ARL ACADEMY FOR TERRITORIAL DEVELOPMENT IN THE LEIBNIZ ASSOCIATION

**Positionspapier aus der ARL 159**

# PLANNING, DESIGNING AND IMPLEMENTING GREEN INFRASTRUCTURE

## A contribution to Alpine spatial planning

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## A contribution to Alpine spatial planning

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The ARL Bavaria Forum is one of seven permanent regional ARL forums in Germany that deal with current issues of state, regional and urban development in their respective regions and address cross-border topics. As a regionalised activity of the ARL European Working Group AlpPlan (Alpine Spatial Planning Network), the working group brought together representatives from spatial science and planning/administration practice from Austria, Switzerland, Liechtenstein and Germany to facilitate a specialist cross-border exchange on green infrastructure in the north-eastern Alpine region.

**Executive Summary**

The Alpine region faces multiple challenges, such as climate change and the biodiversity and energy crises. In addition, there is increasing competition between different land uses and pressure on land and services, for example from recreational activities. Furthermore, these challenges in the Alps cannot always be compared with other regions, mainly due to the specific natural conditions. At the same time, different national frameworks apply to the area, and the Alpine countries have committed themselves to the Alpine Convention, a holistic policy for the conservation and protection of the Alps, which is binding under international law.

Spatial planning and development play a crucial role in the implementation of global, European and national goals for securing and restoring biodiversity. The concept of green infrastructure, defined as a strategically planned network of natural and near-natural areas, is of central importance in this context and complements the specialist debates on securing open spaces through planning and on Alpine spatial policy.

International, European and national guidelines call for greater consideration of ecological concerns in spatial planning. The Global Biodiversity Framework, the EU Biodiversity Strategy, the EU Regulation on Nature Restoration and the Alpine Convention are important frameworks here. At the same time, targets for expanding renewable energies, for example, are intensifying land-use competition. Due to its cross-departmental and integrative role, spatial planning is taking on increasing responsibility for creating the conditions for the joint implementation of these widely recognised goals at the various spatial planning levels.

The implementation of the green infrastructure concept requires a change of perspective in spatial planning so that ecological functions are placed on an equal footing with other land uses. Close coordination between spatial planning and various specialist departments (e.g. agriculture and forestry, nature conservation, water management and the energy sector) and the involvement of land users and civil society are essential. The municipalities play a particularly key role in implementation and communication, but they themselves need special support and awareness training in this area.

An effective network of green infrastructure in the Alpine region promotes biodiversity, protects against the impact of climate change and offers opportunities for multiple-benefit land-use strategies. Spatial planning can create a framework for the long-term development of these areas and connecting corridors. In the Alpine region, ecological connectivity along vertical gradients is of particular importance. Planning with a spatial impact should therefore be able to demonstrate biodiversity and connectivity mainstreaming, ensuring it makes an integral contribution to protecting biodiversity and ecological connectivity.

In order to achieve this and to holistically promote green infrastructure in the Alpine region, structural improvements are necessary in various areas:

> the creation of a suitable legal framework,

> the further development of planning principles and instruments,

> the provision of tailored and unbureaucratic funding,

> the strengthening of interdepartmental cooperation

> and the mobilisation of civil society actors.

This requires both superordinate planning with binding guidelines and bottom-up initiatives at the local level. It is important to encourage a change of standpoint and to ensure that open spaces with their extensive land uses and ecological connectivity are viewed as multifunctional, structuring elements from a spatial planning perspective.

# PLANNING, DESIGNING AND IMPLEMENTING GREEN INFRASTRUCTURE

## A contribution to Alpine spatial planning

### Contents



**Abstract**
The Alpine region faces particular challenges in implementing the international targets of the Global Biodiversity Framework and the EU Nature Restoration Law. In addition to established components of spatial planning, such as landscape protection or local recreation provision, ecological concerns are increasingly in the spotlight. This position paper from the cross-border working group of the ARL Bavaria Forum considers the multifunctional concept of green infrastructure to be a profitable approach for strengthening the role of spatial planning in the northern Alpine region, specifically with regard to coordinating planning and measures related to open spaces. Such measures and plans have to date been the responsibility of a wide range of specialist departments and are often considered and treated in isolation. At the same time, the intention is also to promote acceptance of government sustainability goals and the effective use of public funds. The position paper outlines a vision of an efficient network of green infrastructure in the Alpine region that, above all, strengthens ecological connectivity and is secured by a spatial planning framework. In order to achieve this, recommendations for action include strengthening the legal framework, ensuring the suitability of planning instruments, promoting and financing measures to implement green infrastructure, strengthening interdepartmental cooperation and mobilising civil social actors.

**Keywords**
Green infrastructure – Spatial planning – Alpine region – Open space – Intersectoral cooperation – Ecological connectivity

## 1 Introduction and research focus

Spatial planning and other related specialist departments, indeed society as a whole, are facing multiple crises, such as climate change and the biodiversity and energy crises. In addition, there is increasing competition between land uses such as agriculture and housing development, exacerbated in some areas by the urgent demands of leisure and recreational use. Furthermore, targets and simplified approval procedures for the expansion of renewable energy need to be implemented.

