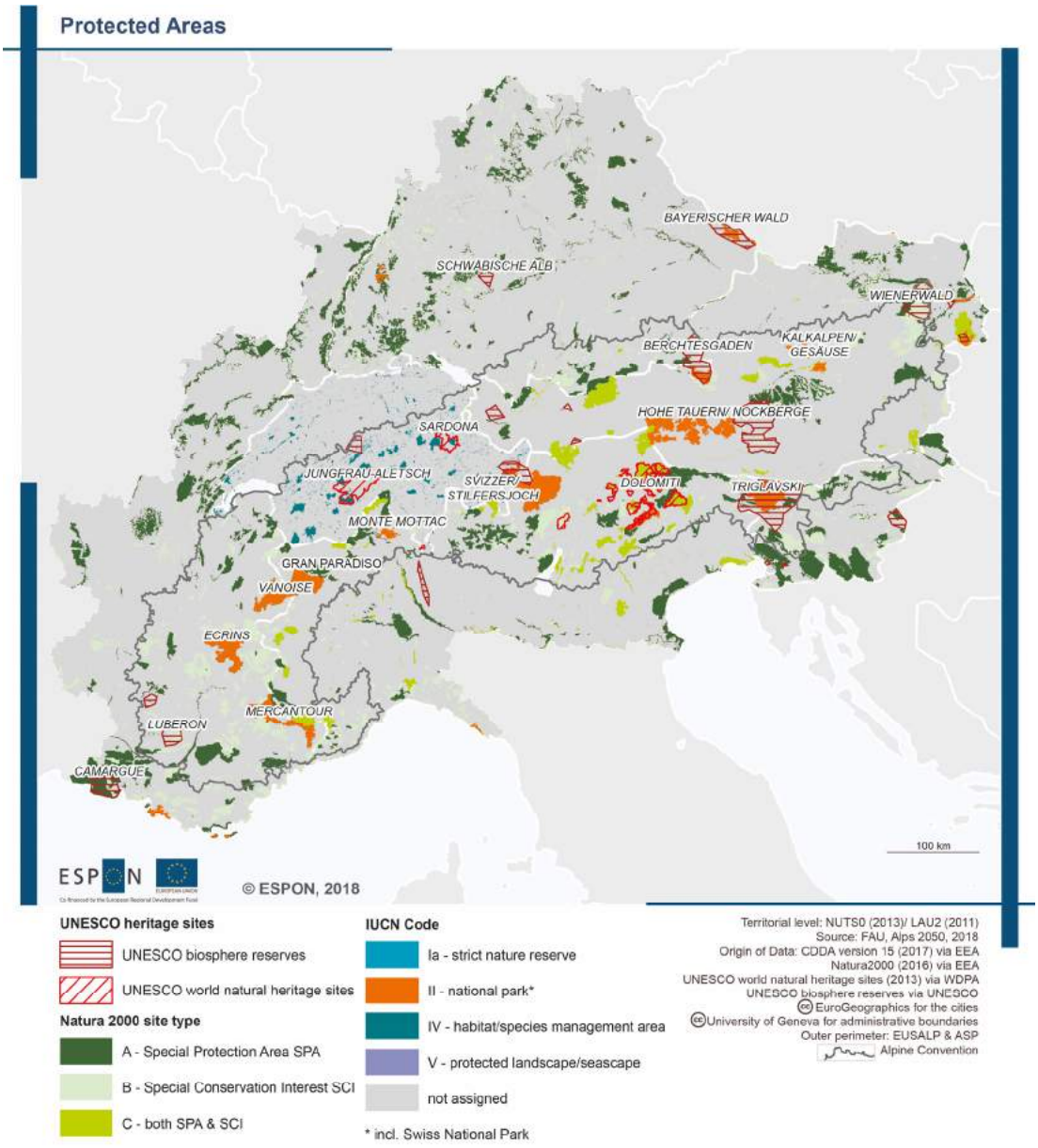
Map 26 Bedplaces change in per cent

Indicator/Methodology: The map shows the changes of bedplaces between 2001 and 2003. Brown/yellow colours indicate a loss, green colours indicate growth dynamics.

Description: In mountainous areas, the economic role of tourism tends to grow. The differences between the national contexts are striking: The values are largely positive for the Italian and Slovenian side and negative for the French side.

6 Ecology and ecosystem services

6.1 Protected Areas



Map 27 Protected areas

Indicator/Methodology: The map provides an overview on the state of the protected areas in the Alps 2050 perimeter. From a methodological point of view, this is a challenge as domestic protection regimes are not standardised or officially documented. But there are diverse helpful sources that are brought together in this map:

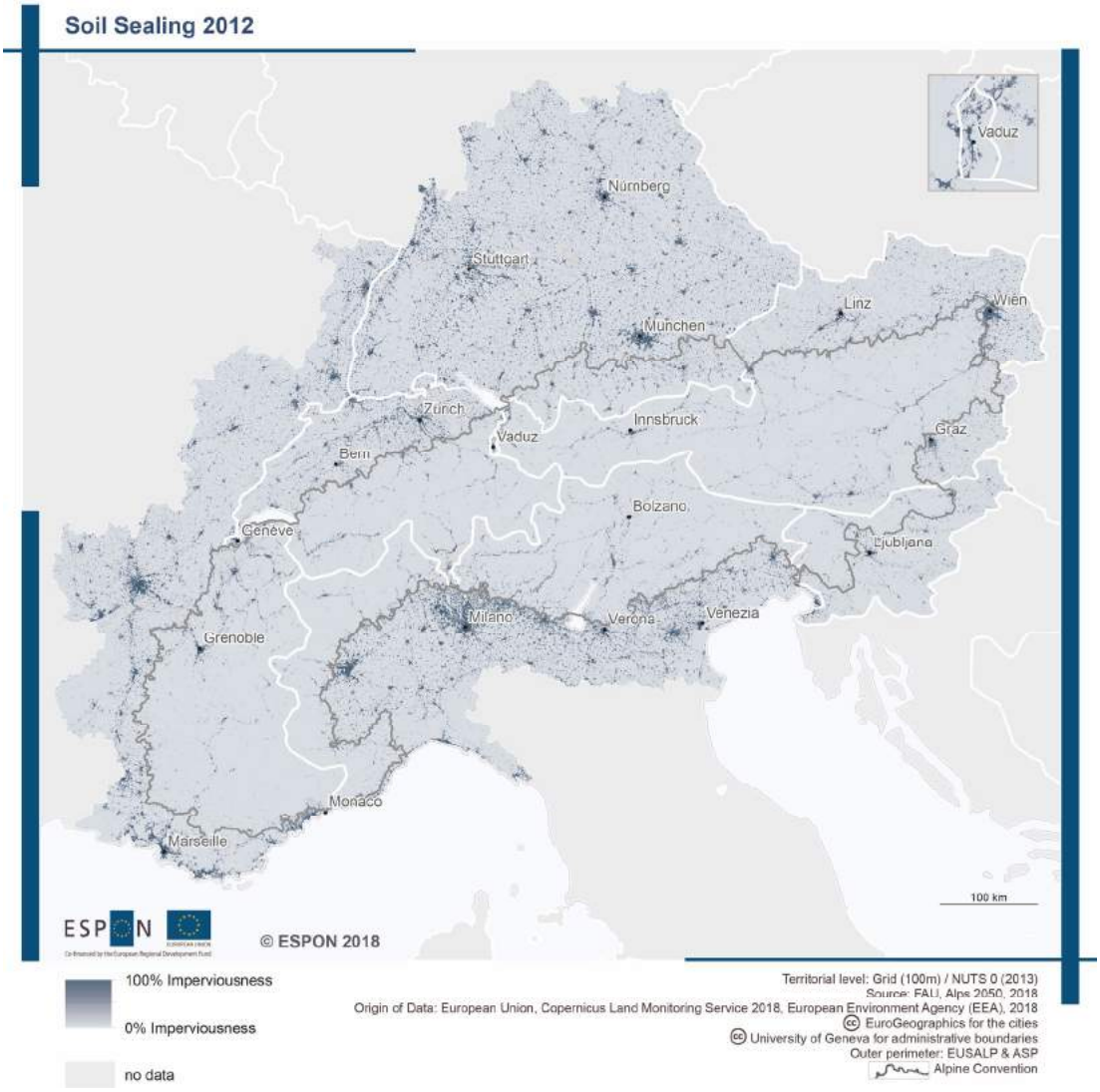
- Within the EU, the Natura 2000 network shows those sites that are protected due to the habitats directive (Special Conversation Interest SCI) and the directive on the conservation of wild birds (Special Protection Area SPA).

- On global level, the UNESCO offers the protection formats of natural heritage sites and biosphere reserves
- In the case of Switzerland, which is (as non EU-member) not included in the Natura 2000 network, the map shows the IUCN codes Ia and IV which follow similar protection purposes as the Natura 2000 network. The IUCN (International Union for conversation of nature) is an NGO umbrella organization that also involves many governmental ministries. The IUCN code helps to make regional and national protection regimes comparable.

Description: Again, we see clear differences between the national protection regimes. For example, national parks are much more frequently enacted in AT, FR and IT, whereas DE and CH have fewer national parks which are mostly relatively small in size. Another example is the different implementation path of the EU protection directives that display very different average sizes of protection areas within the different countries, ranging up to 38% of protected area in Slovenia.

The inner Alpine area is are not necessarily more or less often object to protection measures. However, many famous mountain massifs are object to national park regimes and/or UNESCO protection (e.g. Dolomites in Italy, Triglav in Slovenia).

6.2 Soil sealing



Map 28 Soil sealing 2012

Indicator/Methodology: The map shows soil sealing in the year 2012. Soil sealing is measured as a degree of imperviousness based on grid data (100 m) differentiated by colour. The data is provided by the European Environmental Agency.

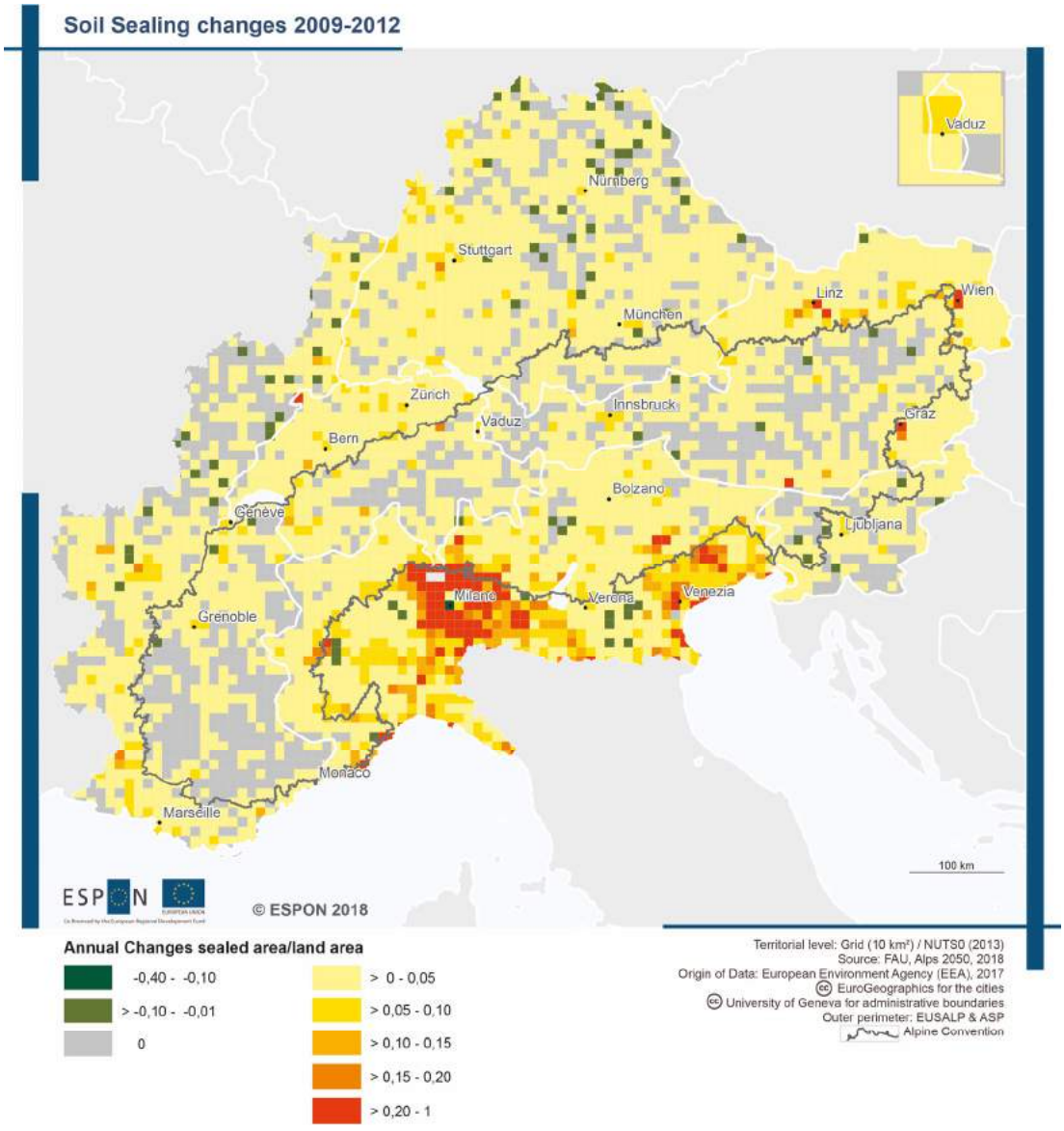
Description: Soil sealing of the Alps 2050 perimeter shows the following patterns and characteristics:

- Within the Alpine Convention perimeter, the extent of the impervious area is much lower than beyond.
- The map shows that the impervious degree is the highest outside the mountainous area, especially in the major urban areas of Lyon, Torino, Milano, Verona, Wien, Linz and Munich. In accordance to the settlement system, some inner Alpine valleys are displayed on the soil sealing map but on a much lower level of imperviousness, e.g. the Rhone valley (Valais), the Rhine valley (North and South of Liechtenstein), the Inn valley (around

Innsbruck), and the Isère valley (between Geneva and Grenoble), the Po valley (from Milano Eastwards) etc.

This is one of the maps that clearly displays a morphological picture of the Alps. It highlights the mountainous area including the exceptions of the biggest Alpine cities of Innsbruck, Bolzano, and Grenoble. The overall picture must not be misunderstood in the sense that soil sealing would not be a problem in mountainous areas: In these areas, the settlement pressure concentrates on the flat valleys that represent only a small share of the whole territory.

In accordance with the settlement system soil sealing also shows the relevance of the morphological structure of the Alpine valleys and the agglomeration ring all around the mountainous area. Soil sealing is not an issue limited to a national context and rather belongs to the common challenges of the Alps and should be part of future macro-regional studies and debated on a transnational level.

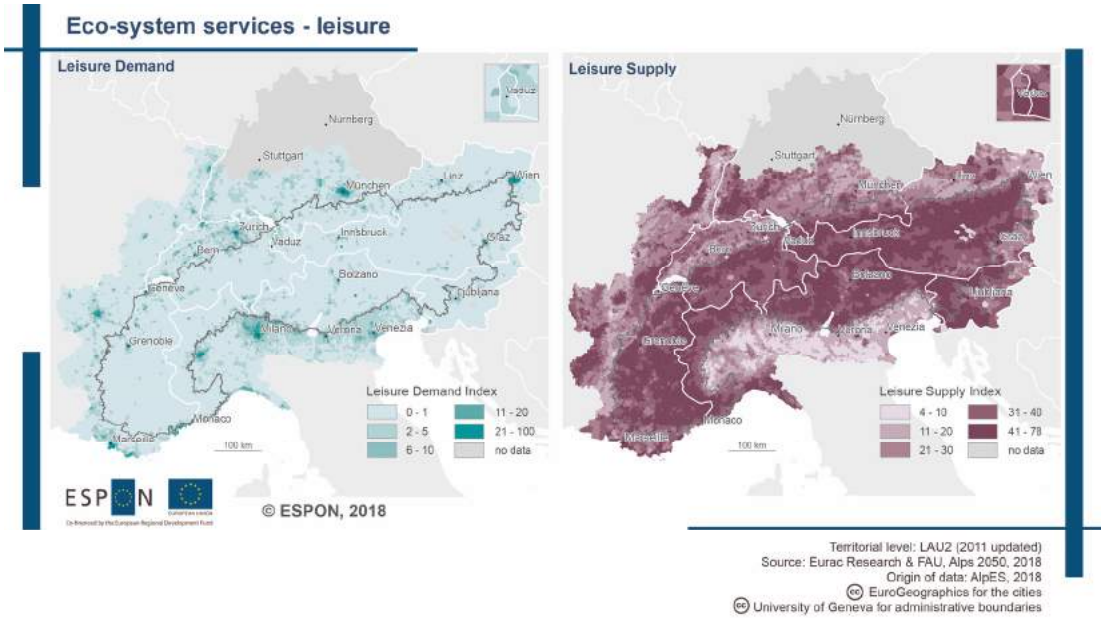


Map 29 Annual change in soil sealing

Indicator/methodology: The map shows the trend in soil sealing between 2009 and 2012. This is a rather short time period and already some years old, but it is the only dataset displaying trends for the complete Alps 2050 perimeter. Soil sealing is measured as the relation of sealed area to land area based on grid data (10 km) differentiated by colour.

Description: Soil sealing is a trend that can be observed in almost all parts of the Alps 2050 perimeter. The map shows that soil sealing is a trend that is most probably to happen in urban areas, and it is most present in the area around Milano, but also Torino and Venice. It is less prominent in the very inner Alpine areas where morphology largely prevents settlement activity. In general, we see that soil sealing is a slow, but steady process affecting almost all municipalities, as the light yellow colour in the map shows. More than the speed it is the omnipresence of the trend that makes it an important topic.

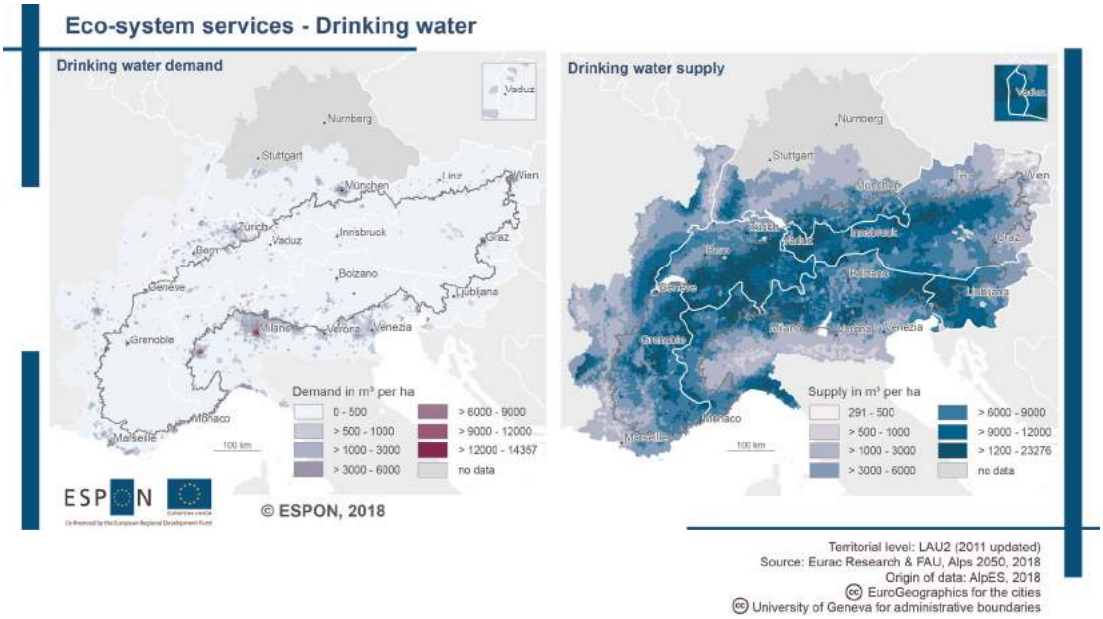
6.3 Eco-system services



Map 30 Leisure demand and supply as eco-system service

Indicator/Methodology: The data behind these representations is based on the outputs of the Alpine Space project "AlpES: Alpine Ecosystem Services – mapping, maintenance, management" that aimed to reflect the spatial patterns and functions of Ecosystem Services in the Alpine Space cooperation area. Leisure supply and demand is one of the Ecosystem services addressed in this project which is described in more detail by Schirpke et al. (2017). Following this approach, the recreation ecosystem service includes both, the recreation potential provided by ecosystems (the supply side) and the possibility to benefit from it (the demand). Recreation supply is defined as the capacity of ecosystems to provide recreation opportunities due to the natural preconditions without human input and regardless of these being actually used. The service, however, is only provided if people can reach the supply areas to carry out recreational activities. Thus, the *supply* (right-hand side) is related to areas capable of providing recreation that are accessible by transport infrastructure. The *demand* for recreational opportunities (left-hand side) is here expressed by quantifying local beneficiaries (inhabitants and tourists) considering their general societal preferences.

Description: The two maps show clearly the difference between both patterns of the ecosystem service recreation (leisure). The demand is located at those places where the population density is very high; leisure supply is mostly concentrated in mountainous regions. What the map does not show (but the more detailed data behind), is that recreational landscapes around urban agglomerations are frequented all the year long, whereas visitation rates in remote mountain areas depend greatly on the season.

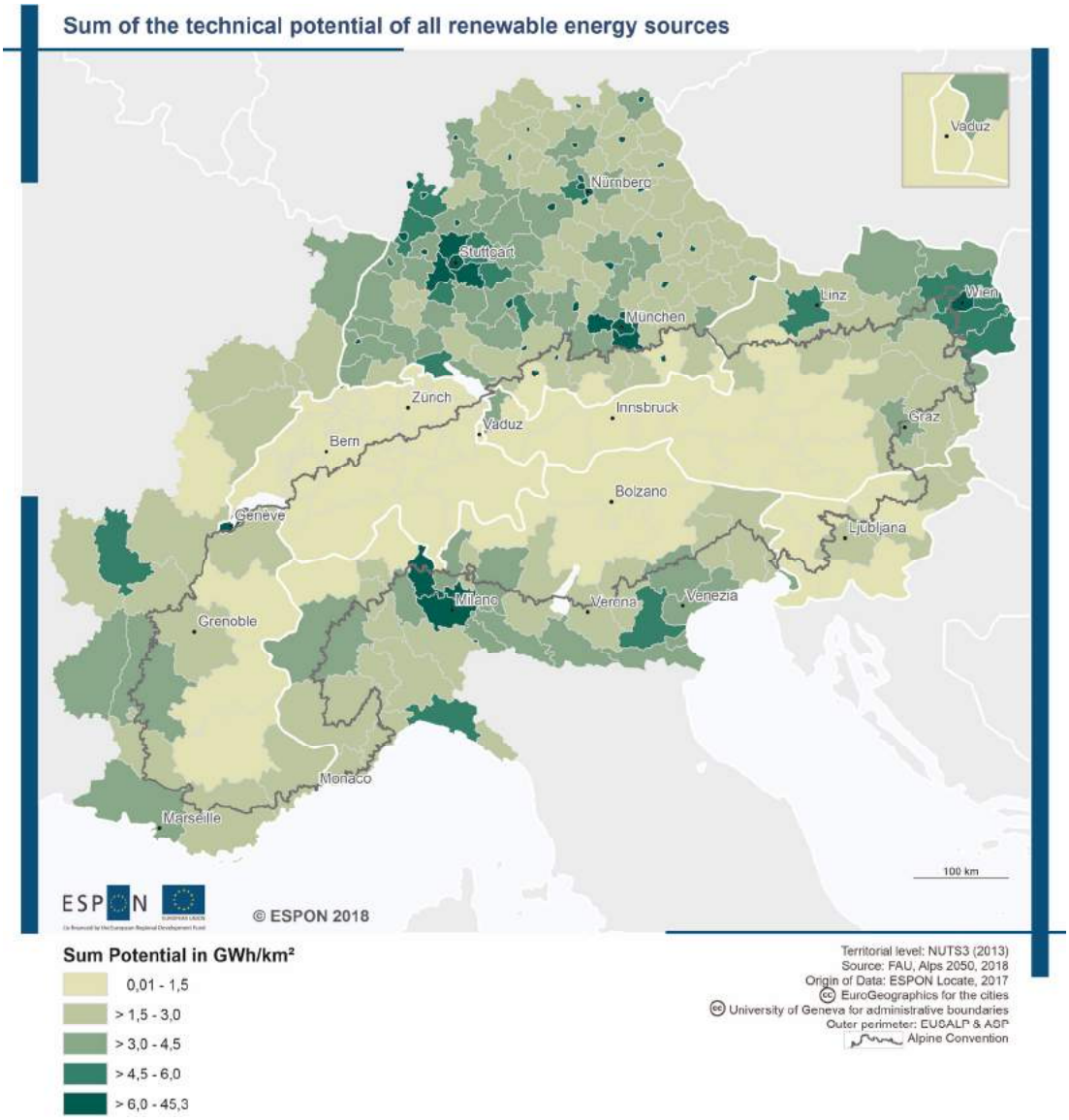


Map 31 Demand and supply of surface water as eco-system service

Indicator/Methodology: The data behind these representations is also based on the outputs of the Alpine Space project "AlpES: Alpine Ecosystem Services – mapping, maintenance, management". They separately confront the surface water supply and the surface water demand. The *supply* indicator (right-hand side) quantifies the annual average available water runoff with drinking-water quality. The model estimates the water runoff from subcatchment areas based on gridded information on climatic, soil, topographic and land-cover characteristics. On the contrary, the demand indicator (left-hand side) quantifies the demand for drinking water as the total annual abstraction of water for the public supply system. Water abstraction is understood as water removed directly from its source.

Description: The contrast of both maps is striking: we see that the supply indicator map clearly delineates the Alpine mountain rage, whereas the peripheral zone, which are mainly lowlands, have much lower runoff. On the contrary, the water demand is very much linked to the urban and metropolitan nodes with elevated population densities or to the permanently irrigated areas within the Alpine space. Organising these spatial patterns with political and spatial development tools is a major challenge of the Alps 2050 perimeter.

7 Energy



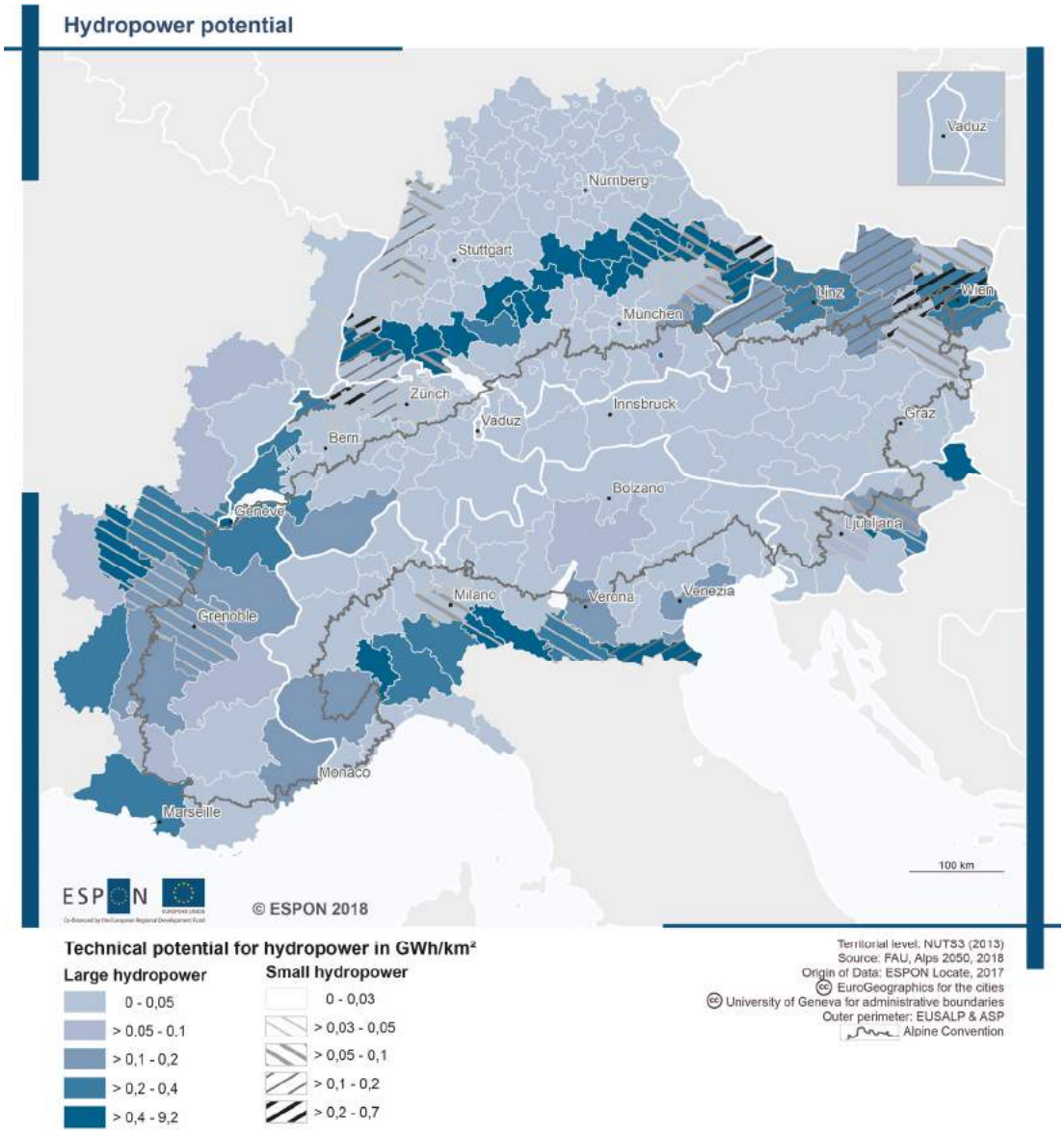
Map 32 Technical potential of renewable energy resources

Indicator/Methodology: The map shows the technical potential of renewable energy sources in the year 2017. The sum potential of different renewable energy sources is assigned to categories differentiated by colour. The potential of renewable energy has been calculated within the Enertile model (ESPON Locate 2017). This model takes into account spatial data, meteorological data and technology-specific calculations as well as current capacities of interconnectors and electricity storage. The calculations do not show the financial investment necessary to exploit the potential. However, economically or politically unfeasible areas and options are not included in the calculations.

Description: The map of the potential of renewable energy sources in the Alps 2050 perimeter shows the following patterns and characteristics:

- This is one of the maps that clearly displays the importance of national and regional contexts. France, Italy and regions in North-eastern Austria as well as Germany show the highest potential for renewable energy sources.
- On the one hand, different potentials of renewable energy sources illustrate different policies for renewable energies. On the other hand, the map shows differences because in some countries and regions the potentials of renewable energy sources have been used already. The latter seems to be true for hydropower in Switzerland and Western Austria as well as wind resources in Germany.

The differences of the potential of renewable energy sources might be related to different policies for renewable energies in the Alps 2050 perimeter. Therefore, developing common macro-regional policies is a real challenge.



Map 33 Technical potential for hydropower

Indicator/Methodology: The map shows the technical potential for hydropower (in GWh) in the year 2017. The map distinguishes between large and small hydropower facilities. Large hydropower is assigned to one of five categories differentiated by colour, small hydropower is assigned to five categories differentiated by hatching lines. Hydropower potential is defined as the combination of existing power plants and the remaining economically and environmentally feasible options for new plants as well as technical upgrades to existing plants. Hydropower potential was allocated to different regions according to long-term data on mean monthly discharges of flow rate stations. The economically and environmentally feasible hydropower potential does not take into account land ownership, legal status of land, planning regulation, political will to support hydropower developments, or other site-specific issues. These issues might further reduce the technical hydropower potential.

Description/Interpretation: The map of the technical potential for hydropower in the Alps 2050 perimeter shows the following patterns: Technical potentials for larger hydropower developments show up in France, along the Danube and Po River and in some Slovenian regions (rivers Sava and Mura). A technical potential for smaller hydropower developments displays in several Alpine regions, e.g. the Upper Rhine Valley including Vosges and Black Forest, Eastern Austrian regions or Southern Tyrol.

The tremendous regional differences of the technical potential for hydropower calls for regionally specific, place-based policies.

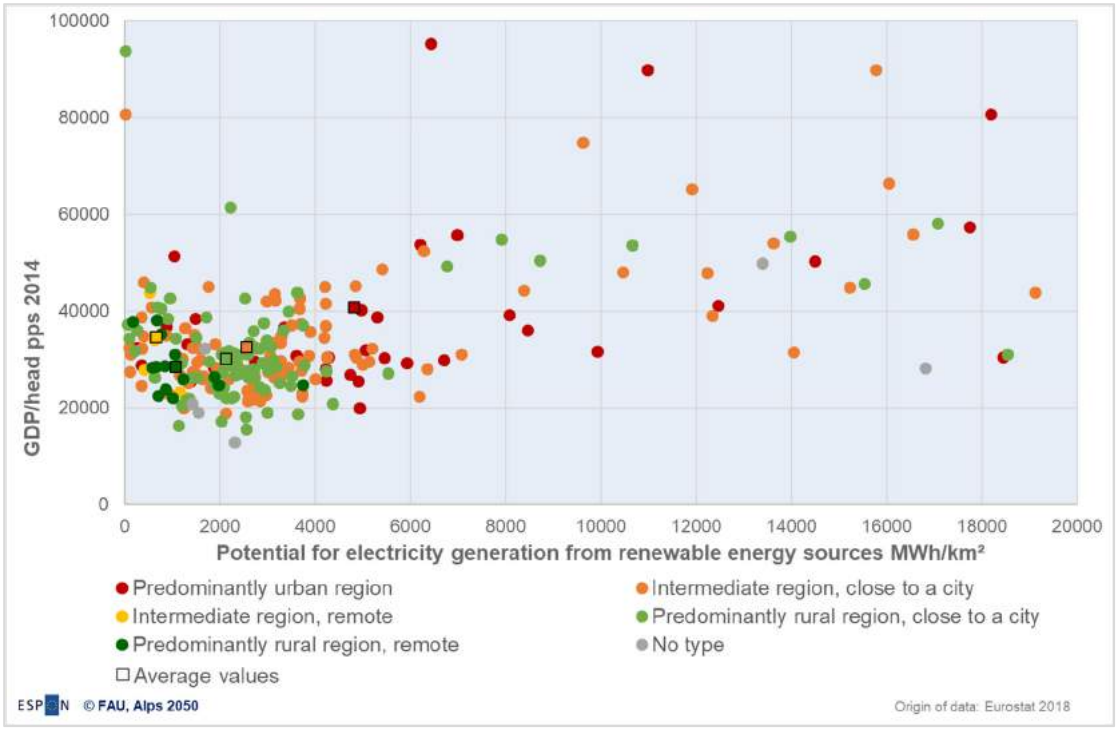
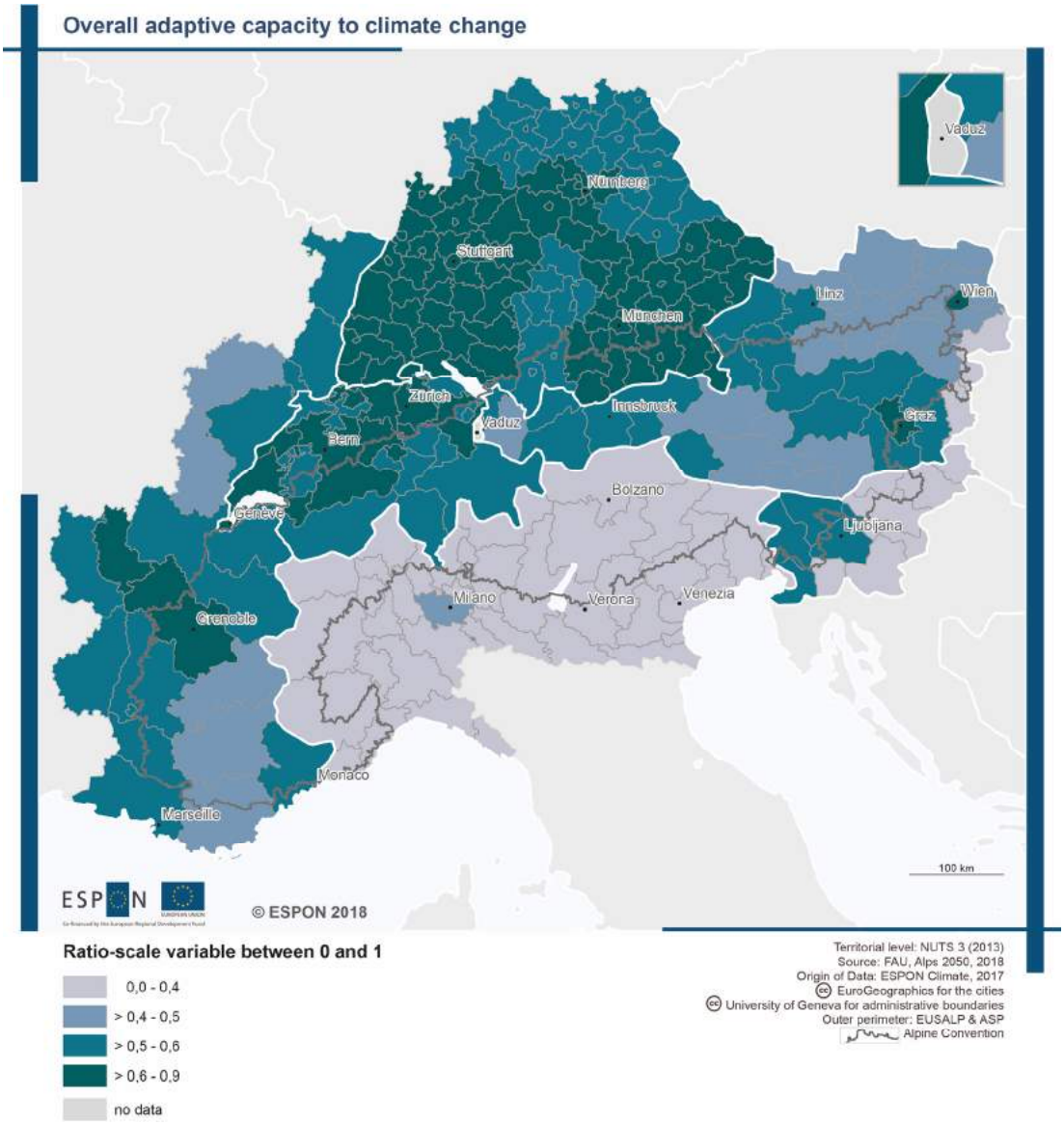


Fig. 6 Economic strength and potential for renewable energy – differentiating urban and rural territories

Indicator/Methodology: The map brings together the renewable energy potential as described above (Map 32), and the urban-rural differentiation as introduced above (DEGURBA typology, cp. Map 4). On the y-axis, the GDP per head values are shown (for details see Map 19 etc.).

Description: The question behind this map is if renewable energy could be a future potential for the more rural and economically less strong performing regions. The figure shows that urban territories tend to perform stronger in the economic sense – which is true for most economies in Europe and beyond. However, it is interesting to note that urban regions also tend to have a higher potential for electricity generation from renewable energy resources than rural spaces. As a result, energy questions are a cross-cutting question that has to be addressed in all kinds of territories.

