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Alpine Space

PlanToConnect

PlanToConnect mid-term workshop

"Alpine Ecological Networks: Integrating Connectivity into Spatial Planning"

Obergurgl (AT), 26th of November 2024



Problem statements and options for ecological connectivity planning in the Alpine Space

A first project approach

Regione Veneto, Eurac Research, ifuplan



State of art of connectivity planning in the Alpine Space

Regione Veneto



Networks plans and concepts in the Alpine Space

Country Region	Existing concept	Planning level	Normative	Specific provision for corridor
Austria	'Habitat Network' (study)	NUTS 0	no	no
France	Trame verte et bleue (Ecological network plan)	NUTS 0	yes	yes
Germany	German Federal Green Infrastructure Concept (study)	NUTS 0	no	no
Slovenia	Green infrastructure network & Ecological network plan: "Corridors to maintain wildlife habitat connectivity" by Slovenia Forest Service	NUTS 0	yes/yes	no/yes
Switzerland	Ecological Infrastructure (Ecological network plan)	NUTS 0	yes	yes
Bolzano	Protected area network Informal studies on Ecological connectivity (2022 ASP project LUIGI, 2015 EURAC)	NUTS 2 & 3	Yes/no	Yes/no
Friuli Venezia Giulia	Ecological network plan	NUTS 2	yes	yes
Liguria	Ecological network plan	NUTS 2	yes	yes
Lombardy	Ecological network plan	NUTS 2	yes	yes
Piedmont	Ecological network plan	NUTS 2	yes	yes
Trento	Protected areas network "Trentino Multipurpose Ecological Network"	NUTS 2 & 3	yes/no	yes/no
Veneto	Ecological network plan	NUTS 2	yes	yes



what we did assess

Normative character

- ✓ Legally binding
- ✓ Guidance docs or studies

General network objectives:

- ✓ biodiversity conservation (all)
- ✓ maintain the connectivity of wildlife habitats
- ✓ Preserving ecosystem functions
- ✓ Preserving cultural and natural landscapes values
- ✓ Considering Green infrastructures and Ecosystem Services in spatial planning (... but no mapping and assessment)
- ✓ Coordinating biodiversity policies with other sector policies (climate, transport, agriculture, economy...)

Network elements (structure of the network)

- ✓ Protected areas and priority areas (such as N2000, Natural parks, Emerald sites, specific biotopes, area protected by third parties, hunting restricted areas, forest reserves ...)
- ✓ Connectivity elements (hydrographic corridors, forest corridors,
- ✓ Other elements: caves, nodes

Connectivity planning approaches

- ✓ Habitat and landscape matrix
- ✓ Multi species, species specific, guild of species
- ✓ General Landscape permeability

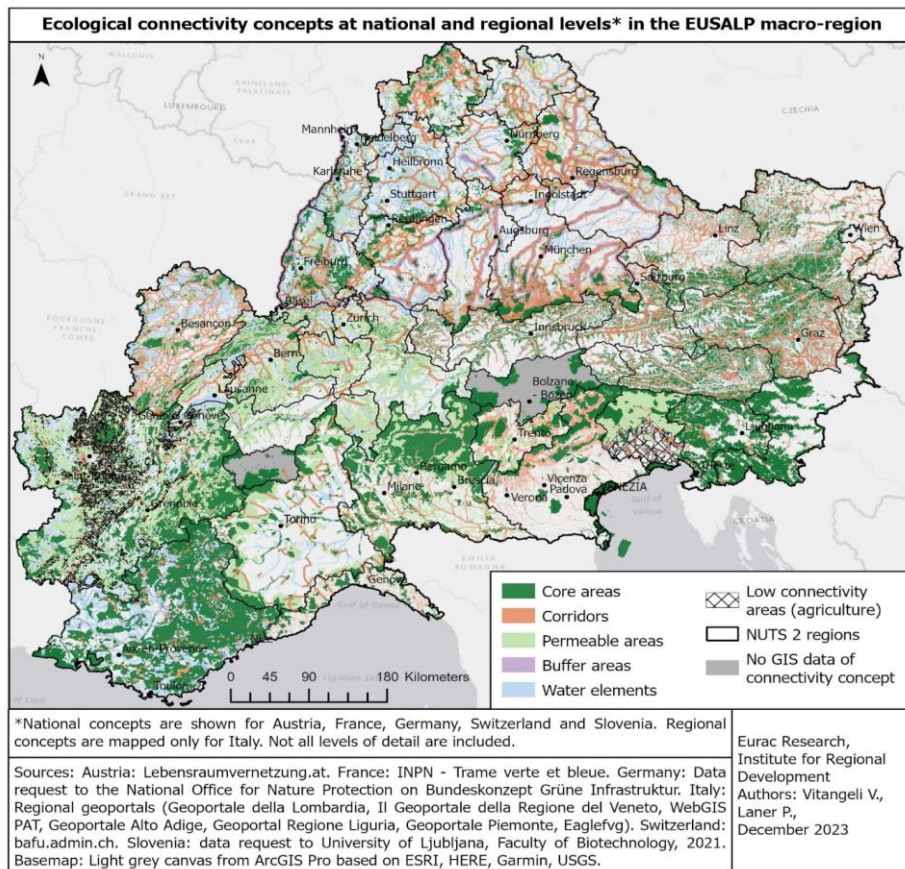
Implementation and monitoring



Weaknesses (harmonization)

