
Climate Scenarios: Linking Climate Change and Spatial Planning

***Contribution to IP_SP1_Step1a
of the Climate Action Plan 2.0***

**Spatial Planning and Sustainable Development Working Group
of the Alpine Convention**

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This report is a result of the Spatial Planning and Sustainable Development Working Group of the Alpine Convention mandate chaired by Germany.

The members of the Working Group were:

Chair: Josiane Meier (*Bundesministerium für Wohnen, Stadtentwicklung und Bauwesen – German Federal Ministry for Housing, Urban Development and Building*), Daniel Meltzian (*Bundesministerium für Wohnen, Stadtentwicklung und Bauwesen – German Federal Ministry for Housing, Urban Development and Building*)

Supported by: Florian Lintzmeyer, Stefan Marzelli, Anna Schopf, Claudia Schwarz (*ifuplan Institut für Umweltplanung und Raumentwicklung – Institute for Environmental Planning and Spatial Development*), Tobias Chilla, Markus Lambracht, Dominik Bertram, Hannah Paul (*Friedrich-Alexander-Universität Erlangen-Nürnberg – Friedrich-Alexander University Erlangen-Nuremberg*)

Contracting Parties:

- **Austria:** Michael Roth (*Bundesministerium für Land- und Forstwirtschaft, Regionen und Wasserwirtschaft - Federal Ministry of Agriculture, Forestry, Regions and Water Management*), Katharina Zwettler (*Bundesministerium für Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie - Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology*), Daria Sprenger (*Land Tirol – Province of Tyrol*)
- **France:** Sylvie Vigneron (*Commissariat de massif des Alpes - Alpine Commissioner's Office*)
- **Germany:** Josiane Meier, Daniel Meltzian, Lukas Kühne (*Bundesministerium für Wohnen, Stadtentwicklung und Bauwesen - Federal Ministry for Housing, Urban Development and Building*), Stefan Esch, Stephan Albert (*Bayerisches Staatsministerium für Wirtschaft, Landesentwicklung und Energie - Bavarian State Ministry for Economic Affairs, Regional Development and Energy*)
- **Italy:** Michele Munafò (*Istituto Superiore per la Protezione e la Ricerca Ambientale - Italian Institute for Environmental Protection and Research*), Andrea Omizzolo (*Eurac Research*), Luisa Pedrazzini (*Politecnico di Milano – Polytechnical University of Milano*), Chantal Treves (*Regione Valle d'Aosta - Aosta Valley Region*), Elisa Ravazzoli (*Eurac Research*), Daniela Versino (*Ministero delle Infrastrutture e dei Trasporti – Ministry of Infrastructures and Transport*)
- **Liechtenstein:** Catarina Proidl (*Liechtensteinische Landesverwaltung, Amt für Hochbau und Raumplanung - Liechtenstein National Administration, Office of Building Construction and Spatial Planning*)
- **Monaco:** Astrid Claudel-Rusin (*Gouvernement Princier de Monaco - Government of Monaco*)

- **Slovenia:** Lenča Humerca Šolar (*Ministrstvo za naravne vire in prostor* - Ministry of the Natural Resources and Spatial Planning)
- **Switzerland:** Sébastien Rieben (*Bundesamt für Raumentwicklung ARE* - Federal Office for Spatial Development ARE)

Observers:

- Matteo Decostanzi (Alpine Space Programme)
- Elena Di Bella (*EUROMONTANA*)
- Christian Drechsler (ARGE ALP)
- Susanne Felzmann (Alliance in the Alps)
- Magdalena Holzer (Alpine Town of the Year)
- Paul Kuncio (*CIPRA International*)
- Constantin Meyer (AlpPlan)
- Janez Nared (*ISCAR*)
- Guido Plassmann (*ALPARC*)
- Steffen Reich (*Club Arc Alpin*)

Permanent Secretariat of the Alpine Convention: Živa Novljan

Authors: Hannah Paul, Dominik Bertram, Tobias Chilla, (Friedrich-Alexander-Universität Erlangen-Nürnberg – Friedrich-Alexander-Universität Erlangen-Nürnberg)



Permanent Secretariat of the Alpine Convention, September 2024

Herzog-Friedrich-Straße 15
A-6020 Innsbruck
Austria

Operational branch office
Viale Druso/Drususallee 1
I-39100 Bolzano/Bozen
Italy

info@alpconv.org

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Executive Summary

The document provides a comprehensive scoping review that examines the interface between climate change and spatial planning, with a focus on the Alpine region. The review contributes to the Alpine Climate Target System and Step 1a Definition and provision of data concerning the impact of climate scenarios on land use in the Implementation Pathway Spatial Planning. By analysing a wide range of scientific literature, the report aims to map out existing knowledge, identify gaps, and explore how spatial planning and climate change are being addressed in the Alpine region.