8 Climate Change



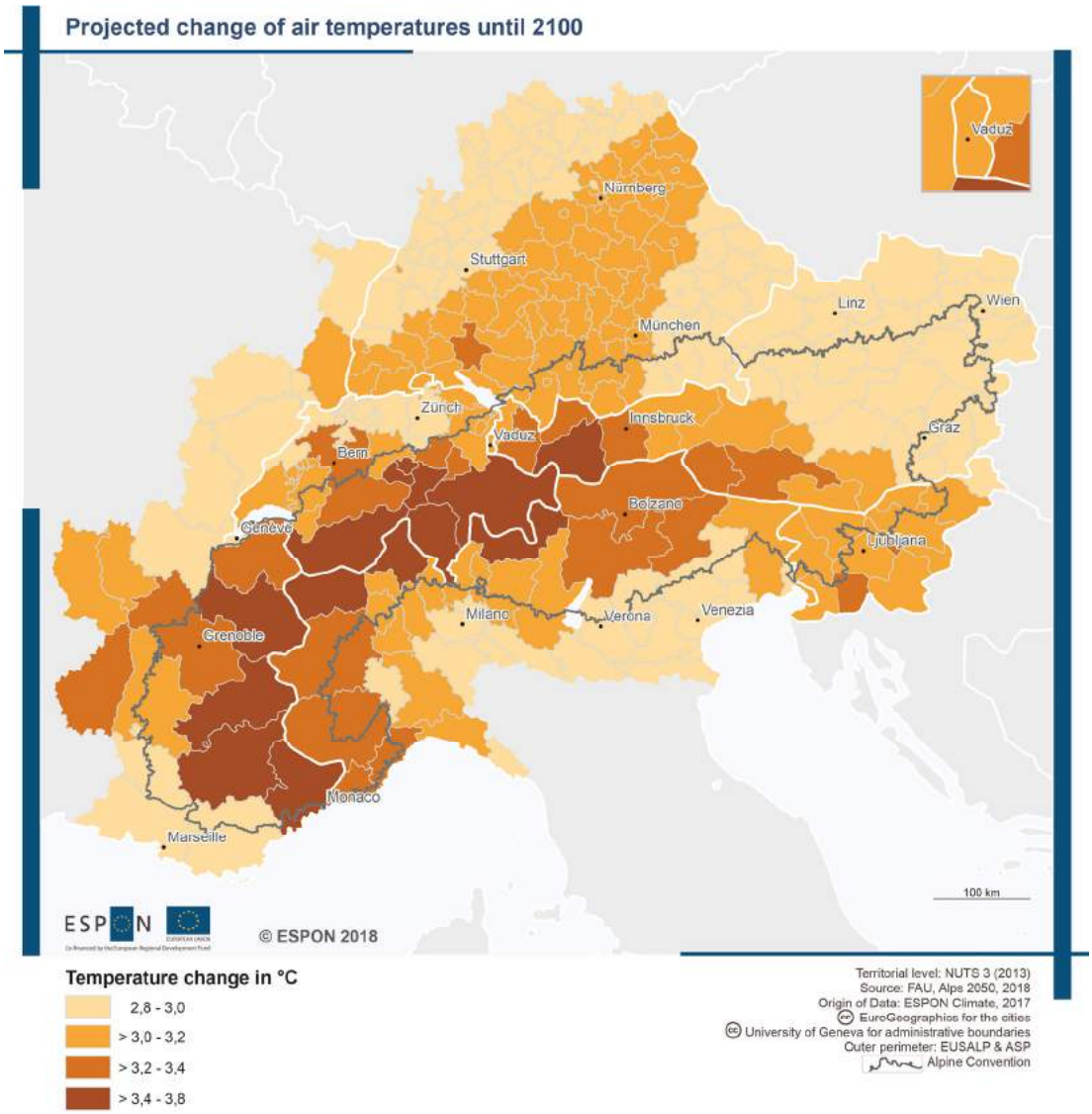
Map 34 Overall adaptive capacity to climate change

Indicator/Methodology: The map shows the overall adaptive capacity to climate change in the year 2017. The adaptive capacity to climate change is measured on a ratio-scale variable between 0 and 1 and is assigned to one of four categories differentiated by colour. The overall adaptive capacity is an aggregate indicator composed of eleven indicators measured in the ESPON Climate project. The overall adaptive capacity was calculated as weighted combination of economic capacity (weight 0.21), infrastructural capacity (0.16), technological capacity (0.23), knowledge and awareness (0.23), and institutional capacity (0.17). Weights are based on a Delphi survey of the ESPON Monitoring Committee. It should be clearly stated that exposure to increasing natural hazards is not directly calculated.

Description: The differences of the adaptive capacity to climate change in the Alps 2050 perimeter show the following patterns and characteristics:

- The map shows lower adaptive capacities in Italy as well as in the Eastern parts of Austria and Slovenia. Correspondingly, higher adaptive capacities to climate change characterise the Western and Northern Alpine regions.
- The map also shows that the adaptive capacity to climate change tends to be higher in urban regions. This observation is true for all Alpine regions. Urban agglomerations such as Grenoble, Milano, Ljubljana, Graz, Vienna, Bern, Zurich, Stuttgart, Nuremberg, and Munich show higher adaptive capacities than their surroundings.
- The map does neither display a morphological picture of the Alps nor distinctions between different Alpine perimeters.

It is striking that the adaptive capacities to climate change are lower in Italy than in all the other Alpine countries. The differences between urban and rural areas might be a barrier for comprehensive solutions at the regional level. This context represents a governance challenge when it comes to developing transnational strategies to adapt to climate change.



Map 35 Projected temperature change in °C

Indicator/Methodology: The map shows the climatic changes calculated on the basis of the IPCC SRES A1B scenario as the 15th percentile of the changes between 1961-1990 and 2071-2100 of 12 ENSEMLBES climate models. The methodology is part of the ESPON Climate project (2017). The change in annual mean temperature is assigned to one of four categories differentiated by colour.

Description: The changes of the (air) temperature in the Alps 2050 perimeter show the following patterns and characteristics:

- The map shows higher changes in annual mean temperature within the Alpine Convention perimeter than beyond.
- Accordingly, this is one of the maps that clearly displays a morphological picture of the Alps. This map clearly represents the mountains in the Alpine region.
- In particular, the Southern side of the Alpine mountain range is characterized by the highest changes in annual mean temperature. This observation illustrates that the French-Italian, Swiss-Italian and Austrian-Italian border regions are the Alpine regions which are most severely affected by climate change.

The relevance of rising temperatures and climate change impacts in general is not bounded to a political system or national contexts. Obviously, the change of annual mean temperature is representing a common challenge of mountain areas and especially of Alpine regions on the Southern side of the mountain range. Consequently, dealing with climate change impacts such as rising temperatures calls for transnational policies and measures.

Indicator/Methodology: The figures (Fig. 7 and Fig. 8) bring the adaptive capacity to climate change and the economic strength, measured as GDP per head, together. For more details see the descriptions in the sectoral analyses above. Fig. 7 differentiates following the urban-rural typology, the Fig. 8 differentiates the national affiliations.

Description: The spatial patterns in Fig. 7 is not very clear and certainly not showing clusters (‘clouds’). However, the average values might be discussed as an argument that economic strength and adaptive capacity might have a link – though a statistical correlation cannot be shown. The picture is much clearer with regard to the national affiliation (Fig. 8) which seems to be an explanatory factor with regard to adaptive capacity. This mirrors well the role of political decisions.

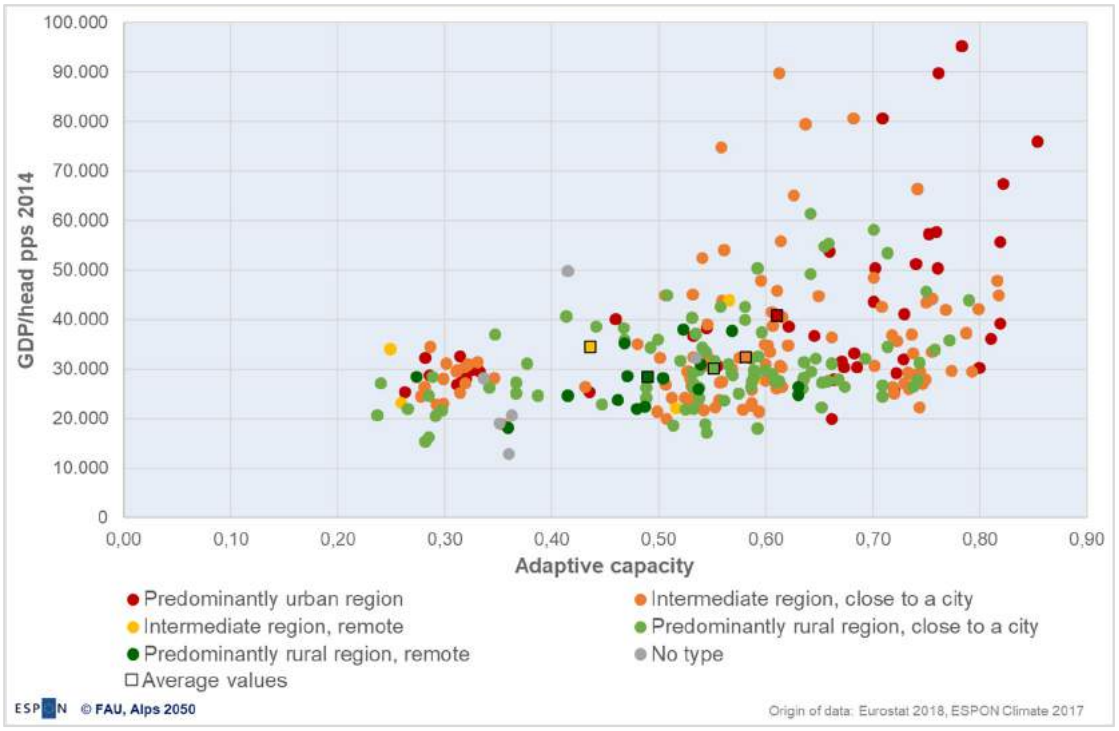


Fig. 7 Adaptive capacity to climate change and economic strength – differentiating urban and rural territories

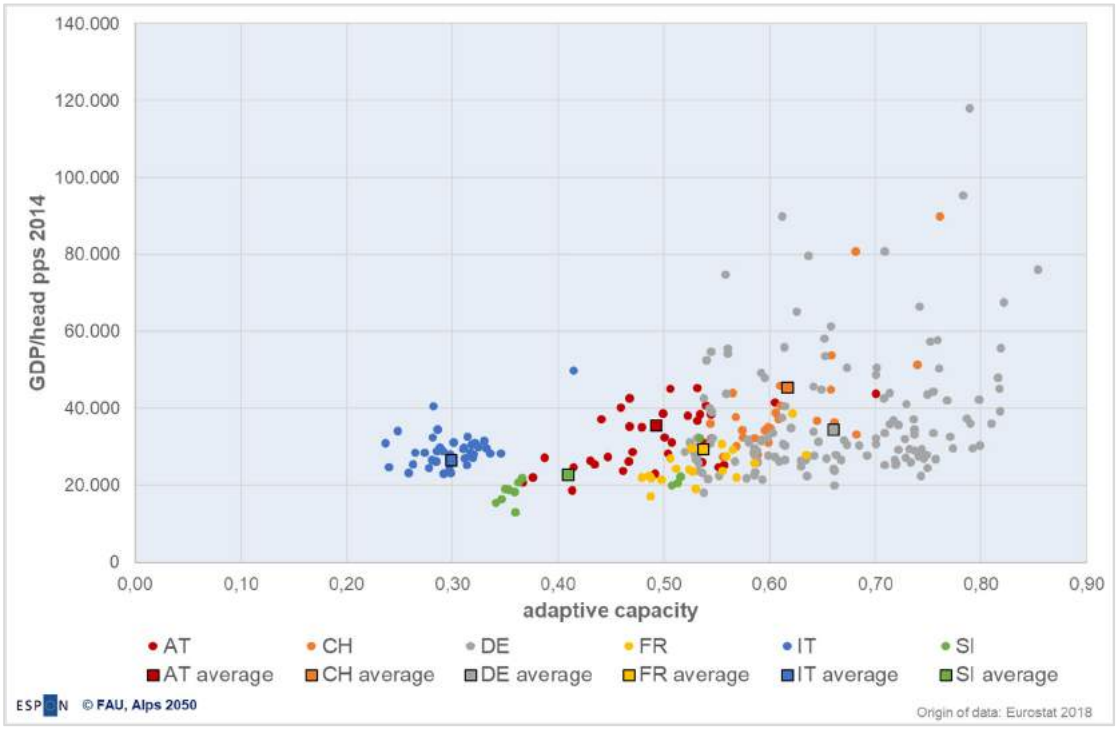
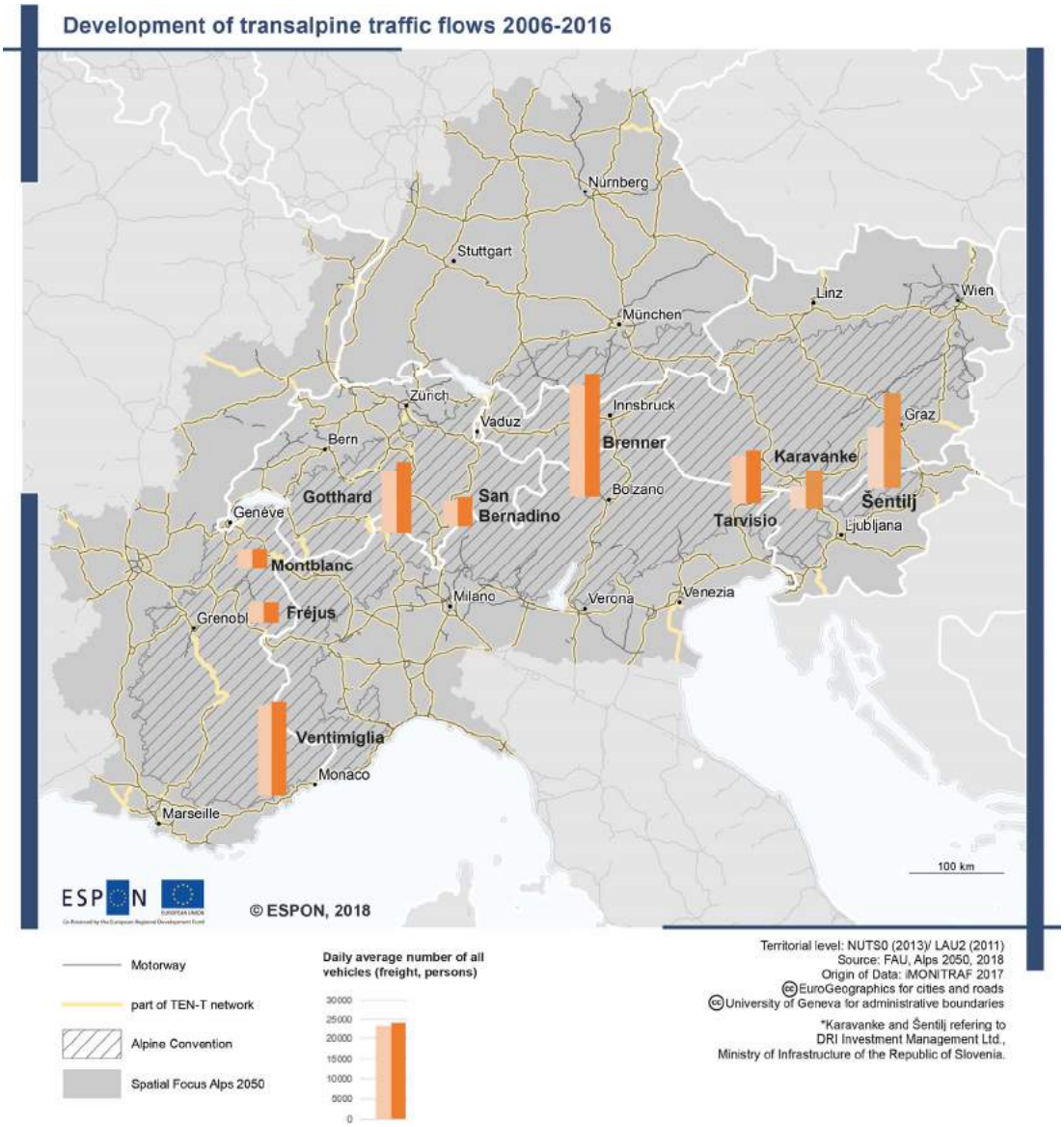


Fig. 8 Adaptive capacity to climate change and economic strength – differentiating national affiliations

9 Transport

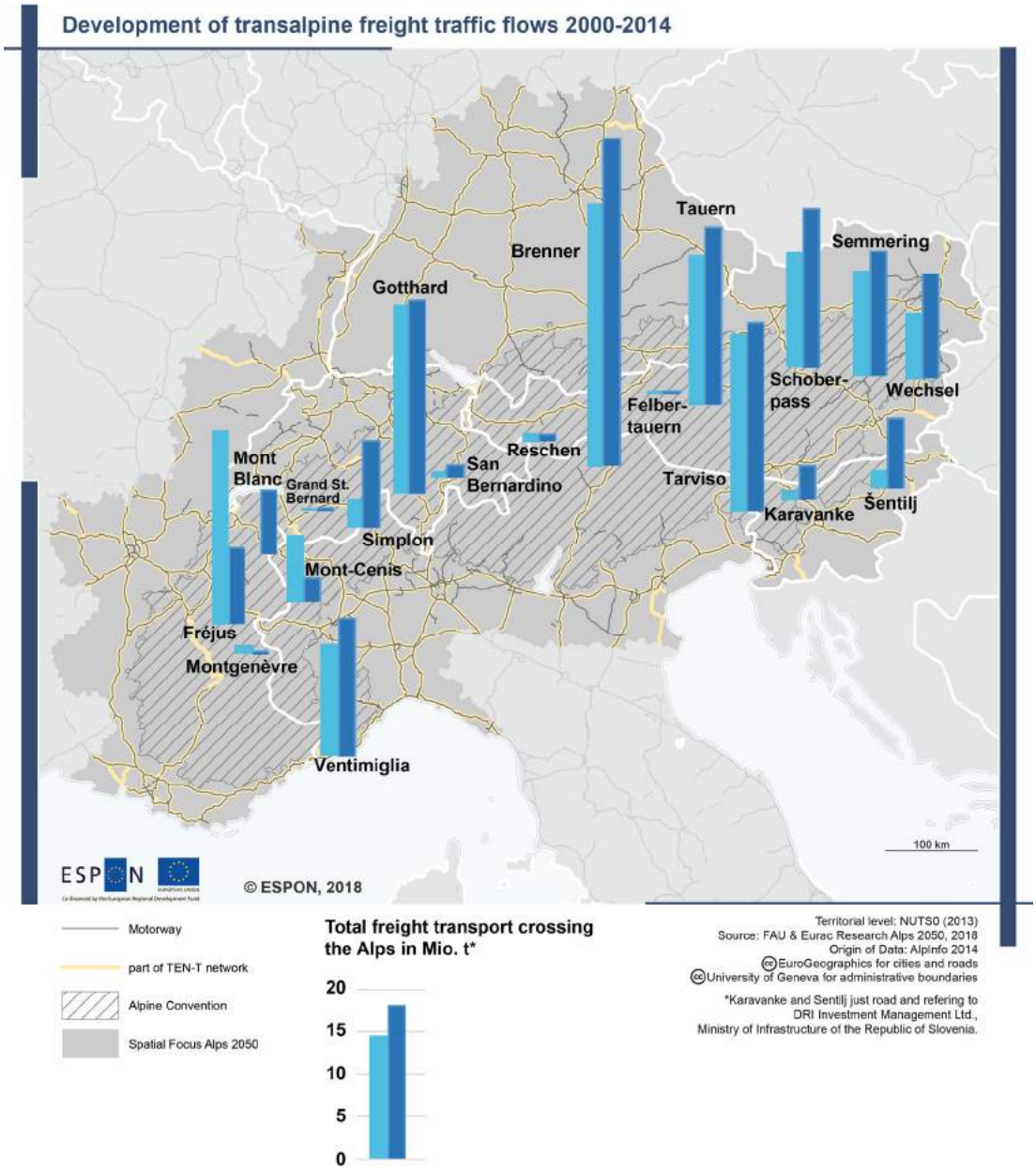


Map 36 Development of transalpine traffic flows 2006-16

Indicator/Methodology: The map shows the transalpine traffic flows for the years 2006 and 2016. The numbers comprise freight and persons and all vehicles via road for selected mountain passes.

Description: The map provides the visualisation of the uneven growth of transalpine traffic. The level of transport has grown at all transit corridors, but to a different degree.

The very simple indicator leads over to complex political debates like the ‘multimodalisation’ of infrastructure, the balancing of extra- and intraregional accessibility needs, the alignment of toll-systems, and potential limits to mobility growth.



Map 37 Development of transalpine freight traffic flows 2000-2014

Indicator/methodology: The data from the AlpInfo platform shows the volume of freight transport crossing the Alps in mio. tons including transit and regional traffic and including road and rail.

Description: Again the growth of transport flows is visible throughout the Alpine region (the numbers of Mont Blanc and Fréjus have to be seen against the background of the tunnel accidents in 1999 and 2005). The mountain passes as such are concentrated in Switzerland and Austria, but the connecting infrastructure involves much larger territories. The highest share passes via the Austrian passes; in particular the Brenner Pass on the border to Italy shows clearly maximum values.

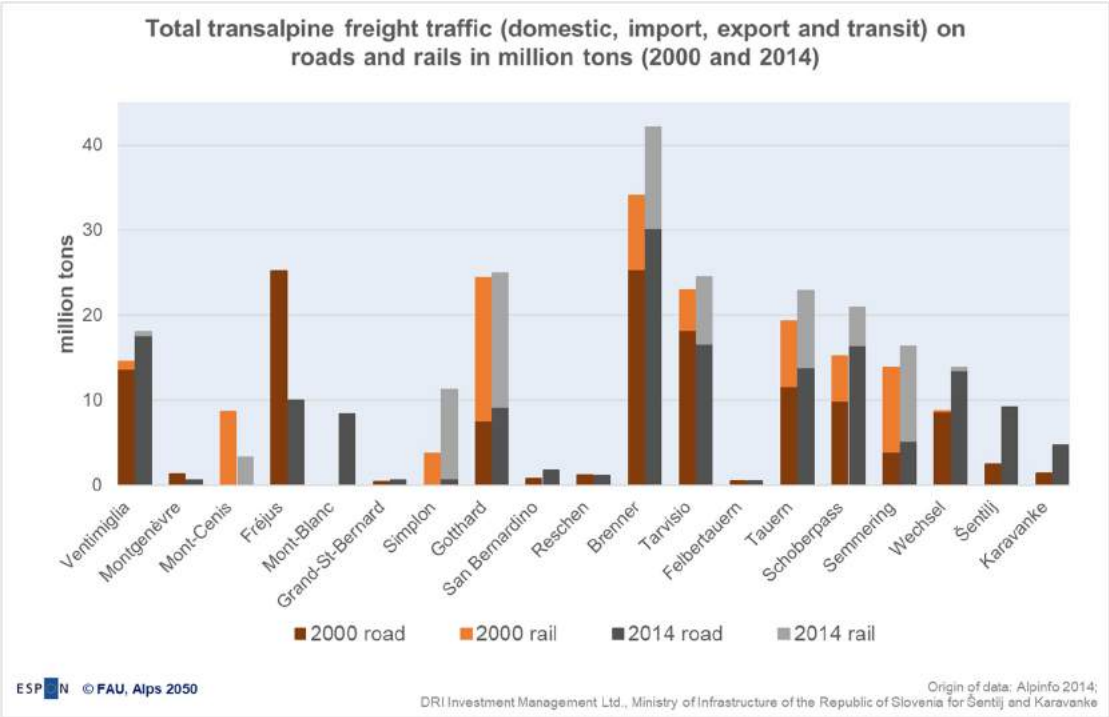


Fig. 9 Alpine transport: road vs. rail (2000-2014)

Indicator/methodology: The data from the AlpInfo platform shows the volume of freight transport crossing the Alps including transit and regional traffic and differentiates transport via road and via rail.

Description: The graphic shows a complex picture. In the Brenner corridor, the growth dynamic comes along with a slight relative modal split. In Tarvisio corridor, the overall growth comes along with a reduction of transport via road but growth on the rail. In most other corridors, the growth numbers can be found in both modes of transport (if applicable). It is obvious, that transport via rail is very much supported by regulative and financial means as the share of transport via rail is very high in the Gotthard and Simplon corridor.

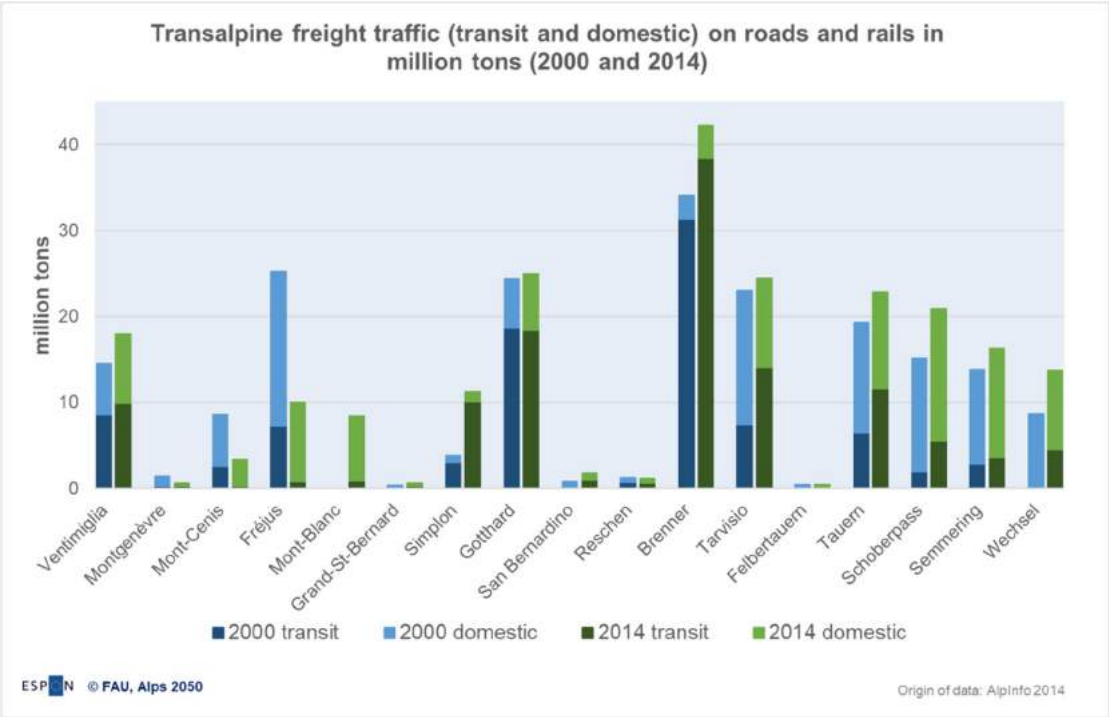
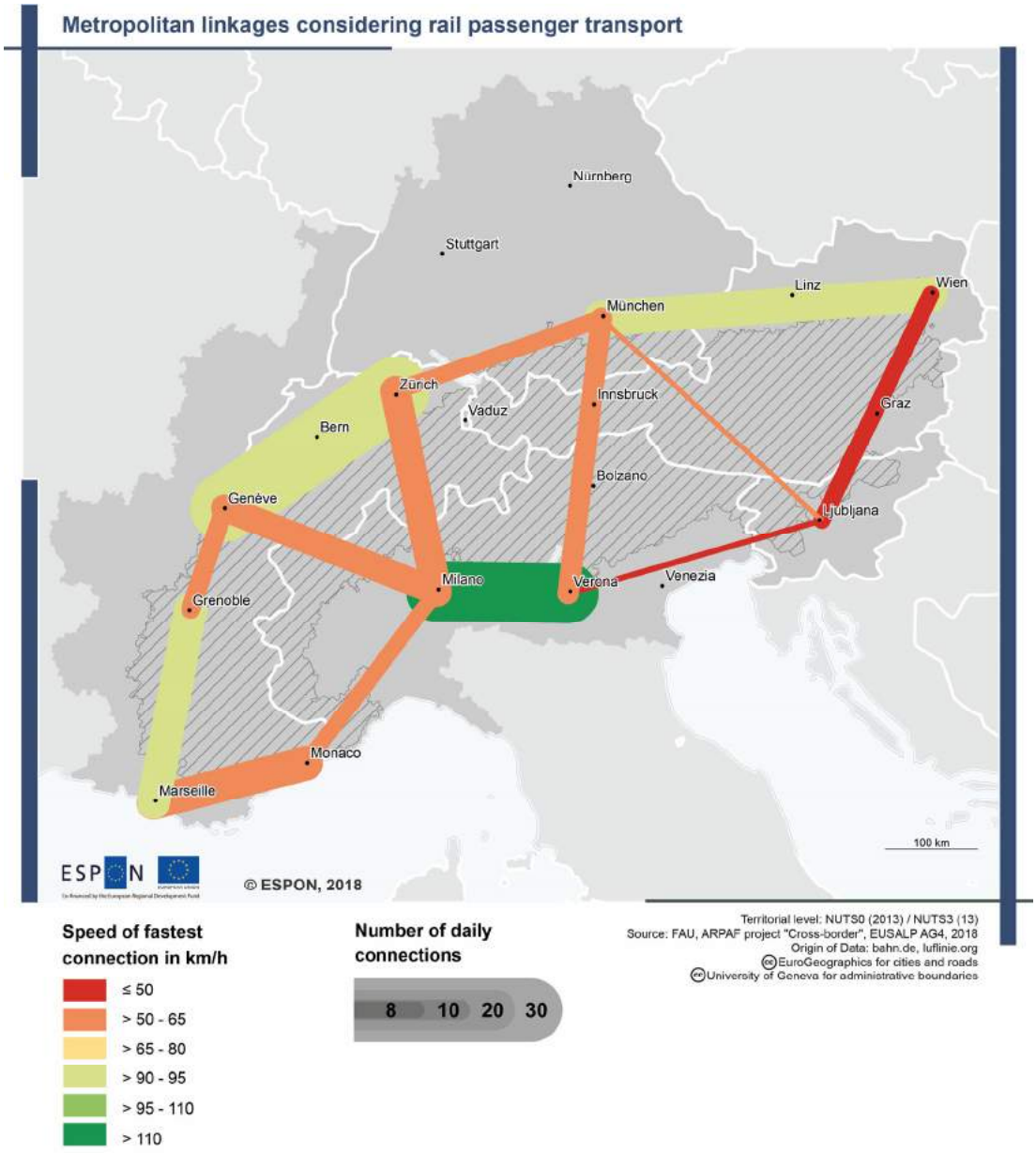


Fig. 10 Alpine transport – transit vs. regional flows (2000-2014)

Indicator/methodology: The data from the AlpInfo platform shows the volume of freight transport crossing the Alps including transport via road and via rail but differentiating transit and regional traffic.

Description: The graphic shows the very different functions of the mountain pass linkages. The Brenner corridor serves predominantly large scale purposes. Only the Brenner route with Ventimiglia, Simplon, Gotthard, Tarvisio and Tauern corridors ensure the main parts of transit flows. It also becomes obvious that the traffic growth predominantly is caused by transit flows and far less by domestic traffic.



Map 38 Quality of rail infrastructure linking the pre-Alpine metropolises

Indicator/methodology: The 'space-time-lines' for the pre-Alpine linkages has been developed in the framework of the ARPAF project cross-border, WP2 cross-border mobility in the Alpine region). The passenger transport via rail is analysed with regard to the speed (referring to air distance) and frequency of linkages (both directions). The time is measured by the fastest train connection between central stations. The basis for the data collection is the travel service site of Deutsche Bahn. The requests refer to the 14th November 2018 from 4 a.m. on (working day Wednesday). The line width shows the number of connections and the colour of the lines illustrates the speed of the fastest connection (both calculated as an average of both directions).

Description: Firstly the map illustrates that fast train connections not only serve transit purposes; metropolitan linkages play an important role for the Alpine region as such. Moreover, domestic linkages tend to be much better than those crossing borders. This is due to the high path dependency of transport infrastructure that depends on large scale investments a long planning/implementation periods. This is in particular true for those connections that pass an intense relief. Both arguments also explain the Slovenian connectivity that has not yet reached the level of the other spaces. Spatial integration on the transnational scale certainly means to improve transnational accessibility.

10 The European perspective on the Alps

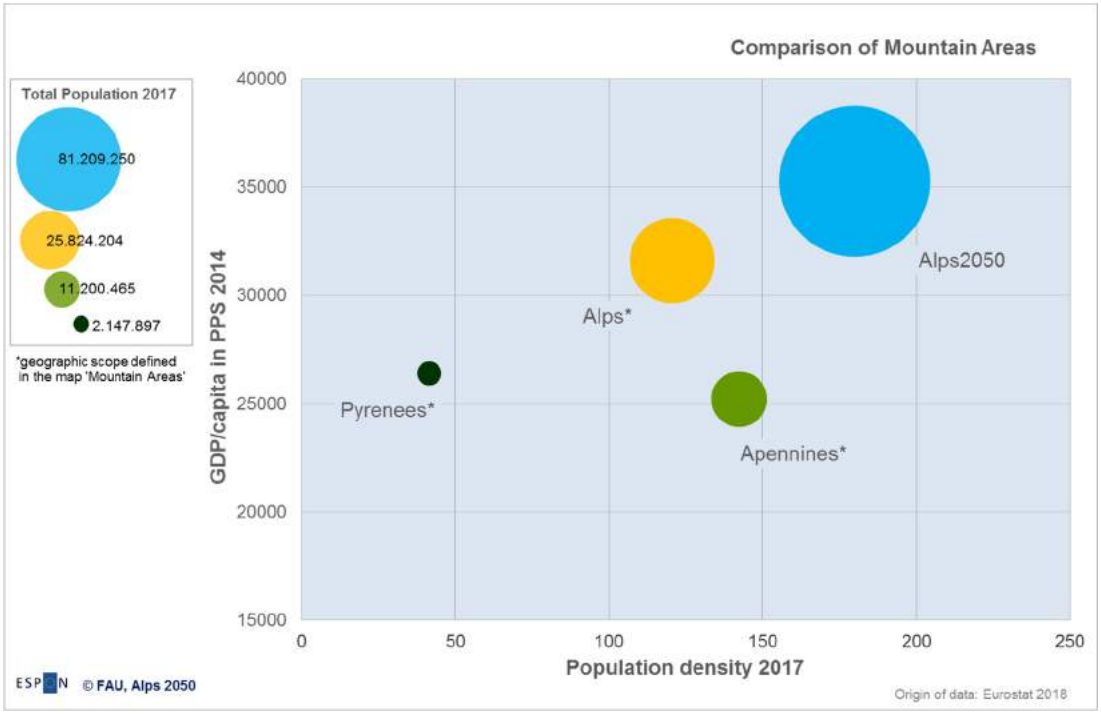
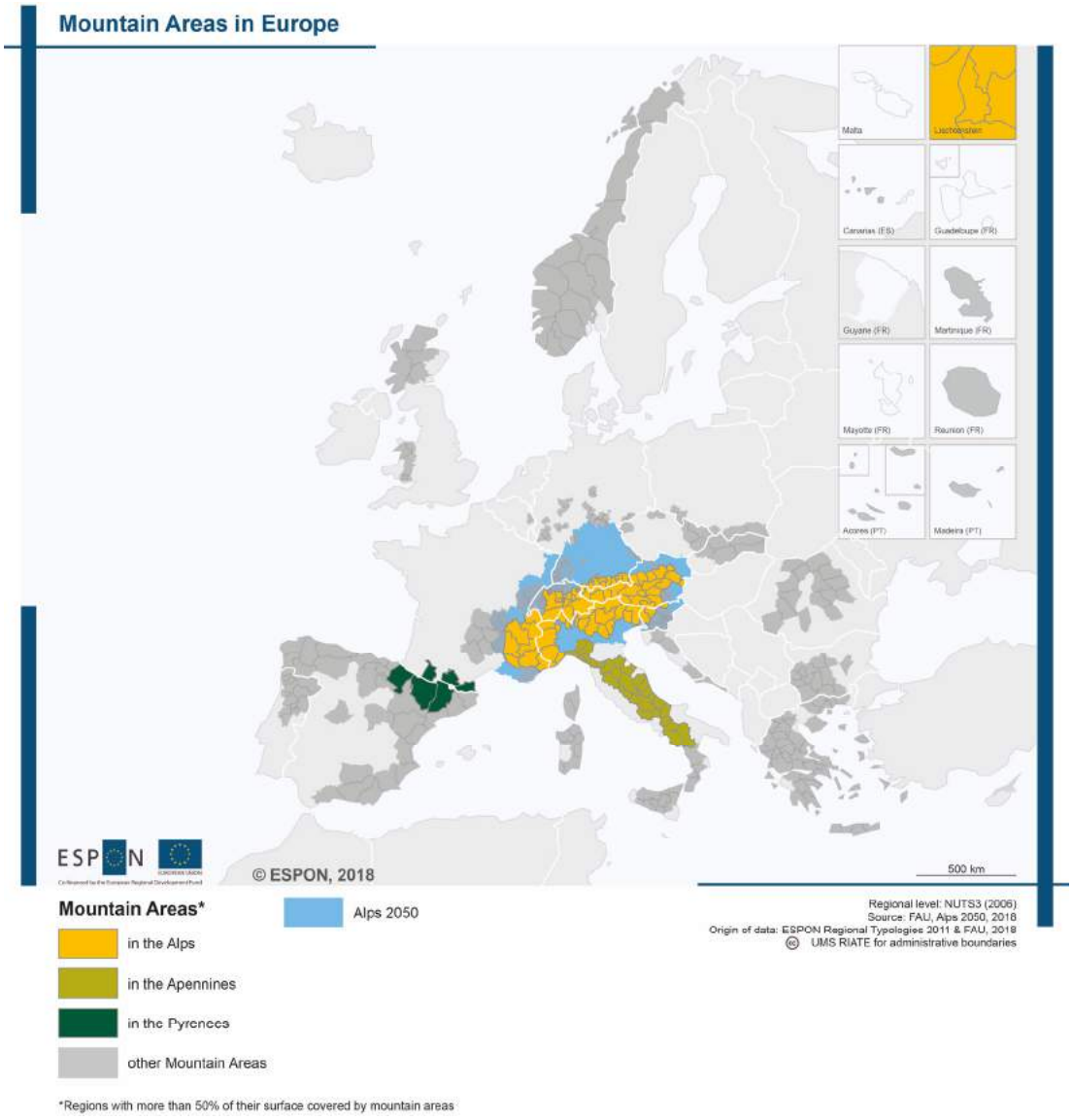


Fig. 11 Comparing Alps, Pyrenees and Apennines with regard to population and GDP

Indicator/Methodology: Fig. 11 compares three large European mountain areas, namely the Alpine Region, the Apennine Region, and the Pyrenees Region. The delimitation is based on the ESPON Regional typology (see Map 39).

The diagram shows the values for the population density 2017 on the x-axis and on the GDP per capita in PPS (y-axis) for 2014. The size of the bubble refers to the total population 2017. Here, the values are also displayed for the much larger Alps 2050 perimeter.

Description/Interpretation: It is obvious that the Alpine region is economically the strongest mountain area which is also more densely populated than the Pyrenees. But the population density in the Apennine region is higher than in the Alpine region. The Alps 2050 area, comprising some of the most metropolitan areas European wide, shows maximum values in both dimensions.



Map 39 Mountain areas in Europe following the ESPON typologies project

Indicator/Methodology: The underlying delimitation approach of Fig. 11 goes back to the ESPON Regional Typology: The mountain areas shown in the map are based on ESPON Regional Typologies for NUTS 3 regions. In that project, topographic mountain areas are defined using the following criteria:

- above 2500m, all areas are included within the mountain delimitation;
- between 1500m and 2500m, only areas with a slope of over two degrees within a 3 km radius are considered mountainous. (Regional Focus No. 1/2011)

The regions that are displayed in the map refer to the codes “2” and “3” of the typology which summarise all regions with more than 50% of their surface covered by mountains.

For the Alpine region, the regionalisation approach is similar to the Alpine Convention perimeter, but not identical; and obviously there are large differences with regard to the Alps

2050 perimeter. One of the main differences is that the ESPON project refers to NUTS 3 regions and the Alpine Convention predominantly argues on the municipal level. Other scientific approaches are more elaborated (e.g. Drexler et al. 2016 based on EEA 2010) but cannot easily be adopted to NUTS 3 regional statistics.

11 Governance

11.1 Domestic level

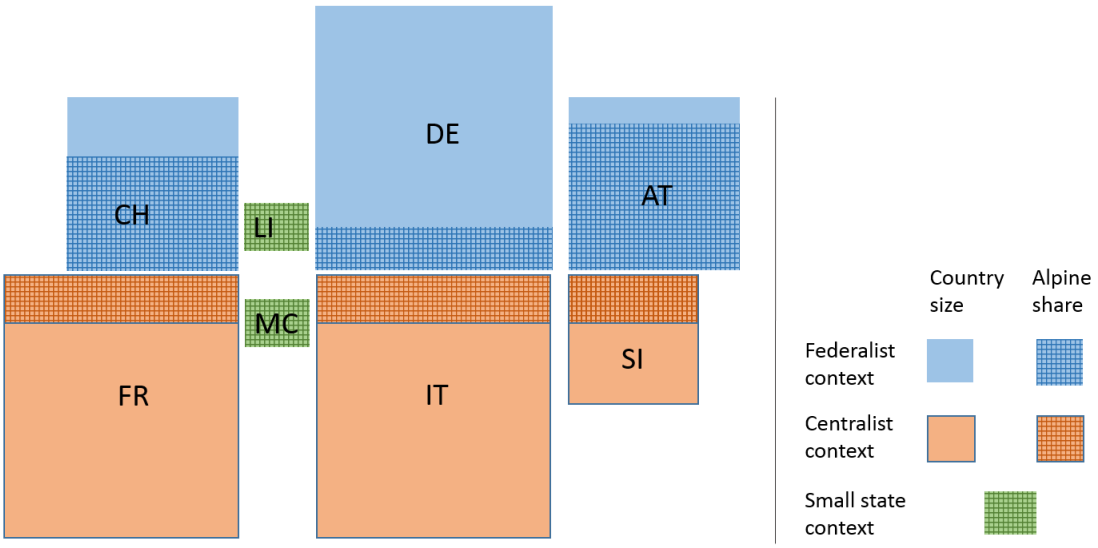


Fig. 12 Institutional mapping of the domestic contexts: country size, Alpine share, and planning typology

Indicator/methodology: Fig. 12 visualises different dimensions of the political/institutional situation in the countries: country size, Alpine share (mountainous parts), and the belonging to the categories federalist/centralist/small state. This institutional mapping reduces relevant characteristics in a simplified visual manner (cp. Chilla et al. 2012). The analytical perspective is based on a series of works on planning cultures, as for example the ESPON Compass Project.