The challenges and conditions in the Alps are not always comparable to other areas, particularly due to the specific natural conditions. These include the limited availability of land due to the relief, the foreseeable increase in natural hazards resulting from climate change, and the effects of climate change on the pronounced biodiversity, which notably includes some highly specialised

species. The Alps also perform important functions, such as acting as a water reservoir for areas extending far into the foothills, which makes the issues here particularly relevant. Despite Alpine-wide instruments such as the Alpine Convention and the EU Strategy for the Alpine Region (EUSALP), there are different national requirements and approaches in the individual Alpine countries. Cross-border cooperation is a necessity but often remains limited to the project level.

In addition to the challenges of land availability and finance, there is a specific requirement for spatial planning and development to contribute to the implementation of global, European, national and federal state objectives. Furthermore, the need to expand green and blue infrastructure and to (re)establish ecological networks has been recognised. Current challenges confronting green infrastructure (GI), e.g. due to species decline and the fragmentation of natural habitats, are particularly relevant in the Alpine region, which is of outstanding importance as a cross-border European cultural and natural landscape with a comparatively high proportion of near-natural open spaces (Job/Meyer/Coronado et al. 2022; ARL 2022). Furthermore, various legal requirements arise from the binding implementation protocols of the Alpine Convention,[1] particularly in the fields of nature conservation and landscape management, spatial planning and sustainable development, and mountain agriculture and mountain forests. These requirements have already been taken into account in various national instruments, such as the inclusion of resource-conserving and climate-change-related open space design in the ten-point programme of the Austrian spatial development concept ÖREK 2030 (ÖROK 2021). This ranges from small green spaces within built-up areas to contiguous open space corridors, large-scale landscapes and protected areas, as well as connectivity between them. The Principality of Liechtenstein also dedicates one of the seven fields of action in their national action plan Biodiversity 2030+ to green infrastructure, with the aim of establishing strategically planned green infrastructure with connecting axes (Fürstentum Liechtenstein 2024).[2] Target 2.3 of the German National Strategy for Biological Diversity 2030 (*Nationale Strategie zur Biologischen Vielfalt 2030* – BMU 2024) envisages the further development of a functional biotope network with a high-priority focus on network sections that should be reconnected, international interfaces in the biotope network, important connectivity structures in highly fragmented habitats and connecting spaces in ribbon-like settlement structures.

In many places, it has become apparent that existing government instruments (especially those relating to nature conservation) are insufficient to effectively halt the loss of biodiversity across the region, particularly at lower altitudes and in the Alpine valleys. However, this is only one of many demands on space that need to be taken into account by spatial planning. At the same time, both the Alpine Convention and various spatial planning regulations in the border region of Germany/Liechtenstein/Austria/Switzerland, which is the area under consideration here, recognise the fundamental need to reconcile ecological functions with the spatial requirements of the economy and society.

Green infrastructure plays a key role here due to its diverse spatial uses, functions and services, the development and maintenance of which can only be accomplished through cross-level, cross-sector and cross-actor cooperation. Spatial planning can make a significant contribution to securing and expanding green infrastructure by protecting and developing near-natural open spaces, promoting the connectivity of habitats, ensuring closer integration of ecological aspects into spatial decision-making processes and, at the same time, creating added value for other land uses, such as agricultural food production or nature-based recreation. Green infrastructure is defined by the EU as 'a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services [...]' (European Commission 2013: 1.2). Thematically closely related, and particularly well established

1 https://www.alpconv.org/de/startseite/konvention/protokolle-deklarationen/ (24 February 2025).

2 Also see the German Sustainability Strategy 2021 with the goal of establishing a transnational biotope network covering 10% of the country's territory by 2025 (Bundesregierung 2021).

in the field of spatial planning, is the concept of open space, which from a supra-local, spatial planning perspective, in line with planning law stipulations, can be defined as largely unsealed areas that are not explicitly intended for settlement or transport purposes, but are rather to be secured and developed for specific open space functions or uses (ARL 2025: 5). This position paper uses both concepts or terms in a complementary manner, but refers primarily to green infrastructure in order to emphasise its multifunctional character and to ensure consistency with the EU's GI strategy.