The review reveals significant research gaps, particularly in the integration of spatial planning and climate change in the Alpine context. While environmental issues such as disaster risk management and land use change are well covered, other critical areas such as energy and transport receive less attention. Furthermore, the academic literature focuses mainly on local and national studies, with fewer cross-border or pan-Alpine approaches. This fragmentation hinders the development of comprehensive, long-term spatial planning strategies. The existing literature also tends to focus more on sectoral approaches rather than integrated planning strategies, which are necessary for addressing the complex, multi-faceted nature of climate challenges.

The report calls for greater interdisciplinary collaboration and the adoption of integrated planning approaches to better address the challenges posed by climate change. It emphasizes that climate change is a multifaceted issue that requires spatial planning to transcend traditional disciplinary and geographic boundaries. By integrating different sectors and extending the spatial scope beyond local contexts, spatial planning can play a crucial role in promoting sustainable development and enhancing resilience in the Alpine region.

1. BACKGROUND

As a contribution to the Alpine Climate Target System, this scoping review of the interface between climate change and spatial planning contributes to Step 1a Definition and provision of data concerning the impact of climate scenarios on land use in the Implementation Pathway Spatial Planning 1.¹

The Alpine Climate Action Plan 2.0 foresees as Step 1a of its 'Implementation Pathway Spatial Planning 1' the definition and provision of data concerning the impact of climate scenarios on land use (Permanent Secretariat of the Alpine Convention 2021:115). The Working Group Spatial Planning and Sustainable Development included this task in its 2023-2024 mandate in the form of following up the Alpine Climate Target System 2050 – here the implementation pathway IP_SP1 – with the planned output of “Definition and provision of data concerning the impact of climate scenarios on land use”.

Against this background, the paper at hand provides an overview of the scientific discourse on the interface between climate change and spatial planning. It addresses the themes and planning foci of a large body of literature collected and analysed through a scoping review. This literature review is useful for identifying the data needs described above. It also shows that there are knowledge gaps in the academic literature on the links between spatial planning and climate change.

2. INTRODUCTION: The Link Between Spatial Planning and Climate Change

When talking about spatial planning, one has to differentiate planning and development. First, planning in a formal and legally binding way is mostly assigned to the local and regional level. Second, spatial development addresses the topic in a less binding, 'softer' way. Funding programs, strategic plans, and governance processes play an important role in this field. Spatial planning – in a formal, juridical and technical sense – is mostly organised via domestic mandates. Spatial development can be found throughout the multi-level system, including the pan-Alpine level.

Both spatial planning and development have the task of coordinating sectoral policies and dynamics from a territorial perspective; and vice versa, spatial development and -planning are strongly influenced by sectoral dynamics. The integrated or strategic perspective is an important aspect of the sustainability objective of spatial planning and development: Balancing sectoral demands helps safe-guarding future qualities of the Alps as a living space and habitat (see Figure 1).

¹ <https://alpineclimate2050.org/climate-action-plan-2-0/spatial-planning/pathway-1/>

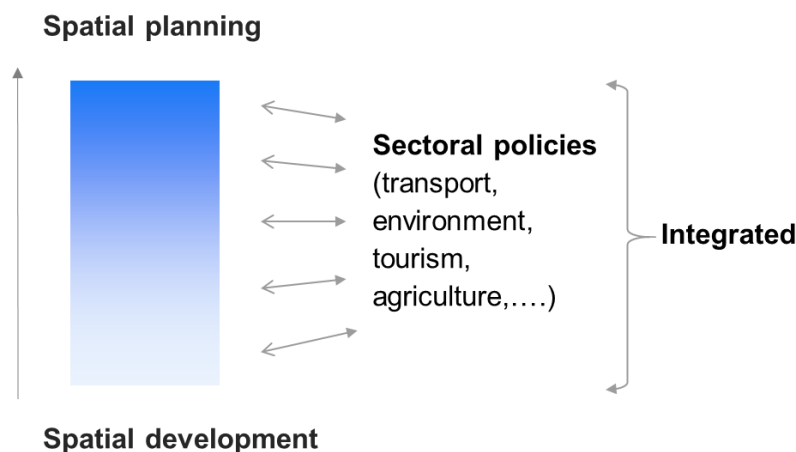


Figure 1: Spatial planning, spatial development and sectoral policies (own elaboration)