Description: The countries of the Alps 2050 perimeter are of very different institutional character – in particular, some of them are of a (very) federalist structure, others are much more centralised. Moreover, it becomes very obvious that not only the country size but also the Alpine share of the territory differs largely.

Table 5 and 3 provide a very condensed overview with regard to spatial planning mandates. The overview is restricted to the larger countries leaving out Liechtenstein (and Monaco).

This rough overview clearly illustrates the political and institutional complexity in the Alpine region. The high number of involved actors and regimes comes along with a high diversity of administrative and political structures, cultures, tools, and agendas. This institutional diversity would become even much more obvious if we would expand the focus on the national and regional priorities in agricultural, tourism, or transport policy. European policies, intergovernmental agreements, and cross-border cooperation formats help a lot to bridge institutional gaps and handle political complexities.

Table 5 Characteristics of the planning system on the national level

	Characteristics of the planning system on the national level
AT	According to the Austrian Constitution (Bundesverfassungsgesetz B-VG), the Federal government is responsible for sectoral policies and sectoral planning issues where explicitly mentioned in the Constitution (e.g. planning for highways, national railways, national electricity on the basis of federal sectoral laws, see B-VG Art. 10 to 12). Relating to "spatial planning" the Federal level is responsible for general coordination of planning issues. In view of the need for further co-ordination mechanisms between Federal level, Länder and municipalities, the Austrian Conference on Spatial Planning (ÖROK) was set up already in 1971. ÖROK serves as the platform for cooperation between the Federal level, the Länder and the associations of municipalities and towns and therefore for all governmental levels dealing with spatial planning (social partners have an advisory role). The current strategic considerations in terms of spatial development are laid down in the Austrian Spatial Development Concept (Österreichisches Raumentwicklungskonzept 2011; ÖROK 2011), and in terms of regional policy (structural funds) in the Partnership Agreement for the Structural Funds (2014).
CH	The Confederation is responsible for the framework legislation on spatial planning. In addition to this federal framework legislation, the Confederation promotes and co-ordinates the spatial planning of the Cantons and also takes into consideration the demands of spatial planning in its own activities. Most important spatial planning instruments are at the federal level the *Raumkonzept Schweiz* and several Sector Plans (*Sachpläne*), e.g. for the coordination of aviation infrastructure or transmission lines.
DE	The national level issues the legal framework law (*Raumordnungsgesetz*) and formulates overall objectives (*Ziele* und *Leitbilder* der Raumordnung). – The Ministerial Conference for spatial planning brings together the state ministers and the federal minister that develop – in a rather federal logic – important principles of spatial development (Ministerkonferenz für Raumordnung, MKRO). The federal level is particularly important via stronger competencies in sectoral planning (transport, environment etc.).
FR	The General Commissariat for Territorial Equality (CGET, working for the Minister of Territorial Cohesion) tackles territorial inequalities and supports regional dynamics by designing and animating city and regional planning policies with local actors and citizens. The main instruments are targeted public subsidies and contracts of government engagement. The mountain national council (CNM) supports mountain territories and ensures the application of the "Mountain law"). The CNM is an advisory institution chaired by the Prime Minister and coordinated by the CGET which involves 59 members (parliamentarians, representatives of the six metropolitan massifs Alps, Corsica, Jura, Massif central, Pyrenees and Vosges etc.). The CNM has a monitoring role and makes proposals that address objectives about mountain development.
IT	In Italy, the national law for spatial planning formulates overall principles. The national interest in Alpine development is obvious in several documents (Ministero dell'Economia e delle Finanze (2003) IX Relazione sullo stato della montagna italiana etc.), complemented by a series of specific Alpine development plans and activities and the Communitá Montane at local level.

	Characteristics of the planning system on the national level
SI	In Slovenia, spatial planning is a national and local competence. The *Spatial Management Act* (adopted in 2017, in implementation from June 2018 on) in the Article 38th foresees a cross-sectoral governmental commission for the spatial development with the task of supervision, co-operation and joint-addressing of the spatial matters on the vertical and horizontal level. As an umbrella strategic policy, *the Strategy of the Spatial Development of the Republic of Slovenia* (2004, in renewal since 2015) defines 12 spatial development objectives (none specifically for the Alps) and 8 priorities of which the last one targets spatial development in the areas with special potentials and problems (hilly and mountain areas are mentioned as one type of such areas): In the renewal process of the strategy, 'mountain and border areas' have been selected as one of five special focuses.

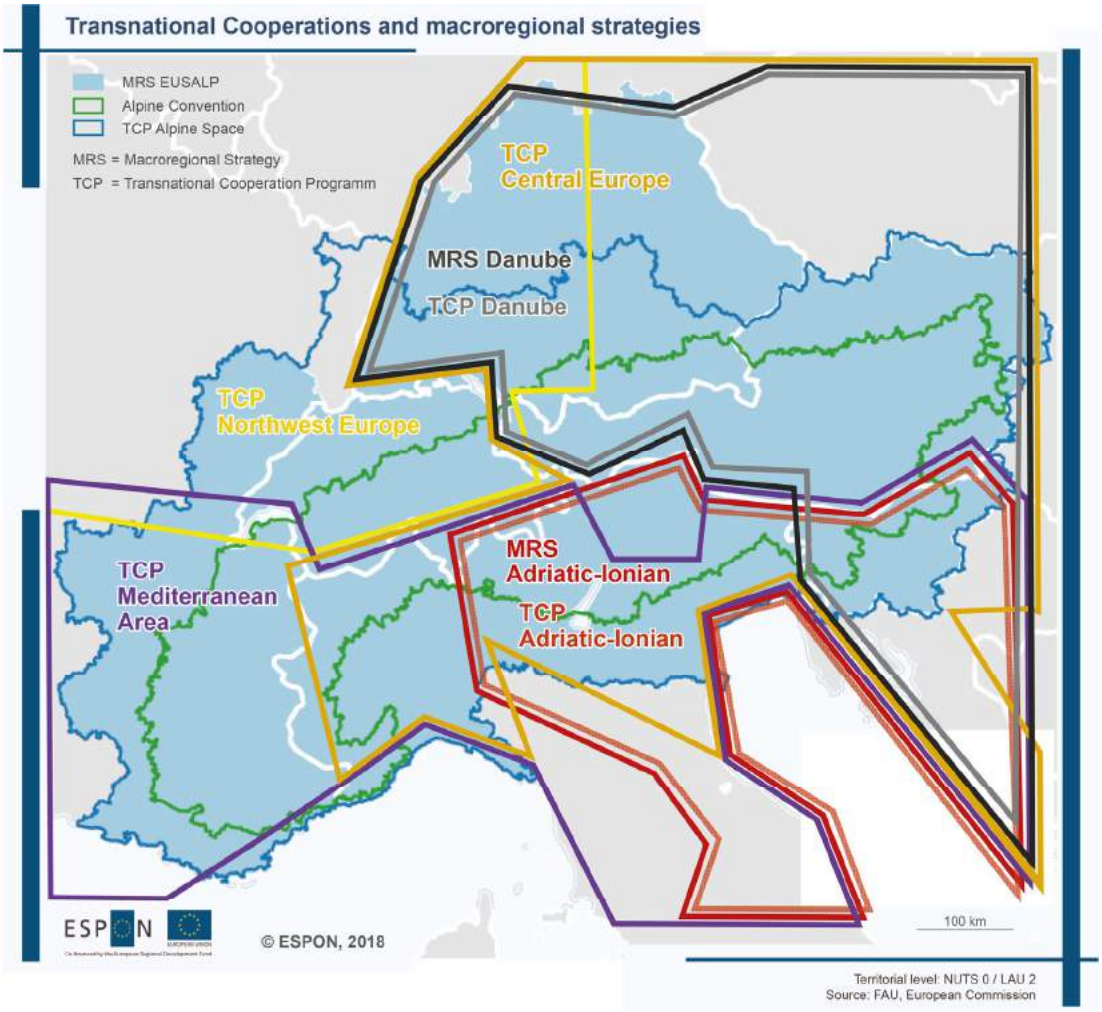
Table 6 provides an overview over the planning systems on the regional level. This overview is also very rough as some regions – in particular in federal structures – can apply very different strategies.

Table 6 Characteristics of the planning system on the regional level

	Characteristics of planning system on the regional level
AT	Austria is a federal country consisting of nine states (Länder). The responsibilities for legislation and administration in areas which affect planning are shared between the federal level, the Länder and municipal level. Whereas the federal level has many competences in sectoral policies, the states (Länder) have an important mandate for the overall planning themes: legislation (spatial planning laws), planning at regional level (e.g. "überörtliche Raumplanung") and a supervisory function for the planning at municipal level. Municipalities have the mandate for local planning (e.g. zoning plans, local concepts) under the supervision of the Länder. The respective responsibilities are laid down in the Austrian Constitution (Bundesverfassungsgesetz B-VG), see e.g. Art. 10 to 12 (sectoral planning at federal level), Art. 15 ("sweeping clause": responsibility for spatial planning at Länder-level) and Art. 118 (responsibilities of municipalities).
CH	The actual creation of spatial planning, practical planning implementation is essentially a matter for the Cantons, which often delegate a number of tasks to the municipalities (local authorities). The Cantons enact cantonal implementing legislation for the Federal Law on Spatial Planning. The main planning instrument of the Cantons is the structure plan (*Richtplan*, *plan directeur*), which is subject to approval by the Federal Council. The structure plan shows how activities with spatial impacts are to be harmonized with each other in the area. This produces a plan binding on the authorities.
DE	In Germany, two federal states are part of the Alps 2050 perimeter, namely Bavaria and Baden Württemberg. The most important tool is the Bavarian Regional development programme (*Landesentwicklungsprogramm, LEP*) with its Annex the Alpine Plan (*Alpenplan*) which defines zones for different degrees of approvable development intensity. The LEP is concretised by 17 planning assemblies (*Planungsverband*) of which three are relevant for the Alps in the morphological sense (*Allgäu, Oberland, Südostoberbayern*).

	Characteristics of planning system on the regional level
	The situation in Baden-Württemberg is similar with a *Landesentwicklungsplan* as the basis and 10 regional planning assemblies (*Planungsverband*) but without covering the Alps in the morphological sense.
FR	The French government created the function of regional prefect "massif coordinator" and of a commissioner for development, development and protection of the massif (Alps, Jura, Massif Central, Pyrenees, Vosges). These territorialized teams of the General Commissariat for Territorial Equality (CGET) are territorial relays of the CGET's missions and actions in terms of territorial development and balance. The CGET ensures the animation of the network of commissioners of the massif.
IT	The main body responsible for spatial planning are the regions (*regioni,* corresponding NUTS2 level). Each region has its own spatial planning law, the Regional Territorial Coordination Plans or Regional Territorial Plans (*Piano Territoriale Regionale di Coordinamento*, PTR), which are defining the general directions of the economic and spatial development of the region. They are the most important instruments at the regional level, together with the Regional Development Programs or Plans (*Programma/ Piano Regionale di Sviluppo,* PRS). The autonomous Regions of Trentino and of Alto Adige/ Südtirol have their own spatial planning laws and instruments at provincial level, which assimilate to the regional instruments.
SI	12 regions exist in Slovenia, but only for EU- and state-financed development, not for political tasks. On this level, an important tool is *the regional development programme* (RRP – regionalni razvojni program) which defines visions and development goals for the 6-year period and presents a basis for the preparation and delivery of projects in the region. A series of regional development programmes cover the Slovenian part of the Alps, namely Goriška, Gorenjska, Koroška Osrednjeslovenska, Savinjska and Podravska region. In addition, there are 33 local action groups (focus on the rural development of the country) which prepare LEADER-based programme and projects. In Slovenia, the regional level is politically active through local actors. 212 municipalities with their departments of spatial planning (in smaller municipalities the field is covered with one person or with a person covering multiple fields) are in charge of spatial development.

11.2 Transnational level

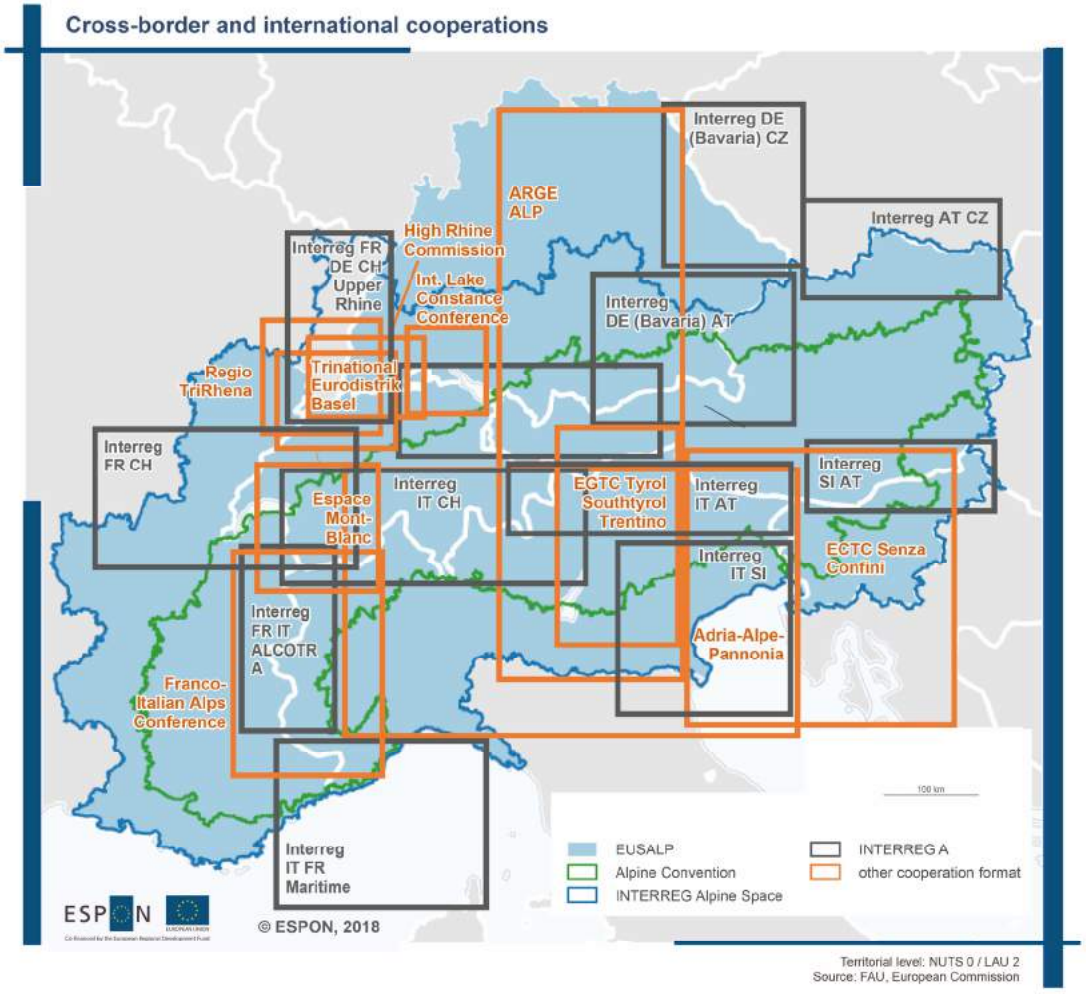


Map 40 Perimeters of transnational cooperation and macroregional strategies

Indicator: The map shows the exact perimeters of the EUSALP, the Alpine convention and the TCP Alpine space. The other transnational and macroregional cooperation formats are visualised in a very much simplified manner ('institutional mapping').

Description: The picture shows the transnational scale with three macroregional strategies and four territorial cooperation programmes that are mostly overlapping. This shows the high density of transnational cooperation programmes in the Alps 2050 area and the close spatial relationship between the transnational cooperation programmes and the Macro-regional strategies.

11.3 Cross-border level



Map 41 Cross-border and international cooperation

Indicator: The map shows the cross-border existing cooperation formats of the EU cross-border scale ('INTERREG A) and is complemented with a series of bi- and multilateral cooperation formats like ARGE ALP or IBK that are of comparable size. The perimeters are – again – not exact but provide a general overview with a simplified cartographic language (institutional mapping).

Description: The visual impression confirms the message of the transnational analysis above that the diversity and intensity of cooperation initiatives is enormous in the Alpine region.

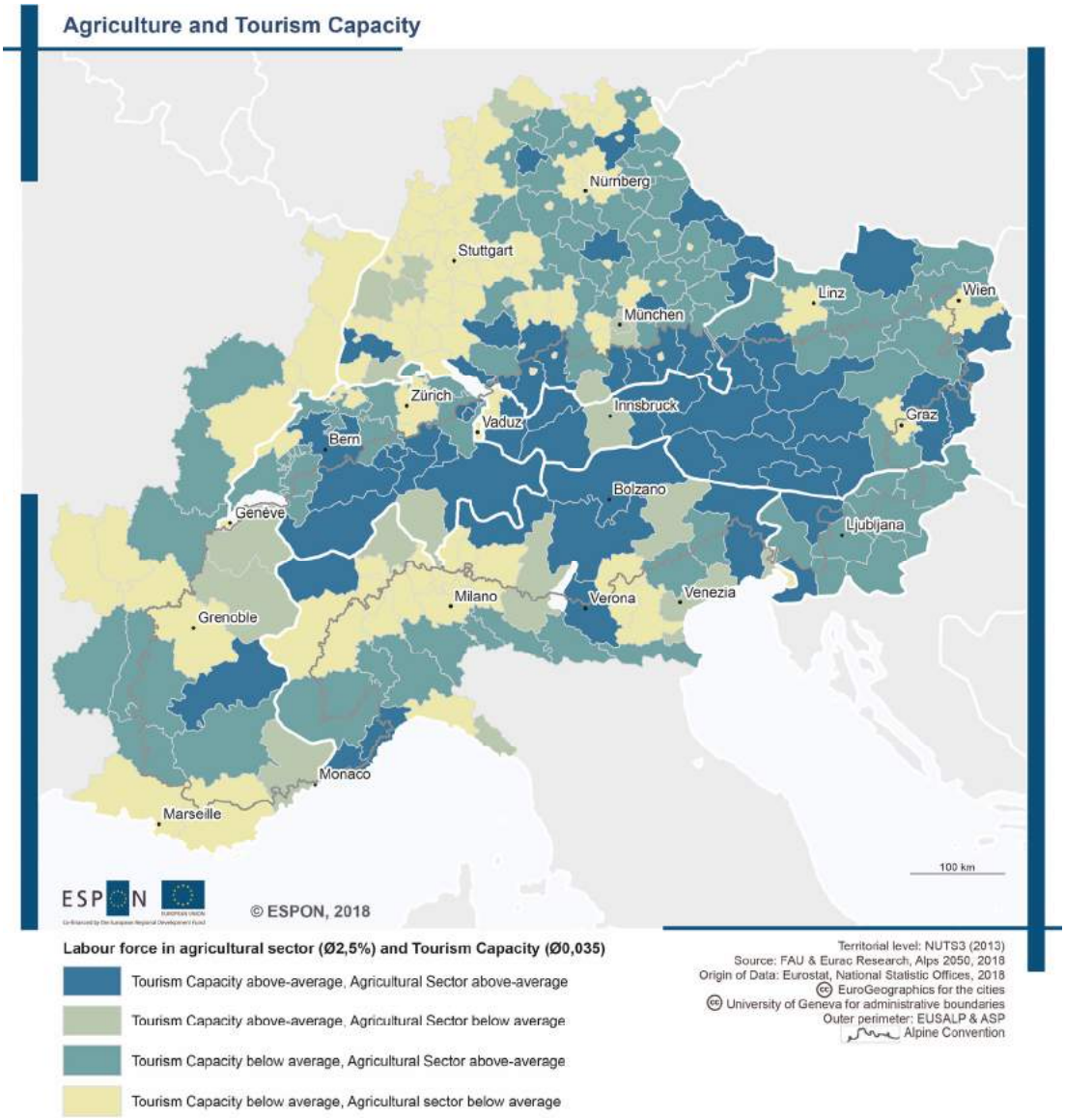
One might differentiate between cooperation forms that rely on the intergovernmental logic and that go mostly back to those years before the start of the EU cooperation programmes. Some of them started with a rather sectoral focus (water, environment) and developed towards a more general perspective of regional development. The Alpine Convention, the Lake Constance Conference, and the High Rhine Commission are important examples. Others had a more

general focus and allowed ‘high politics’ on the regional level. ARGE ALP is the most prominent example.

Many cooperation formats can also be traced back to EU policies. This is in particular true for the small-scale Euregios along many borders whose main focus lies on the implementation of cross-border cooperation programmes (INTERREG A). Some also refer to the transnational cooperation programmes like the ALCOTRA cooperation which comprises the Italian-French Alps (INTERREG B). More recently, the regions of Tyrol, Southern Tyrol and Trentino have founded a European Grouping of Territorial Cooperation (EGTC).

12 Territorial structuring based on indicator combinations

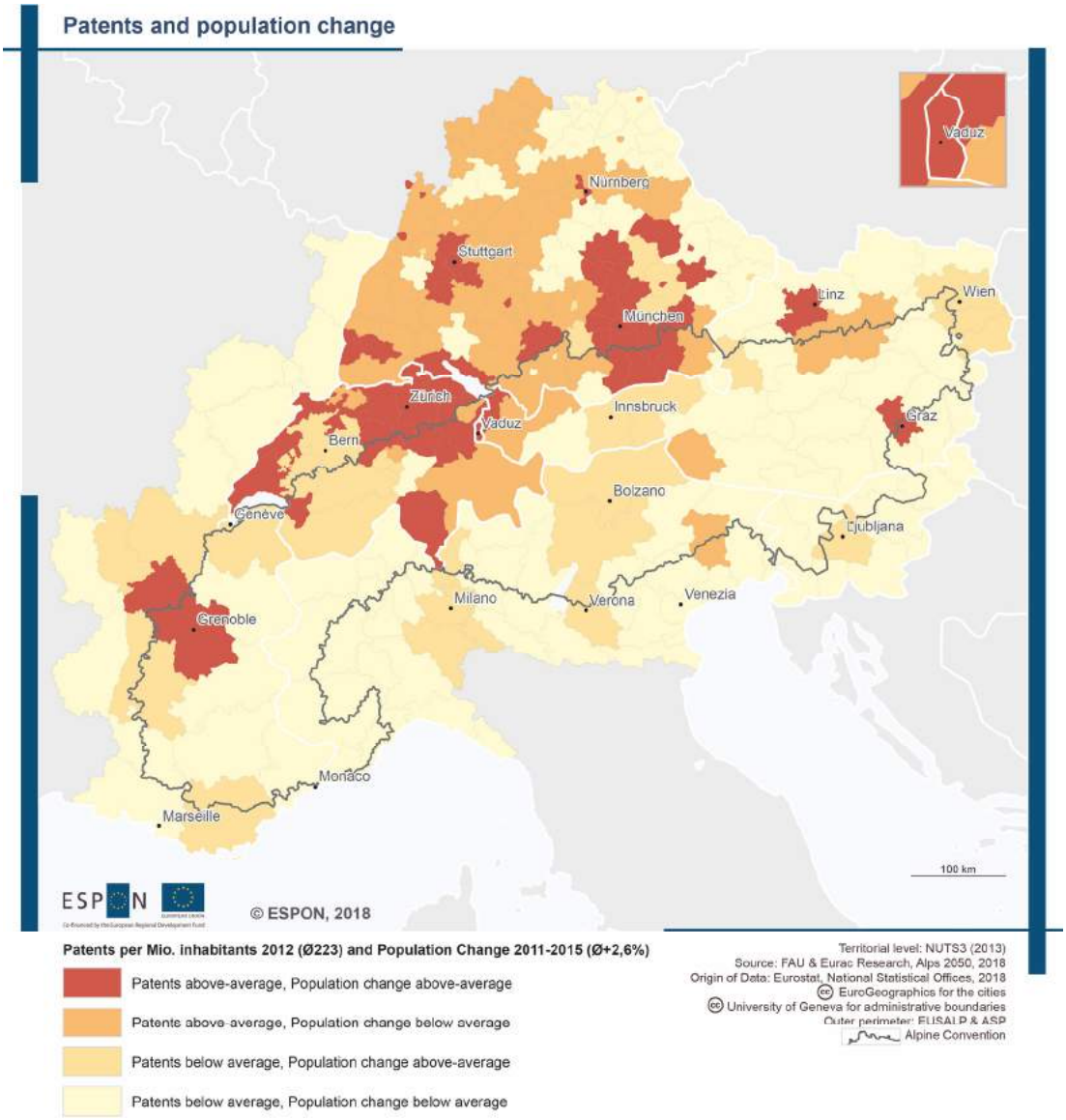
The sectoral analyses of the Alps 2050 perimeter provide a multitude of perspectives on this space. At the same time, the diversity and differentiation in this territorial analysis makes it challenging to integrate the information: From the perspective of an integrated spatial development, the combination of sectoral indicators is an important step. The following three maps apply different indicator combinations that are visualised in a rather simplifying way.



Map 42 Combining agriculture and tourism capacity

Indicator/Methodology: The map shows the two indicators tourism intensity and employment in the agricultural sector on the NUTS 3 level as they have been introduced in the sectoral analyses up above: tourism intensity means the share of bedplaces per inhabitant, and the share of agricultural employees is calculated in relation to all employees (both NUTS 3 level).

Description: Both indicators refer to the economic sectors that in general have particular relevance for rural spaces. We see that this largely applies to the Alps 2050 perimeter, too: In particular many inner-Alpine areas show over average values for both indicators, whereas below average values can be found in the urbanised areas. This way of internal differentiation shows the important role of the mountainous areas with regard to agriculture and tourism and by that also for ecosystem services in the broadest sense. At the same time, this picture focuses very much on the traditional connotation the Alpine region to be primarily picturesque landscape – and this perspective tends to oversee innovative economies, urbanisation pressure and societal differentiation.

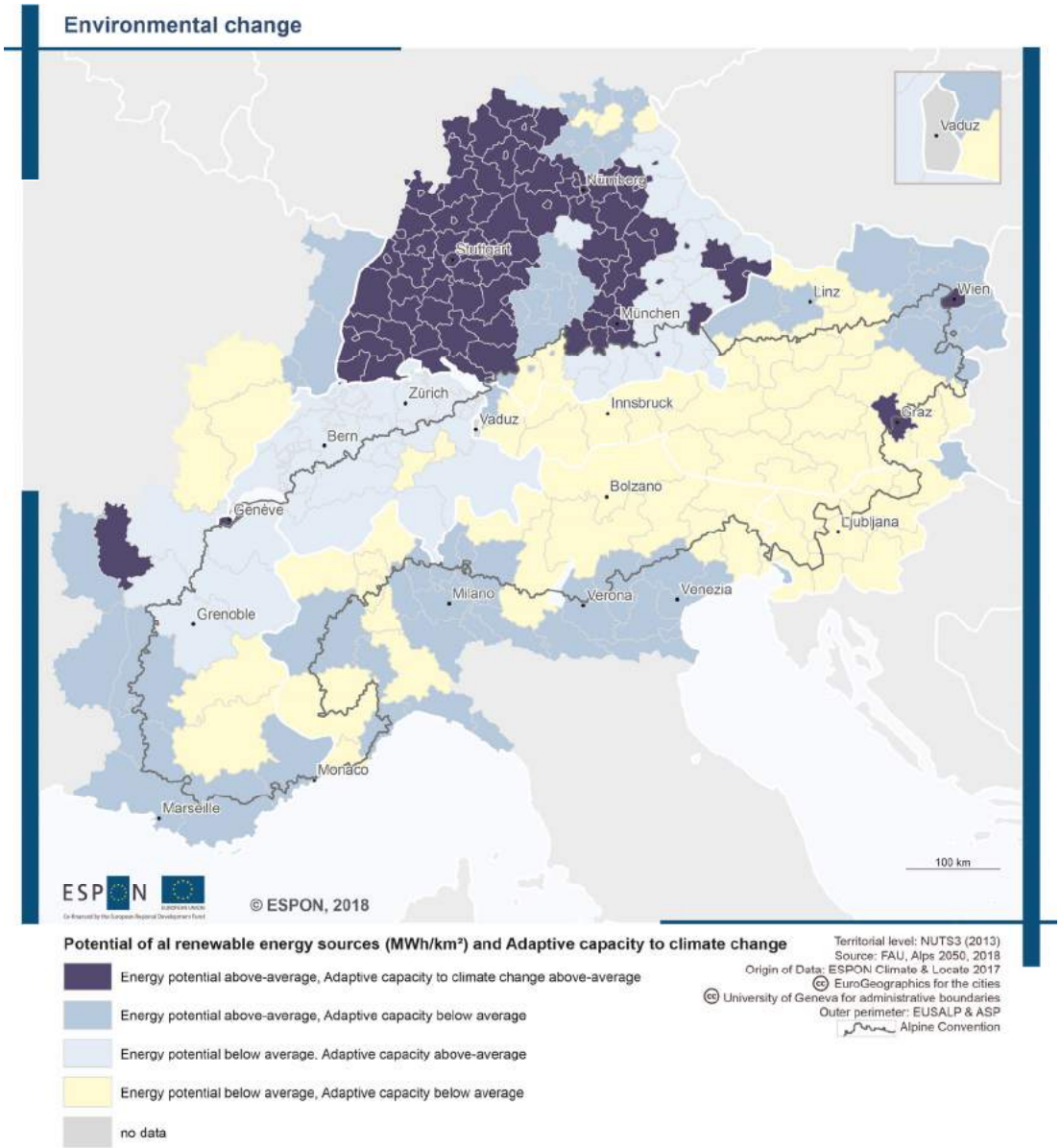


Map 43 Patents and population change

Indicator/Methodology: The map combines economic innovativeness (measured in European patents per million inhabitants) and population dynamics (measured in population change

2011-15 in %; both on the NUTS 3 level) – for more details see the respective descriptions above in the sectoral analyses.

Description: The picture shows over average values for Northern parts of Switzerland, the Munich area in Bavaria and on the French side the Grenoble area. These regions can be regarded as innovative and growing areas of metropolitan functionality. The overall picture shows a certain North-South divide which can be found in several of the socio-economic analyses: Norther regions tend to be positive in innovation terms; Southern regions with regard to demographic dynamics.



Map 44 Combining energy potential and adaptive capacity to climate change

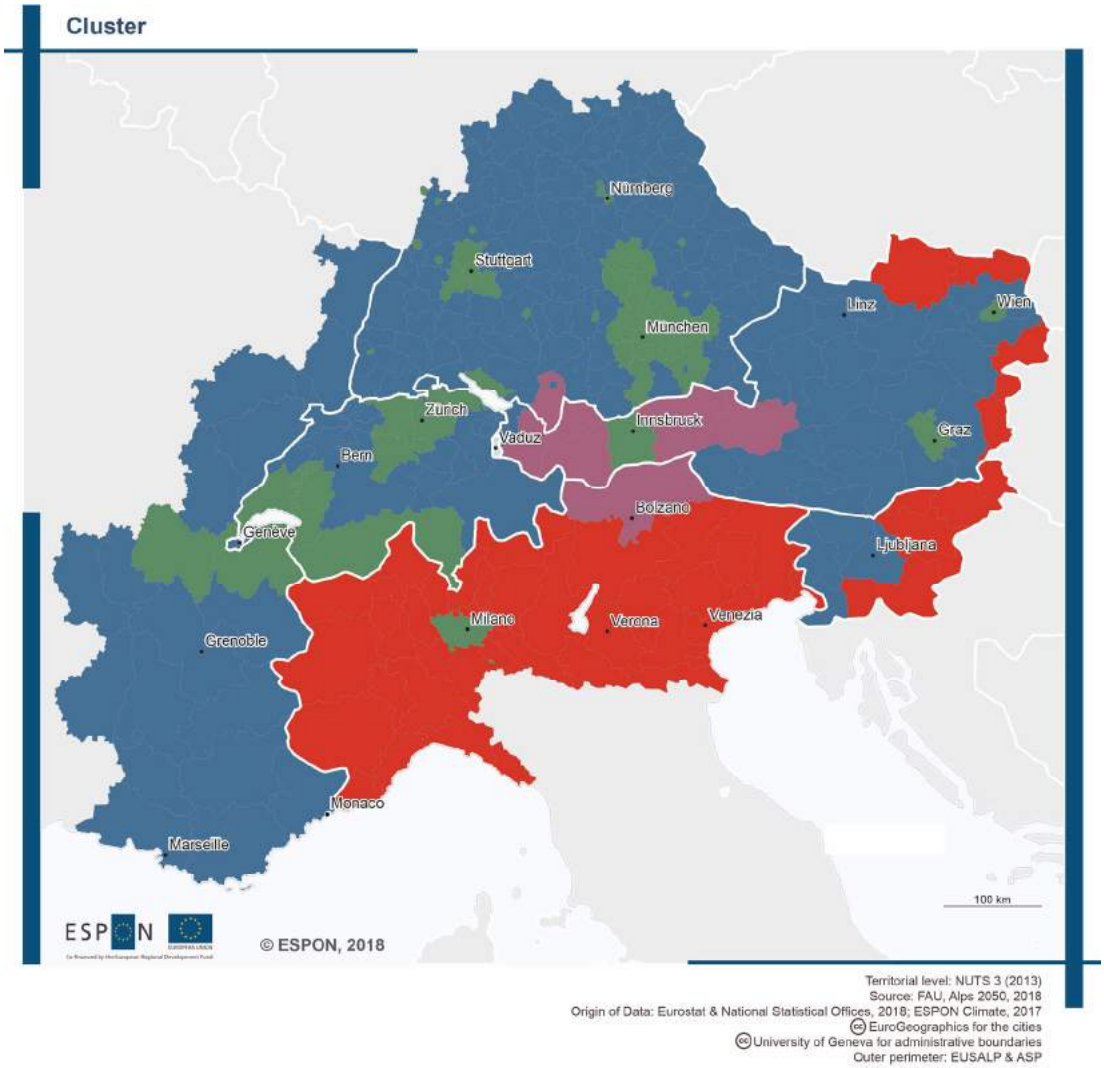
Indicator/Methodology: The map combines the potential for renewable energy sources and the adaptive capacity to climate change, and both values are differentiated to be over or below the Alps 2050 average. Both indicators were developed in the framework of the ESPON programme. The potential for renewable energy sources was developed in the ESPON Locate project (ESPON Locate 2017) and the adaptive capacity to climate change in the ESPON Climate project (ESPON Climate 2011) and updated in 2017. Both are here applied for the Alpine region.

The energy potential indicator shows where *future* potentials can be used, considering political and planning conditions as well as already used sources. The darker coloured areas show those regions with over average values, which are mostly located in pre-Alpine areas.

The adaptive capacity reflects the political and institutional framework conditions with regard to climate change reaction strategies.

Description: For this indicator we see an urban-rural gradient as well as a North-West / South-East gradient. As a result, metropolitan regions tend to have positive values in both dimensions; in particular the Geneva-Grenoble region, the largest Baden-Wuerttemberg area as well as some large cities.

The inner-Alpine space is somehow split in the Eastern part (under average energy potential and under average adaptive capacity) and the Western part (under average energy potential, over average adaptive capacity).



Map 45 Cluster analysis on the basis of the indicators population change 2011-2015, adaptive capacity to climate change and tourism intensity

Indicator/Methodology: The next aggregation step in order to reach a synthesising regionalisation is the cluster analysis. A cluster analysis helps to detect similarities in complex datasets. We chose three indicators that cover different dimensions of spatial development and conducted a cluster analysis on the NUTS 3 level[4]. The indicators comprise population change 2011 to 2015, adaptive capacity to climate change (see Map 34) and tourism intensity 2015 (see Map 24). This selection is a broad approach to ensure an integrated perspective, but is certainly just one of many possible choices.

Description: Map 45 shows the resulting clusters confirming many patterns that have already been described in the sectoral analyses. The map can differentiate four clusters:

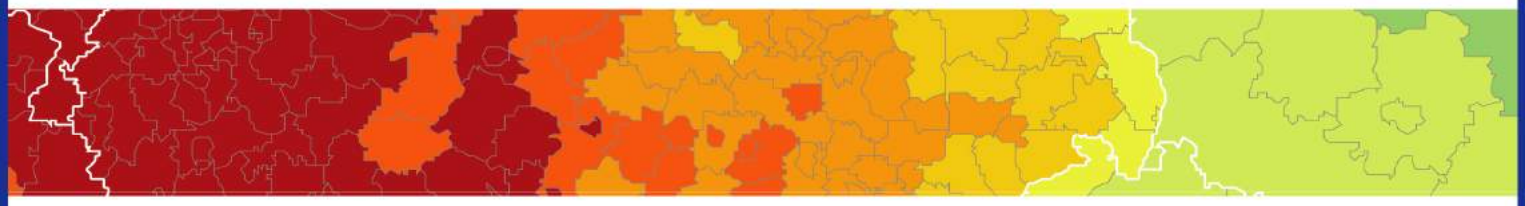
- The **green cluster** (n = 49) comprises mainly metropolitan areas. These areas have the highest values in demographic development, for most of the areas this is due to an

[4] methodological references: z-standardisation, ward criterion, 4 clusters based on elbow criterion

innovative economy in the centres. The adaptive capacity to climate change shows high values, too. The tourism intensity is on a low level (with some outliers, e.g. Innsbruck).

- The **red cluster** (n = 49) comprises mainly Italian regions and some Eastern Slovenian and Austrian regions. This cluster is characterised by a high relevance of the climate change context, the values of the adaptive capacity are the lowest compared to the other clusters. The population change rates are for 75% of the values positive but not that high as in the green cluster. The tourism intensity shows similar values as the green cluster also with some ouliers in Italy (e.g. Trento, Venice, Valle d´Aosta).
- The **purple cluster** (n = 7) comprises mainly central inner-Alpine regions. This cluster is characterised by a very high relative importance of the tourism sector. The minimum value of tourism intensity lies over the maximum values of all other clusters. The demographic development shows no negative values but not the high values of the green cluster. The adaptive capacity to climate change shows higher values than the red cluster but the relevance of the climate change is also high.
- The **blue cluster** (n = 166) comprises mainly rural regions in France, Switzerland, Germany and Austria. The population change dynamic is comparable to the dynamic of the red cluster – here, too, 75% of the values are positive. The tourism intensity is comparable to the red and green cluster but with the most outliers (e.g. Garmisch, Liezen, Oberkärnten, Regen). But compared to the red cluster the crucial difference are the values regarding adaptive capacity to climate change. They are far higher comparable to those of the green cluster.

It is interesting to note that the clusters form a spatially structured picture with mostly spatially connected areas. This reflects the important importance of three key explanatory factors, namely metropolitan quality, national affiliation and morphological structure.



ESPON 2020 – More information

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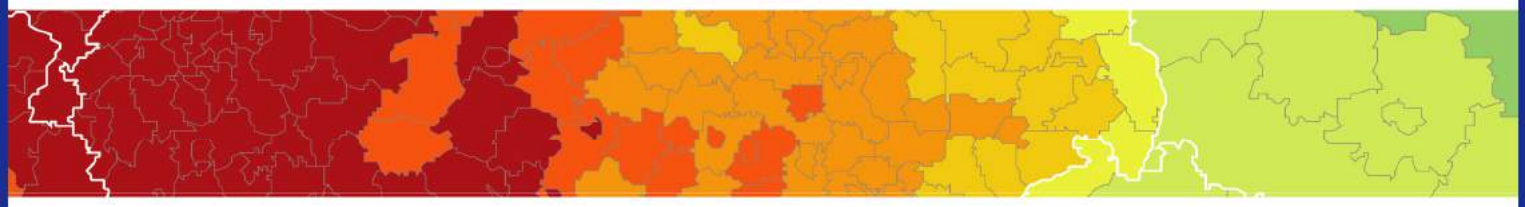
Inspire policy making by territorial evidence



The Alps 2050 Atlas.

Alps2050
Common spatial perspectives for the Alpine area.
Towards a common vision

Targeted Analysis

Scientific Annex

21.11.2018

This targeted analyisis activity is conducted within the framework of the ESPON 2020 Cooperation Programme, partly financed by the European Regional Development Fund.

The ESPON EGTC is the Single Beneficiary of the ESPON 2020 Cooperation Programme. The Single Operation within the programme is implemented by the ESPON EGTC and co-financed by the European Regional Development Fund, the EU Member States and the Partner States, Iceland, Liechtenstein, Norway and Switzerland.