Against this technical and political backdrop, the ARL Bavaria Forum established the cross-border working group Green Infrastructure in the Northern Limestone Alps: Integrative (Open-Space) Planning for Natural Climate Protection, Ecological Connectivity, Natural Hazard Prevention and Renewable Energies (*Grüne Infrastruktur in den nördlichen Kalkalpen: Integrative (Frei-) Raumplanung für natürlichen Klimaschutz, ökologische Konnektivität, Naturgefahrenabwehr und Erneuerbare Energien*), which pursues a practice-oriented and comparative approach. Drawing on a wide range of expertise and transnational exchange, approaches to strengthening green infrastructure were compiled and joint recommendations developed. The recommendations for action formulated in this position paper should also be seen as contributing to the discussion on Alpine spatial planning, which today is understood as seeking integrative planning solutions for complex challenges at the nexus of Alpine settlement, tourism and transport development, and nature and climate protection (see Job/Meyer/Coronado et al. 2024; Schindelegger 2020). According to Tischler (2022: 10), Alpine spatial planning encompasses all measures and activities of public authorities, companies, associations and private individuals that focus on the future design of the Alpine region, taking into account regional, national and international objectives.

## 2 International guidelines create new urgency

In recent years, targets and guidelines have been formulated on global, European and national levels stipulating a much greater emphasis on and consideration of ecological concerns in spatial planning. These include the Global Biodiversity Framework adopted at the 15th UN Biodiversity Conference in Montreal,[3] the EU Biodiversity Strategy,[4] the EU Nature Restoration Regulation[5] and the targets and objectives formulated by the nation states of the Alpine region.[6] As a binding agreement under international law, the Alpine Convention also provides measures for its signatory states to establish a cross-border ecological network, for example in Article 12 of the Protocol on Nature Conservation and Landscape Management.

In addition, the Renewable Energy Directive (RED I-III) sets targets for the expansion of renewable energies, which has exacerbated competition between land uses in open spaces by establishing acceleration areas for renewable energies. This is because measures to simplify and accelerate planning processes for the expansion of (energy) infrastructure risk watering down key environmental and participation standards. There have been many demands to reduce bureaucracy, but this particularly impacts opportunities for citizen participation in spatial planning (cf. Busse/Grefe 2024: 99 f.). Going forward, with its interdepartmental and integrative role, spatial planning will be increasingly responsible for creating the conditions for the joint

3 For instance, restoration of 30% of global (land) ecosystems by 2030, placing 30% of all land areas under protection by 2030, and identification and elimination of biodiversity-damaging subsidies of US$ 500 billion per year by 2030.

4 For instance, placing at least 30% of the EU's land area under protection and placing 10% of the land area under strict protection, establishing a Europe-wide nature network and connecting it through ecological corridors.

5 For instance, restoration measures for 20% of terrestrial ecosystems in need of restoration by 2030 and restoration of all damaged ecosystems by 2050; development, monitoring and updating of national restoration plans.

6 For instance, Germany's national strategy on biological diversity aims to increase the share of protected areas to 30% (on land and at sea), with strict protection sought for one third of these areas. The objectives of Austria's biodiversity strategy 2030+ include restoring 30% of Natura 2000 protected sites that are not in favourable conservation status to favourable status by 2031 and improving the status of 30% of endangered biotope types. Switzerland targets a systemic treatment of landscape and biodiversity in spatial planning.

implementation of these societal requirements at the various spatial planning levels. This applies to public acceptance of government sustainability targets and the effective use of public funds and resources.

## 3 Green infrastructure requires transdisciplinary, stakeholder-oriented action

At an abstract level, safeguarding ecological functions and natural habitats is part of the remit of spatial planning. At a concrete level, however, there is often a lack of corresponding provisions in spatial development plans: graphic specifications such as regional green corridors address individual aspects of the range of services provided by green infrastructure, but do not constitute a coherent spatial planning instrument for the protection and development of the same. They often focus more on settlement structure, local recreation provision and local climate. Spatial planning specifications for biotope axes target ecological connectivity, but are not fully identified and depicted in regional planning documents. One challenge is therefore to close the implementation gap between planning objectives and instruments, for example in the form of quotas to limit land take for housing and transport (Blecken/Böhnke/Götze et al. 2025).

Spatial planning finds itself in a field of conflict between:

> mandatory and voluntary approaches,

> demands for faster and simpler planning (e.g. for the expansion of renewable energies) on the one hand and expectations of greater participation on the other,

> the complexity of managing diverse spatial demands and the deficits of spatial planning instruments, and

> the dichotomy of the long-term need to protect open spaces and short-term local political constraints.

The municipal level is key in this context, acting as an interface: municipalities are responsible for their local contexts and for implementing higher-level plans. This means that they must represent their own local interests while also taking supra-local goals and requirements into account. In addition, municipalities play an important role in communicating with the local population, especially when it is necessary to render unpopular measures acceptable. Political actors are therefore responsible for a great deal of awareness raising. However, municipal governments are not usually made up of planning experts, and their local government responsibilities in themselves involve a wide range of mandatory tasks. This means that, as multipliers for newer and more unfamiliar topics such as green infrastructure, they require information.