Spatial planning has a major potential to address both climate change mitigation and adaptation to its impacts (Hurlimann & March 2012). This understanding is based on the recognition that the spatial configuration of settlements and regions, as well as land use and development, have significant impacts on climate change. There is no doubt about the importance of the interaction between spatial planning and climate change (Biesbroek et al. 2009, Chilla et al. 2022).

Scientific literature reflects the current academic discourse on climate change and spatial planning. A search for “spatial planning” and “climate change” in Scopus, a leading database of international scientific literature, shows around 1,200 results, underscoring this importance. A search request for “climate change” and “Alps” yields almost 4,000 hits. Adding “spatial development” to the query reduces the number of hits to 73. “Spatial planning” instead of “spatial development” lead to only 40 hits. This shows that there is a lot of literature on climate change in the Alps (4,000), much less on the interface between spatial development and climate change (only 73), but much less on the link between spatial planning and climate change (namely 40) in the Alpine region. Against this background, the aim of this study is to explore the thematic interface in the academic discourse.

3. METHOD: Scoping Review

A so-called scoping review is the appropriate method to explore academic discourses. Scoping reviews have been developed as a methodology to map study fields, data sources, approaches and methods (Peters et al. 2015). They are an ideal tool to determine the scope or coverage of a literature-body on a given topic and provide an overview of its focus (Munn et al. 2018). They are also used to identify knowledge gaps, set research agendas and identify implications for decision-making (Tricco et al. 2016). The review process follows obligatory three steps of a scoping review (Peters et al., 2015; Casali et al. 2022): (a) planning the review by developing

selection criteria; (b) identifying relevant literature through database searches, screening and selection; (c) conducting the review and charting the results.

a) Planning the review

The selection criteria for the analysis are the following ones:

- 1) The included papers address the *interface* between spatial planning and climate change. This step excludes studies with a too narrow research focus (e.g. only on climate change without addressing spatial planning).
- 2) Those papers were excluded that have only indirect relevance for spatial planning (e.g. by postulating that a sectoral dynamic is generally important for planning) without addressing planning concretely (i.e. technical planning, policy options, recommendations).
- 3) Papers with a focus on the European Alps were included but not those publications addressing the Alps in New Zealand, Australia and Japan.
- 4) The included papers had to be peer-reviewed and listed in Scopus and Web of Science.

b) Databases and search strategies

The scoping review relies on the Scopus database and Web of Science. Scopus is the abstract and citation database of the Elsevier publishing company and is, in terms of size, amongst the largest databases worldwide (Gurgiser et al 2022; Singh et al 2021). Web of Science is the oldest, most widely used database of publications and was used to ensure the validity of the articles and for its broad and multidisciplinary coverage (Birkle et al. 2020).

Relying on Scopus and Web of Science means excluding non-scientific studies and planning documents that can be highly relevant for spatial planning 'on the ground'. However, the main strength of this approach is its systematic coverage of scientific publications, which is supported by quality assurance processes and has gained international recognition. As a result, a scoping review reflects the internationally available knowledge based on scientific publications; even if it does not reflect all regional and local expertise from practitioners.

The data query was carried out on 26th October 2023. The 'all-time' timeframe was chosen, and no specific language was selected. The search is based on Boolean operators. Six queries within the 'article title', 'abstract', and 'keywords' were performed.