This delivery does not necessarily reflect the opinion of the members of the ESPON 2020 Monitoring Committee.

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Alps2050
Common spatial perspectives for the Alpine area. Towards a common vision

Table of contents

1 Overview: Methodological operationalisation

The Alps 2050 project basis is threefold (see Fig. 5). Firstly, and typical for an ESPON project, territorial evidence stands in the forefront. Quantitative indicators, regional statistics, and cartographic representations build a solid basis for scientific analysis and for political reflection.

Secondly, political frameworks and spatial development systems throughout the multi-level governance system play an important role. Political documents, institutional publications and scientific reflections are the main resources in this regards.

Thirdly, participatory elements are of particular importance for the development of the territorial vision. There is certainly some common ground for future spatial development as well as competing agendas. Developing a spatial vision for the Alps means to take the multiplicity of development options seriously. It is necessary to address the multitude of exisiting ideas/concepts/processes of Alpine development and policies, as an important background to the current discussion.

These three elements have to be combined in terms of an 'iterative triangulation': Findings from the different methodological steps are positioned towards other methodological results, following the qualitative principles of transparency, traceability, and plausibility.

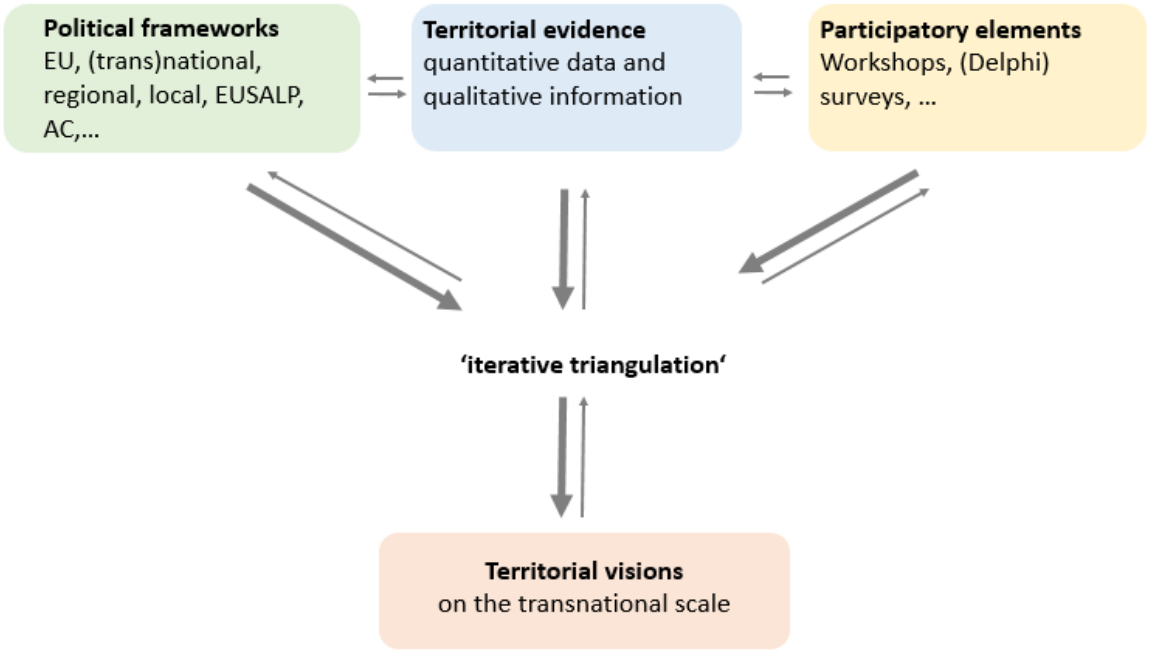


Fig. 1 Elements for the development of spatial perspectives, visions and guidelines.

2 Territorial analyses (Task 1)

2.1 Indicator selection, analysis and challenges

Task 1 is the analytical basis of the Alps 2050 project. Its goal is to analyse and visualise the current state of the Alpine area and to identify the main drivers for the spatial development by means of territorial evidence. The aim of this task is to grasp the most important characteristics and trends, and to detail the challenges with regard to a sustainable and successful future towards 2050. The key results of this step are the basis for the following steps, including the participatory elements.

The data basis consists of a core data set and further data for contextualisation:

- The *core data set* consists of those indicators that are available for the complete Alps 2050 space in a haromonised way on NUTS 3 or LAU 2 level and where no relevant data challenges are to be expected; originally existing challenges have been overcome by involving statistical offices and other institutions (see chapter 2.2). This dataset is explored in a cartographic or graphical way (e.g. scatter plots), it will be scrutinised by means of a hierarchical cluster analyses and it allows cross-sectoral analyses between several indicators. The selection of this data is based on a) the relevance and significance of the indicators and b) data availability.
- The annex 2.2 also gives an overview on further data that is available for the Alps 2050 space. These data are referred to wherever useful, mainly by means of single maps or in terms of background information that play a more qualitative role in developing arguments (*context data*). For the context data, grid data can be used, too; for the core data, grid data is transferred to LAU 2 or NUTS 3 data in order to allow regional statistical analyses. the data are available only on a coarse scale (e.g. NUTS2) or not for the complete Alps 2050 perimeter (e.g. only on Alpine Convention or EUSALP perimeter), but still serve as useful territorial evidence.

This data set allows, firstly, *sectoral* analyses of the relevant indicators reveal important trends and patterns.

Secondly, *cross-sectoral* analyses combine different kinds of indicators and topics in order to ensure a comprehensive understanding of the region and to allow sustainable policy strategies.

Thirdly, the results are the basis for the later participatory steps, (in particular the Delphi study) and for the political recommandations of task 3. This indicator organisation ensures that challenges with regard to data harmonisation and availability would limit or slow down the analytical progress.

2.2 Data availability analysis

2.2.1 Data availability economy

Table 1 Data availability economy

topic	indicator (description of data)	spatial units	perimeter	available period of time	source	notes
Economy	GDP change 2008-14	NUTS 3	Alps 2050	2008-14	Eurostat, national statistical offices	Core data set
Economy	GDP / head pps 2014	NUTS 3	Alps 2050	2014	Eurostat, national statistical offices	Core data set
Labour Market	Change in employment 2008-14	NUTS 3	Alps 2050	2008-14	Eurostat, national statistical offices	Core data set
Labour Market	share & change of labour force in agricultural sector (NACE R2 A)	NUTS 3	Alps 2050	(2008-) 2014	Eurostat, national statistical offices	Core data set
Innovation	patent application per Mio inhabitants	NUTS 3	Alps 2050	2012	Eurostat, national statistical offices	Core data set
Economy	GDP	NUTS-3	EUSALP+ Alpine Space (not all regions)	2000-2015	Eurostat, nama_10r_3gdp	
Economy	Real growth rate of regional gross value added (GVA) at basic prices, percentage change on previous year	NUTS-2	EUSALP+ Alpine Space (not all regions)	2000-2015	Eurostat, nama_10r_2gvagr	
Economy	Gross value added at basic prices	NUTS-3	EUSALP+ Alpine Space (not all regions)	2000-2015	Eurostat, nama_10r_3gva	
Economy	Gross fixed capital formation	NUTS-2	EUSALP+ Alpine Space (not all regions)	2000-2015	Eurostat, nama_10r_2gfcf	

topic	indicator (description of data)	spatial units	perimeter	available period of time	source	notes
Economy	Compensation of employees	NUTS-2	EUSALP+ Alpine Space (not all regions)	2000-2015	Eurostat, nama_10r_2coe	
Economy	Employment (thousand hours worked) by	NUTS-2	EUSALP+ Alpine Space (not all regions)	2000-2015	Eurostat, nama_10r_2emhrw	
Economy	Allocation of primary income account of households	NUTS-2	EUSALP+ Alpine Space (not all regions)	2000-2015	Eurostat, nama_10r_2hhpri	
Economy	Income of households	NUTS-2	EUSALP+ Alpine Space (not all regions)	2000-2015	Eurostat, nama_10r_2hhinc	
Economy	Secondary distribution of income account of households	NUTS-2	EUSALP+ Alpine Space (not all regions)	2000-2015	Eurostat, nama_10r_2hhsec	
Economy	SBS (Structural business statistics) data by NACE (local units, wages and salaries, persons employed, growth rate of employment, share of employment in manufacturing total)	NUTS-2	EUSALP+ Alpine Space (not all regions)	2008-2015	Eurostat, sbs_r_nuts03 (1995-2007) sbs_r_nuts06_r2 (2008-2015)	
Economy	Employment (thousand persons) by NACE	NUTS-3	EUSALP+ Alpine Space (not all regions)	2000-2015	Eurostat, nama_10r_3empers	
Economy	employees per sectors (NACE)	NUTS-2	EUSALP+ Alpine Space (not all regions)	1999-2008 und 2008-2016	Eurostat, lfst_r_lfe2en1 (1999-2008) lfst_r_lfe2en2 (2008-2016)	

topic	indicator (description of data)	spatial units	perimeter	available period of time	source	notes
Economy	Employment in technology and knowledge-intensive sectors	NUTS-2	EUSALP+ Alpine Space (not all regions)	1999-2008 und 2008-2016	Eurostat, htec_emp_reg (1999-2008) und htec_emp_reg 2 (2008-2016)	
Economy	Patent applications to the EPO by priority year (Number, per million inhabitants, nominal GDP)	NUTS-3	EUSALP+ Alpine Space (not all regions)	1977-2012	Eurostat, pat_ep_rtot	
Economy	High-tech patent applications to the EPO by priority year	NUTS-3	EUSALP+ Alpine Space (not all regions)	1977-2012	Eurostat, pat_ep_rtec	
Economy	Biotechnology patent applications to the EPO by priority year	NUTS-3	EUSALP+ Alpine Space (not all regions)	1977-2012	Eurostat, pat_ep_rbio	
Economy	Population of active enterprises	NUTS-3	EUSALP+ Alpine Space (not all regions)	2008-2015	Eurostat, bd_hgnace2_r3	
Economy	Births of enterprises in t	NUTS-3	EUSALP+ Alpine Space (not all regions)	2008-2015	Eurostat, bd_hgnace2_r3	
Economy	High growth enterprises measured in employment (growth by 10% or more) - number	NUTS-3	EUSALP+ Alpine Space (not all regions)	2008-2015	Eurostat, bd_hgnace2_r3	
Economy	Deaths of enterprises in t	NUTS-3	EUSALP+ Alpine Space (not all regions)	2008-2015	Eurostat, bd_hgnace2_r3	
Economy	Birth Rate	NUTS-3	EUSALP+ Alpine Space (not all regions)	2008-2015	Eurostat, bd_hgnace2_r3	

topic	indicator (description of data)	spatial units	perimeter	available period of time	source	notes
Economy	Death Rate	NUTS-3	EUSALP+ Alpine Space (not all regions)	2008-2015	Eurostat, bd_hgnace2_r3	
Economy	Total intramural R&D expenditure (GERD) by sectors of performance	NUTS-2	EUSALP+ Alpine Space (not all regions)	1981-2014	Eurostat, rd_e_gerdreg	
Economy	Total R&D personnel and researchers by sectors of performance, sex	NUTS-2	EUSALP+ Alpine Space (not all regions)	1980-2014	Eurostat, rd_p_persreg	
Economy	HRST (Human resources in science and technology) by category	NUTS-2	EUSALP+ Alpine Space (not all regions)	1999-2016	Eurostat, hrst_st_rcat	

2.2.2 Data availability demography

Table 2 Data availability demography

topic	indicator (description of data)	spatial units	Perimeter	available period of time	source	notes
Demo-graphy	population change 2001-2010 and 2010-2015	LAU2	Alps2050	2010-15	Eurostat, national statistical offices	Core data set
Demo-graphy	net migration 2015	NUTS 3	Alps2050	2015	Eurostat, national statistical offices	Core data set
Demo-graphy	net natural change 2015	NUTS 3	Alps2050	2015	Eurostat, national statistical offices	Core data set
Demo-graphy	elderly population: Total resident population aging index, 2015 (P65+/P0-14) *100	LAU2	Alps2050	2015	Eurostat, national statistical offices	Core data set
Demo-graphy	migration: share of inhabitants by foreign citizenship 2015	NUTS 3	Alps2050	2015	Eurostat, national statistical offices	Core data set
Demo-graphy	Total Population 2001	LAU2	EUSALP	2001	Eurac RegDev, Data source: National statistical offices	
Demo-graphy	Total Population 2010	LAU2	EUSALP	2010	Eurac RegDev, Data source: National statistical offices	
Demo-graphy	Population density 2010	LAU2	EUSALP	2010	Eurac RegDev, Data source: National statistical offices	
Demo-graphy	Population growth rate (per 100 residents)	LAU2	EUSALP	2001-2010	Eurac RegDev, Data source: National	

topic	indicator (description of data)	spatial units	Perimeter	available period of time	source	notes
					statistical offices	
Demo-graphy	Total Resident population by sex	LAU2	ALPINE CONVENTION	2012 et similia	Alpine Convention RSA5	available also at ALPINE SPACE level for the year 2011
Demo-graphy	Women (per 100 residents)	LAU2	ALPINE CONVENTION	2012 et similia	Alpine Convention RSA5	available also at ALPINE SPACE level for the year 2011
Demo-graphy	Elderly population (per 100 residents)	LAU2	ALPINE CONVENTION	2003 et similia, 2012 et similia	Alpine Convention RSA5	available also at ALPINE SPACE level for the year 2011
Demo-graphy	Total resident population aging index (per cent residents)	LAU2	ALPINE CONVENTION	2003 et similia, 2012 et similia	Alpine Convention RSA5	available also at ALPINE SPACE level for the year 2011 (except Lichtenstein)
Demo-graphy	Working-age total resident population (per cent residents)	LAU2	ALPINE CONVENTION	2003 et similia, 2012 et similia	Alpine Convention RSA5	available also at ALPINE SPACE level for the year 2011
Demo-graphy	Crude birth rate (per 1000 residents) and Variation	LAU2	ALPINE CONVENTION	2001 et similia, 2012 et similia	Alpine Convention RSA5	available also at ALPINE SPACE level for the year 2011
Demo-graphy	Crude death rate (per 1000 residents)	LAU2	ALPINE CONVENTION	2012 et similia	Alpine Convention RSA5	available also at ALPINE SPACE level for

topic	indicator (description of data)	spatial units	Perimeter	available period of time	source	notes
						the year 2011
Demo-graphy y	Foreign resident population (per 1000 residents)	LAU2	ALPINE CONVENTION	2003 et similia, 2012/2013	Alpine Convention RSA5	available also at ALPINE SPACE level for the year 2012
Demo-graphy	Population on 1 January by age group, sex and citizenship	NUTS 3	EUSALP	2007-2016	EUROSTAT, migr_pop1ctz	Liechtenstein: 2009-2016 Categories for citizenship: reporting country, EU28 countries except reporting country, Non-EU28 countries nor reporting country, Stateless, unknown
Demo-graphy	Average household Size	LAU2	ALPINE SPACE	2011	EURAC AlpEnv	
Demo-graphy	General fertility rate	LAU2	ALPINE SPACE	2011	EURAC AlpEnv	
Demo-graphy	Married Residents	LAU2	ALPINE SPACE	2011	EURAC AlpEnv	
Demo-graphy	Divorced Residents	LAU2	ALPINE SPACE	2011	EURAC AlpEnv	

topic	indicator (description of data)	spatial units	Perimeter	available period of time	source	notes
Demo-graphy	Single person households	LAU2	ALPINE SPACE	2011	EURAC AlpEnv	

2.2.3 Data availability settlement systems and land use

Table 3 Data availability settlement systems and land use

topic	indicator (description of data)	spatial units	perimeter	available period of time	source	notes
Settle-ment system	perimeters of FUA	LAU2	Alps 2050	2016	ESPON	Core data set
Settle-ment system / land use	degree of urbanisation: DEGURBA classification	LAU2	Alps 2050	2016	ESPON	Core data set
Land use	change in annual soil sealing 09-12	Grid > NUTS 3	Alps 2050	2009-12	EEA	Core data set
Settle-ment system	MEGAs, settlement structure typology	LAU	ESPON space	2016	ESPON EGTC (cf. policy brief polycentricity)	
Settle-ment system	Settlement size		Alpine Conventio n	2015	Bartoletti 2015	
Land use	Corine Land Cover 1990 raster data		Europe		CORINE	
Urban sprawl at the level of NUTS-2 regions	WUP values at the NUTS-2 region level	NUTS-2	EEA	2009	EEA 2016	
Urban sprawl at the level of NUTS-2 regions	Changes in WUP values at the NUTS-2 region level between 2006 and 2009 (absolute and relative)	NUTS-2	EEA	2006-2009	EEA 2016	
Degree of urban sprawl at country level	Weighted urban proliferation (WUP), dispersion (DIS), land uptake per person (LUP) and percentage of built-up area (PBA) on the country level	Countr y	EEA	2009	EEA 2016	

topic	indicator (description of data)	spatial units	perimeter	available period of time	source	notes
Degree of urban sprawl at country level	Comparison of the values of weighted urban proliferation (WUP), dispersion (DIS), land uptake per person (LUP) and percentage of built-up area (PBA) on the country level for 2006 and 2009 (	Country	EEA	2006-2009	EEA 2016	
Urban sprawl at the level of NUTS-2 regions	WUP values at the NUTS-2 region level	NUTS-2	EEA	2009	EEA 2016	
Urban sprawl at the level of NUTS-2 regions	Changes in WUP values at the NUTS-2 region level between 2006 and 2009 (absolute and relative)	NUTS-2	EEA	2006-2009	EEA 2016	
Urban sprawl at the 1-km2-grid level	Urban sprawl in Europe on the 1-km2 scale in 2009 (based on WUPp values)	1-km2-grid data	EEA	2009	EEA 2016	
Urban sprawl at the 1-km2-grid level	Changes in WUP in Europe between 2006 and 2009 on the 1-km2-grid scale	1-km2-grid data	EEA	2006-2009	EEA 2016	

2.2.4 Data availability mountain areas & services of general interest

Table 4 Data availability mountain areas & services of general interest

topic	indicator (description of data)	spatial units	perimeter	available period of time	source	notes
Services of General Interest	car travel time to next doctor	Grid > LAU2	Alps 2050	2017	ESPON PROFECY	Core data set
Services of General Interest	car travel time to next primary school	Grid > LAU2	Alps 2050	2017	ESPON PROFECY	Core data set
Service of General Interests	Availability, Accessibility (Distance, Traveltime by public transport and private car) of 10 Services of general interest.	SETTLEMENTS	9 Case Studies in the ALPINE CONVENTION	2017	INTESI - Project	
Service of General Interests	Number of hospital beds (per 1000 residents)	LAU2	ALPINE CONVENTION	2012 et similia	Alpine Convention RSA5	
Service of General Interests	Number of long-term residential care facilities (per 1000 residents)	LAU2	ALPINE CONVENTION	2012 et similia	Alpine Convention RSA5	

2.2.5 Data availability tourism

Table 5 Data availability tourism

topic	indicator (description of data)	spatial units	perimeter	available period of time	source	notes
Tourism	intensity: overnight stays per inhabitants	LAU2	Alps 2050	2015	National and regional statistical offices, Eurostat	Core data set
Tourism	Tourism Density (Overnight stays/square km 2001)	LAU2	ALPINE CONVENTION	2001, 2006, 2010	Alpine Convention RSA4	
Tourism	Average length of stay (overnight stays/arrivals)	LAU2	ALPINE CONVENTION	2001, 2006, 2010	Alpine Convention RSA4	
Tourism	Population based tourism function index (overnight stays*100/population)	LAU2	ALPINE CONVENTION	2001, 2006, 2010	Alpine Convention RSA4	
Tourism	Tourism intensity (Number of bedplaces in hotel and similar establishments by population)	LAU2	ALPINE CONVENTION	2010	Alpine Convention RSA4	Data from Austria and France concerning bed places refer to 2011. Missing data for 107 municipalities.
Tourism	Tourism intensity (Number of bedplaces by population)	NUTS 3	EUSALP	2010	EUROSTAT, tour_cap_nuts3 and demo_r_pjangrp3	to be calculated
Eco-system/ Tourism	Outdoor Recreation	LAU2	ALPINE SPACE	2012	EURAC AlpEnv	Outputs of AlpES Project

2.2.6 Data availability climate change

Table 6 Data availability climate change

Topic	indicator (desciption of data)	spatial units	perimeter	available period of time	source	notes
Adaptive capacity	Overall adaptive capacity to climate change	NUTS 3	Alps 2050	2014	ESPON Climate	Core data set
Exposure	Change in annual mean temperature in annual mean number of frost days in annual mean number of summer days in annual mean precipitation in winter months in annual mean precipitation in summer months in annual mean number of days with snow cover	NUTS 3	ESPON CLIMATE	1961-1990, 2061-2100	ESPON CLIMATE (CCLM model and LISFLOOD model)	
Sensitivity	Combined physical sensitivity to climate change Combined environmental sensitivity to climate change Combined social sensitivity to climate change Combined economic sensitivity to climate change Aggregate sensitivity to climate change	NUTS 3	ESPON CLIMATE	2010	ESPON CLIMATE	Sensitivity indicators that are based on CORINE land-use data or Gallego data do not cover Switzerland.

2.2.7 Data availability energy

Table 7 Data availability energy

topic	indicator (description of data)	spatial units	perimeter	available period of time	source	notes
Renewable energy potential	potential for electricity generation [GWh] including wind ohshore, Small / large hydropower, PV, biomass, biogas	NUTS 3	Alps 2050	2016	Eurostat, ESPON Locate	Core data set
Energy	Total energy consumption (GWh/year)	LAU2	ALPINE CONVENTION	2013	EURAC RenEn	Data availability to verify
Energy	Renewable Energy Installations (Type of installation, Capacity of plant [MW])	PUNTUAL DATA	ALPINE CONVENTION	2010	EURAC RenEn	Data availability to verify

2.2.8 Data availability ecosystems

Table 8 Data availability ecosystems

topic	indicator (description of data)	spatial units	perimeter	available period of time	source	notes
Eco-system services	leisure supply demand	LAU 2	Alps 2050	2017	AlpES, EURAC Alpine Environment, Schirpke et al. 2017	Core data set
Eco-system services	Supply / demand drinking water	LAU 2	Alps 2050	2017	AlpES, EURAC Alpine Environment	Core data set
Protection regimes	protected areas (CDDA, Natura 2000)	Georef. > NUTS 3 or LAU2	Alps 2050	2017	EEA, protected planet, national/ regional authorities	Core data set
Ecological conec-tivity	continuum suitability index	Grid data > NUTS 3 or LAU2	Alps 2050	2015	Swiss National Park	Core data set
Eco-System/ Energy	Fuel Wood availabitliy	LAU2	ALPINE SPACE	2006	EURAC AlpEnv	Outputs of AlpES Project
Eco-System/ Energy	Special protected areas	LAU2	ALPINE SPACE	2011	EURAC AlpEnv	
Eco-System/ Energy	Hemeroby index (degree of naturalness)	LAU2	ALPINE SPACE	2012	EURAC AlpEnv	
Eco-System/ Energy	Artificial Areas	LAU2	ALPINE SPACE	2012	EURAC AlpEnv	
Eco-System/ Energy	Light pollution	LAU2	ALPINE SPACE	2011	EURAC AlpEnv	
Eco-System/ Energy	Protective Forests	LAU2	ALPINE SPACE	2012	EURAC AlpEnv	Outputs of AlpES Project
Eco-System/ Energy /Climate	CO^2 Sequestration	LAU2	ALPINE SPACE	2006	EURAC AlpEnv	Outputs of AlpES Project
Eco-System/ Energy	Biomass production from Grasslands	LAU2	ALPINE SPACE	2012	EURAC AlpEnv	Outputs of AlpES Project - some restriciton might be

topic	indicator (description of data)	spatial units	perimeter	available period of time	source	notes
						applied on this dataset

2.2.9 Data availability transport

Table 9 Data availability transport

topic	indicator (description of data)	spatial units	perimeter	available period of time	source	notes
Transport	transit corridors: daily average of all vehicles	Georef.	Alps 2050	2006-16	Imonitraf	Core data set
Transport	car travel time to train stations	Grid > LAU2	Alps 2050	2017	ESPON Profecy	Core data set
Transport	Accessibility to urban centers (travel time by car to the closest municipalities > 5000 inhabitans)	LAU2	ALPINE CONVENTION	2017	Analysis of EURAC RegDev by data of Open Street Map	Enlargement of data for EUSALP / ASP perimeter is foreseen
Transport	Development of traffic flows and tons of freight transported on road and on railways	ALPINE CORRIDORS	ALPINE CONVENTION	2005-2015	iMonitraf, Alpine Convention	
Transport	Flight route density	LAU2	ALPINE SPACE	2011	EURAC AlpEnv	
Transport	Road densitiy of Major Roads	LAU2	ALPINE SPACE	2011	EURAC AlpEnv	
Transport	Road densitiy of All Roads	LAU2	ALPINE SPACE	2011	EURAC AlpEnv	

2.2.10 Data availability cultural and natural heritage

Table 10 Data availability cultural and natural heritage

topic	indicator (description of data)	spatial units	perimeter	available period of time	Source
Natural heritage	Number of indigenous livestock species and breeds	LAU2	ALPINE SPACE	2010-2016	Marsoner et al. (2017)
Cultural heritage	Open Street Map layers on *important historic objects* and *points of interest*)	Punctual data	EUASLP	2017	http://histosm.org/#8/11.16235/45.51045/0/
Cultural heritage	UNESCO Word Heritage Sites	Punctual data	EUSALP	2017	UNESCO, whc.unesco.org/en/list

2.2.11 Core indicator set for Task 1 analyses

Table 11 Core data set

topic	indicator (description of data)	spatial units	perimeter	available period of time	source
Economy	GDP change 2008-14	NUTS 3	Alps 2050	2008-14	Eurostat, national statistical offices
Economy	GDP / head pps 2014	NUTS 3	Alps 2050	2014	Eurostat, national statistical offices
Labour Market	Change in employment 2008-14	NUTS 3	Alps 2050	2008-14	Eurostat, national statistical offices
Labour Market	share & change of labour force in agricultural sector (NACE R2 A)	NUTS 3	Alps 2050	(2008-) 2014	Eurostat, national statistical offices
Inno-vation	patent application per Mio inhabitants	NUTS 3	Alps 2050	2012	Eurostat, national statistical offices
Demo-graphy	population change 2001-2010 and 2010-2015	LAU2	Alps2050	2010-15	Eurostat, national statistical offices
Demo-graphy	net migration 2015	NUTS 3	Alps2050	2015	Eurostat, national statistical offices
Demo-graphy	net natural change 2015	NUTS 3	Alps2050	2015	Eurostat, national statistical offices
Demo-graphy	elderly population: Total resident population aging index, 2015 (P65+/P0-14) *100	LAU2	Alps2050	2015	Eurostat, national statistical offices
Demo-graphy	migration: share of inhabitants by foreign citizenship 2015	NUTS 3	Alps2050	2015	Eurostat, national statistical offices
Settle-ment system	perimeters of FUA	LAU2	Alps 2050	2016	ESPON

topic	indicator (description of data)	spatial units	perimeter	available period of time	source
Settle-ment system / land use	degree of urbanisation: DEGURBA classification	LAU2	Alps 2050	2016	ESPON
Land use	change in annual soil sealing 09-12	Grid > NUTS 3	Alps 2050	2009-12	EEA
Services of General Interest	car travel time to next doctor	Grid > LAU2	Alps 2050	2017	ESPON PROFECY
Services of General Interest	car travel time to next primary school	Grid > LAU2	Alps 2050	2017	ESPON PROFECY
Tourism	intensity: overnight stays per inhabitants	LAU2	Alps 2050	2015	National and regional statistical offices, Eurostat
Adaptive capacity	Overall adaptive capacity to climate change	NUTS 3	Alps 2050	2014	ESPON Climate
Re-newable energy potential	potential for electricity generation [GWh] including wind ohshore, Small / large hydropower, PV, biomass, biogas	NUTS 3	Alps 2050	2016	Eurostat, ESPON Locate
Eco-system services	leisure supply demand	LAU 2	Alps 2050	2017	AlpES, EURAC Alpine Environment, Schirpke et al. 2017
Eco-system services	Supply / demand drinking water	LAU 2	Alps 2050	2017	AlpES, EURAC Alpine Environment
Protection regimes	protected areas (CDDA, Natura 2000)	Georef. > NUTS 3 or LAU2	Alps 2050	2017	EEA, protected planet, national/ regional authorities
Eco-logical conec-tivity	continuum suitability index	Grid data > NUTS 3 or LAU2	Alps 2050	2015	Swiss National Park

topic	indicator (description of data)	spatial units	perimeter	available period of time	source
Transport	transit corridors: daily average of all vehicles	Georef.	Alps 2050	2006-16	Imonitraf
Transport	car travel time to train stations	Grid > LAU2	Alps 2050	2017	ESPON Profecy

3 Stakeholder participation

3.1 Stakeholder workshop

3.1.1 Background and objective

One key element of the participatory process was a stakeholder workshop on May, 23rd, in Munich, hosted by the Bavarian Ministry for the Environment. About 25 experts were present, including members of the Alps 2050 research consortium and the steering committee as well as further experts of the Alpine spatial environment.

The workshop was open to all approx. 150 experts that were invited to participate in the Delphi study. This event took place between the first and the second round of the Delphi study and comprised two main elements: in the morning, the interim analytical results of the Alps 2050 project were presented and discussed. In the afternoon, four thematic stations reflected on the following topics, before a final plenary reflection concluded the workshop (cp. Fig. 2).

The overall objectives of this workshop included:

- Better understanding of ongoing political discussions within the multi-level governance system
- Linking analytical results with political options

The thematic stations were conducted in four interactive sessions of about 20 minutes discussion each. Different groups of experts from different countries participated in each session. The topics of the thematic stations were:

- Thematic orientations and perspectives of the Alpine spatial development towards 2050
- The role of EU funding post 2020, including cross-border tools
- National and regional planning tools in the Alpine context
- The relation ship between the EUSALP and the Alpine Convention

It was agreed to keep the detailed discussions confidential as some controversial political topics were addressed in a very frank way. Furthermore, it should be avoided exposing individual experts or opinions. This is why the following summary of the workshop remains rather abstract.

Fig. 2 Impressions from the Munich workshop in May 2018 – thematic stations and plenary discussion

3.1.2 Documentation

Thematic station 1: "National and regional planning tools"

The discussion of the thematic station "National and regional planning tools" concentrated on relevant topics from a domestic point of view as well as on the transnational dimension of these topics and appropriate governance tools. The starting question was which were the most pressing and current topics on the agendas of spatial development in the respective regions of the present experts.

Generally speaking, there was a high agreement on the relevance of the topics transport, ecological connectivity, water, energy, climate change, and dual education. The overall impression was that the experts focused more on environmental topics and less on social and economic issues like quality of life, migration, growth debates, etc.

With regard to the transnational dimension there have been several important inputs:

- **Transnational level**: there was a certain consensus that a (strong) transnational exchange of important topics would be fruitful. Participation of the relevant actors is seen as the key to success. It is important to bring people together, to involve stakeholders. There is a need for better / more appropriate / elaborated methods for transnational exchange.
- **Spatial development**: The four discussion groups asked for a stronger and coordinating role of spatial planning. However, against the background that it is already difficult on the national and regional level to bring together different sectors, the potentials on the transnational level were seen in rather careful way.
- **Cooperation:** The need of territorial cooperation is obvious, but in practice it is not easy to push/stimulate people to work together, particularly in a transnational setting.
- **Multilevel governance**: The regional level seems to be the most appropriate level for cooperation. The local and national level has to be involved, but cooperation dynamics are most appropriate at the regional level.
- **Instruments:** With regard to the instrumental side, there was a general consensus amongst the participants that *processes* are the key ("HOW rather than WHAT"). A series of more general and also more technical character were discussed, often in a controversial mode:
    - Development of a spatial development tool for the Alpine area, complementing the Alpine Convention planning protocol
    - Establish transnational roundtables to emerge questions that need transnational attention (particularly thematic issues concerning flows and corridors)
    - Establish soft planning instruments on a transnational level
    - Establish legal instruments for consultation (widening/broadening existing laws)

Thematic station 2: "EU funding post 2020"

The Alps 2050 project has been implemented in a time when the budget negotiations on the post 2020 period were in a dynamic phase. The guiding question was "what are the current

challenges and possible improvements for EU funding in the Alpine area?". All participants agreed that EU funding is beneficial for the Alpine Region and shall be kept in order to face transnational challenges. However, the discussion on funding post 2020 has proofed to be a sensitive one. During the interaction, we noticed different opinions concerning the relevance of the different cooperation platforms currently working in the Alpine area (Alpine Convention, Interreg Alpine Space, Eusalp). The discussions were very vivid and addressed thematic, institutional and technical aspects.

The debate can be summarized in the following three strands:

- **Identification and endorsement of transnational priorities**: Funding instruments should follow and support political priorities, which shall be few, feasible and relevant. Priorities should be agreed among all actors (MRS, AC, Interreg ..) – according to some participants, this process is already going on. Transnational priorities should be embraced also at national level and in mainstream programs, i.e. structural funds managed at regional/national level. The strategy currently does not have the power to systematically introduce transnational priorities in national funding.
- **Coordination, communication and capitalization:** At the moment, projects on similar topics are funded in parallel by the different funds. A better communication and a comprehensive collection of all (not just Interreg) projects results facing transnational issues in the Alpine area could be foreseen, so that results can become a permanent achievement. In addition, events to exchange and network might also help, as well as a far-reaching information of which are (all) the funding possibilities ('funding inventory').
- **Alpine Space Programme related suggestions**: The program is currently a precious asset for the region, which is certainly worth keeping. Some improvements to be applied to the program (and projects) are here suggested, including:
    - additional flexibility both in terms of topics and timing of funding, simplification of the bureaucratic tasks, coherence with EUSALP AG needs, opening towards bigger (and smaller investments), re-introduction of innovation (and related risks) in the projects
    - Increase budgetary opportunities for Interreg B, in order to allow bigger investments
    - Increase of "territorial thinking" in transnational funding
    - Funding should support real needs and problems of the area and outstanding ideas
    - Reshape projects, maybe introduce shorter, smaller ones (partnership and budget, so that smaller organization are not intimidated)
    - New funding instruments can be developed
    - Better embedding of MRS in funding instruments (Financing of MRS?)

Increase implementation skills, capacity building to get funding (introduce targeted funds for rural areas that have lower capacity (skills) to access funding

Thematic station 3: "Future of EUSALP and Alpine Convention"

The first part of each session started out with the same guiding question: "How to strengthen the coherence of EUSALP and Alpine Convention?". Three major amendments have been suggested during the interactive sessions:

- The Interreg Alpine Space Programme has to be seen as a third big player connecting stakeholders at the transnational level as well as providing funds to realise at lots of

projects taking place on the ground in Alpine regions. Further transnational activities are possible within the framework of the ARGE ALP.

- Some transnational activities are rather restricted to single sectors only. However, initiatives such as the Zurich process for transportation policies or the concept of transeuropean corridors are very important pillars of transnational policy-making in the Alpine Space.
- Transnational activities are complemented by a lot of cross-border activities at smaller scales. Cross-border cooperation (e.g. in the Lake Constance Region) is considered as an important groundwork for transnational policy making.

It remains an open question how EUSALP, the Alpine Convention, the Alpine Space Programme, ARGE ALP, sectoral policies, cross-border projects, and other activities relate to each other. Obviously, these different elements of Alpine governance play different roles in terms of networking, funding, policy making, or policy implementation. It also remains an issue of debate which role spatial planning is playing and should play within the Alpine governance arrangement.

In the second part of each session participants discussed both the necessity and options to strengthen the coherence of EUSALP, Alpine Convention, and other policies. On the one hand, some participants preferred the co-existence of different policies, and endorsed the benefits of competition and overlaps. Especially the role of EUSALP putting pressure on other policies was appreciated. Also, stakeholders wearing different hats were considered as an advantage to enable, balance, and speed up policy-making processes. On the other hand, other participants favoured better coordination, more coherence, and less redundancy between policies. In that respect it was suggested to reduce the number of EUSALP Action Groups or Alpine Convention Platforms. In general, stakeholders called to reduce overlaps, to concentrate on core issues, to cooperate, to make better use of synergies.

Thematic station 4: Thematic priorities

The station on “thematic priorities” differed from the other three groups as it focused not on institutional and governance aspects but on the content side of the Alps 2050 project. The initiate question was: “Imagine that the EUSALP has a Department for Spatial Planning with an unlimited budget and an unlimited political mandate for spatial development. What would be the first three measures/projects you would plan?”

Three of the four groups at this thematic station developed graphic outputs on blind maps of the Alps 2050 perimeter. These ‘mental maps of the future’ were of exploratory, sometimes experimentalist character (see Fig. 3).

They cannot directly be translated political agendas or even into planning documents. However, the synopsis of these drawings and the discussions deliver important elements for developing spatial perspectives in the Alpine region:

- **Transport**: (high speed) rail axes with noise reduction measures, ban of road expansion, European transit axes, sustainable mobility

- **Tourism**: touristic hotspots, green tourism,
- **Economy**: „brain-circulation“,regional value chains
- Spatial **planning**: one comprehensive transnational spatial planning perimeter and development axes,relations between metropolitan and rural areas, relations between mountainous and non-mountainous areas, poly-centricity sprawl reduction social services
- **Ecology**: green infrastructure and ecological connectivity

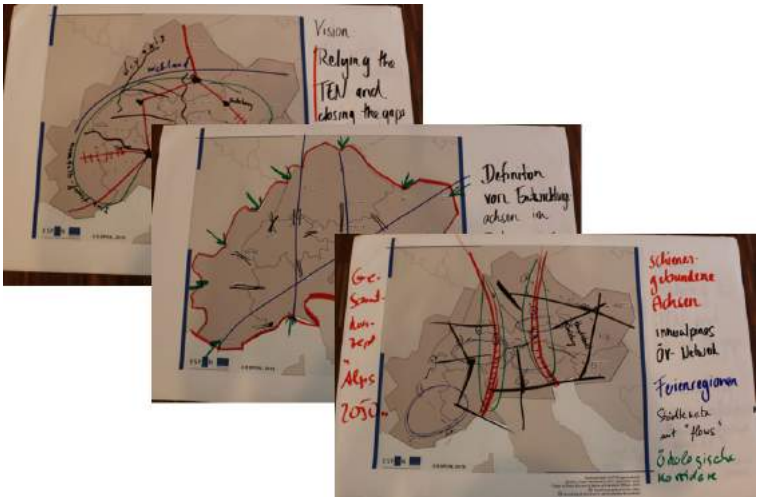


Fig. 3 Experimentalist ‘mental maps’ from the workshop on the Alpine future

Considering the workshop input in the project

The workshop input has been systematically been taken into account throughout the project’s lifetime. This was the case in different forms:

- Inspiration for the drafting of the Delphi 2nd round
- Take-up of concrete ideas and proposals in the scenarios and visions
- Guidance for the development of possible roadmap elements

3.2 Involvement in political process

It is important to link the results of the Alps 2050 project with the broader political context. During the recent implementation process, the interaction was fruitful, and there are further discussions foreseen:

- Permanent Committee of the Alpine Conference, Liechtenstein, June 2018 (Liechtenstein)
- Alpine Space Programming Process 1./2. October 2018
- Permanent Committee of the Alpine Conference, Innsbruck November 2018 (Innsbruck)
- Workshop on EUSALP 2nd Annual Forum in Innsbruck, 20/21.11.2018, http://www.eusalpforum2018.com/index.php/en/programme/workshops-en#workshop5

All these elements will help to concretise political options in interaction with the political stakeholders, and they contribute to the dissemination of the project results.

3.3 Delphi study

3.3.1 The Delphi approach

For the Alps 2050 project, an online based two round Delphi is currently conducted (to record initial assessment and adjusted perspectives of respondents), including both textual and cartographic elements. The Alps 2050 project implements a so called policy Delphi study, i.e. a Delphi study that aims to identify and concretise political options for the future (Balram et al. 2003, Landetta et al. 2011, Evrard et al. 2013).

The selection of the Delphi followed the following criteria, a) *expertise* and b) an *institutional* balance and c) *geographical* balance. The expertise has both an institutional dimension (political mandate to contribute to the process) and a personal dimension (working experience on a relevant field for the Alpine development). The balanced selection considers the different levels of the governance system in place, the representation of the different national and regional contexts, and the representation of remote and central places as well as inner Alpine and lowland areas of the whole EUSALP area.The concrete list of persons has been drafted by the consortium members and was then checked and partially complemented by the the steering committee. Table 12 illustrates the logic of the experts identification.