What is needed is a change of perspective in spatial planning, one which gives green infrastructure the same importance as grey infrastructure (ARL 2025). The planning and implementation of a network of green and blue infrastructure is a transdisciplinary task and requires close coordination and binding interfaces between spatial planning and other spatially relevant departments such as agriculture and forestry, nature conservation, water management and the energy sector. This also applies to the distinction between, and different responsibilities related to, the management of land uses and the implementation of measures. In addition to official action, the perspectives and contributions of land users and landowners are of central importance: How can awareness of the issues be raised and people be motivated to integrate aspects of green infrastructure into land use?

What financial incentives, know-how (e.g. on production-related measures) and legal requirements are necessary for this?

Civil society engagement is another key factor that can supplement the limited administrative capacities for implementing a green infrastructure network. Superordinate planning with binding guidelines must therefore be complemented by the facilitation and support of bottom-up initiatives at the local level. One promising approach for the latter, for example, are rural development initiatives by the Bavarian administration that first establish a communication framework within which local actors can work on implementation ideas and solutions on an equal footing.

## 4 Vision of an efficient network of green infrastructure in the Alpine region

A functioning green infrastructure network promotes biodiversity and ecosystem stability in the climate crisis. It thus protects humans from the effects of climate change and the impact of species loss on anthropogenic systems (agriculture) and, as a nature-based solution, offers enhanced opportunities for cost savings and efficiency gains compared to anthropogenic mitigation and compensation measures.

Green infrastructure is a multifunctional concept that forms part of multiple-benefit land-use strategies (WBGU 2020) and thus contributes to the widespread resolution of conflicts between biodiversity and climate protection on the one hand and agricultural land use on the other. This framework is secured by spatial planning and allows areas and corridors to develop over the long term and thus achieve high ecological value. This is essential given the volatility of cooperative, non-mandatory approaches and their dependence on scarce budgetary resources and political priorities. The Alpine region is a biodiversity hotspot with a high level of exposure due an increased risk of natural hazards. It is therefore particularly important to ensure the ecological connectivity of different altitudes in response to climate change. A promising approach could be to ensure that planning with a spatial impact demonstrates biodiversity (Wilson 2023) and connectivity mainstreaming,[7] so that it makes an integral contribution to protecting biodiversity and ecological connectivity.

## 5 Recommendations for action

### Legal framework

The role of green infrastructure can be reliably strengthened in planning processes if the appropriate legal conditions are created. The legal framework should reflect the paradigm shift towards open space being a key planning focus. To this end, it is necessary to explicitly stipulate the protection and development of green infrastructure as a task of spatial planning and to anchor this in law in all four countries. A promising approach could involve interdepartmental planning of the open space required with regionalised area targets and implementation deadlines, comparable to the German Wind Energy Area Requirements Act (*Windenergieflächenbedarfsgesetz*), which would also tie in with the current requirements of the EU Nature Restoration Law. This would create comparable guidelines for all regional planning units throughout the country and, where necessary, provide financial compensation for spatial inequalities.

In many countries in the Alpine region, spatial planning pursues the fundamental goal of creating a large-scale, ecologically effective network of open spaces (cf. Art. 6 Para. 2(3) Sentence 3

7 See the declaration 'Achieving functional biodiversity in the Danube-Carpathian Region by mainstreaming ecological connectivity' at http://www.carpathianconvention.org/tl_files/carpathiancon/Downloads/02%20Activities/Biodiveristy/Connectivity%20Declaration_Final_with%20logos_f.pdf (13 May 2025).

BayLplG[8]). The EU Biodiversity Strategy and the EU Nature Restoration Regulation have created ambitious and, in some cases, binding frameworks at European level, which must now be implemented at various spatial levels. By coordinating and integrating specialist planning, spatial planning has the opportunity to incorporate the pending ecological improvement measures into a comprehensive and multifunctional concept. Within the scope of its competences and existing concepts (e.g. the German Federal Green Infrastructure Concept – *Bundeskonzept Grüne Infrastruktur*), spatial planning at national level can set guidelines for connectivity planning in the form of a national biotope network and cross-border biotope networks (SRU/WBGR/WBW 2024). The aim should be to bundle interdepartmental cooperation and the various specialist activities in order to implement plans that are as effective and acceptable as possible.

## Planning principles and instruments

Local, individual initiatives are essential for establishing an effective green infrastructure network. At the same time, overall spatial strategies based on specialist knowledge are needed to identify gaps and areas where action is required, and to optimise the way in which local initiatives can contribute towards a coherent network. Analogous to established demand-based planning, such as the demand-based planning of transport infrastructure or the areas of action in spatial planning, the ARL working group Securing and Developing Open Space in Spatial Planning (Freiraumsicherung und -entwicklung in der räumlichen Planung) proposes the demand-based planning of open space (cf. Hüppauff/Kufeld 2025). This would be a logical corollary of the above-mentioned paradigm shift. It would allow the identification of open spaces that required particular action, which in turn could form the basis for the focused application of planning instruments and funding.