- ((“spatial planning” OR “spatial development” AND “climate change”) AND “alps”)
- ((“spatial planning” OR “spatial development” AND “climate change”) AND “alpine”)
- Spatial development AND climate change AND alps
- Spatial development AND climate change AND alpine
- Spatial planning AND climate change AND alps
- Spatial planning AND climate change AND alpine

1,159 potentially relevant articles were identified through the searches.

c) Review and analysis

In the first step, the studies were screened for relevance based on title scans and 1,068 articles were excluded. This step was performed independently by two reviewers. There were hardly

any discrepancies between the selection results. After the title scans, only 91 papers remained relevant (Figure 2). Once the articles had been selected according to the above criteria, the literature was analysed. In order to map the themes and planning focus, the information was collected in tables by analysing each article. The analysis covered two different perspectives:

First, the topics covered in the papers were categorized to identify priority research areas and research gaps. Twelve sectoral priorities were defined:

- climate change adaptation (long-term measures),
- water management,
- disaster risk management,
- land-use changes,
- agriculture,
- forestry,
- biodiversity,
- ecosystem services,
- energy,
- economic development,
- tourism and
- transport.

Secondly, the documents were categorised based on the scale they addressed: local/regional/national and transnational or cross-border. They were also categorised based on whether they focused solely on one sector (sectoral planning) or integrated (cross-sectoral) planning, which takes a more holistic approach to address multiple issues.

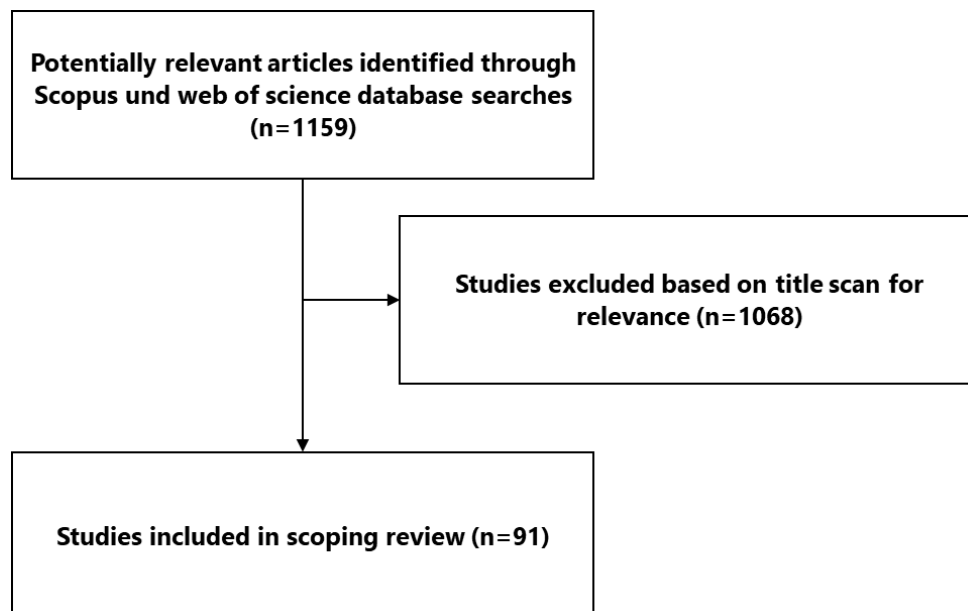


Figure 2: Scoping review process of the study selection

4. FINDINGS

The time distribution of the publications is shown in Figure 3. The earliest paper on spatial planning and climate change dates back to 2001 and focuses on flood events in the (Alpine) Rhine basin. Two peaks in the number of papers can be observed, one in 2013 and the other in 2021. The number of papers on this topic has been increasing since 2012, with a low of four papers in 2016. The significance of spatial planning and development in mitigating and adapting to climate change has gained importance in academic discourse over the last decade.