Table 12 Systematic for the identification of experts for the Delphi Study

		AT	CH	DE	FR	IT	MC	SI
Alpine level	EUSALP Executive Board member	nn	nn	nn	nn	nn	nn	nn
	Alpine Convention Delegation member	nn	nn	nn	nn	nn	nn	nn
	Alpine Space national coordinator	nn	nn	nn	nn	nn	nn	nn
National level	Experts for territorial development / planning	nn	nn	nn	nn	nn	nn	nn
	Experts from sectoral policies	nn	nn	nn	nn	nn	nn	nn
	NGOs, associations, chambers, cross-border cooperation	nn	nn	nn	nn	nn	nn	nn
Regional level	Experts for territorial Development / Planning	nn	nn	nn	nn	nn	nn	nn
	Experts from sectoral policies	nn	nn	nn	nn	nn	nn	nn
	NGOs, associations	nn	nn	nn	nn	nn	nn	nn
EU Com		nn	nn	nn	nn	nn	nn	nn
EUSALP Action groups		nn	nn	nn	nn	nn	nn	nn
Alpine Convention thematic groups		nn	nn	nn	nn	nn	nn	nn
Other		nn	nn	nn	nn	nn	nn	nn

The survey takes up important insights from the sectoral analyses and developes postulates. The participants were asked to contribute with avaluating the postulates in a standardised way and to formulate their visions in an open manner.

3.3.2 Conduction and analysis of the Delphi study – 1st round

The first survey was sent out end of march 2018 to more then 100 experts that represent the above introduced governance setting. 56 responded this survey.

The interpretation of the first round results followed the postultes of the qualitative social science methodology, i.e. that those perspectives and assessments werde combined and grouped that share common characteristics. In practical terms, also the quantitiative picture of the respondends was taken into account. This is not to be misunderstood as a (descriptive) statistical analysis: The expert selection and the respondant rate of the expert groups does not allow *representative* results. A Delphi study as a qualitative method does not (primarily) aim at quantification and statistical representative data, but at revealing the *relevant* options for future developments, the respective argumentations and institutional implications. But still, in the phase of identifying relevant patterns, quantitative ratios were one argument (in parallel to others).

Fig. 4 shows an example from the interim analysis of the first survey, visualised in terms of a so-called Likert scale. The respondends were asked to express their degree of consent and they were given the opportunity to comment this in detail. These comments will be analysed after the closure of the first survey round. This overall picture allowed to formulate postultes which political priorities were typically combined by certrain fractions of experts.

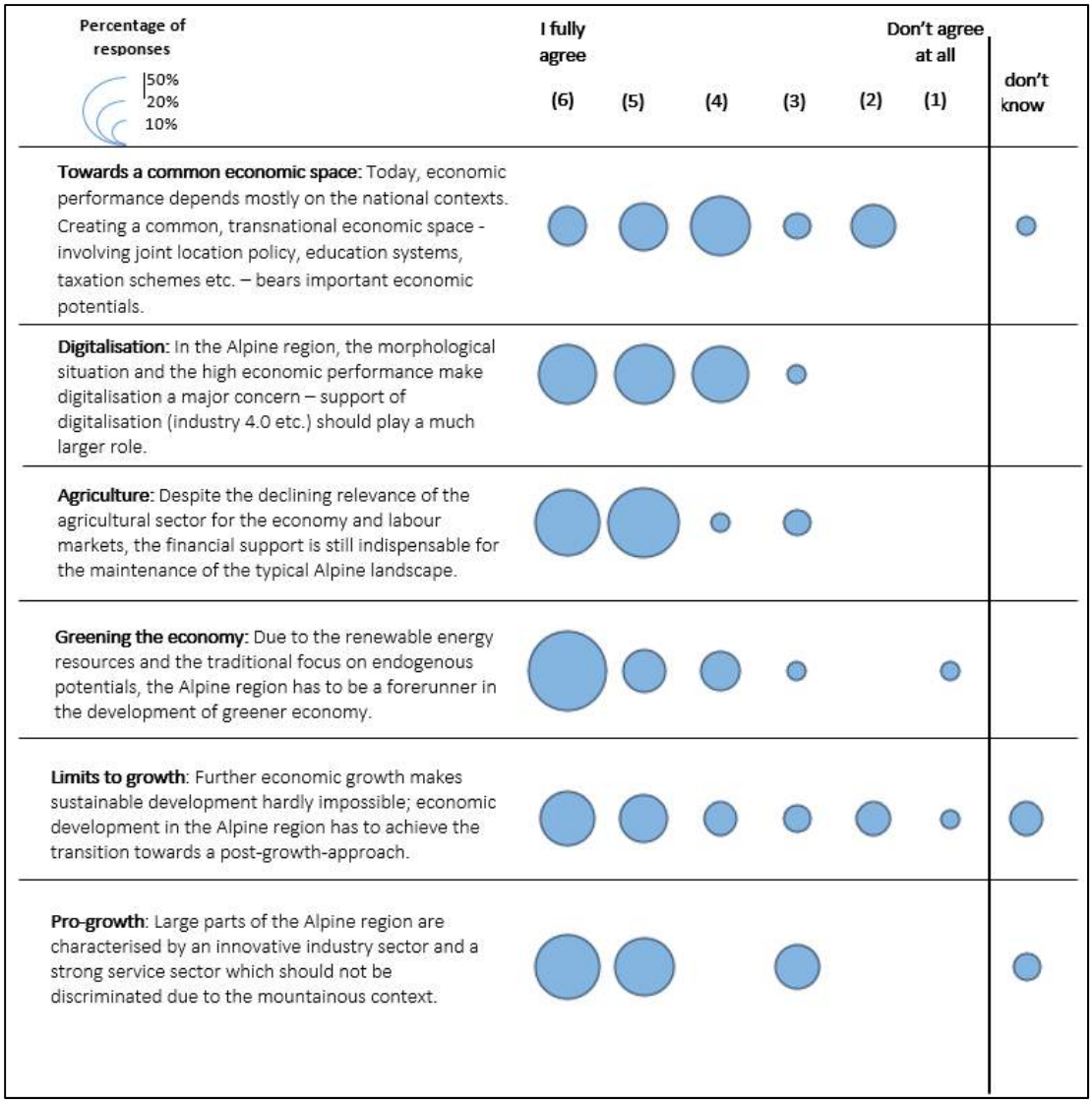
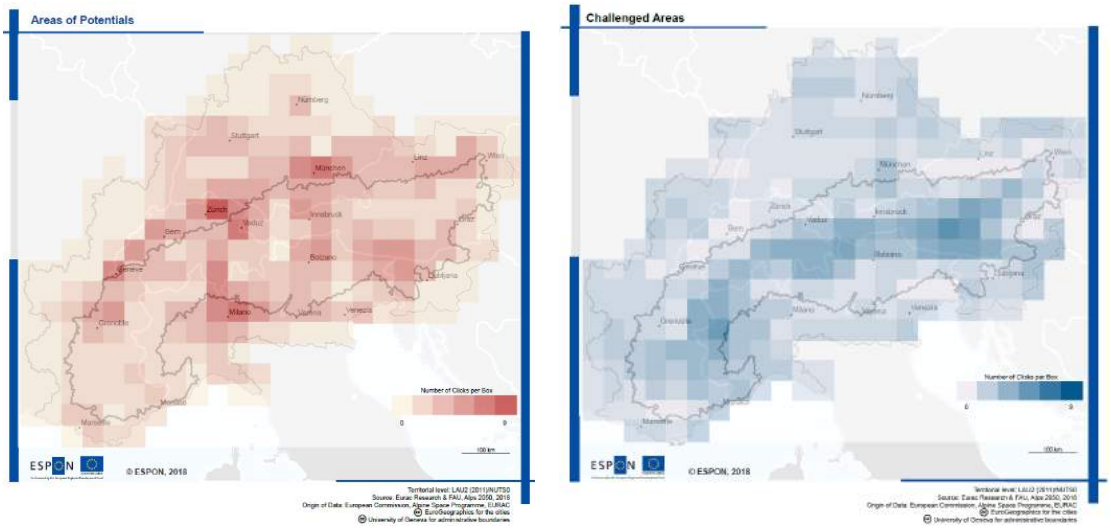


Fig. 4 Interim results Delphi study: postulates and responses on questions regarding the economic development

The same is true for Map 1: The interim analysis revealed spatial patterns in the cartographic representation that contributed to the development of postulates for spatially bound options.



Map 1 'heat map' of most mentioned areas of action (n=52 responses, 21 cartographic answers)

One of the main objectives was to formulate scenarios that covered the different expert opinions in very condensed but still meaninfull way. The Delphi 1 input was combined with territorial evidence from task one of the Alps 2050 project, workshop input, and information from literature and political documents (chapter 4 illustrates this more in detail).

3.3.3 2nd Delphi survey

Based on the above mentioned sources, the second Delphi round propsed three contrast scenarios that comprised all (groups of) arguments that were articulated in the first round. These scenarios are described in more detail in chapter 4 and they are entitled "Alpine protection", "functional linkages", and "European core".

27 experts responded to the second round, which is about more than half of the 1st round. This result is not optimal and can be explained to the rather short project life time that forced to conduct the 2nd survey in the summer months. But still, relevant results can be extracted – and again, quantification can only be an approximate tool for structuration.

Table 13 shows that the formulation of the scenarios worked well as the experts' assessments covered them in a rather balanced way. The scenario of European accessibility was more polarizing than the other two scenarios, but all of them are relevant.

More important than the quantitative result were the qualitative responses. They helped to sharpen the scenario priorities and to concretize the policy options. The overall reactions were very constructive, sometimes including some comments about the somehow simplistic and very short format of the scenario descriptions, but this is a typical part of the Delphi approach, and often this led to helfpull differentiations of the responding experts.

	Rank	Number of responses
Scenario 1: Alpine Protection	**1**	**9**
	2	15
	3	1
	No response	0
Scenario 2: Functional linkages	**1**	**10**
	2	8
	3	6
	No response	1
Scenario 3: European accessibility	**1**	**7**
	2	1
	3	16
	No response	1

Table 13 The respondents' choice for the different scenarios

The qualitative interpretation of the Delphi 2 respondents focused on detecting (further) connections between arguments and political priorities. These argumentations were the basis for the finalisation of the scenario formulation as presented in the main report and the summary report.

4 Scenario building

4.1 Introduction

When reflecting on the development of the Alpine region up to the year 2050, one tends to leave solid scientific ground. The further in the future the references of prognostics and scenarios are, the larger becomes the uncertainty (Hopkins & Zapata 2007). This is true for all kinds of future related research, but in particular for territorial development as the multiplicity of influences and causalities increases uncertainty and complexity (Fürst 2012). This is why it is of crucial importance to involve a very broad range of information sources. Given the vast focus of the project at hand, the ambition cannot be to be complete and comprehensive, but aim to include all kinds of relevant information (and not all information).

Against this background, the Alps 2050 scenarios were developed based on the following elements (cp. Fig. 5):

- The **territorial analyses,** including contemporary territorial evidence and ex-post analyses of long-term past developments.
- The **participatory elements** entail**,** in particular the Delphi study and the workshop conducted in May 2018.
- The **political documents**, which describe the political context.
- **Mega-trends** of socio-economic development that potentially influence the trends and dynamics within the Alpine context.

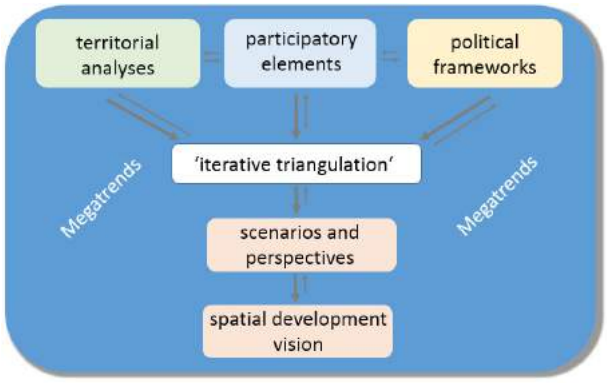


Fig. 5 Elements for the development of the scenarios, perspectives and the vision

Starting from the rich basis of information, opinions, ideas, and documents, scenarios have to condense the main characteristics and priorities in the process of iterative triangulation, i.e. by combining the arguments in a hermeneutic way (Fig. 5).

Bringing together all the different kinds evidence and the different arguments can not be presented in a complete way . However, in the following tables and sections, we present exemplary arguments from what has fed our analyses. This is certainly a simplistic sketch of the analytical paths, but it allows a presentation in a chronological way that replaces the different software based analytical steps.

4.2 Status quo scenarios

Scenario 1 – Status quo

The status quo scenario assumes that the hitherto dominant trends will be carried forward. Development paths are mainly based on national, domestic politics that lead to complex spatial patterns. The overall positive trend in economic development continues. However, this comes along with only limited success in achieving sustainable development and strategic spatial development. Dispersed spatial trends in demography and settlement development lead to dispersed developments, blurring the spatial structure of mountainous and non-mountainous regions and the urban-rural relations.

Fig. 6 Sketch of the Status quo scenario

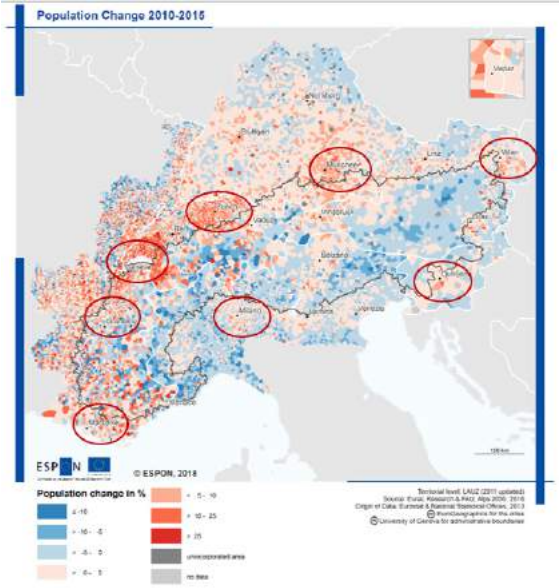
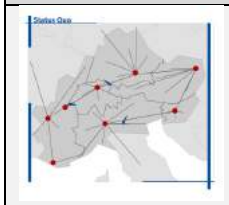
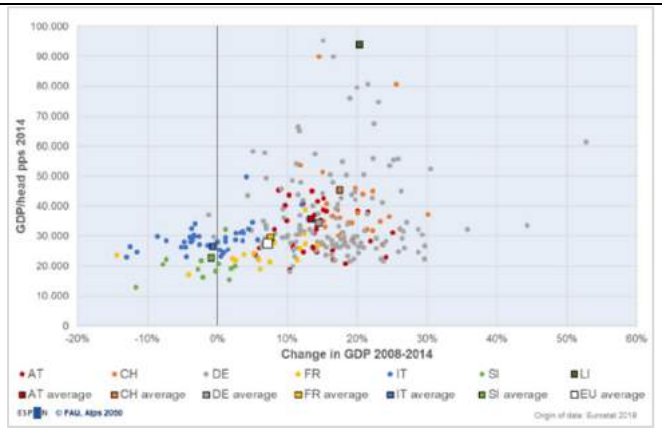
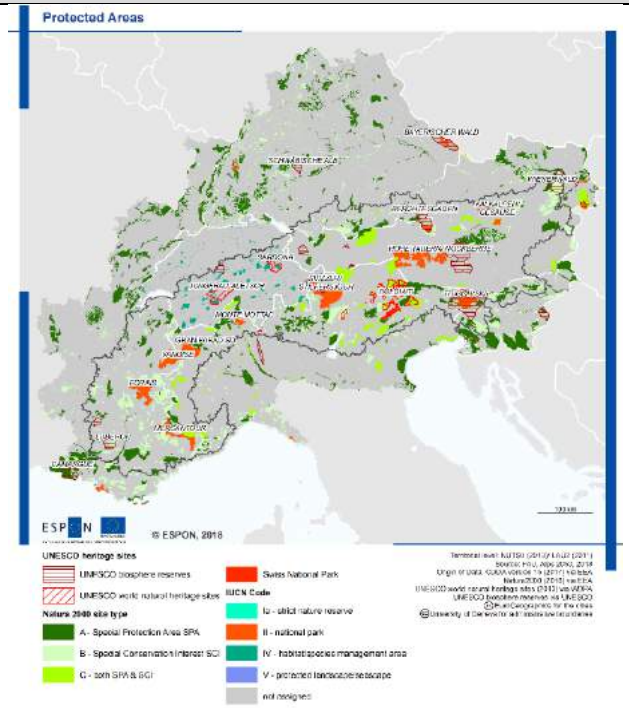
<table>
<tr><th>Status Quo scenarios</th><th>Basic elements – main messages</th><th>Exemplary territorial evidence</th><th>Examplary arguments from Delphi / workshop / literature</th></tr>
<tr><td>Sketch
  </td><td>• Predominantly domestic organisation (marked with borders), overall economic growth, limited sustainability
• Metropolitan ring around the Alps (large cities with population growth and capitals) as growth poles but overall dispersed spatial trend in demography and settlement development</td><td> 

Fig. 7 Population change 2010-15 on municipal level (for details see Alps 2050 Atlas, chapter “Demography”)</td><td>• Alpine Convention (2015): Demographic changes in the Alps.
• Workshop-Input: doubts of participants to make progress under current circumstances (“hard to involve relevant actors”, “trend of sectoralisation also in domestic policies”)
• …</td></tr>
<tr><td>perspective “People & Territories”</td><td>• Predominantly domestic organisation
• Metropolitan ring around the Alps (large cities with population growth and capitals) as growth poles but overall dispersed spatial trend in</td><td><table><tr><th>Spatial unit</th><th>Population Change 2001-2015</th></tr><tr><td>Alps2050 space</td><td>7,8%</td></tr><tr><td>AT</td><td>6,1%</td></tr><tr><td>CH</td><td>15,5%</td></tr><tr><td>DE*</td><td>3,5%</td></tr><tr><td>FR*</td><td>12,1%</td></tr></table></td><td>• Alpine Convention (2007): Transport and mobility in the Alps.</td></tr>
</table>

Status Quo scenarios	Basic elements – main messages	Exemplary territorial evidence	Examplary arguments from Delphi / workshop / literature
	demography and settlement development • Domestic linkages to metropolitan areas as settlement, transport system and services of general interest are organised in a predominantly national way	IT* 8,1% LI 12,2% SI 4,8% *parts that belong to the Alps2050 perimeter *Fig. 8 Population change 2001-15 depending on national affiliation* *Source: Alps 2050 Atlas, chapter "Demography".*	
perspective "Economy" 	• Economic strength of regions depending very much on national affiliation • Innovative and growing regions (around Grenoble, between Geneve and Zurich/Rhine-Valley, around Munich) situated in the North or West of the Alps	 *Fig. 9 Change in GDP – comparing districts of different national affiliation* *Source: Alps 2050 Atlas, chapter "Economy"*	• COM (2017a): Regional Innovation Scoreboard • COM (2017b): 7th Report on Economic, Social and Territorial Cohesion

Status Quo scenarios	Basic elements – main messages	Exemplary territorial evidence	Examplary arguments from Delphi / workshop / literature
perspective "Environment" 	• Series of area protection instruments with frictions along borders	 *Fig. 10 Protected areas* *Source: Alps 2050 Atlas, chapter "Ecological concerns"*	• Alpine Convention (2004): cross-border ecological network • Sutter et mult al. (2017): External costs in mountain areas

4.3 Protected Alps

Scenario 2 – Protected Alps

The second perspective underlines the necessity to protect the inner-Alpine mountainous areas. The Alpine mountains are a precious and vulnerable natural and cultural heritage. Touristic demand, transport needs, settlement growth and other human activities have put this region under high pressure. Protection regimes as initiated by the Alpine Convention are more than necessary and are further strengthened. The dynamic of the 'metropolitan ring' surrounding the Alps will be organised in a way that does not question sustainable development within the Alps (e.g. with regard to settlement sprawl, transport emissions).

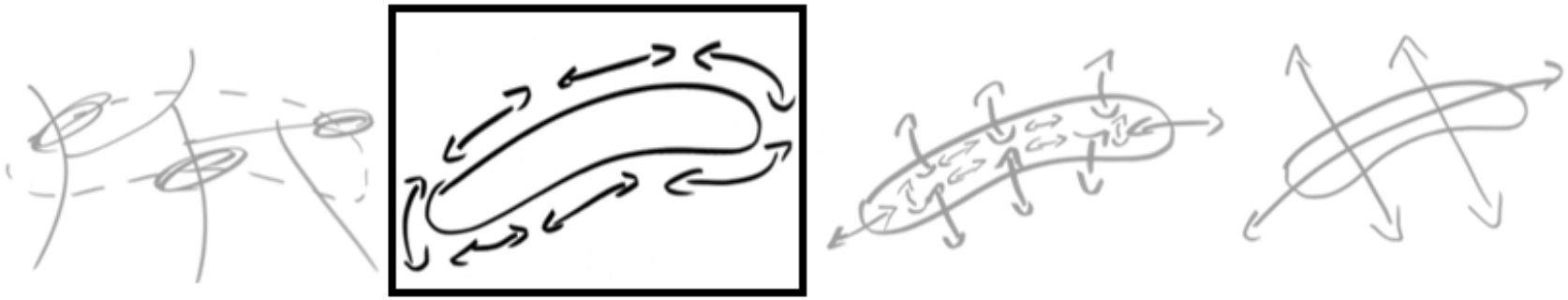
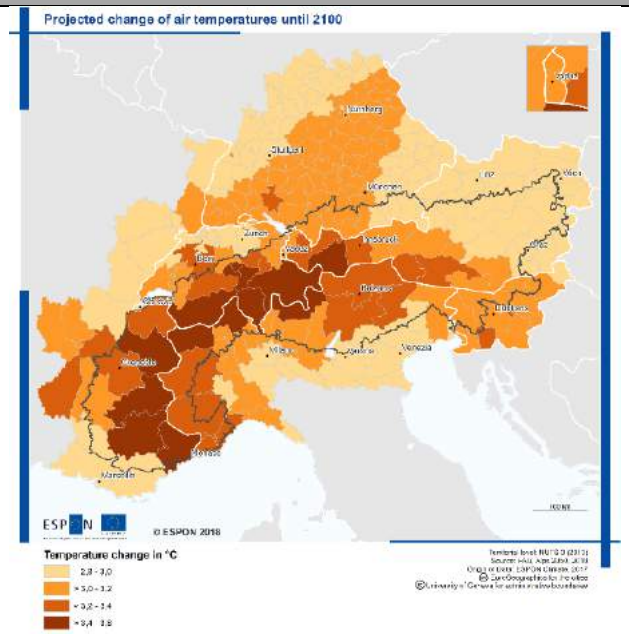
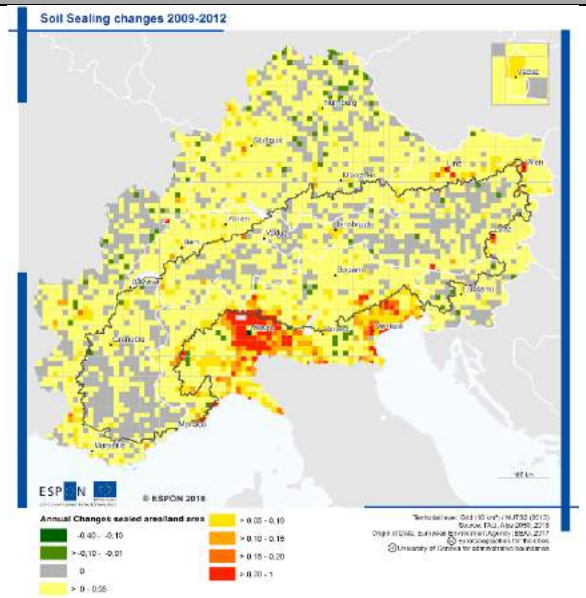
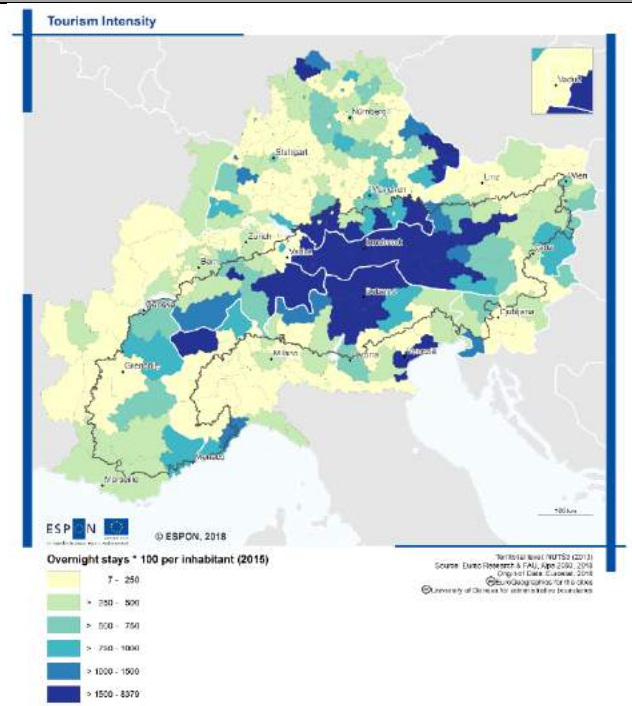
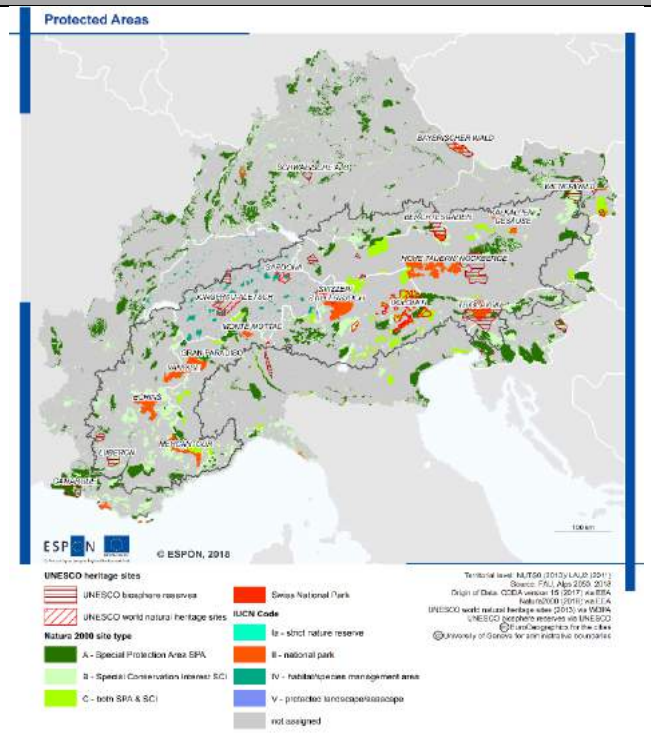


Fig. 11 Sketch of the Protected Alps scenario

Protected Alps scenarios	Basic elements – main messages	Exemplary territorial evidence	Examplary arguments from Delphi / workshop / literature
Sketch 	• Protection of the inner-Alpine mountainous areas • dynamic of the metropolitan ring is organised in a way that does not question sustainable development in the inner-Alpine area	 The map on projected change of air temperature shows the high vulnerability of inner Alpine areas that call for particular policies (cp. Atlas chapter on climate change)	• Bätzing W (2015): Die Alpen: Geschichte und Zukunft einer europäischen Kulturlandschaft. • Erlacher R (2014): Makroregionale Strategie Alpen und Alpenkonvention • Delphi Input: „A strong level of protection has to be provided by legislation. Nature protection will be neglected without political effort.“ • …

Protected Alps scenarios	Basic elements – main messages	Exemplary territorial evidence	Examplary arguments from Delphi / workshop / literature
perspective "People & Territories" 	• Metropolitan ring around the Alps (large cities with population growth and capitals) is organised in a way that does not question sustainable development in the inner-Alpine area • Transport system is transformed into a sustainable regime, traffic in the inner-Alpine area is reduced • growth dynamics regarding the settlement system are limited in the inner-Alpine area	 *Soilsealing as overall trend (Atlas chapter on soil sealing)*	• Delphi input "I do not support any further settlement spead in the (core) alpine area." • Workshop input: policy priority on noise reduction measures, ban of road expansion

Protected Alps scenarios	Basic elements – main messages	Exemplary territorial evidence	Examplary arguments from Delphi / workshop / literature
perspective "Economy" 	• inner-Alpine areas do not exceed their limits of growth • focus on regional value-chains, small-scale afarming, soft tourism etc.	 *The map shows the high touristic demand in inner Alpine regions – coming along with considerable challenges for sustainable development*	• Alpine Convention (2013): Sustainable Tourism in the Alps • Alpine Convention (2017): Greening the economy • Delphi Input: "The transition towards a green economy is one major opportunity for the Alpine region and should be highlighted here. A Green Alpine Economy is climate-neutral and resilient; resource efficient; preserving its natural capital and preventing the loss of biodiversity and ecosystem services; as well as improves quality of life and well-being of its citizens." • Workshop input: focus on regional value chains

Protected Alps scenarios	Basic elements – main messages	Exemplary territorial evidence	Examplary arguments from Delphi / workshop / literature
perspective “Environment” 	• Establishment of a differentiated protection regime on transnationale scale	 *The predominantly domestic organization of protected areas underpins the potentials of transnational approaches*	• Delphi input: “It is necessary to make clear […] the special functions of the alps - not only as natural and cultural heritage, but also a special space for to sustain biological variability and evolution (while overusing and overheating the earth)”

4.4 Functional Space

Scenario 3 – Functional space

The scenario that describes the Alpine region as one ‘functional space’ underlines the necessity to improve linkages between the different subregions. Towards the year 2050, the relationship between mountainous inner-Alpine and the more urbanised pre-Alpine parts will be strengthened, and in parallel the cross-border relations will be addressed more intensively. This has to be seen against the background that the territorial structure of the Alpine region is complex: The numerous borders between the Alpine countries have been frictions for a long time. Smart spatial development strategies overcome existing frictions with innovative political agreements and with adequate infrastructure investments. Removing barriers and enhancing functional links is of key importance (e.g. for labour markets, budget organisation, public services).

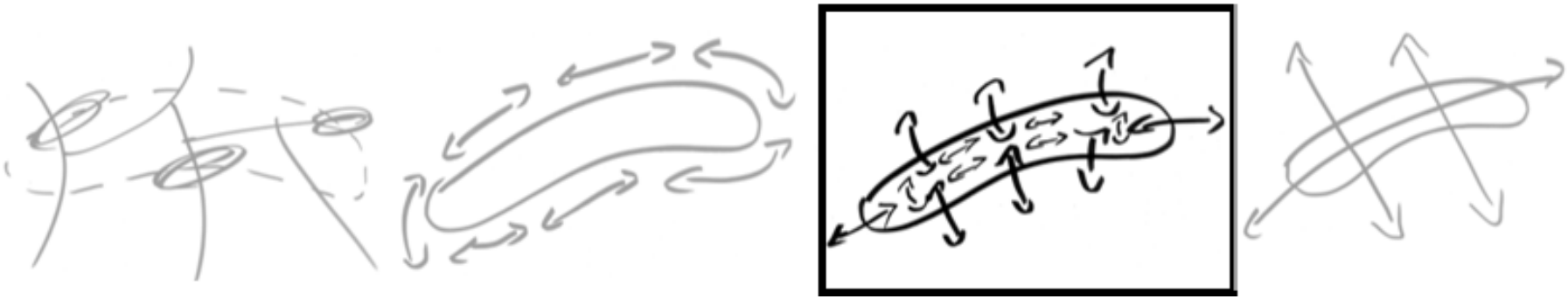
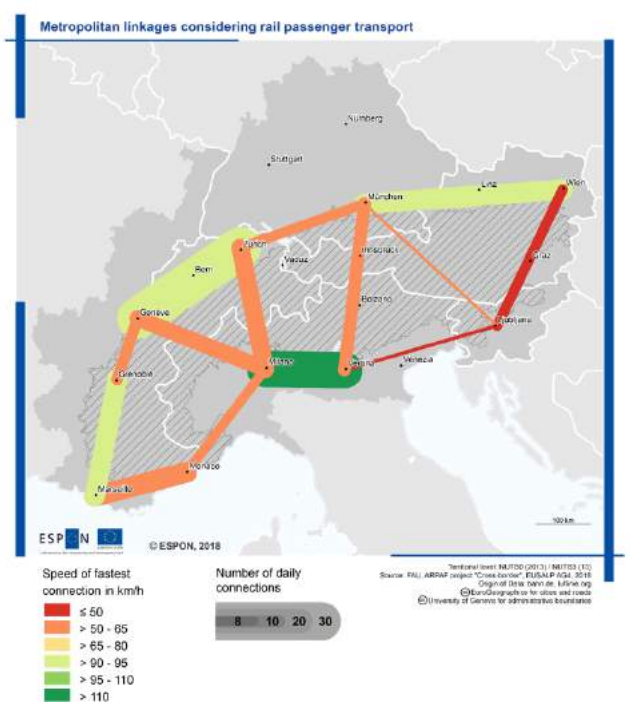
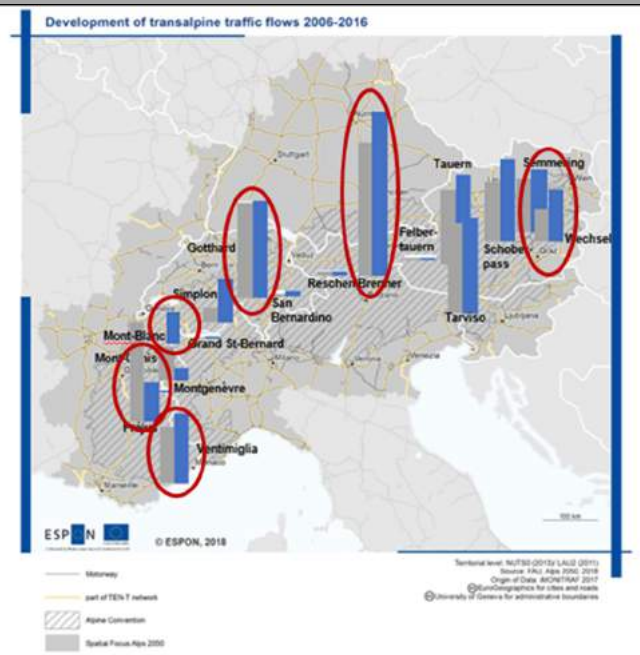
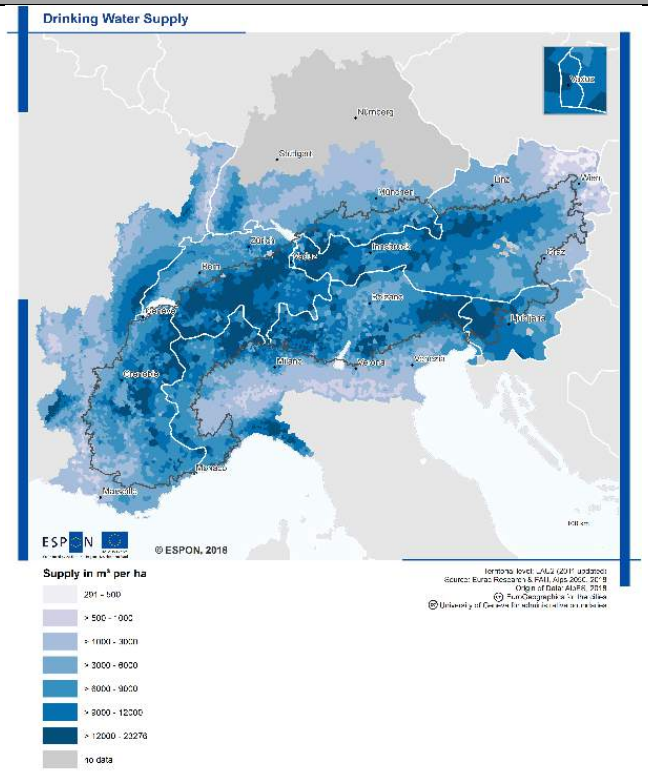


Fig. 12 Sketch of the Functional space szenario

Functional space scenarios	Basic elements – main messages	Exemplary territorial evidence	Examplary arguments from Delphi / workshop / literature
Sketch 	• Linkages between subregions are improved • Relationship between mountainous inner-Alpine part and more urbanised pre-Alpine parts are strengthened	 *The map shows rail connectivity on the transnational scale and the differences in quality – one example for potentials of better connections in the broader sense (cp. Atlas chapter on transport)*	• Bausch, T. et al. (2005): ALPINE SPACE Prospective Study. Sustainable territorial development in the Alpine Space. Towards long term Trensnational cooperation. • Delphi Input: “Territorial development is all about funcional linkages.” • …

Functional space scenarios	Basic elements – main messages	Exemplary territorial evidence	Examplary arguments from Delphi / workshop / literature
perspective "People & Territories" 	• Overcoming of frictions and borders • Stronger functional linkages within the settlement system, strengthening of the relationships between mountainous and non-mountainous parts • cities (with a population over 100.000) are connected, links within the mountainous parts are organised in a way that safeguards fairness and compensation between different territories • Biggest functional linkages along existing routes are used to optimise transit flows, other linkages help to overcome intra-regional bottlenecks	 *Fig. 13 Development of transalpine freight traffic flows 2000-2014* *Source: Alps 2050 Atlas, chapter "Transport"*	• Delphi Input: "Borders still cause frictions, there are still tensions between metropolitan areas and their surroundings. What I would also like to be stressed a bit is that we clearly see different sub-zones or different territorial types in the alpine area, they have similar challenges and problems and I see great potential that we support them in share expertise and knowledge and find common approaches" • Workshop input: potentials of soft instruments for spatial development on the transnational level

Functional space scenarios	Basic elements – main messages	Exemplary territorial evidence	Examplary arguments from Delphi / workshop / literature
perspective "Economy" 	• Development of a transnational economic space • Innovation as main driver: Building on existing regional innovation systems and innovation cultures and link them in a productive way (turquiose spaces), profiting from metropolitan functions that are already in place (red spaces)	 *Fig. 14 Urban and rural areas folowing the DEGURBA approach* *Source: Alps 2050 Atlas, chapter "Settlement system"*	• Delphi input: "There are, and will more frequently be in the future, linkages and exchanges with the surrounding areas, not only of economic nature, […] but also of demographic and cultural nature" • Delphi input: "This scenario might to a certain degree overcome the problem of (iner)periferies by supporting their functional integration, […] - in particular crossborder functions […] might improve the provision of services. Scenario seems to build on regional potentials […] that is a right way to procide but a bearing capacity needs to be determined as functional linkages encourage flows." • Workshop input: importance of Alpine wide "brain circulation"

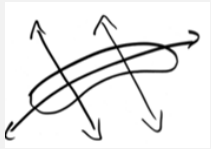
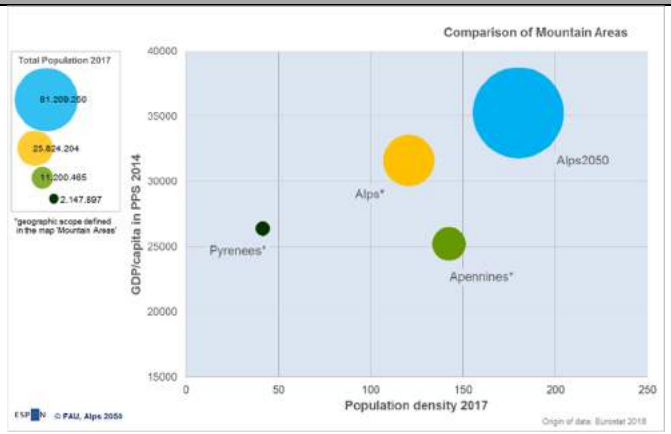
Functional space scenarios	Basic elements – main messages	Exemplary territorial evidence	Examplary arguments from Delphi / workshop / literature
perspective “Environment” 	• Consolidating existing protection instruments • Natural uniqueness offers unique ecosystem services with the Alps	 *Fig. 15 Supply of water as eco-system service* *Source: Alps 2050 Atlas, chapter “Ecological concerns”*	• Delphi input “the Alpine wide protection regiomes should be aligned for the area which are important at Alpine level (ecological connctivity, river regimes, flood management along crossborder rivers,..) but not for example for landscape or regional parks, which include also regionally specific cultural heritage or landscape heritage which base on specific agricultural practices.”