In view of the ambitious targets for nature restoration and conservation, it makes sense to combine different degrees of commitment towards green infrastructure. A core framework can be anchored in planning law and flanked by supplementary structures that may be more flexible in terms of both time and space, thus requiring a correspondingly lower level of long-term commitment. The latter could include, for example, agri-environmental measures or comparable voluntary measures. Established concepts such as open space network systems could thereby gain new significance and value. Appropriate digital tools could accompany such processes as planning support systems (cf. the set of criteria proposed by Neu/Ismail/Reusser 2024) and could also support the communication of procedural steps and process results, for example through interactive 3D visualisations.

Planning instruments such as Bavaria's municipal landscape plans and regional landscape frameworks (*Landschaftsrahmenpläne*) would be suitable for securing and developing green infrastructure across the whole region and in specific areas. However, their content is not wholly incorporated into regional development plans and is not sufficiently linked to implementation instruments – the latter in particular do not apply to the whole region. Current developments, such as the drawing up of the nature restoration plans and the related measures, seem to serve as future points of reference in this regard. It is therefore necessary to further develop the planning principles for green infrastructure and to make them more binding. Cross-border consistency between spatial concepts and plans is particularly important in the Alpine region, where natural regions often cross national borders. Positive examples include the two cross-border agglomeration programmes in the Alpine Rhine Valley,[9] where the strategic plan is linked to specific implementation projects and co-financed by the Swiss Confederation. Regional development concepts include ecological networking, green infrastructure and biotope networks in text (objectives and measures) and plans. These then form the basis for assessments, for example of land-use plans.

8 Bayerisches Landesplanungsgesetz (BayLplG) of 25 June 2012 (GVBl.: 254, BayRS 230-1-W), last amended in § 4 of the Act of 23 July 2024 (GVBl.: 257)

9 cf. https://agglomeration-rheintal.org/agglomerationsprogramm/ (13 May 2025).

Recently, infrastructure projects have also included measures to improve the climate and promote biodiversity in the landscape.

Not all the supra-local spatial planning instruments that impact open space protection and green infrastructure have the same prerequisites, making it difficult or impossible to generalise about their potential. To support further well-founded debate, the authors of this position paper have developed a matrix, which can be found in the appendix. It provides an overview of existing instruments in the part of the Alpine region under investigation, including an assessment of their multifunctional character, their binding nature for subordinate planning levels and their impact on green infrastructure.

## Finance and funding

The central lever for establishing (and also maintaining) green infrastructure is the law governing state and federal funding programmes, including the implementation of EU funding programmes. There are a variety of funding options for realising projects in the field of green infrastructure. At the same time, there is a high demand for finance across all administrative levels in order to meet the aforementioned challenges. Consequently, not only must funding be made consistently available and its fields of use diversified, but the effort required to apply for funds must also be reduced and applicants must be empowered to navigate the complex funding regulations. The combination of low-threshold access to funding in the field of green infrastructure and expert, high-performing bodies helps to ensure the targeted and efficient use of funding. Obstacles can be removed, for example, by bundling funding opportunities across departments, streamlining billing, simplifying public procurement law, standardising inspections and earmarking periods, and rewarding personal contributions. A considerable lever could be created by linking EU Common Agricultural Policy funds even more closely to nature conservation and spatial planning concepts for open space protection and ecological networking. A complementary approach could be to conduct social science evaluations to optimise the success of the funding option from the applicants' perspective.

A comprehensive and coherent network of green infrastructure can only be successfully implemented by linking and supporting spatial planning concepts with financial instruments that offer effective incentives for those working with the land, for businesses and for municipalities (e.g. the Federal Ministry for the Environment, Climate Action, Nature Conservation and Nuclear Safety's [BMUV] programme Natural Climate Protection in Municipalities [*Natürlicher Klimaschutz in Kommunen*]). For example, after identifying ecological corridors, they can be optimised and secured, at least temporarily, through additional subsidies for agri-environmental measures. So-called eco-points can also be offered in return for contributing to a regional biotope network system. In addition to public funds, private capital can also be mobilised through $CO_2$ certificates or the financing of environmentally oriented companies and projects by socio-ecological banks.

The positive external effects of green infrastructure and functioning ecosystems (ecosystem services, One Health[10]) are well-proven and justify greater financial commitment. In addition to funding, it is therefore at least as important to promptly reduce counterproductive subsidies and incentives that are harmful to biodiversity (cf. Burger/Bretschneider 2021; Zerzawy/Beermann/Fiedler et al. 2021; Gubler/Ismail/Seidl 2020), as envisaged in the implementation of the Global Biodiversity Framework.

10 The One Health approach assumes that the health of humans, domestic and wild animals, plants and the wider environment (including ecosystems) are closely linked and interdependent; see https://www.who.int/health-topics/one-health#tab=tab_1 (29 July 2025).

## Interdepartmental networking and cooperation

Interdepartmental exchange within the working group has highlighted the potential that lies in more intensive and binding coordination and in interfaces between spatial planning and the other departments involved in spatial issues. A cross-departmental definition of responsibilities and workflows would allow a much more effective use of resources in the development and safeguarding of green infrastructure.