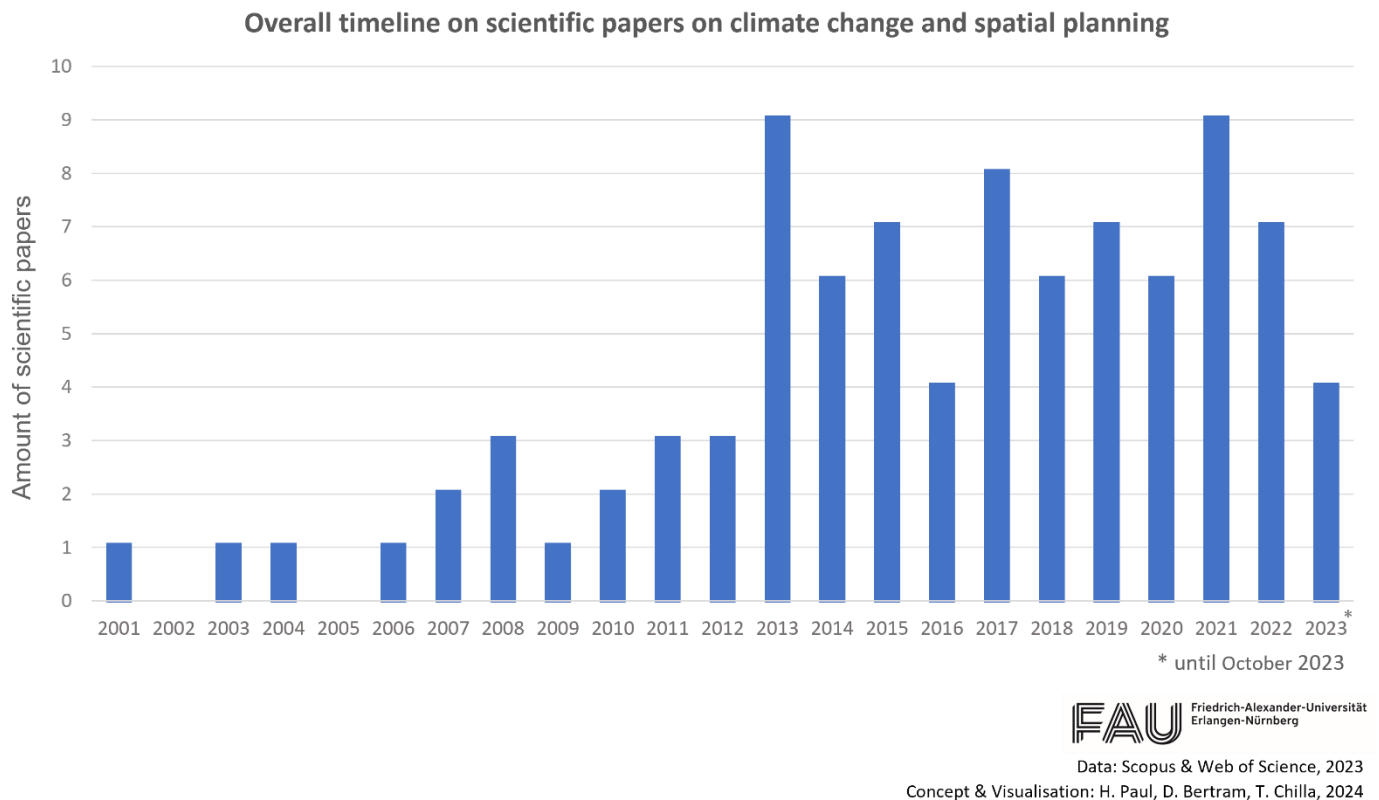


Figure 3: Development of the publication intensity over time

In addition to analysing the temporal distribution of research publications, the thematic distribution of the body of literature was also mapped (Figure 4). The chart provides a comprehensive overview of the literature categorised by different thematic domains, ranging from climate change adaptation to transport. Each bubble within the chart represents a specific theme, with its size proportional to the number of papers addressing that particular topic.