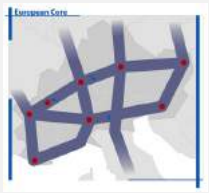
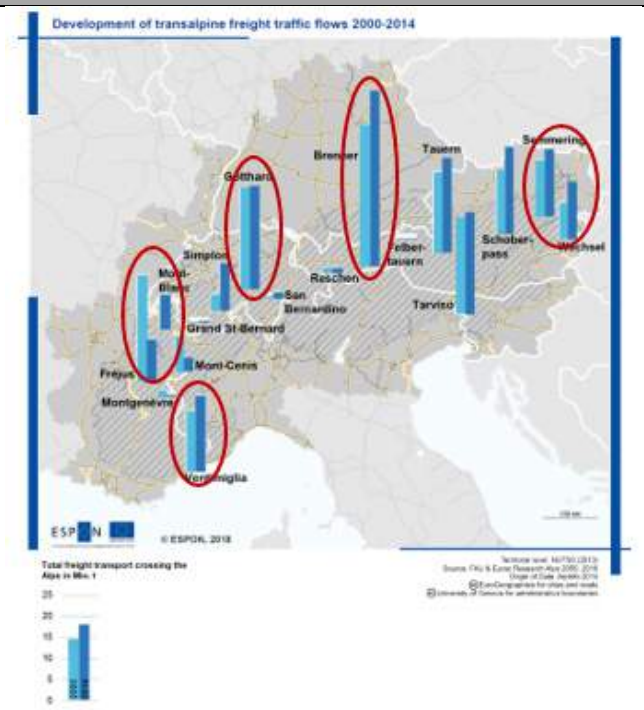
4.5 European Core

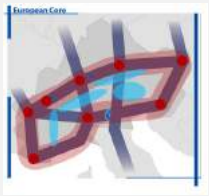
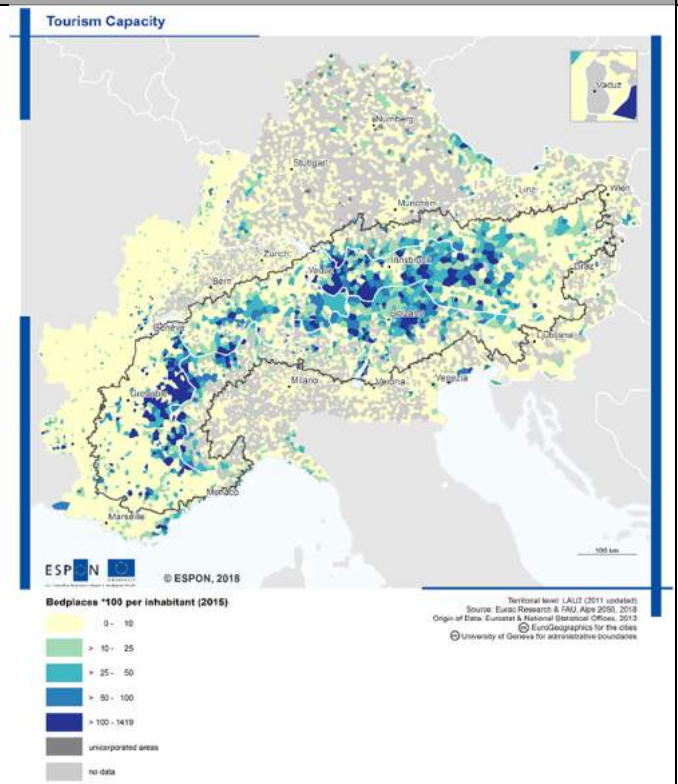
Scenario 4 – European core

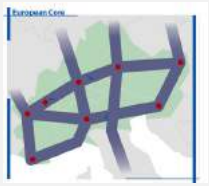
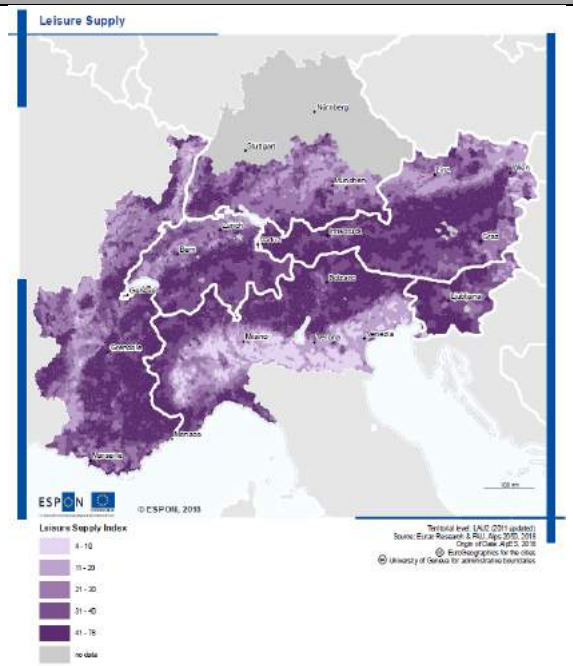
The Alpine region is one of the most successful economic spaces in Europe and one of the most attractive touristic destinations worldwide. Moreover, the position in the centre of Europe causes the need for transit flows to ensure European economic prospering. It is of major importance to build on this strong basis. The metropolitan 'hubs' and the major corridors are the basis of successful spatial development. Attracting skilled labour force and entrepreneurial investments is as important as to ensuring good transport and economic flows on the Alpine and European level (e.g. with regard to transport and ICT infrastructure).

Fig. 16 European core

European Core scenrios	Basic elements – main messages	Exemplary territorial evidence	Examplary arguments from Delphi / workshop / literature
Sketch 	• Alpine region as one of the most successful spaces in Europe • position in the centre of Europe causes need for transit flows to ensure European economic prospering	 *Comparing the overall socio-economic performance of the Alpine region with other mountain areas and also with the EU average shows a rather strong picture*	• Delphi input "personal opinion: on the (very) long run, east-west corridors will become much more important than north-south (see, e.g., the new silk road or the enormous economic growth potential of eastern european contries)..." • Workshop input: graphic proposals for improving large scale accessibility

European Core scenrios	Basic elements – main messages	Exemplary territorial evidence	Examplary arguments from Delphi / workshop / literature
perspective "People & Territories" 	• The Settlement system is part of European urban network: Connections between metropolitan ring (cities with population growth, important functions e.g. capital as cities with hub quality) and to other European metropolises • Large corridors are developed as important axes with reduced transaction costs	 Development of transalpine freight traffic flows 2000-2014 (2050 Atlas, chapter "Transport")	• Delphi input: "corridors are important for the alpine development. The different flows should however be limited: quality more than quantity!" • Delphi input: "The key points are: sustainable mobility through intermodality, innovative (e.g. electric) solutions, good connectivity with the maritime transport routes; completing the main corridors and linking them to second tier transport infrastructures."

European Core scenrios	Basic elements – main messages	Exemplary territorial evidence	Examplary arguments from Delphi / workshop / literature
perspective "Economy" 	• Metropolitan ring positioned as a hub of global economy, rural spaces profit from spill over effects (red spaces) • Agricultural sector steered where there is an important role for tourism , touristic sector includes new clients due to climate change and geopolitica conflicts in other destinations (blue spaces)	 *Tourism capacity – bedplaces per 100 inhabitants (Alps 2050 Atlas, chapter "Economy")*	• Delphi input: "a integrated, multilevel transport system is a priority for the alpine region. its objectives are: facilitating communication and integration in the alpine area and with the external european and non european territories and markets; ensure good accessibility and connectivity for peripheral areas, as instrument for economic and social inclusion; ensure good accessibility and services for tourists."

European Core scenrios	Basic elements – main messages	Exemplary territorial evidence	Examplary arguments from Delphi / workshop / literature
perspective "Environment" 	• The Alpine Region has an important environmental function for Europe • The unique and attractive landscape and natural capital has to be safeguarded and developed for touristic and leisure use drinking water resources, energy supply and energy storage are major functions that the Alps have to fulfil	 *Fig. 17 Leisure supply as eco-system services* *Source: Alps 2050 Atlas, chapter "Ecological concerns"*	• Delphi input: "it is certainly fair to give adequate value to ecosystem services […] But we also need to improve the services that the metropolitan areas can give to the rural and mountain areas, in [terms of] visibility, innovation transfer, economic potential, accessibility." • Delphi input: "To see the alps as a fishbowl of protection activities is attractive but not realistic."

5 Proposal for further research

The Alpine region is not only characterized by a high density of territorial cooperation and development platforms but also by a high number of research activities. This comprises

- A high number of university institutes, public research institutions and consultancies with a strong focus on Alpine development; some of them are part of the Alps 2050 research consortium.
- Some scientific journals are more or less exclusively dedicated to Alpine topics (e.g. eco-Mont / Journal on Protected Mountain Areas Research and Management, Revue de géographie alpine etc.). This has led to a dynamic and multi-faceted publication activity (cp. Körner 2009).
- The research network ISCAR with strong links to NGOs, in particular the CIPRA, that develops and implements a strong research agenda (for details see Scheurer & Sgard 2008)
- The Alpine Convention Permanent Secretariat host a series of information sources, including a WebGIS and the SOJA and DIAMONT databases. Many of these data are part of the respective publications (in particular the reports on the state of the Alps)

	local	regional	national	Alpine space/EU
Policies at local/regional level				
LEADER programmes	x	**x**		
Interreg	x	**x**		
Biosphere Reserves	x	**x**		
Local Agenda 21	**x**	(x)		
Climate Alliance	**x**	(x)		
Learning Regions		**x**		
Thematic regional initiatives		**x**		
National "mountain" policies (e.g. NRP - New Swiss Regional Policy)		x	**x**	
Alpine area				
Alpine Convention	x	(x)	(x)	**x**
Alpine Space Programme (ASP)		x	(x)	**x**
CIPRA and NGO networks	x	x	x	**x**
Regional cooperation (ARGEALP etc.)		**x**		(x)
Macro-regional Strategy (EUSALP)		x	x	**x**

Fig. 18 Policy initiatives in the Alpine regions. Source: Dax 2014

Beyond these institutional activities, there is a high number of programme and project based activities throughout the multi-level system that provides important input with specific reports

and databases. Fig. 18 provides an overview of policy related activities that deliver continuously important knowledge support. One should add the European programmes, for example:

- The project “Re-Search Alps” form the Connecting Europe Facilities context
- The Horizon 2020 project on “social innovation in marginalized rural areas”
- The Alpine Space project ASP AlpInnoCT on Alpine innovation on combined transport

All the mentioned activities have provided a rich basis of knowledge and information that allow, in general, evidence based policies and relevant political debates. However, and somehow surprisingly, the *data* base is for from being adequate:

- There is in particular a lack of flow data on the transnational scale. If the potentials of *common challenges* are at the heart of macro-regional implementation procedures, the knowledge base has to be improved. There are good examples on the field of the traffic policy with regard to the transit theme (Zürich process, iMonitraf etc.), but few information beyond. This is true for economic and trade interlinkages, for labour market mobility, for eco-system services etc.
- There are few standardized data on the municipal level. The problem lies, firstly, in a high complexity of municipal geodata, due to numerous and ongoing territorial reforms on this level that lead to misfits (data management, coding etc.). The problem continues with regard to data definitions (e.g. employees) and data protection (e.g. bedplaces for touristic purpose) and does not end with availability questions (e.g. cross-border commuters). – If tailor made territorial strategies are the aim, these questions should soon be addressed.

A transnational spatial monitoring tool certainly misses, even if there are promising initiatives that might pave the way: *Alpine Convention WebGIS tool* (limited to AC perimeter) and *ESPON European and Macro-regional Territorial Monitoring Tool* (under construction for all MRS). In the long run, it will be important to have a meaningful platform on the transnational level that provides continuously relevant spatial data on the transnational level with an adequate accuracy.

The topics addressed concern in particular the political will to improve the data quality. In the meantime, thematically and regionally bound studies should bridge the gaps – in particular with regard to the interrelatedness. One must join the assessment in the mountain research initiative (Drexler et al. 2016: 9 f.):

> *“The reality is that mountain regions heavily influence, and are heavily influenced by, lowland areas – both nearby and distant – and are part of global economic systems. However, the cause-effect relationships of these interdependencies are not well known”*

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7 Additional material

7.1 Delphi survey form – first round

DELPHI Study Alps 2050

ESPON

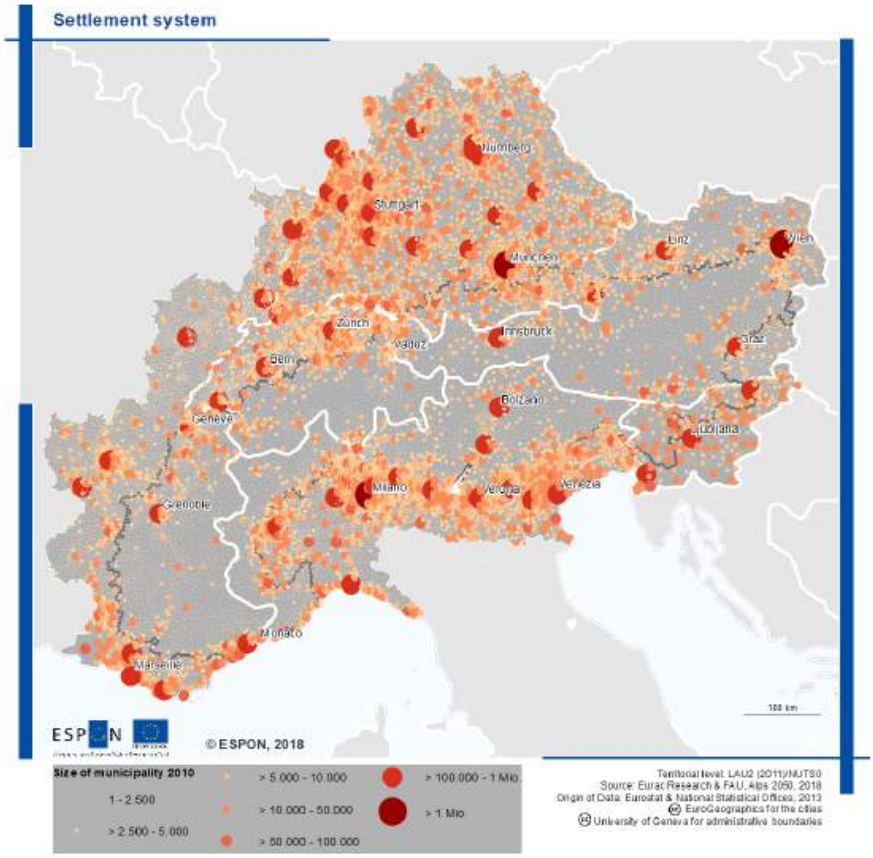
EUROPEAN UNION

Co-financed by the European Regional Development Fund

Thank you for participating in this Delphi study. Your expertise will help the Alps 2050 project to develop spatial perspectives and a vision for the larger Alpine area towards the year 2050.

When filling in this form, you can answer the open questions either in English (preferred option) or in your native language (German, French, Italian, Slovenian).

STEP 1/11

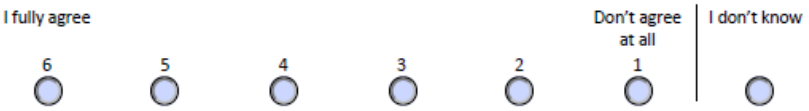


The polycentric **settlement system** of the Alps 2050 region shows complex patterns (of which the map shows just some aspects):

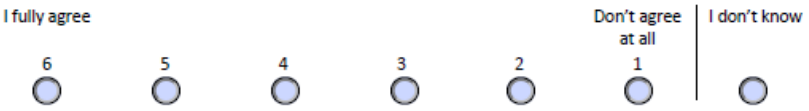
- The overall structure is characterised by a rather **rural** settlement structure in the Inner Alpine perimeter and by a much more **urbanised** structure in the surrounding area.
- Compared with other mountain regions, the Alpine region is **densely populated**, even in the inner Alpine areas, many valleys and lower parts are intensively used for settlement purposes.
- **Metropolitisation**: In socio-economic terms, urban and metropolitan regions tend to develop more positively than many rural or peripheral regions.
- **Urban sprawl** is an important trend of the recent years, in particular around the larger cities and along the valleys.

Please give your opinion on the following postulates.

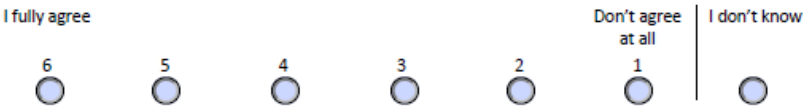
The inner alpine area should be **protected** from further urbanisation; instead, settlement growth should be limited to the pre-Alpine settlements.



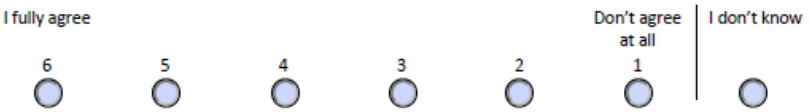
The settlement system of the Alps 2050 area lacks a large scale perspective: **Functional linkages** along transport corridors, the organisation of large scale labour markets, synergies in border regions etc. are key tasks for the future development.



Polycentric development: Small and medium sized settlements must be fostered in order to balance current metropolisation trends.

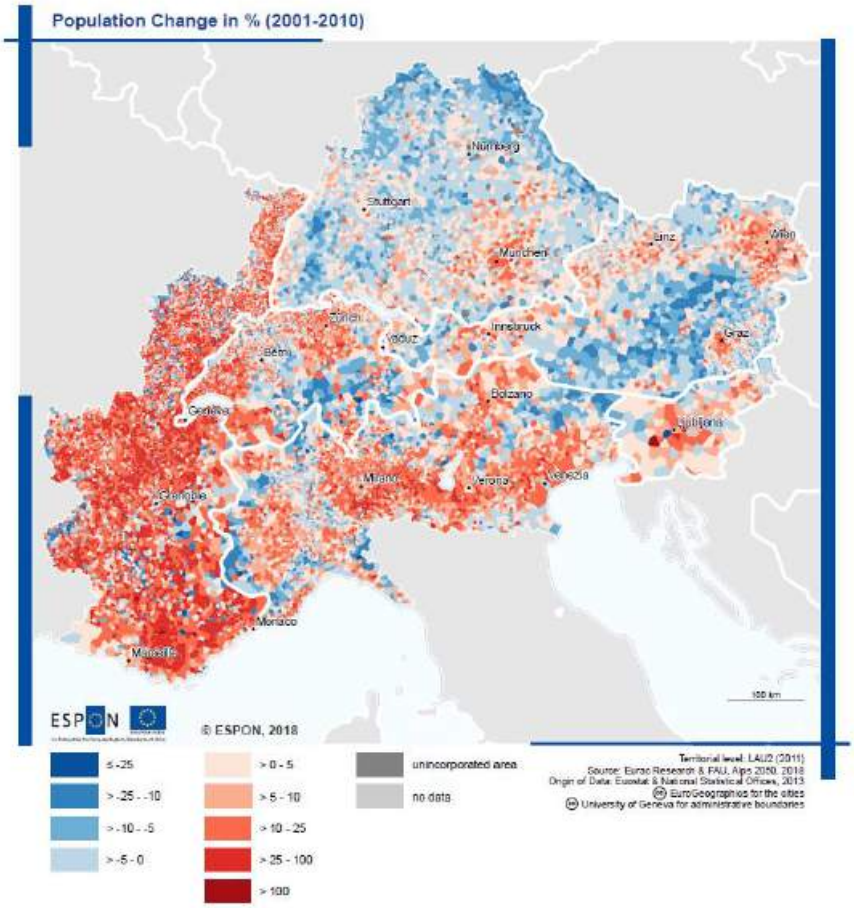


Metropolisation: In order to achieve a competitive settlement system in a globalised world, the large cities and metropolitan places have to be privileged.



From a **future perspective** towards 2050 for the Alps 2050 region: How should the development patterns of the settlement system look like? Please describe your personal 'vision'.

STEP 2/11



The **demographic development** in the Alps 2050 region shows diverse developments (of which the map shows just some aspects):

- **South-West vs. North-East**: We see growing municipalities in most parts of France, Italy, and Switzerland, and much more diverse patterns in the German and Austrian parts.
- **Rural areas**: many rural areas are hit by demographic decline; others are strongly growing – diversity is characterising the rural space.
- **Migration**: Migration means very different things, comprising labour force migration from neighbouring countries, asylum seeking, second homes in touristic places etc. – each coming with particular chances and challenges.

Please give your opinion on the following postulates.

More than safeguarding traditional identities, it is of crucial importance for rural spaces to be **attractive** living places for skilled labour and young people from other regions and countries.

I fully agree					Don't agree at all	I don't know
6	5	4	3	2	1	
○	○	○	○	○	○	○

Amenity migration, i.e. the in-migration of rather wealthy inhabitants looking for nice landscape and attractive leisure infrastructure - is an important demographic potential for rural Alpine regions.

I fully agree					Don't agree at all	I don't know
6	5	4	3	2	1	
○	○	○	○	○	○	○

Spatial development policies must play an important role for the **integration** of international immigrants, e.g. by influencing real estate and labour markets.

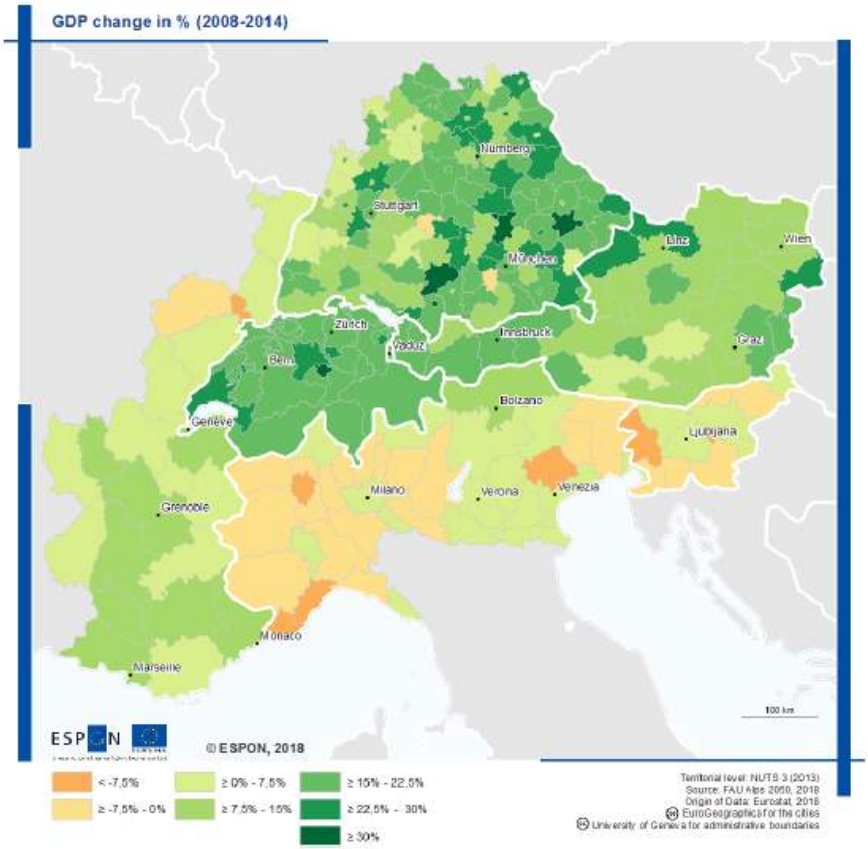
I fully agree					Don't agree at all	I don't know
6	5	4	3	2	1	
○	○	○	○	○	○	○

Outmigration from rural spaces has to be accepted as a consequence of structural change in the agricultural sector.

I fully agree					Don't agree at all	I don't know
6	5	4	3	2	1	
○	○	○	○	○	○	○

From a **future perspective** towards 2050 for the Alps 2050 region: How should demographic development patterns look like? Please describe your personal 'vision'.

STEP 3/11



The economic development in the Alps 2050 region is characterised by the following patterns (of which the map shows just some aspects):

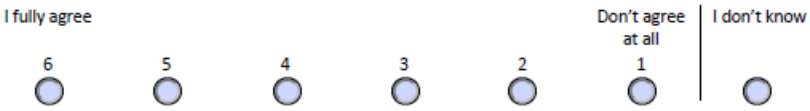
- Economic strength: Compared to the European average, the Alpine area is a strong one. The Swiss, Austrian and German parts have recently performed rather strongly, whereas parts of Slovenia, France and Italy have recently performed less positively.
- Structural change: we see a declining economic relevance of the agricultural sector in most parts of the Alps 2050 perimeter, a rather stable industrial sector and a growing service sector.

Please give your opinion on the following postulates.

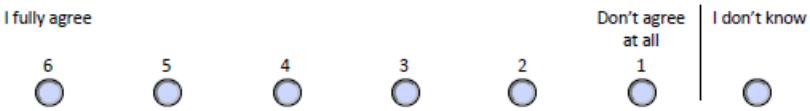
Towards a common economic space: Today, economic performance depends mostly on the national contexts. Creating a common, transnational economic space - involving joint location policy, education systems, taxation schemes etc. – bears important economic potentials.

I fully agree — 6 — 5 — 4 — 3 — 2 — Don't agree at all — 1 | I don't know

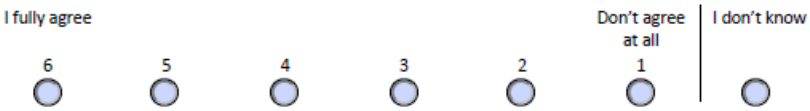
Digitalisation: In the Alpine region, the morphological situation and the high economic performance make digitalisation a major concern – support of digitalisation (industry 4.0 etc) should play a much larger role.



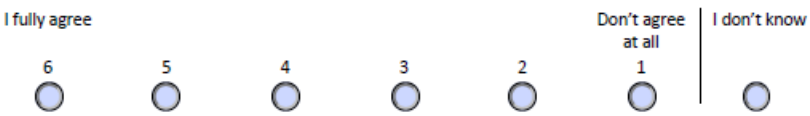
Agriculture: Despite the declining relevance of the agricultural sector for the economy and labour markets, the financial support is still indispensable for the maintenance of the typical Alpine landscape.



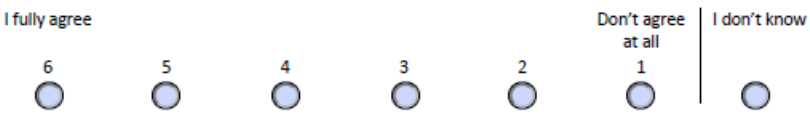
Greening the economy: Due to the renewable energy resources and the traditional focus on endogenous potentials, the Alpine region has to be a forerunner in the development of greener economy.



Limits to growth: Further economic growth makes sustainable development hardly impossible; economic development in the Alpine region has to achieve the transition towards a post-growth-approach.

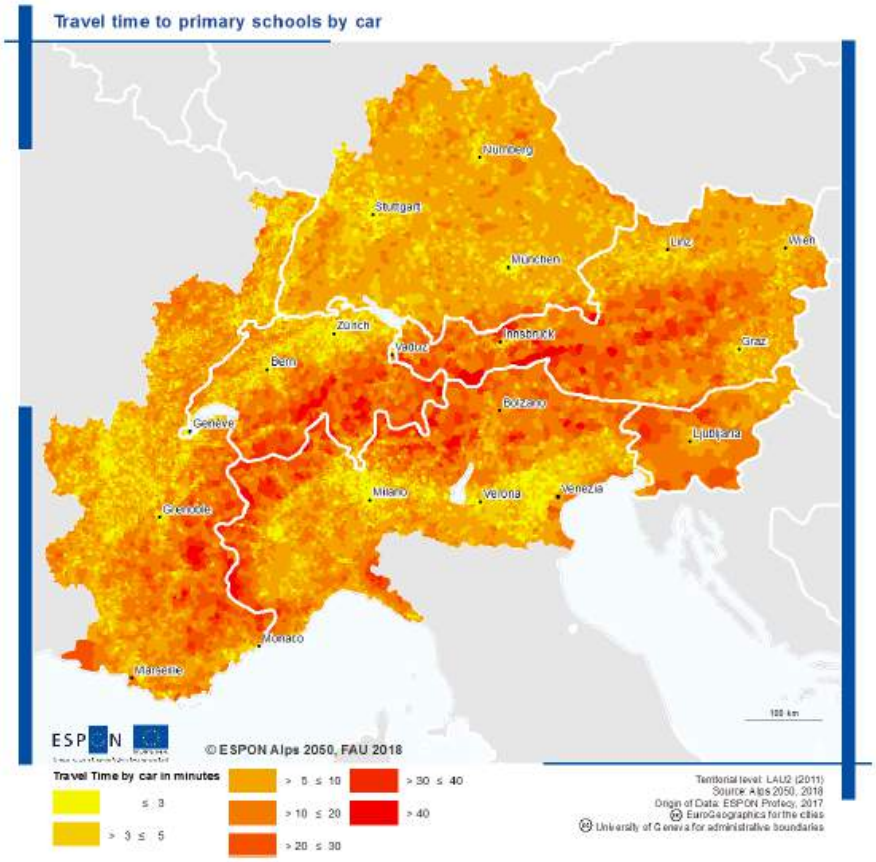


Pro-growth: Large parts of the Alpine region are characterised by an innovative industry sector and a strong service sector which should not be discriminated due to the mountainous context.



From a **future perspective** towards 2050 for the Alps 2050 region: How should economic development patterns look like? Please describe your personal 'vision'.

STEP 4/11



The accessibility of public services in the Alps 2050 region is illustrated in the map by the example of access to primary schools. Obviously, it is a challenge to provide a good level of access to public services (like schools, medical facilities or retail structures) in all regions. Population density and the morphological context are the main explanatory factors.

Please give your opinion on the following postulates.

Cohesion policy has to accept that providing public services is much more expensive in rural and mountainous regions and, thus, provide higher budgets then in other regions.

I fully agree					Don't agree at all	I don't know
6	5	4	3	2	1	
○	○	○	○	○	○	○

Technological alternatives like tele-medicine, tele-learning, and online shopping put into question if public services in rural areas must be maintained on the same level as today.

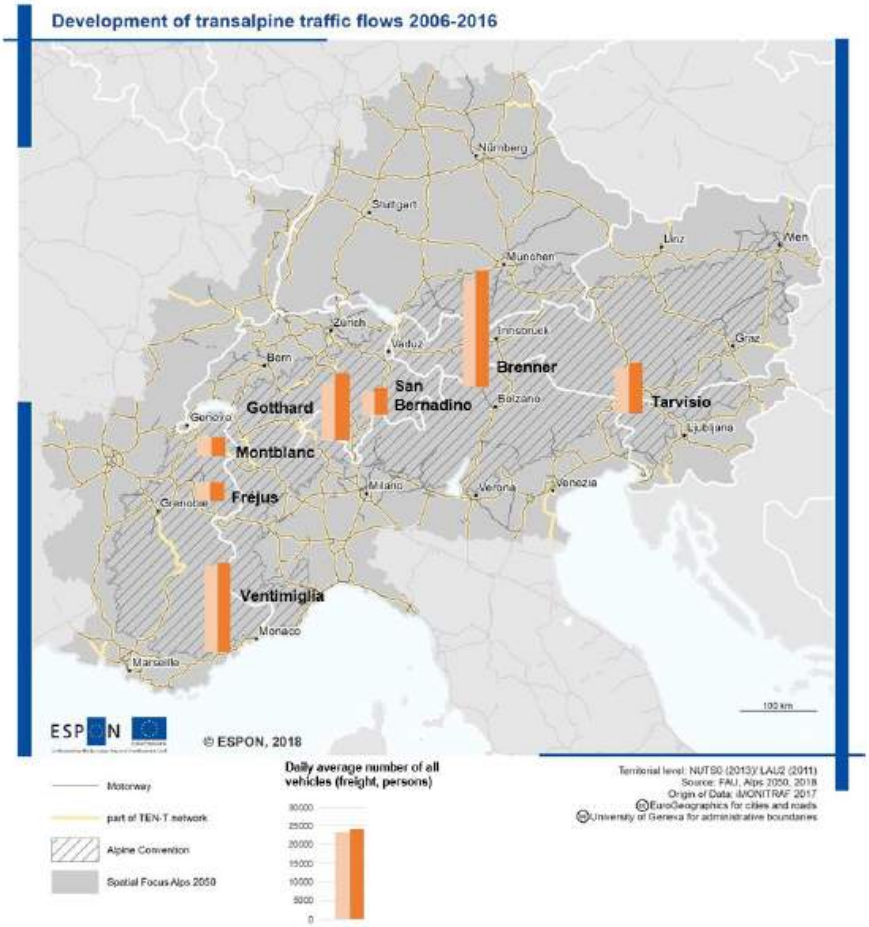
I fully agree					Don't agree at all	I don't know
6	5	4	3	2	1	
○	○	○	○	○	○	○

Improving the accessibility of public services (health, education, etc.) can be achieved by investing in mobility infrastructure or by investing public services infrastructure: It is more efficient to invest in mobility infrastructure.

I fully agree					Don't agree at all	I don't know
6	5	4	3	2	1	
○	○	○	○	○	○	○

From a **future perspective** towards 2050 for the Alps 2050 region: What should public services provision look like? Please describe your personal 'vision'.

STEP 5/11



The transport development in the Alps 2050 region shows the following patterns (of which the map shows just some aspects):

- Growing numbers: Freight and passenger transportation, public and individual mobility are growing in almost all parts of the Alps, raising multiple questions of environmental concerns and infrastructure organisation.
- Uneven spatial organisation: The spatial patterns of transport, and in particular of trans-Alpine traffic, is unevenly distributed, raising questions of transnational transport management.

Please give your opinion on the following postulates.

Economic relevance: From the European perspective, the Alps are a barrier for transport flows. Improving transalpine infrastructure is of high economic importance.

I fully agree					Don't agree at all	I don't know
6	5	4	3	2	1	
○	○	○	○	○	○	○

Alpine wide transport policy: There should be stronger efforts for a coherent transport policy through an Alpine wide organisation of toll policy and heavy goods transport.

I fully agree					Don't agree at all	I don't know
6	5	4	3	2	1	
○	○	○	○	○	○	○

Modal split: sustainable modes of mobility (public passenger transport, freight transport via rail) have to be developed in a far more effective way, applying increasing restrictions on less sustainable transport modes.

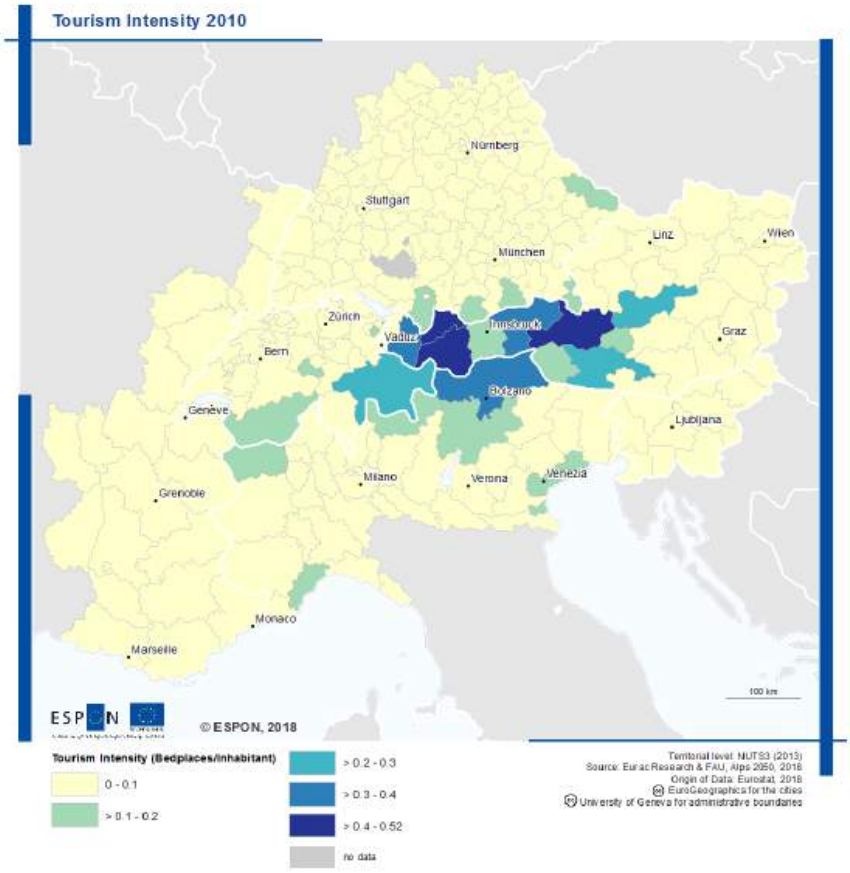
I fully agree					Don't agree at all	I don't know
6	5	4	3	2	1	
○	○	○	○	○	○	○

Rural mobility: Due to financial restrictions and ecological concerns, investments in high-ranking transport infrastructure should be reduced in rural spaces.

I fully agree					Don't agree at all	I don't know
6	5	4	3	2	1	
○	○	○	○	○	○	○

From a **future perspective** towards 2050 for the Alps 2050 region: What should transport patterns and management systems look like? Please describe your personal 'vision'.

STEP 6/11



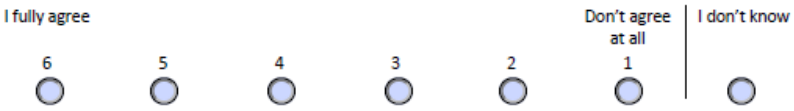
The Alpine region comprises some of the most popular touristic 'hot spots' world-wide. The highest importance can be found in the Inner Alpine area, both for summer and winter tourism.

Please give your opinion on the following postulates.

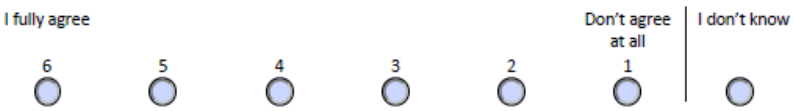
Capacity overload is an important challenge, therefore a much more restrictive management of touristic flows is necessary, favouring soft forms of tourism.

I fully agree					Don't agree at all	I don't know
6	5	4	3	2	1	
○	○	○	○	○	○	○

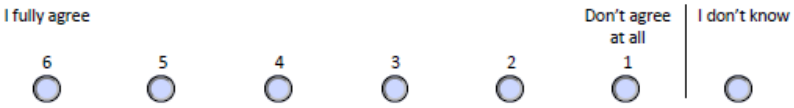
Climate change and ecological concerns forbid further any support of downhill **skiing** infrastructure.



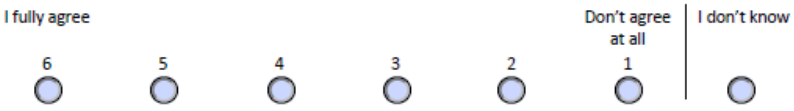
The relevance of the touristic sector is of high potential for rural, mountainous areas and needs particular **support**, including further infrastructure expansion.



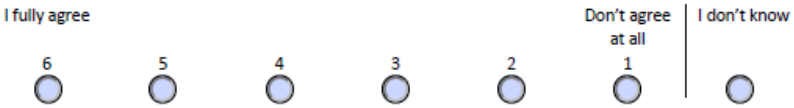
In recent years, some parts of the Alps have become important destinations of **global tourism** (in particular from Asia, Arabian countries): exploiting these potentials is a key future potential.



Climate change is an opportunity for the Alpine tourism due to the moderate summer temperatures.

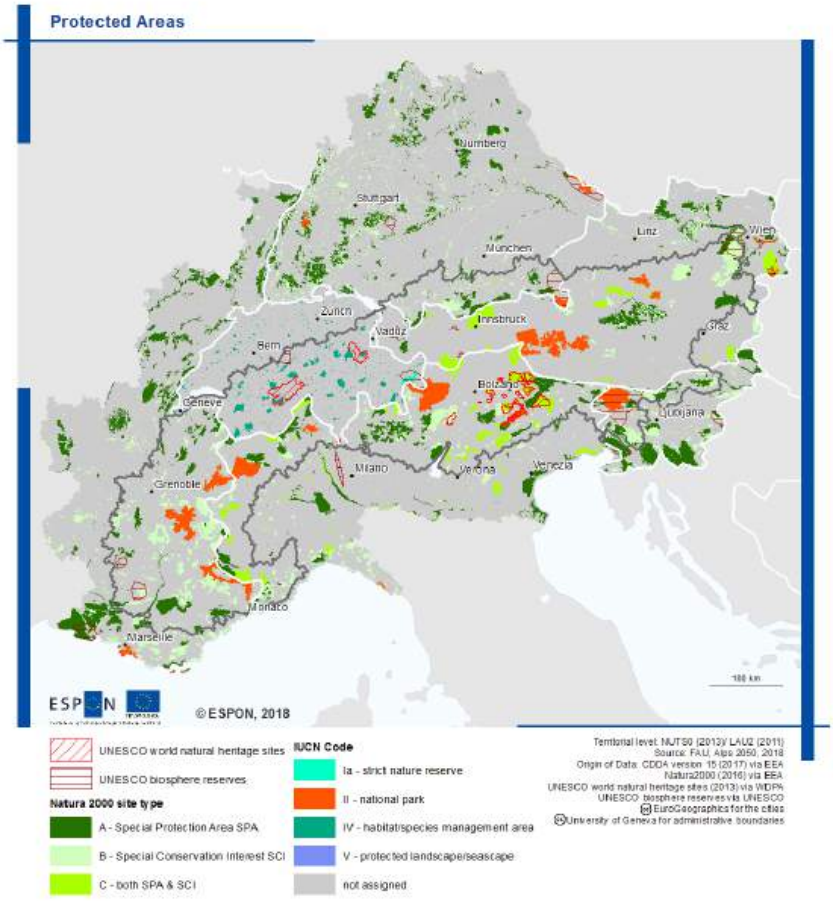


It is important to strictly limit the share of **second homes** in order to avoid negative effects on real estate markets and the vitality of settlements.