Spatial planning can play a coordinating role in the implementation of open space concepts and multiple-benefit strategies in the landscape: not as the implementer of measures, but as a 'caretaker' with a mandate for strategic interdepartmental coordination. This expansion of the remit of spatial planning would also require structural adjustments: proactive land agencies could serve as contact and coordination points for land provision, implementation and the consolidation of measures.

## Mobilisation, communication and awareness raising

By creating the right conditions and raising awareness, it is possible to win over land users to green infrastructure measures and spread innovative approaches. The focus here is not necessarily on comprehensive, region-wide regulations or coordination. Rather, it is about creating a framework in which pilot approaches can be tested according to the principles of cooperation and voluntariness. This includes the courage to allow for unplanned developments in specific cases and to foster an open culture of error in which failure is also permitted. Examples of how to win over and motivate land users include the *Allgäuer Moorallianz* in Bavaria,[11] which has ensured the cooperative implementation of a large-scale nature conservation project, and the *Boden-Freiheit*[12] initiative in Vorarlberg, which purchases land through crowdfunding and keeps it undeveloped. In Bavaria, the Rural Development Administration (*Verwaltung für Ländliche Entwicklung*) recently pursued pilot initiatives such as *land.belebt*[13] and *boden:ständig*[14] that established a communication framework within which all stakeholders could talk to each other on an equal footing. The main participants were citizens willing to implement the initiatives and landowners, while the authorities only became involved at the second stage, for example when it came to funding.

Municipal politicians can play a particularly key role in promoting green infrastructure by actively encouraging communication and awareness raising at the local level. More specifically, municipal maintenance employees can be approached for support, especially for maintenance work. But citizens can also be motivated to get involved. It is essential to communicate the role of green infrastructure in understandable language. Targeted information campaigns and participatory processes upstream of decision-making can highlight the advantages and necessity of green infrastructure to political actors, thereby increasing acceptance among the population (cf. Salchner/Weizenegger 2025). However, it is important to encourage a change of standpoint and to ensure that open spaces with their extensive land uses and ecological connectivity are viewed as multifunctional, structuring elements from a spatial planning perspective.

11 https://www.moorallianz.de (29 July 2025).

12 https://www.bodenfreiheit.at (29 July 2025).

13 https://land-belebt.bayern/ (29 July 2025).

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## Appendix

### Matrix illustrating supra-local spatial planning instruments

### Selection[15] of formal supra-local spatial planning instruments that impact green infrastructure and the protection of open spaces in the Northern Limestone Alps (DE – AT – CH – LIE)

| | Instrument (German terminology) | Instrument (English translation) | Designed to be mono-/ multifunctional | Binding for subordinate planning levels (low/ medium/high) | Green infrastructure directly/ indirectly impacted |
|---|---|---|---|---|---|
| Germany (Free State of Bavaria) | Landschaftliches Vorbehaltsgebiet (Regionalpläne) | Landscape Reserved Area (regional plans) | multi | low | directly |
| | Regionaler Grünzug (Regionalpläne) | Regional Greenway (regional plans) | multi | medium | directly |
| | Trenngrün (Regionalpläne) | Green Divide (regional plans) | mono | medium | directly |
| | Vorranggebiet für Hochwasserschutz (Regionalpläne) | Priority Area for Flood Protection (regional plans) | mono | high | indirectly |
| | Vorranggebiet für Wasserversorgung (Regionalpläne) | Priority Area for Water Supply (regional plans) | mono | high | indirectly |
| | Vorbehaltsgebiet für Wasserversorgung (Regionalpläne) | Reserved Area for Water Supply (regional plans) | mono | low | indirectly |
| | Alpenplan (Landesentwicklungsprogramm) | Alpine Plan (state development programme) | multi | high | indirectly |

15 Protected areas and federal inventories of specialist planning for nature conservation, water management and forestry (e.g. Tyrolean resting areas, Liechtenstein landscape conservation inventory or Swiss federal inventories) were not included in the table as they do not constitute spatial planning instruments. Nevertheless, they play a role in green infrastructure planning and are sometimes included in spatial plans for information purposes.