Thematic distribution over time

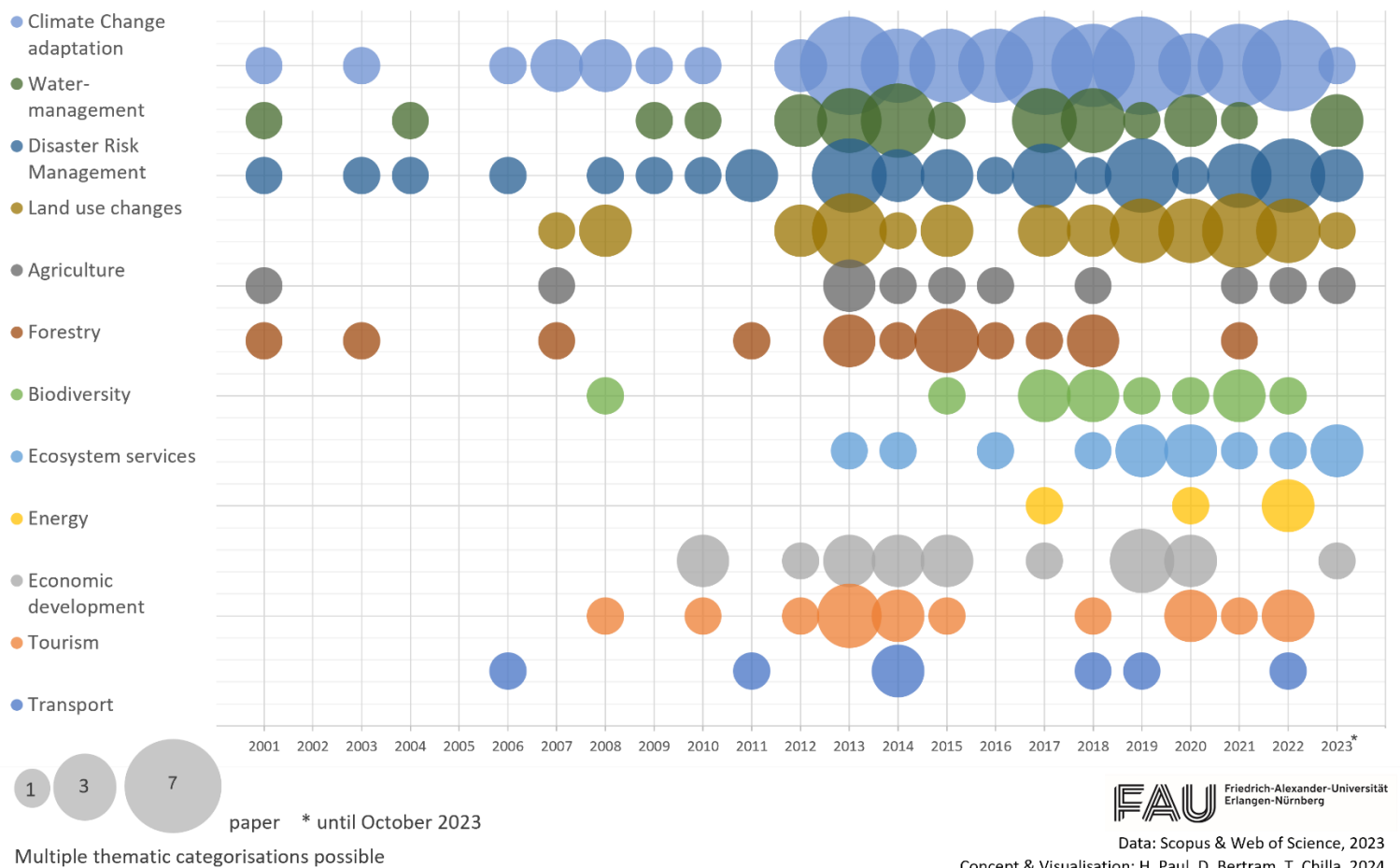


Figure 4: Thematic distribution over time

It is evident that certain issues persist throughout the timeline, particularly climate change adaptation and disaster risk management, which have been long-standing concerns in environmental research. The topics addressed include for example the debate concerning protection areas in the thematic group 'forestry', and the vulnerability of ski tourism and implementation of sustainable tourism via spatial development in the thematic group 'tourism'. Additionally, more recent topics like energy and transport are also discussed, although they are not novel in the academic discourse on the interface between climate change and spatial planning. Overall, the body of literature predominantly focuses on environmental concerns, with less attention given to other sectors such as tourism or the economy.

Figure 5 shows the distribution of the planning focus and the distribution of the scales in the papers. The left bar shows the local/regional and national analysis, the right bar the transnational (cross-border or pan-Alpine) ones. The blue bar represents a sectoral planning approach while the yellow one is integrated or cross-sectoral. Integrated spatial planning generally refers to spatial planning that goes beyond conventional or single-purpose land-use planning. It is comprehensive, integrated and long-term. Integrated planning takes into account the mandates and impacts of other sectoral policies that affect the territory of a region and the use of

its land resource. The objective of integrated spatial planning involves planning for future development and investment opportunities in a specific geographic area, taking into account all relevant policies and their impact on the area and its inhabitants (Lausche 2019). Sectoral planning, such as transportation or landscape planning, uses sector-specific laws to balance sectoral tasks and measures, affecting the spatial development and function of an area by utilizing space and land (Danielzyk & Münter 2018).