From a **future perspective** towards 2050 for the Alps 2050 region: What should tourism development look like? Please describe your personal 'vision'.

STEP 7/11



The Alpine region is of high ecological value and vulnerability which is challenged by the high level of socio-economic development. As an example, the map shows the tool of protected areas that aim to safeguard ecological functions.

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Please give your opinion on the following postulates.

The '**ecological connectivity**', i.e. the linkages between important natural areas, are challenged by fragmentation. Linking corridors should be treated with much higher priority.

I fully agree					Don't agree at all	I don't know
6	5	4	3	2	1	
○	○	○	○	○	○	○

Protected areas: Protection regimes remain a predominantly national or regional issue, which should be complemented by a much stronger cross-border and transnational perspective.

I fully agree					Don't agree at all	I don't know
6	5	4	3	2	1	
○	○	○	○	○	○	○

The important ecological function of the Alpine region should be much better **compensated financially**, reducing the need for economic development.

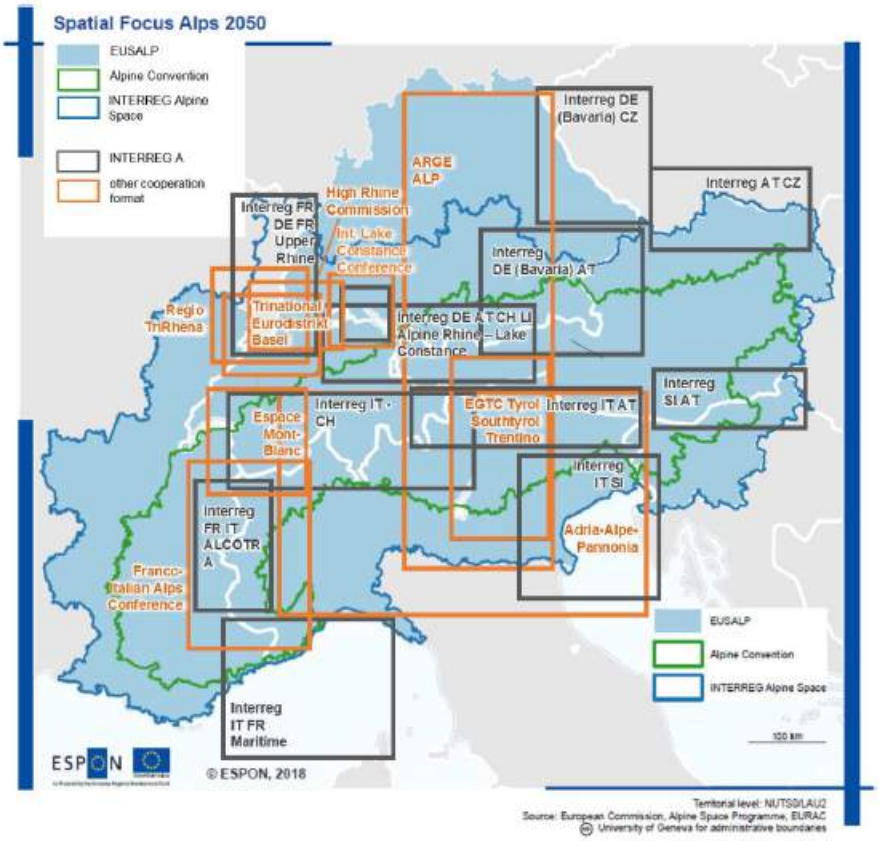
I fully agree					Don't agree at all	I don't know
6	5	4	3	2	1	
○	○	○	○	○	○	○

Protection regimes should be **less static** as e.g. climate change bears strong implications for habitats and natural developments anyway.

I fully agree					Don't agree at all	I don't know
6	5	4	3	2	1	
○	○	○	○	○	○	○

From a **future perspective** towards 2050 for the Alps 2050 region: What should the ecological situation look like? Please describe your personal 'vision'.

STEP 8/11



Governance: The Alpine Areas is characterised by small territorial units and a high density of national borders on the one side – and on the other side by a high intensity of cooperation formats on all levels, which is shown in the map.

Please give your opinion on the following postulates.

The small size of territorial units in the Alpine areas – in particular on the municipal level – is hindering efficient spatial development.

I fully agree					Don't agree at all	I don't know
6	5	4	3	2	1	
○	○	○	○	○	○	○

In some parts of the Alps 2050 perimeter, **the regional level** is politically not strong enough.

I fully agree					Don't agree at all	I don't know
6	5	4	3	2	1	
○	○	○	○	○	○	○

The high number of **national borders** is hindering efficient spatial development.

I fully agree					Don't agree at all	I don't know
6	5	4	3	2	1	
○	○	○	○	○	○	○

Spatial development is too heavily dominated by **sectoral policies** and integrated spatial development and planning are not given enough relevance

I fully agree					Don't agree at all	I don't know
6	5	4	3	2	1	
○	○	○	○	○	○	○

The relevance of **European funding** for spatial development is overestimated.

I fully agree					Don't agree at all	I don't know
6	5	4	3	2	1	
○	○	○	○	○	○	○

It would be useful to merge the **EUSALP** and the **Alpine Space** programme.

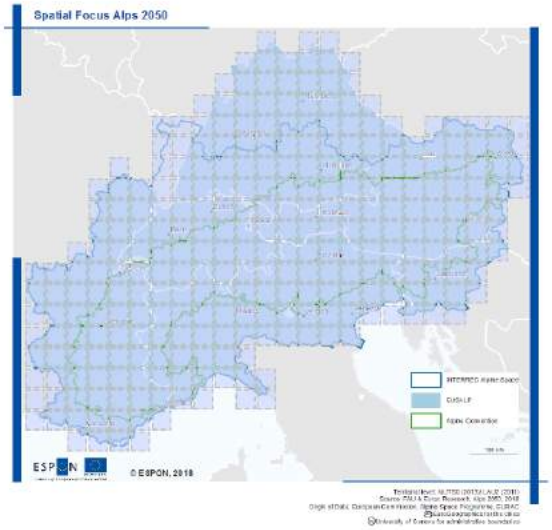
I fully agree					Don't agree at all	I don't know
6	5	4	3	2	1	
○	○	○	○	○	○	○

A stronger cooperation of the **Alpine Convention** with the EUSALP and the Alpine Space programme bears high potentials.

I fully agree					Don't agree at all	I don't know
6	5	4	3	2	1	
○	○	○	○	○	○	○

From a **future perspective** towards 2050 for the Alps 2050: What should the governance system look like? Please describe your personal 'vision'.

STEP 9/11



Based on your expertise: Which are the three most important **'areas of potentials'** in this map?
Please activate these areas by clicking on the boxes (each area can consist of one or more boxes).
Please comment on the potentials of these areas.

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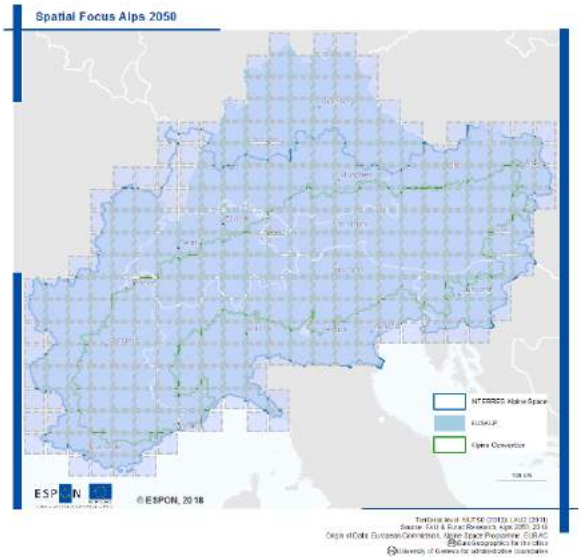
STEP 10/11



Based on your expertise: Which are the three most important **'challenged areas'** in this map?
Please activate these areas by clicking on the boxes (each area can consist of one or more boxes).
Please comment on the challenges of these areas.

STEP 11/11

There might be challenges and opportunities that are of more abstract character and that can hardly be located in the map.

Please feel free to formulate such aspects here.

Thank you for your support.

We will come back to you soon.

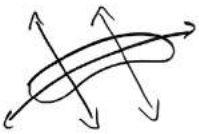
7.2 Delphi survey form – second round

DELPHI Study Alps 2050 (second survey)

ESPON

A) Scenarios

If we synthesize and simplify the experts' feedback to a certain extent, we can identify three general scenarios of the Alpine region towards the year 2050, reflecting the general priorities. In the following section, we summarise these perspectives in a very condensed and slightly provoking way.
On the next page, we will ask you to comment on these perspectives.

Scenario 1: Alpine protection	**Scenario 2: Functional linkages**	**Scenario 3: European accessibility**
The Alpine mountains are an area of a highly precious and vulnerable natural and cultural heritage. Touristic demand, transport needs, settlement growth and other human activities have put this region under high pressure. Protection regimes, supported by the Alpine Convention, are more than necessary and have to be further strengthened. The dynamic of the 'metropolitan ring' surrounding the Alps has to be organised in a way that does not question sustainable development within the Alps and the eco-system services (e.g. with regard to settlement sprawl, transport emissions).	The territorial structure of the Alpine region is complex: The numerous borders between the Alpine countries function as frictions with regard to functional linkages, public services, economic development, eco-system services etc. Moreover, the relationship between mountainous inner-Alpine and the more urbanised pre-Alpine parts has to be strengthened. Removing barriers and enhancing functional links is of key importance (e.g. for labour markets, budget organisation, public services).	The Alpine region is one of the most successful economic spaces in Europe and one of the most attractive touristic destinations worldwide. Moreover, the position in the middle of Europe causes the need for transit flows to ensure European economic prosperity. Against this background, ensuring good transport and economic flows at the Alpine and European level is of major importance (e.g. with regard to transport and ICT infrastructure).
		

Please provide a ranking of these scenarios. We would be thankful if you could comment the scenarios.

1. Rank: scenario no.
Comments

2. Rank: scenario no.
Comments

3. Rank: scenario no.
Comments

B) Towards implementation

Regardless which scenario you support most, we would like to reflect on the instruments that pave the way towards future Alpine development. The following proposals describe concrete actions that could be part of a political roadmap. Again, we would like to ask your degree of consent and your comments.

1. Large scale **corridors** (Brenner, Mont Blanc etc.) should be developed not only as transport infrastructure but as functional corridors of supraregional importance, that do not only share transport infrastructure but also important settlement functions, tourism flows etc. Transnational corridor development schemes should be developed.

I fully agree — Don't agree at all — I don't know

6 5 4 3 2 1

Comments

2. Defining budget schemes should be based on the provision of large scale **ecosystem services** – i.e. metropolitan areas 'paying' rural areas for delivering drinking water, landscape qualities etc.

I fully agree — Don't agree at all — I don't know

6 5 4 3 2 1

Comments

3. So far, the **protection regimes** in the Alpine countries are organised in very different ways. An Alpine wide protection regime should align the different approaches, including the instruments and cross-border linkages.

Comments

4. Spatial **fragmentation** is considered to be one of the most important issues for the environmental quality. Defining an Alpine wide area **connectivity** regime beyond protected areas would be an important step.

Comments

5. The definition of **local cross-border settlement partnerships** allows a better access to public services (in particular for schools, doctors, ...). The regions and countries of the Alpine regions should agree on the systematic establishment of such partnerships.

Comments

6. Overcoming **border-effects** has to be addressed by developing a binding to-do-list for the removal of border-barriers, in particular with regard to transport infrastructure, juridical barriers.

Comments

7. A political declaration should define the Alpine **settlement system**, listing metropolitan cities, large cities, regional cities etc. This would facilitate the organisation of public services, transport regimes, and spatial planning procedures.

Comments

8. There is an overall consensus that the current transport policy is too much based on national and regional particularities. Developing a binding Alpine wide **transport** policy is promising and should comprise a joint transnational toll system for transit, limitations to heavy goods transport via road and prescriptions for the construction of transport infrastructure.

Comments

9. Developing a stronger Alpine **economic policy** is regarded to be promising. This should include economic cluster policies, transnational labour mobility, digitalisation support, green economy transition support and a cross-border location policy.

Comments

10. **Governance:** There are controversial positions about the future governance in the Alpine region with different opinions about the relationship between EUSALP, Alpine Convention, the Alpine Space Program and other relevant institutions. Moreover, discussions extend particularly to the future of EU funding in general. Regardless of these debates: Would you agree that it is necessary to develop a stronger **institutionalisation** of Alpine wide politics, providing more budget and stronger political mandates?

Comments

11. **Tourism:** The first Delphi round has revealed different opinions about the future role of tourism. The balance of socio-economic potential and ecological burden is seen differently. Beyond this controversy: Should there be an Alpine wide, large scale zoning of touristic activities, comprising different categories like 'touristic hot spots', 'small scale endogenous tourism', and 'touristic prohibition zones'?

Comments

12. **AOB:** Which other concrete measures would you like to suggest or underline for the future development of the Alps?

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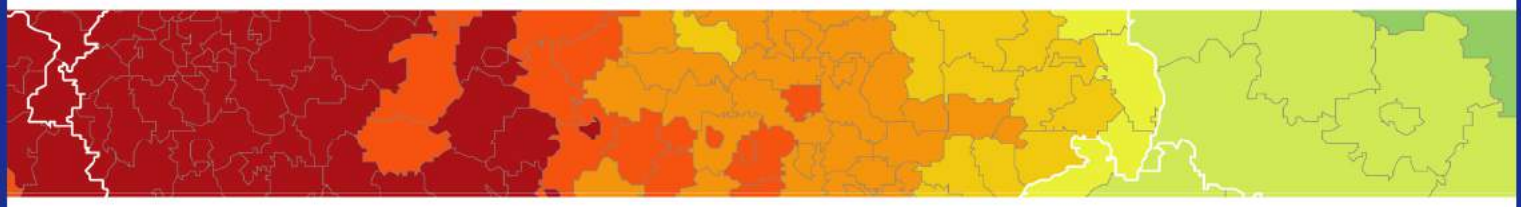

Alps2050

Common spatial perspectives for the Alpine area. Towards a common vision

Targeted Analysis

Executive Summary
“Territorial Analyses”

21.11.2018

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1 Background

The comprehensive territorial analyses of the Alps 2050 project reveal the complex patterns of spatial dynamics and interrelations of mountain and lowland areas. Depending on the sectors and the different scales involved, the analytical picture is very mixed. Still, our summary of the findings points to the following rather general aspects:

On the one hand, spatial development in the Alpine region shows many positive trends. The Alpine region is a space with above average socio-economic performance in most of its parts. Moreover, the diversity and density of territorial cooperation is impressive. The region is attractive in a literal sense, attracting tourists and migrants on the national, European and global scale. Maintaining these positive aspects implies to work for a competitive economy also in the future, while focusing simultaneously on the maintenance of the cultural landscapes, and addressing rising challenges of environmental and demographic change.

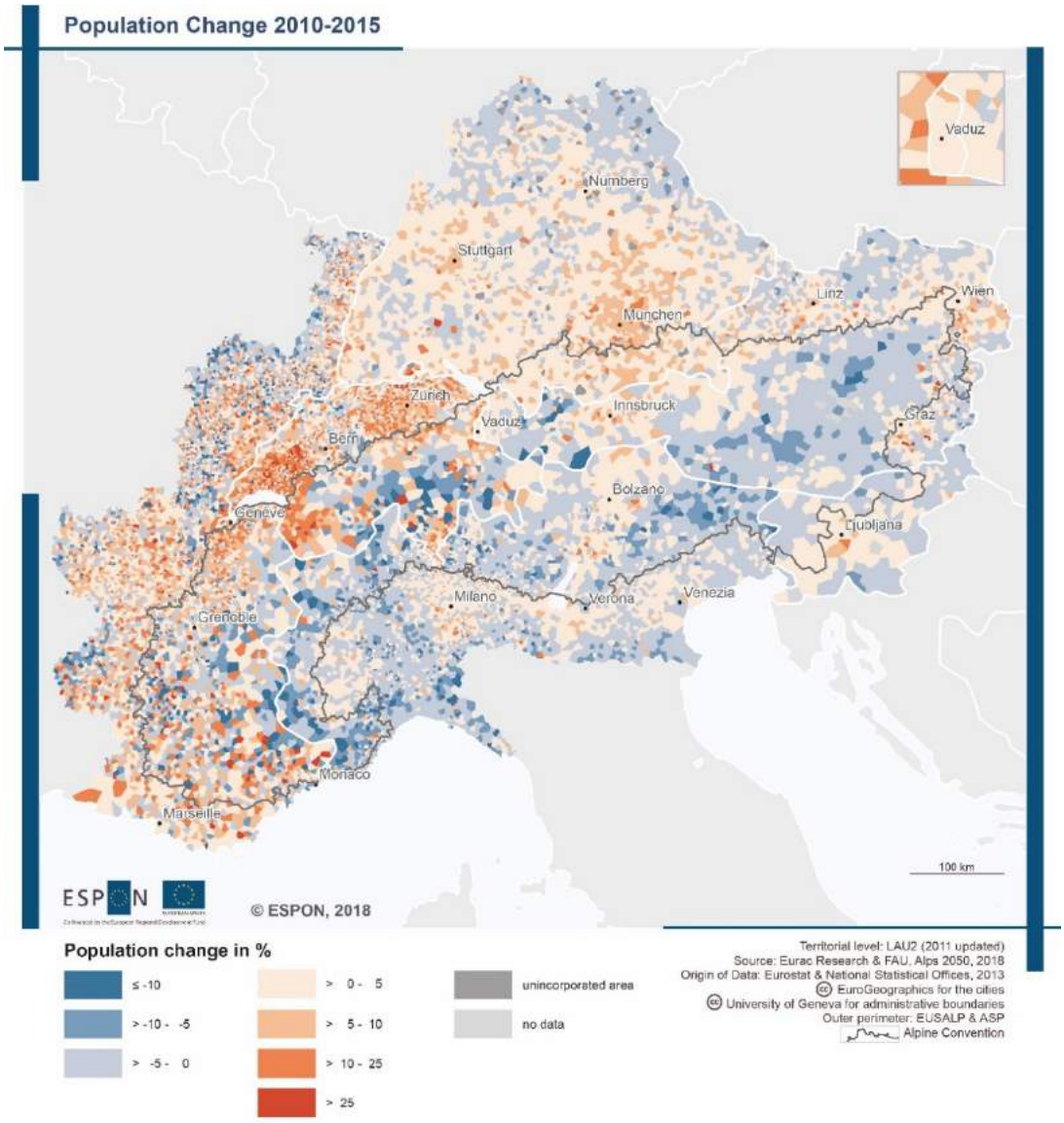
On the other hand, there are considerable challenges of spatial development – which differ depending on the region concerned. Outmigration from peripheral spaces, severe structural change in rural labour markets, threats of climate change implications not only in high mountain regions, and shortage of skilled labour in metropolitan areas are major on-going trends that underpin the variety and scope of the challenges. These aspects also indicate that political responses have to be designed in a really tailor made way.

In a transnational context, the *common challenges* are in the forefront of strategic spatial development. These common challenges can be formulated in the following way:

- The Alpine region is a space of multifaceted diversity that often lacks coherence, linkages and strategic orientation between its different types of territories: The relations between urban and rural spaces, between mountainous and pre-Alpine territories, and along the manifold national borders are not yet elaborated. Addressing these challenges means to better understand spatial divergences and better link the different categories. Reflecting the interlinkages requires to bridge functional gaps and define institutional roles throughout the multi-level governance system. Defining relations between territories can impact on the organisation of transnational transport regimes, the financial schemes with regard to eco-system services, labour market mobility programmes etc.
- The Alpine region is facing considerable challenges of sustainable development. This is true with regard to the environmental dimension (climate change, biodiversity, water and soil quality, land use and urban sprawl, energy production etc.), the social (services of general interest, disparities) and economic dimension (structural change in agriculture and tourism, labour markets, competetivity). Addressing these challenges means to avoid trade-offs between all these dimensions and, at the same time, to pursue a long-term perspective. In addressing sustainable development it is crucial to aim at innovation in a comprehensive sense. This includes very different aspects (leaving ample opportunity and scope for political implementation): investment in technical R&D, development of transnational protection regimes, drawing benefits from digitalisation of SGI in peripheral mountain areas, enhancing social cooperatives, e.g. in the field of tourism or renewable energies, etc.

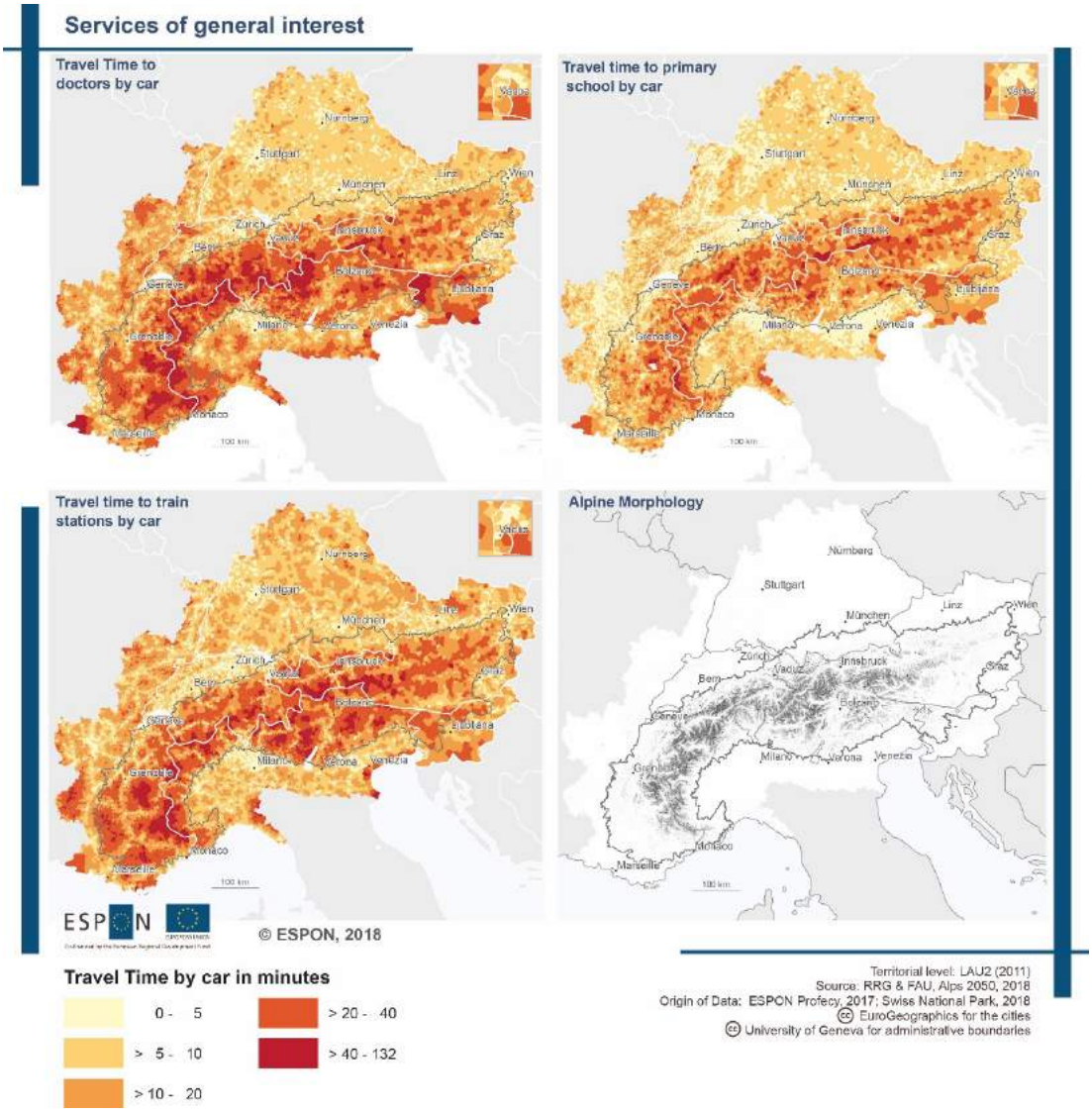
2 The people and their territories

When we talk about the situation of the Alps 2050 region and their territories, we see a complex structure with many facets. The **demographic development** within the Alps 2050 perimeter is as diverse as for the whole European territory. The morphology plays a less important role than in the current settlement system. Map 1 shows the demographic trend for the period 2010-15: The overall picture clearly underpins the core influence of the degree of urbanisation: Metropolises and larger cities are almost always the centre of growth trends, whereas the patterns in the rural areas are much more diverse. For example, the South Tyrol area is demographically developing more positively than the Belluno province. The observed trends are significantly different between the Alpine countries, e.g. along the French-Italian and the German-Swiss borders. The importance of transport corridors is clearly perceptible – the Inn Valley, the High Rhine Valley and most of all the Brenner corridor are clearly visible.



Map 1 *Demographic development on the municipal level*

The diversity of rural areas and the large scale influence of metropolitan 'growth poles' lead to a complex picture. This complexity is even increased by the combination of diverse and overlapping in- and out-flows of migrants which produce a highly diversified situation for all parts of the Alpine space. Many demographic indicators refer to these patterns, highlighting the increase of bi-directional (and circuit) migratory flows, negative natural trends, significance of specific age groups and gender differences in migration movements, length and frequency of movements etc.: Still, metropolitan places tend to show, in general, positive values whereas rural patterns are more diverse in their demographic development.



Map 2 *Services of public interest*

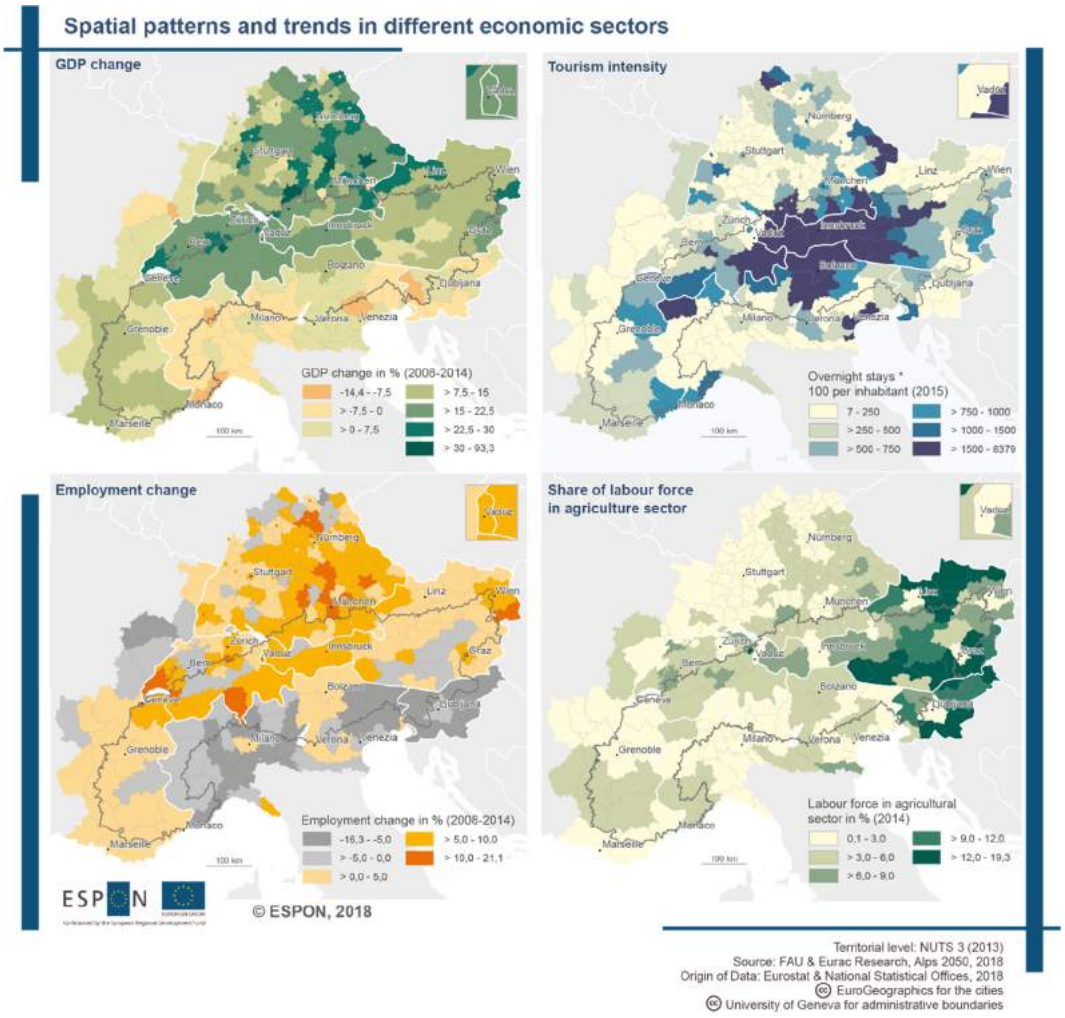
Map 2 shows the accessibility to so-called **services of general interests** (SGI), namely to doctors, primary schools and train stations. The indicator was developed in the ESPON project PROFECY. This indicator represents different aspects: It shows both the density of the services and at the same time the accessibility of the services through the road network. To a large extent, both aspects are the result of population density and linked to economic development

of the regions. The overall picture shows that the morphology matters: the inner-Alpine perimeter (Alpine Convention) shows clearly lower values of accessibility than the pre-Alpine and more urbanized areas.

Also with regard to **transport services**, the contrast between inner- and pre-Alpine areas plays a substantial role – with the determining topic of transit traffic and its unequal consequences: corridors of pan-European importance play a major role on all political levels whilst environmental damage is mainly experienced in the transit areas.In parallel to freight transport, passenger transport is a challenge for sustainable management: (intra-)regional accessibility and transit flows demand for smart strategies, including in particular multi-modal transport regimes.

3 The economy

From a more general European perspective, the economic performance of the Alpine region is rather strong. Most indicators, including GDP per capita, are above European average. Map 3 shows the spatial patterns and trends for different economic sectors.



Map 3 *Spatial patterns and trends in different economic sectors*

This compilation of Map 3 illustrates the diversity of spatial patterns and trends across Alpine regions:

- On the left hand side, we see two maps with spatial patterns of a **North-South divide**: the trends in employment and in GDP (economic strength) have developed much more positive on the Northern side of the Alps 2050 space than on the Southern side. Innovation patterns are not displayed here, but show a similar North-South divide.
- The map on tourism intensity based on overnight stays (upper right hand side) shows a '**central-peripheral pattern**': the gradient goes from the (inner-Alpine) centre to the (pre-Alpine) 'periphery' of the Alps 2050 space. This shows the role of the Alpine massif as a touristic hot spot with much economic potential and also the incumbent threat for sustainable development pathways on the local level.
- The map on the lower right hand side shows an **East-West gradient** of an economic feature: The share of labour in the agricultural sector is the highest in the Eastern Austrian and in the Slovenian regions (in both cases relevant for all regions except capital regions).

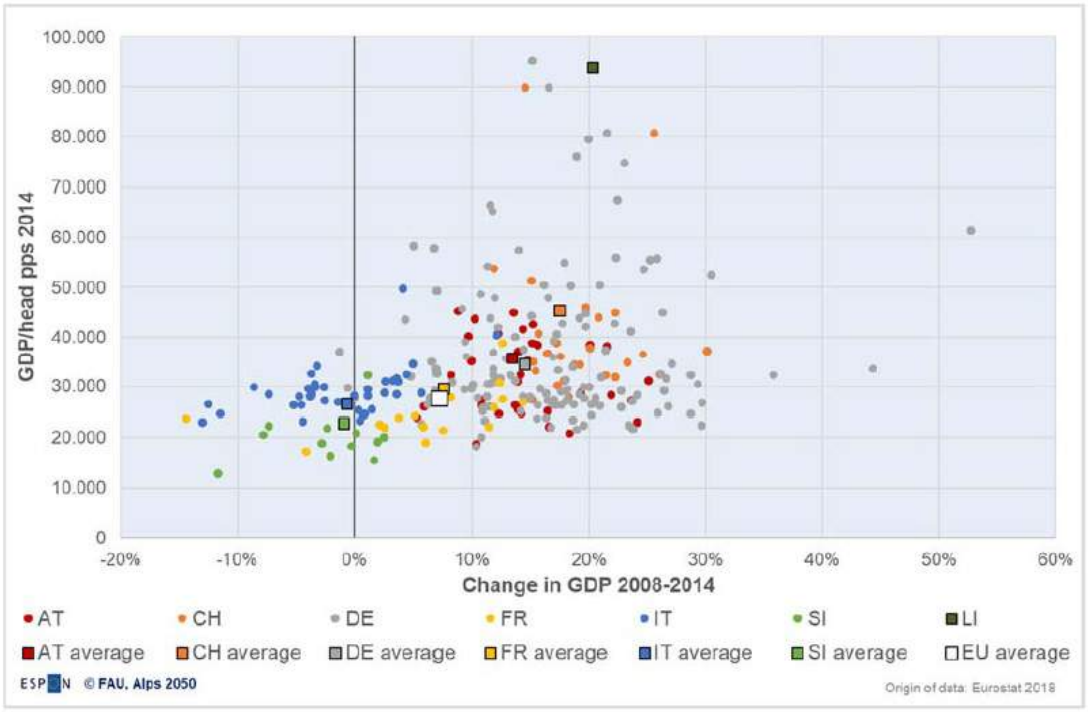
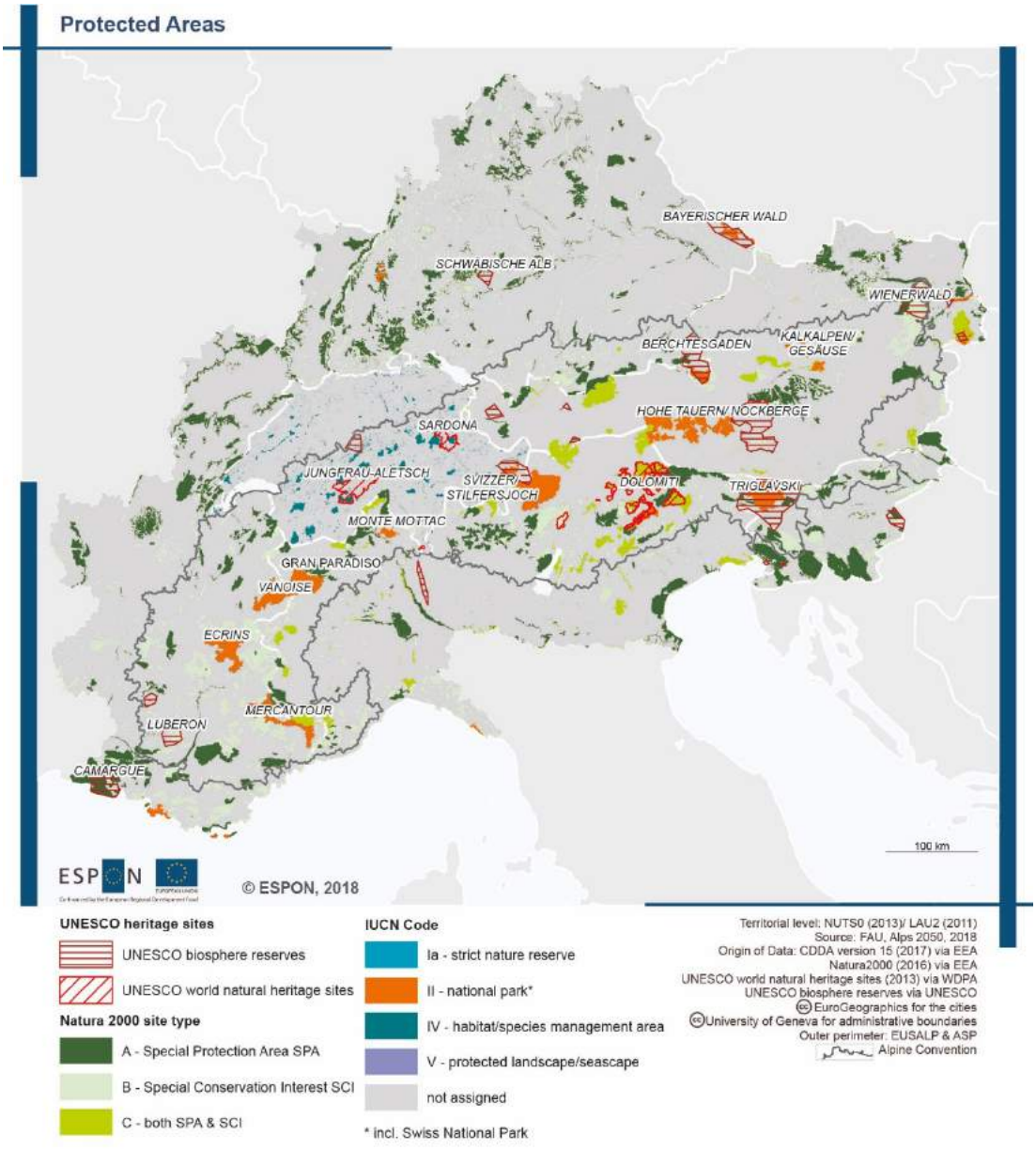


Fig. 1 National differences in economic performance

Moreover, Fig. 1 underscores the high relevance of **national differences** in economic development. The NUTS3 regions of each country make up a kind of 'cloud' that can be differentiated from other countries. The high variability within the 'clouds' of Switzerland and Germany can be interpreted as implication of the small size of the NUTS3 regions in these countries. However, the overall picture is clear: Belonging to a specific nation-state determines the economic level and path to a high extent. In comparison, the situation of a region in the inner-Alpine or pre-Alpine area seems much less decisive.

4 The environment

Responding to the multiple challenges and threats of the Alpine environment is not trivial. It particularly refers to respect the societal demand for well-being and development and, simultaneously, to safeguard an ecologically functioning system. The overarching importance of climate change in particular is broadly debated. Dealing with the large scale origin of climate change impacts, expressed through rising temperatures, increase of natural hazards, precipitation changes etc., calls for transnational policies and measures.

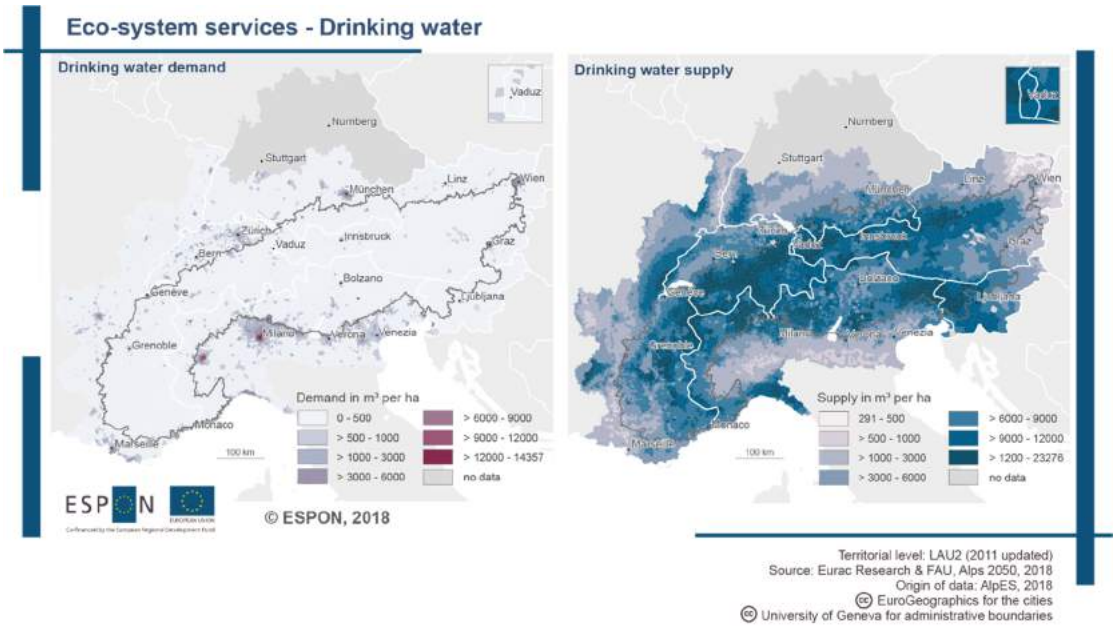


Map 4 *Protected areas in the Alps 2050 perimeter*

In recent years, the question of ecological connectivity came high on the political agenda. The key idea is to ensure sufficiently large functional ecological systems by – ideally – connecting

protected areas in a way that flora and fauna can interact. Against this background, ecological connectivity is concerned about continued big-scale construction activities and settlement dynamics that cut across ecological networks and extend to hitherto unaffected areas. One classical instrument in order to safeguard and improve the situation is the protection of areas. Map 4 provides an overview of the existing protected areas in the Alps 2050 space as example for the concrete instruments of environmental policies. Obviously, many famous mountain massifs are object to national park regimes and/or UNESCO protection (e.g. Dolomites, Triglav). However, the share of protected spaces is not necessarily higher in the inner-Alpine area than in lowlands. In the map, we see clear differences between national protection regimes.