| | Instrument (German terminology) | Instrument (English translation) | Designed to be mono-/ multifunctional | Binding for subordinate planning levels (low/medium /high) | Green infrastructure directly/ indirectly impacted |
|---|---|---|---|---|---|
| Germany (Free State of Bavaria) | Vorranggebiete für den Klimaschutz | Priority Areas for Climate Protection | multi | high | directly |
| | Vorbehaltsgebiete für den Klimaschutz | Reserved Areas for Climate Protection | multi | low | directly |
| | Vorranggebiete für die Klimaanpassung | Priority Areas for Climate Adaptation | multi | high | directly |
| | Vorbehaltsgebiete für die Klimaanpassung | Reserved Areas for Climate Adaptation | multi | low | directly |
| | Vorranggebiete für die Landwirtschaft | Priority Areas for Agriculture | mono | high | indirectly |
| | Vorbehaltsgebiete für die Landwirtschaft | Reserved Areas for Agriculture | mono | low | indirectly |
| Austria (State of Salzburg) | Alpine Ruhezone (Landesentwicklungsprogramm) | Alpine Resting Zone (state development programme) | multi | low | indirectly |
| | Grünraum- und Wanderkorridore (Landesentwicklungsprogramm) | Green Space and Wildlife Corridors (state development programme) | mono | low | directly |
| | Grüngürtel (Regionalprogramm Salzburg Stadt und Umgebungsgemeinden) | Green Belt (regional programme for the city of Salzburg and surrounding municipalities) | multi | high | directly |
| | Vorrangbereich/ -fläche Ökologie (Regionalprogramme) | Priority Zone/ Land for Ecology (regional programmes) | multi | high | directly |

| | Instrument (German terminology) | Instrument (English translation) | Designed to be mono-/ multifunctional | Binding for subordinate planning levels (low/ medium/high) | Green infrastructure directly/ indirectly impacted |
|---|---|---|---|---|---|
| Austria (State of Salzburg) | Regionale/r Grünzug/-verbindung // (Über-) Regionaler Grünkorridor (Regionalprogramme) | Regional Greenway / Link // (Supra) regional Green Corridor (regional programmes) | multi | medium | directly |
| | Kern-/Vorsorgeraum für Landwirt- schaftsproduktion (Regionalprogramme) | Core/Reserved space for Agriculture/al (Production) (regional programmes) | mono | medium | indirectly |
| | Vorrangbereich Erholung // Kulturlandschaftsbetonte Erholungszone (Regionalprogramme) | Priority Zone for Recreation // Cultural Landscapeoriented Recreation Zone (regional programmes) | multi | low | indirectly |
| | Vorsorgeraum für den regionalen Biotopverbund (Regionalprogramme) | Reserved Space for the Regional Biotope Network (regional programmes) | multi | high | directly |
| Austria (State of Tirol) | Regionalprogramme betreffend überörtliche Grünzonen | Regional Programmes concerning Supra-Local Green Zones | multi | high | directly |
| | Regionalprogramme betreffend landwirtschaftliche Vorrangflächen | Regional Programmes concerning Priority Land for Agriculture | multi | high | indirectly |

| | Instrument (German terminology) | Instrument (English translation) | Designed to be mono-/ multifunc-tional | Binding for subordinate planning levels (low/ medi-um/high) | Green infra-structure directly/ indirectly impacted |
|---|---|---|---|---|---|
| Austria (State of Vorarlberg) | Landesgrünzonen Rheintal und Walgau (Landesraumpläne) | Rheintal and Walgau Regional Green Zones (state spatial plans) | multi | high | directly |
| | Blauzone Rheintal (Landesraumplan) | Rheintal Blue Zone (state spatial plan) | mono | high | indirectly |
| | Inventar Weißzone (Planungsgrund-lage auf Landes-ebene) | White Zone Inventory (planning basis at state level) | multi | low | indirectly |
| | Regionale räumliche Entwick-lungskonzepte (inkl. Entwicklung des Freiraums) | Regional Spatial Development Concepts (including open space develop-ment) | multi | low | indirectly |
| Switzerland (federal level) | Fruchtfolgefläche (Sachplan des Bundes) | Crop Rotation Land (federal sectoral plan) | multi | high | indirectly |
| | Agglomerations-programme (mit Zukunftsbild, Strategien, Maß-nahmen) für Siedlung, Verkehr und Landschaft | Agglomeration Programmes (with vision for the future, strategies, measures) for Settlement, Transport and Landscape | multi | high | directly |
| Switzerland (cantons[16]) | Fruchtfolgefläche (Kantonale Richtpläne) | Crop Rotation Land (cantonal structure plans) | multi | high | indirectly |
| | Wildtierkorridor (Kantonale Richtpläne) | Wildlife Corri-dor (cantonal structure plans) | mono | low | directly |

16 The Swiss Spatial Planning Act contains only very limited provisions on the procedure and responsibilities for structural planning. The responsibility and thus also the binding nature of the individual contents of the cantonal structure plans therefore varies from canton to canton, and also over time.