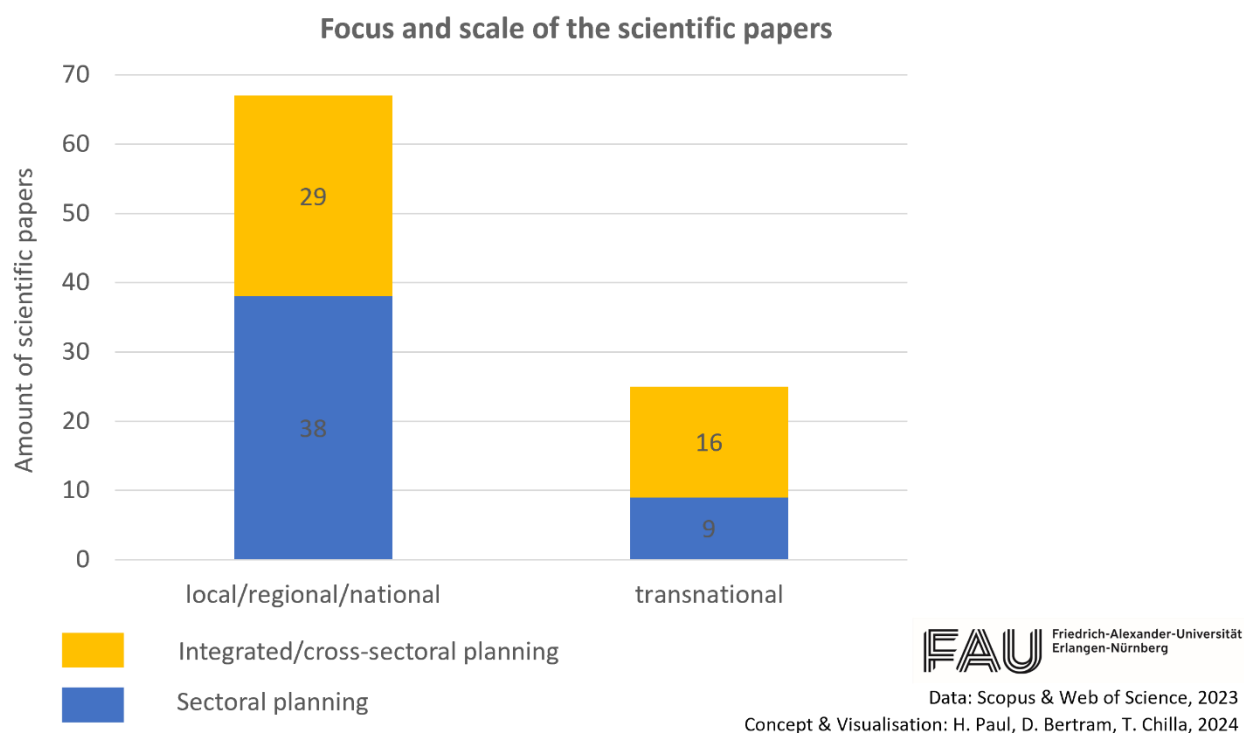


Figure 5: Focus and scale of the analysed publications

It is obvious that there are far more local or national studies than transnational ones. This is because the academic articles focus more on local or national case studies than on a pan-Alpine or cross-border perspective. The cross-sectoral approach is also well represented in the academic debate, particularly in papers with a transnational focus. However, in order to address the current challenges of climate change, local and sectoral thinking is not sufficient. An integrated, cross-border planning approach like the Alpine Spatial Planning perspective bears obvious potential.

5. CONCLUSION

The scoping review on the interface of spatial planning and climate change scientific literature in the Alpine region has revealed important gaps. Although there is a substantial body of literature addressing climate change as such, there are only few publications that integrate spatial development/planning and climate change. The analysis suggests that there are more sector-specific studies than those taking an integrated spatial perspective. Additionally, the focus is primarily on local and national case studies, rather than on the cross-border or pan-Alpine

scale. Furthermore, the literature predominantly focuses on environmental concerns (e.g. land use changes or disaster risk management), with less attention to other important spatial planning sectors, such as transport or energy issues. This limits the understanding of the multifaceted challenges posed by climate change and inhibits the development of integrated planning strategies.

This finding can be seen as a call for more interdisciplinary collaboration and a broader consideration of spatial planning approaches in climate change research and policy development. The analysis shows the potential of integrated spatial planning approaches to address the complex challenges posed by climate change in the Alpine region and beyond. By transcending traditional disciplinary boundaries and adopting a long-term, integrated perspective, spatial planning can facilitate sustainable development and resilience-building.

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