Generally speaking, the ecological functions of the Alpine region have an importance that goes far beyond its perimeters. Questions of biodiversity change, as addressed with the protection and connectivity policies, are just one example. This leads to the question of 'services' of diverse kinds that the Alpine region provides for other regions beyond. The concept of eco-system services reflects on the ecological systems that humans gain in daily life. They are built on functioning eco-systems like forest, grassland, or aquatic eco-systems, and they are important in terms of drinking water or leisure areas supply. Map 5 illustrates the drastic difference in the supply-and-demand-relation through the example of drinking water.



Map 5 *Ecosystem services: drinking water demand and supply*

Drinking water demand is very much linked to urbanized and metropolitan areas. The spatial structure of settlement areas shows a very punctual structure surrounding the core mountainous area of the Alps. The demand for drinking water linked to Alpine sources is not limited to the Alps 2050 perimeter but goes far beyond. Contrary to that, the supply structure is heavily linked to the morphological structure. This is a typical picture for ecosystem-services

regimes – supply and demand show contrary spatial structures (see a similar spatial distribution for the example of leisure supply and demand in the Atlas).

5 The governance

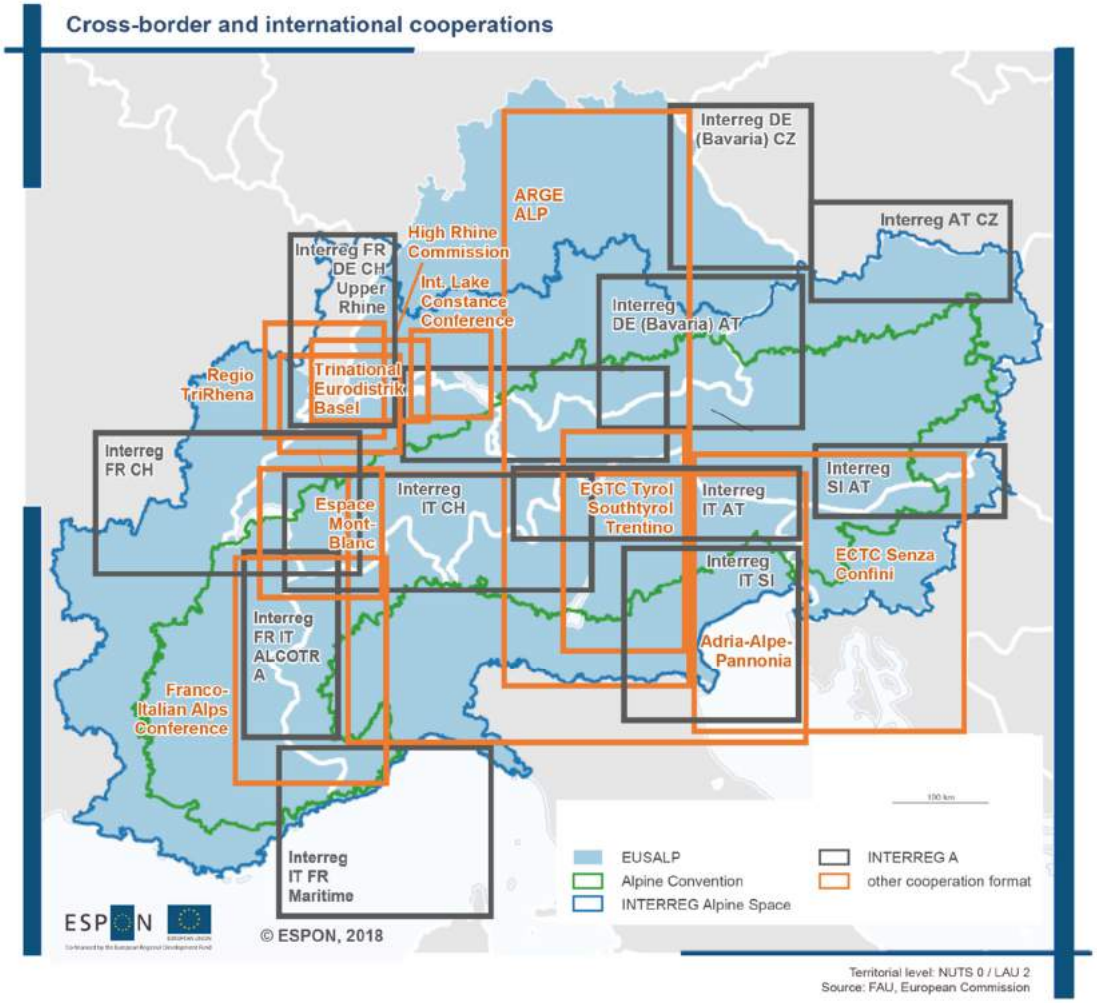
From the governance perspective, the Alpine region is remarkable as it is the 'contact zone' of several nation states and, at the same time, of different administrative and political systems. Despite this political fragmentation (or maybe because of it?), territorial cooperation looks back on a remarkable tradition and diversity. Map 6 shows most of the cooperation formats on the cross-border level (for the transnational tools, see Atlas).

The high number of cooperation formats might be due to the low correlation of national borders with cultural differences like language, regional belonging, historic relationships etc. There are few regions in Europe that show a comparable institutional diversity, and density of cooperation frameworks, perhaps with the exception of the Baltic Sea region.

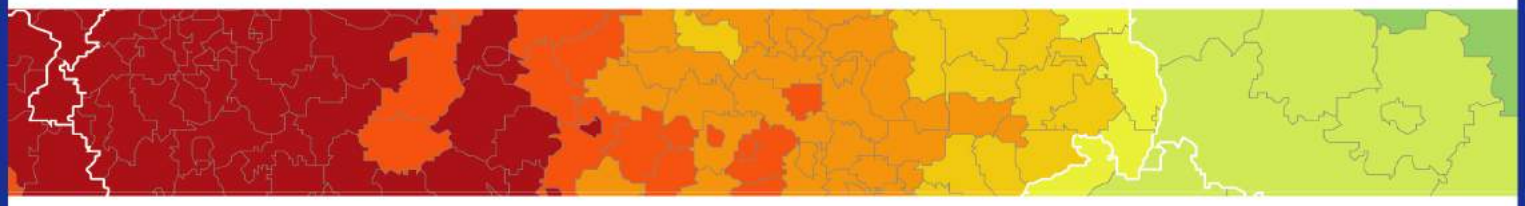
This situation can be summarised by the following characteristics.

- The **institutional diversity** enhances the relevance of multi-level governance, including EU and domestic instruments as well as the use of cross-border programmes for many issues of regional policy and spatial development.
- Generally speaking, there is a **long-standing experience** in territorial cooperation. Many of these cooperation formats have the roots or depend on forerunners in the 1970s (e.g. ARGE ALP, Lake Constance). This broad experience has led to stable and large networks between the involved institutions and persons that might even be understood as 'epistemic community', i.e. a group of experts from different institutional backgrounds that know each other pretty well and that work together along the different phases of the policy cycle; INTERREG committees, Alpine Convention and EUSALP groups, scientific networks like ISCAR etc. are just some examples.
- The large number of institutional formats certainly comes along with forms of competition, in particular with regard to funding and political priorities. In particular, the current relations between Alpine Convention and the EUSALP might be seen as **co-opetition.**
- **Instrumental softness:** The density of cooperation tools must not be misunderstood with regard to the instrumental vigour. It is true that the Alpine Convention constitutes a legally binding intergovernmental regime to balance development and protection through innovative approaches. The Alpine Convention protocols formulate important objectives and principles and it is up to the Alpine states to implement them properly. It is also true that the ASP and other European programs provide a substantial amount of funding. At the same time, infrastructure and other investments rely to a major extent on domestic implementation policies and co-funding arrangements.
- **European policies matter**: As mentioned above, the institutional complexity induces a particular role to European policies. This applies even for Switzerland and Liechtenstein who are not EU member states but have adopted a series of important regulations and follow common rules to participate in a number of programs. This is most visible for the Schengen regulations, the provision of tools for cross-border cooperation and the transnational scale (since the 1990s in form of INTERREG B cooperation, and nowadays also by cooperation for the macro-regional strategy; see the respective map in the Atlas on the perimeters).

- **The domestic scale**: The complexity on the domestic level is due to a) the differences of the involved countries with regard to country size and the share of the mountainous areas and b) the politico-administrative contexts ('planning cultures') that comprise more centralist and more federalist countries as well as the two small states of Liechtenstein and Monaco.



Map 6 *Cross-border and international cooperation in the Alpine area*



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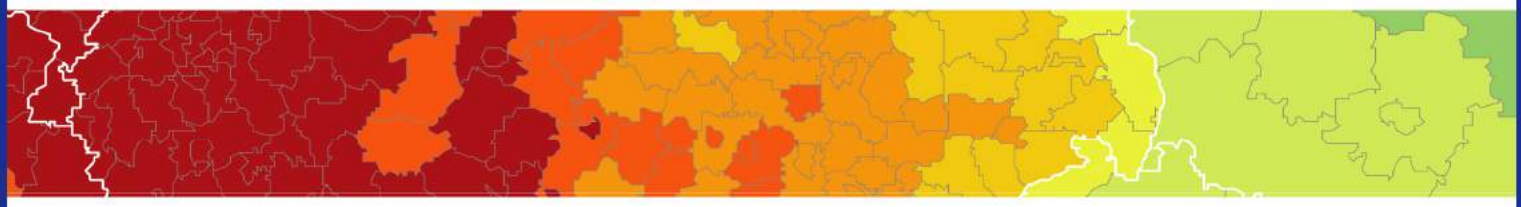

Alps2050

Common spatial perspectives for the Alpine area. Towards a common vision

Targeted Analysis

Executive Summary "Vision Alps 2050"

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1 Background

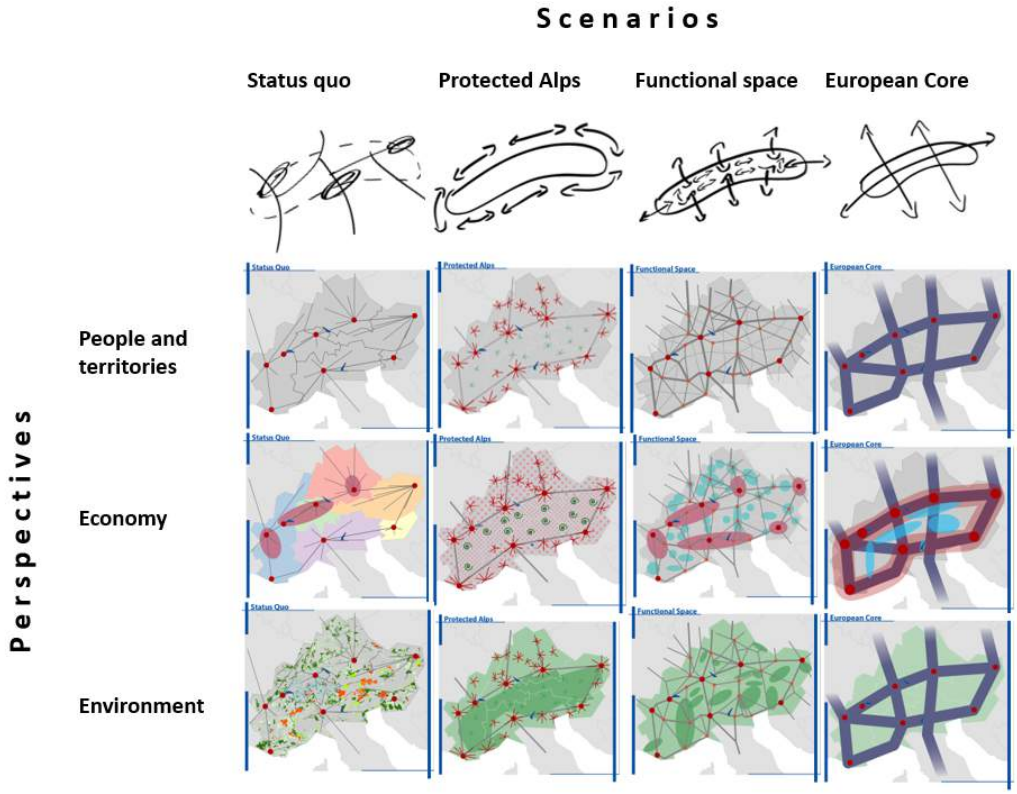
The Alpine region is a particular geographical space, embodying spectacular landscape features, a precious cultural heritage, a touristic destination of global importance, being simultaneously an overall prosperous region and an ecological hot spot – diverse, unique, and vulnerable. At the same time, the Alpine area is a space of important internal linkages and characterised by an increasing embeddedness in global networks: Being located in the heart of Europe, the region is hence part of the dynamic development of a globally integrated economy. Globalisation and the need for competitive economic activities is an important driving force for the Alpine region. Against this background, sustainable development of this sensible area is a particular challenge for regional policies. Balancing development opportunities and protection regimes is a fundamental challenge and a strategic requirement: maintaining prosperity and quality of life, ensuring innovation, managing settlement demand, responding to climate change, reducing fragmentation of ecosystems, and steering agricultural transformation are just some of the most important issues at stake in the political agenda.

The ESPON Alps 2050 project analyses the development challenges and opportunities in many respects. Based on these analyses and on the involvement of diverse stakeholders, the Alps 2050 vision gives answers on how to achieve a more sustainable development and on how to ensure a harmonious development across borders and spatial perimeters.

Map 1 gives an idea on the multiplicity of perspectives and possible scenarios that have fed this process. It is obvious that developing future perspectives refers to different sectoral priorities, political world views and instrumental options. The Alps 2050 project has developed four contrasting scenarios including a status quo (or trend) scenario and has illustrated the different implications in three thematic layers: the ‘protected Alps’ scenario prioritises wide-ranging environmental measures in the inner Alpine parts; the ‘functional space’ scenario focusses on facilitating functional relations across territorial demarcations; and the ‘European core’ scenario concentrates on the role of the Alpine region for large-scale economic flows and hub functions. These scenarios can be made palpable in more sectoral ‘perspectives’ that show that spatial development matters – with a particular emphasis on territorial priorities leading to different futures. Beyond all the controversies that come along with such a complex object of spatial development, important inspiration for the future development arise from this study being summarised in the Alps 2050 vision:

This vision Alps 2050 goes beyond existing differences in the political debate. Instead, it focusses on common ground and formulates elements of a *leitbild* (a future-oirented model) that goes beyond general principles and beyond sectoral objectives. The Alpine 2050 vision is illustrated in a cartographic and very condensed manner in the following chapters. It should be

mentioned that mapping means to simplify complex situations to a large extent and tends to leave out important aspects that are of more diffuse spatial character (e.g. quality of life, greening the economy etc.). Nevertheless, it is essential to seize the main thrust of political processes with regard to long-term objectives.



Map 1 Scenarios and perspectives on the Alpine region

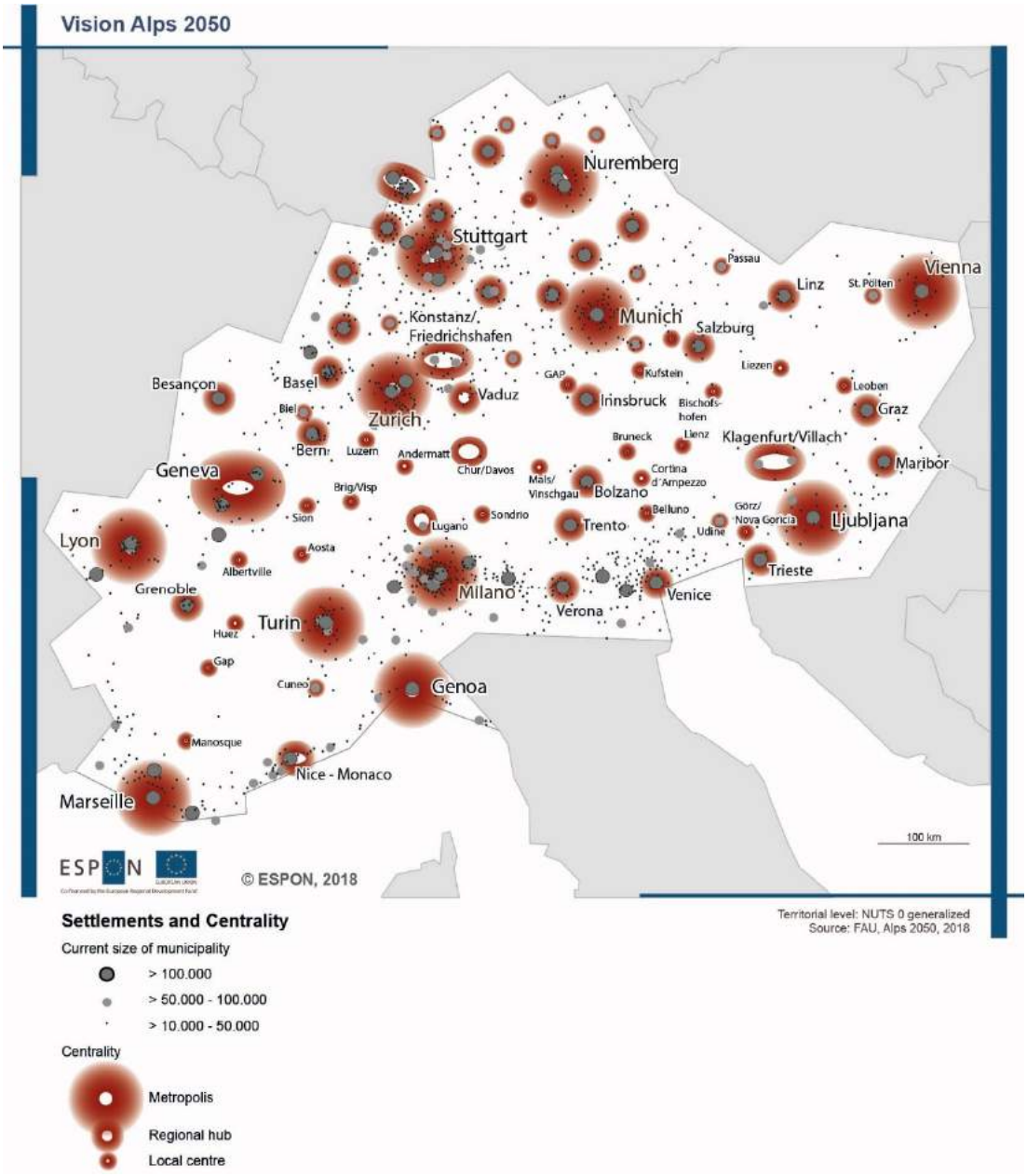
2 Mapping the vision

2.1 Settlements and centrality

Background: Currently, the settlement system of the Alpine region is characterised by mainly national and regional policy regimes. However, the main challenges are the same in all involved countries: Processes of metropolisation put large cities under pressure whereas many regions of rural and mountainous character are confronted with demographic decline and structural changes. Providing adequate services of public interest is a challenge in both kinds of territories. Frictions along the many national borders in the Alpine region aggravate the anyway challenging situation. Moreover, the increasing share of older people shows that the challenges will grow in the coming years, even if the economic situation remains positive and skilled labour in-migration would continue.

Objective: The aim is to achieve spatial development that ensures a good and comparable quality of life for all inhabitants and an efficient organisation of services of public interest. Urban

and rural areas or mountainous and non-mountainous settlements have to be linked in a (more) sustainable way.



Map 2 The settlement system of the Alps 2050 vision

Map 2 presents an overview on the settlement system, combining two core aspects: Firstly, it shows the current size of the larger settlements, differentiating towns and cities into three size groups (> 100,000; 50,000 – 100,000, and 10-50,000 inhabitants). This map illustrates the differences between the pre-Alpine areas (outside of Alpine Convention perimeter) with the far higher degree of urbanisation and the inner-Alpine areas with less and much smaller cities. Secondly, the map indicates the function of the cities for the surrounding area, i.e. its centrality. It is important to note that central spaces are no geographical points but nuclei for regional development that perform as rather soft spaces in practices. The definition of development

areas has also to define risk zones that are less appropriate for settlement development due to climate change (flooding, landslides etc.). – The map proposes three levels of centrality:

- **Metropolises**: The metropolitan cities are characterised by a central role on the transnational scale. They host economic headquarter and innovation functions and large scale political decision-making. They serve as gateways for many incoming professionals from other regions. In general, they have high numbers of inhabitants.
- **Regional hubs**: Regional hubs host important functions in economy and policy for the larger region. The settlement size can vary largely depending on the context (rather more than 100.000 in pre-Alpine and often far less in mountainous regions). It is important to safeguard a critical mass of high ranking R&D infrastructure, a complete offer of services of public interest and the potential for development without affecting rural spaces nearby ('decentral centrality'), in particular as strong suburbanisation processes are already going on. In exemplary cases, the positioning of two cities as one regional hub illustrates that 'division of labour' can help to provide the most fitting basis.
- **Local centres** have a high importance for rural spaces, in particular with regard to services of public interest and for economic incentives. In the mountains, some of these centres have less than 10,000 inhabitants and still provide important functions for their catchment area.

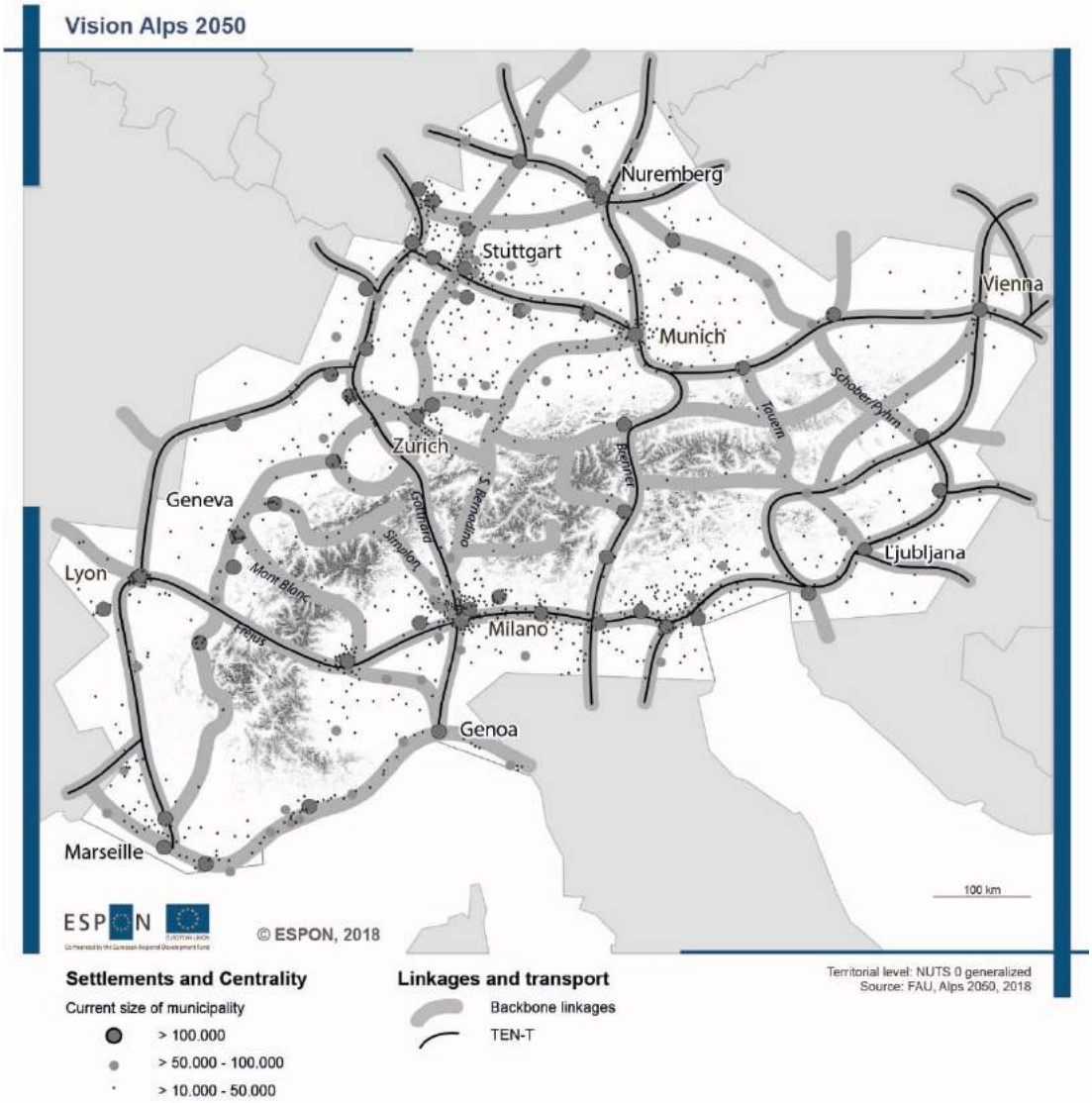
Political action: The organisation of settlement systems is a domestic policy field, following the principle of subsidiarity. Still, the following political activities on the transnational scale can improve the situation:

- Work towards a possible political definition of a common typology of settlement functions on the transnational level as proposed in our map. This may facilitate monitoring and exchange.
- An action plan on the removal of cross-border barriers would improve the organisation of public services across boundaries.

2.2 Linkages and transport

Background: The spatial structure of the Alpine region is characterised by functional linkages on different scales that are based on axes and corridors, carrying major parts of transport flows, hosting main parts of the settlement system, and providing important services of general interest.

The challenges are manifold: growing transport quantities (in particular of freight and via road) aggravate current traffic problems which imply a significant economic and environmental burden and question the local quality of life. Non-action would mean almost permanent congestion situations, increasing noise and air pollution and a widely-shared sense of decreasing quality of life in large scale corridors. Already now, political conflicts along transit routes are serious (among national ministries and between subregional entities along the connecting routes and national decision-makers). It is obvious that improved coordination is needed, including both sectoral transport policy measures and integrated spatial coordination. At the same time, local accessibility remains a complex challenge in many mountainous parts.



Map 3 Linkages, corridors and the transport system of the Alps 2050 vision

Objectives: The objective is to balance transnational mobility and accessibility on the one hand, and ecological quality and good local quality of life on the other. This can only be achieved by considerable efforts on the domestic level, but requires also increased attention at the transnational level. The new infrastructure and the new modes of mobility lead to new geographies due to new accessibility patterns that fundamentally change regional development paths. – Map 3 differentiates the following elements:

- **Backbone linkages**: The (inter-) regional axes further strengthen the existing transport and settlement systems, taking into account of the morphological structure (in particular along the valleys). It is important to concentrate growth dynamics along these lines in order to avoid sprawl and to ensure efficient spatial structures in the long run.
- **TEN-T**: Many of the backbone linkages host the TEN-T infrastructure that are displayed in the map. It is important to implement the investment measures that were decided on the European and transnational level.

- **Major Alpine Passes/Tunnels**: The major Alpine passes or tunnels are displayed here mainly for the purpose of orientation and as important elements for regional dynamics.

Political Action: Towards the year 2050, the following actions have to be undertaken:

- **Sectoral level**: The TEN-T has to be completed, including connecting routes, completing a transnational accessibility regime. Moreover, enhancing multi-modality, combining in particular road and rail, is of high priority. A transnational toll policy might be an important element in this respect. In parallel, internal accessibility (passenger transport) has to be developed in a sustainable way.
- **Integrated spatial development**: Transport policy has to be closely interwoven with general spatial planning processes. There has to be a clear differentiation of transit flows of high quantities that have to be organised along few corridors that are capable to handle large flows in a way that does not harm environmental quality. On the other hand, accessibility on the regional and local level have to be closely linked to questions of the settlement system including services of general interest and to economic dynamics.

2.3 Territories

Background: Spatial development in the Alpine region is challenging as manifold demands meet on a complex and vulnerable territory. So far, spatial planning and development are based on a predominantly domestic regime, with only little reference to the transnational scale. The challenges on the transnational scale are manifold: urban sprawl and ecological connectivity are important in all parts of the Alps 2050 perimeter. The relations between urban and rural as well as between inner-Alpine and pre-Alpine areas are often unclear: the political organisation of transport flows as well as eco-system services, the development of services of general interests and of economic activities is a complex task and has to consider its territorial dimension: areas of long-standing SME innovative tradition, agricultural communities, hotspots of biodiversity and areas of structural transition meet on the ground. Detecting and developing their potential is the key task.

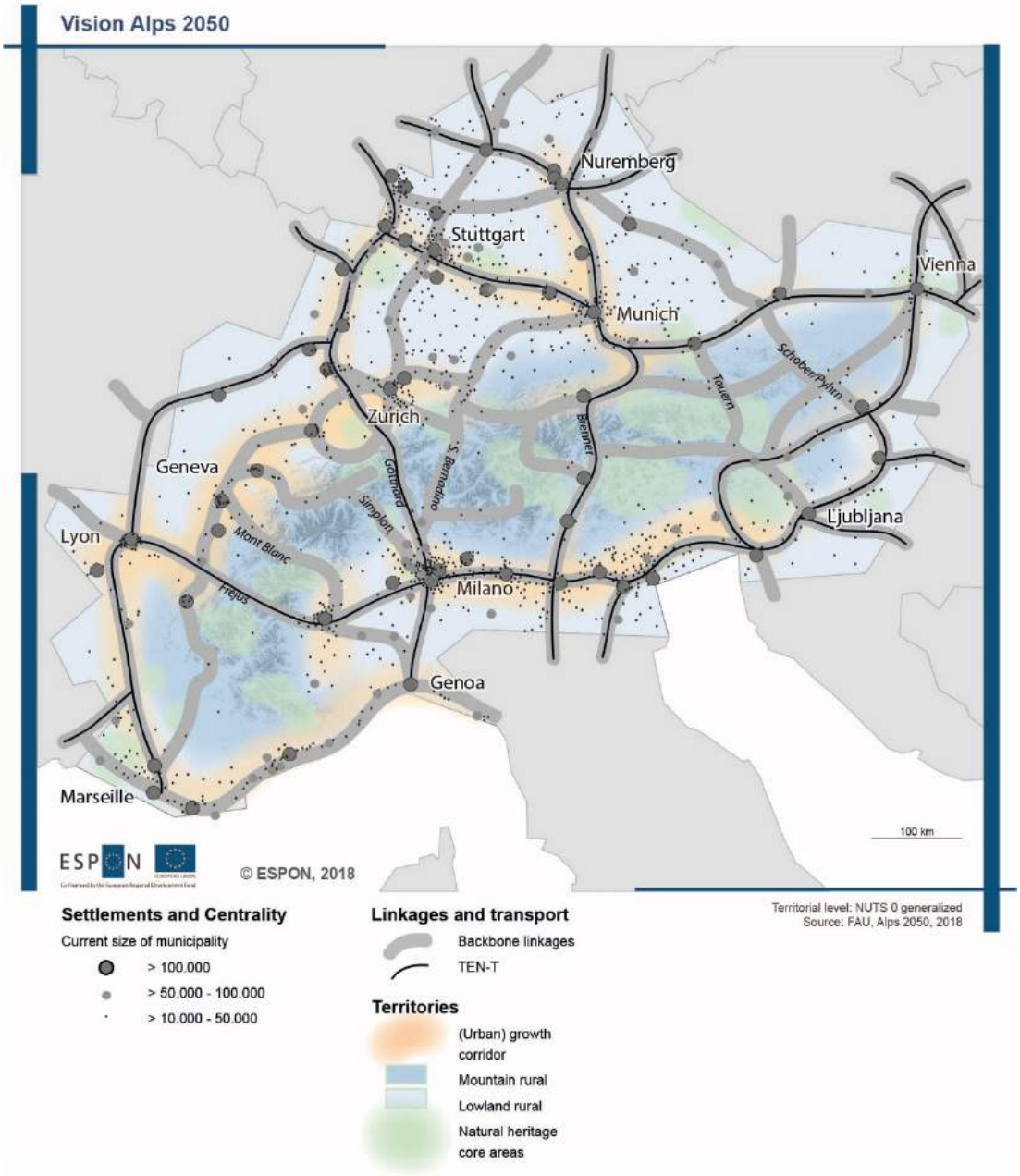
Objective: The objective is to achieve a sustainable spatial development process that goes beyond domestic regimes. However, it is crucial to develop the regional potentials on a cross-border and transnational scale. A common definition of priorities and complementarity facilitates a spatial development that addresses common challenges.

Map 4 differentiates four general kinds of territories – not neglecting that spatial development on the ground has to go far beyond these more general categories.

- **(Urban) growth corridors** are very much linked to the above mentioned backbone linkages. Concentrating growth dynamics on these corridors is important in order to avoid settlement sprawl and in order to achieve an efficient spatial organisation.
- **Mountain rural**: Due to the lower population density, the morphological context and the often less positive demographic change, spatial organisation in these regions has to undertake considerable efforts with regard to the insurance of public services. From the economic perspective, smart innovations are of major importance that lead in the best case to rural innovation systems, potentially comprising technological, agricultural and

touristic dynamics. In particular, regional opportunities along the backbone linkages, but also niche options beyond those areas should be seized and developed.

- **Lowland rural**: The category of rural areas beyond the mountains is very diverse and comprises different contexts in the demographic and economic sense. Developing endogenous potentials and developing fruitful linkages to the metropolises and other centres is the main task.
- **Natural heritage core areas**: Protected areas are one important aspect of environmentally sound development. The map is not meant to show the exact protection regimes but illustrates a spatial category that prioritizes action to protect and develop natural heritage, taking into account touristic potentials wherever reasonable (in the map based on existing UNESCO sites and national parks).



Map 4 The territorial structuring of the Alps 2050 vision

Political Action means in particular the following points:

- **Innovation focus**: Economic development strongly depends on innovation in technology, and, at the same time, adaptations in economic and social processes. Supporting innovation with R&D infrastructure, networking facilities on a transnational level in order to develop endogenous potentials has to be organised in a cross-border way where possible.
- **Cross-border protection regimes**: The hitherto established protection areas are predominately selected and restricted to national boundaries. Strengthening the cross-border dimension seems very promising, considering the primary challenge for ecological connectivity.

2.4 Synthesis

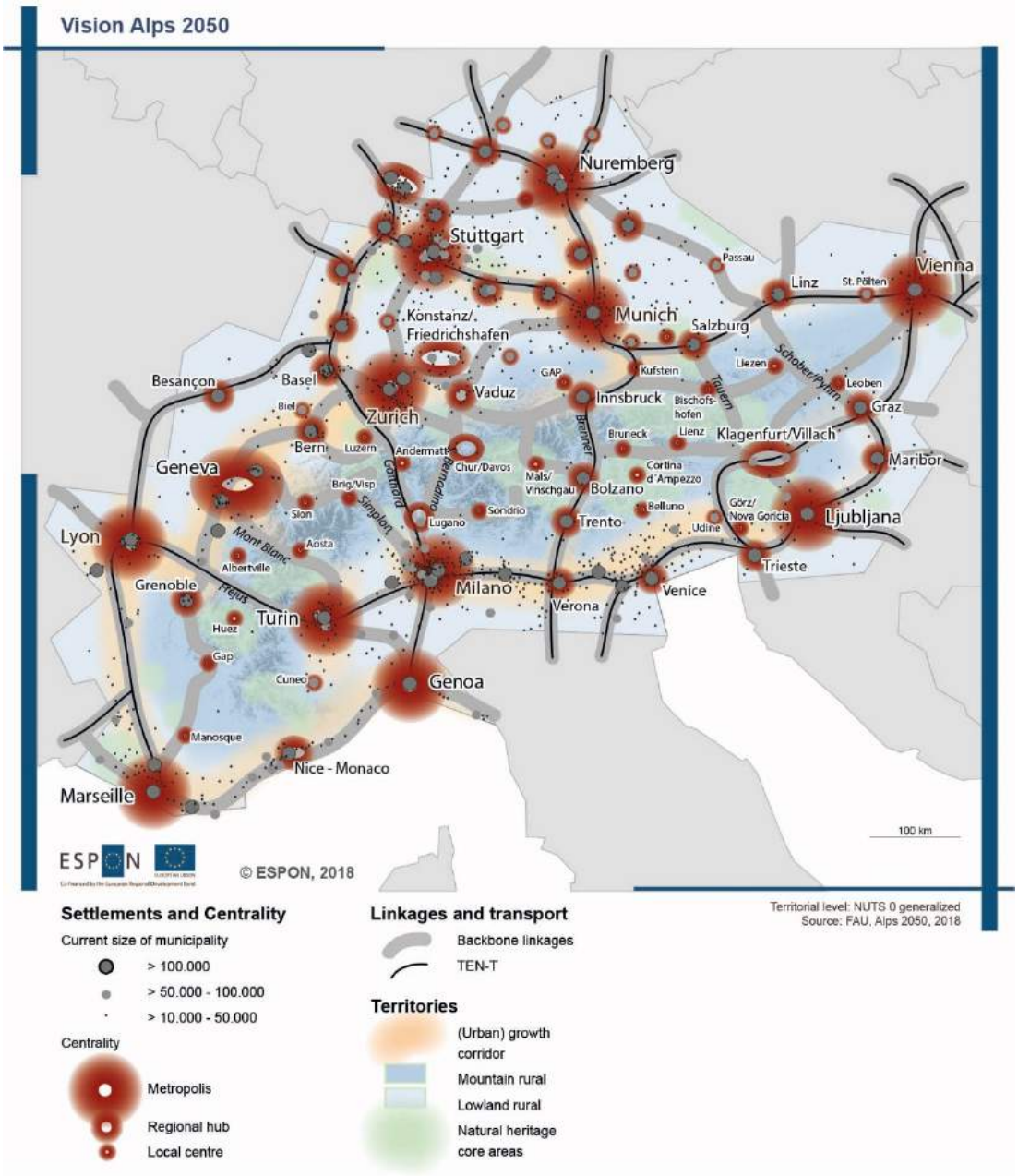
The overall picture shows a common space on the transnational scale, comprising both mountainous and lowland parts that are based on a joint inter-related spatial organisation.

The **general objective** of the Alps 2050 vision is to achieve a balanced spatial development based on sustainability, safeguarding a good quality of life and an efficient management approach of governance. The political measures introduced in the sections above contribute to achieving this goal. Map 5 combines the different dimensions in a visual and simplified way.

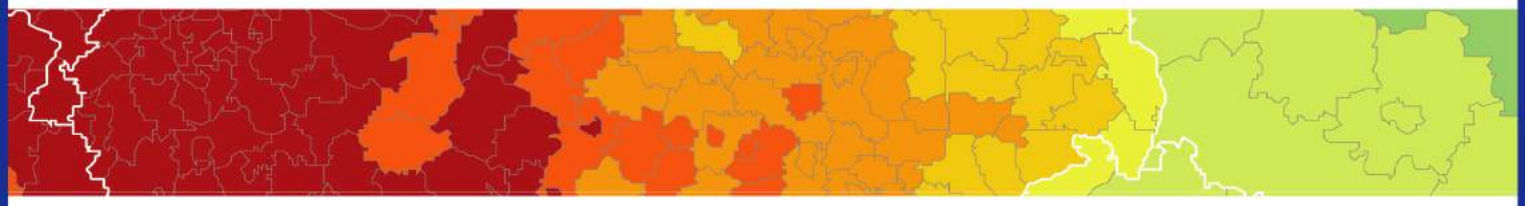
On a more general level, the following political measures help to achieve a harmonious, sustainable and successful development.

- **Inter-regional policy processes:** The existing platforms on the transnational level (in particular the EUSALP action groups and the Alpine Convention working bodies) are without doubt a good basis for further political dynamic: Improve data availability, ensure public transparency, pave the way towards transnational action is the promising direction (as it has been done for the transport policy under the roof of the so-called 'Zürich process'). Developing such processes for labour market mobility, mountain agriculture support initiatives or ecological connectivity regimes are more than promising.
- **Enhancing governance efficiency**: A consequent reflection on mandates and division of labour amongst the involved institutions is a minimum common denominator. The objective is to reduce overlaps, concentrate on core issues and to cooperate in order to make better use of synergies.
- **Funding alignment**: Alignment means stronger links between programmes and easier combination of funding opportunities. This is of crucial importance due to the macro-regional "three no's" rejecting new institutions, new regulations and new budgets. Better linkages between the different strands of European Territorial Cooperation (ETC), and between ETC and investment or research oriented funding (cohesion, agriculture, research etc.) is of key importance.
- **Innovative funding**: Reducing the high bureaucratic burden in European funding in general and in particular in cooperation is an ongoing challenge. Beyond this debate, many experts of the Alpine region call for more openness for innovative projects and experimental action that are currently impeded by formal requirements. This includes a more explicit focus on spatial development and goes beyond purely sectoral policy strands.

The Alpine region is the ‘contact zone’ of different natural spaces and of regional and national regimes and cultures. Turning this diversity into a regional strength and creating a real transnational region is the overarching objective. Achieving sustainable development demands to use the synergies and complementarities on the transnational level and requires a high priority for common action.



Map 5 Alps 2050 vision



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