| | Instrument (German terminology) | Instrument (English translation) | Designed to be mono-/ multifunctional | Binding for subordinate planning levels (low/ medium/ high) | Green infrastructure directly/ indirectly impacted |
|---|---|---|---|---|---|
| Switzerland (cantons) | Gebiet mit Vorrang Landschaft // Kantonales Interessengebiet Landschaftsschutz // Landschaft Kantonaler Bedeutung (Kantonale Richtpläne) | Area with Priority Landscape // Area of Cantonal Interest for Landscape Protection // Landscape of Cantonal Importance (cantonal structure plans) | multi | low | directly |
| | Lebensräume bedrohter Arten – Kern-/Schongebiete (Kantonale Richtpläne) | Habitats of Endangered Species – Core Areas/ Sanctuaries (cantonal structure plans) | mono | high | directly |
| | Gebiet mit Vernetzungsfunktion (Kantonale Richtpläne) | Area with a Connective Function (cantonal structure plans) | mono | low | directly |
| | Landwirtschaftsgebiet, Nichtbaugebiet (Kantonale Richtpläne) | Agricultural Area, Non-building Area (cantonal structure plans) | mono | high | indirectly |
| | Kantonales Interessengebiet Grundwasser (definitive Grundwasserschutzzonen) // Grundwasserreserven (Kantonale Richtpläne) | Cantonal Area of Interest for Groundwater (definitive groundwater protection zones) // Groundwater Reserves (cantonal structure plans) | mono | high | indirectly |
| Liechtenstein | Rechtskräftige Landwirtschaftszone (Landesrichtplan 2011) | Legally Binding Agricultural Zone (2011 state structure plan) | mono | high | indirectly |

| | Instrument (German terminology) | Instrument (English translation) | Designed to be mono-/ multifunctional | Binding for subordinate planning levels (low/ medium/ high) | Green infrastructure directly/ indirectly impacted |
|---|---|---|---|---|---|
| Liechtenstein | Kernlebensräume / Trittstein / Scharnier, Erhaltungszone und Ruhezone (Landesrichtplan 2011) | Core Habitats / Stepping Stones / Hinge Areas, Conservation Zones and Resting Zones (2011 state structure plan) | mono | high | directly |
| | Entwicklungskonzept Landschaft, Zwischenbericht Analyse (Agglomerationsprogramm Werdenberg Liechtenstein 2013, Synthesebericht 2016) | Development Concept for Landscape, Interim Report Analysis (Werdenberg Liechtenstein agglomeration programme 2013, synthesis report 2016) | multi | low | directly |
| | Hitzeangepasste Siedlungsentwicklung (Agglomerationsprogramm Werdenberg Liechtenstein 2021) | Heat-adapted Settlement Development (Werdenberg Liechtenstein agglomeration programme 2021) | mono | medium | directly |
| | Aktionsplan Biodiversität 2030+ (Regierung des Fürstentums Liechtenstein 2024) | Biodiversity Action Plan 2030+ (government of the Principality of Liechtenstein 2024) | multi | medium | directly |

## Current Position Papers of the ARL

No.

159 **Planning, designing and implementing green infrastructure – A contribution to Alpine spatial planning.**
This position paper was prepared by members of the cross-border working group 'Green Infrastructure in the Northern Limestone Alps' (*Grüne Infrastruktur in den Nördlichen Kalkalpen*) of the ARL Bavaria Forum. Hanover, 2025.
https://doi.org/10.60683/yfhf-vf30

158 **Grüne Infrastruktur planen, entwickeln und umsetzen – Ein Beitrag zur Alpinen Raumordnung.**
Dieses Positionspapier wurde von den Mitgliedern der grenzübergreifenden Arbeitsgruppe „Grüne Infrastruktur in den Nördlichen Kalkalpen" des ARL-Forums Bayern der ARL erarbeitet. Hannover, 2025.
https://doi.org/10.60683/s9db-jn28

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https://doi.org/10.60683/9rhx-0b78

156 **Regulation of the European Parliament and of the Council on facilitating Cross-Border Solutions – BRIDGEforEU.**
This position paper was prepared by members of the ad-hoc Working Group 'Cross-Border Solutions' at the ARL. Hanover, 2025.
https://nbn-resolving.org/urn:nbn:de:0156-2505211034385.929456732711
https://doi.org/10.60683/x2zq-ze16

155 **Raumentwicklung für eine gute Zukunft: Jetzt die große Transformation gestalten – Ergebnisse der ARL-Tagung am 7. und 8. November 2024 in Radolfzell am Bodensee in elf Botschaften (Bodensee-Protokoll).**
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https://nbn-resolving.org/urn:nbn:de:0156-2505211031157.680912389280
https://doi.org/10.60683/1svy-2t56

154 **Güterverkehr, Logistik und Raumentwicklung: Planerischer Handlungsbedarf.**
Dieses Positionspapier enthält Ergebnisse und Empfehlungen des Ad-hoc-Arbeitskreises „Güterverkehr, Logistik und Raumentwicklung" der ARL. Hannover, 2025.
https://nbn-resolving.org/urn:nbn:de:0156-2503050823586.528634954613
https://doi.org/10.60683/mnk2-em11

153 **Aktuelle verkehrsrechtliche Entscheidungen – Neuer Schub für die kommunale Mobilitätswende.**
Positionspapier von den Mitgliedern des Ad-hoc-Arbeitskreises „Aktuelle verkehrspolitische Entwicklungen für die kommunale Mobilitätswende nutzen" der ARL. Hannover, 2025.
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