Alpine wide connectivity map

- Some missing concepts (south tyrol, Lichtenstain)
- Inconsistencies among defined core areas, linkages, and permeable areas (not harmonized)
- Priority linkages important for macro-level connectivity concept are not visible

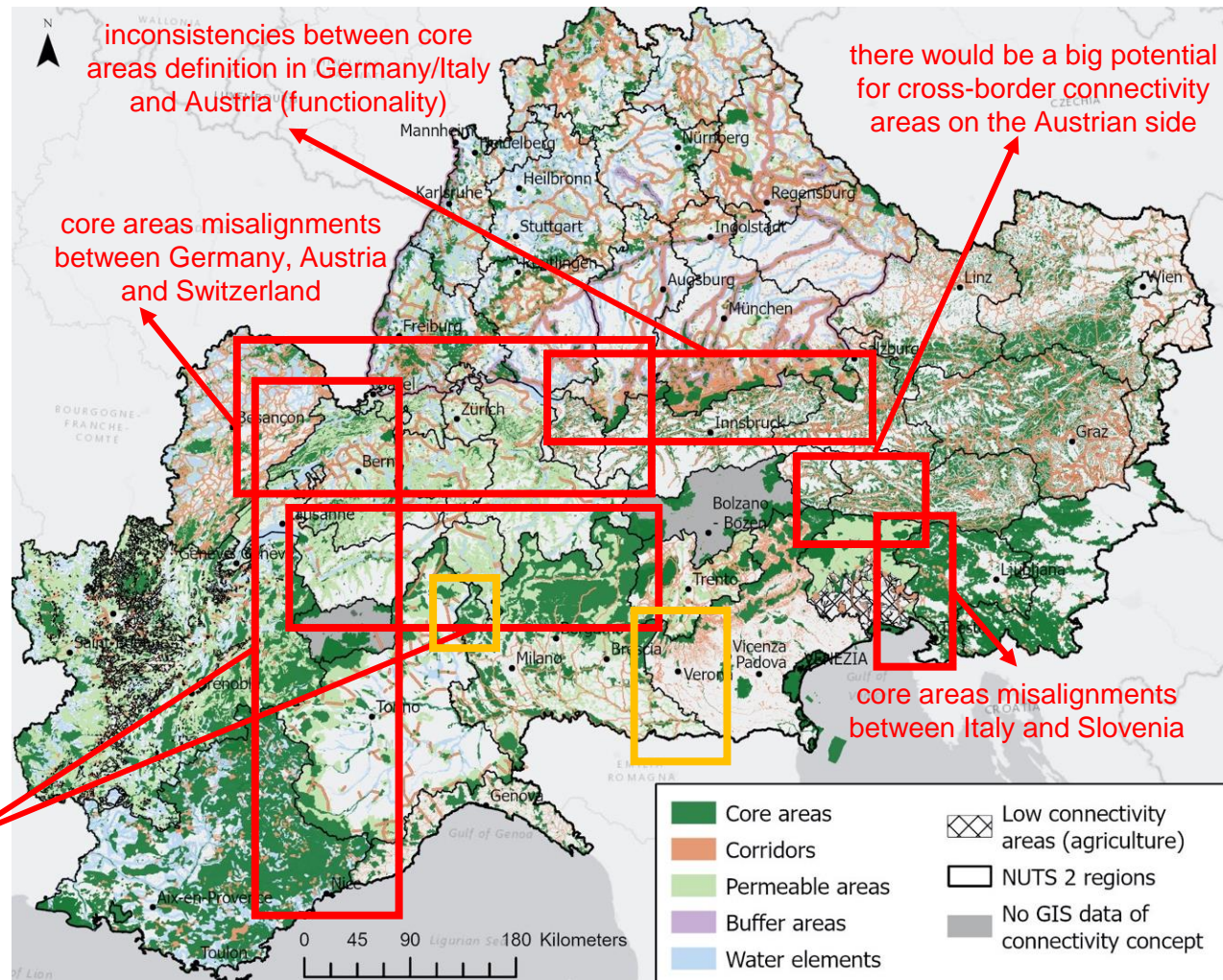




Weaknesses (harmonization)

Alpine wide connectivity map

inconsistencies between core and permeable areas in Italy, France and Switzerland





Weaknesses (implementation)

Inconsistent land-use planning:

- ✓ **Poor integration of GBI and connectivity concept** into urban and regional planning:
- ✓ **Pro-forma or no application of impact assessment:** lack of norms regulating transformations and uses in connectivity areas and criteria for mitigation and compensation measures

Governance and Policies

- ✓ **Lack of integration across jurisdictions:** Ecological connectivity often spans multiple administrative boundaries (local, regional, national), but poor coordination and inconsistent policies create gaps in implementation
- ✓ **Limited cross-border collaboration:** across EUSALP regions, differences in regulations, languages, and management priorities hinder the creation of cohesive networks.
- ✓ **Conflicting land-use priorities:** Urban development, agriculture, forestry, and infrastructure projects frequently take precedence over conservation, leading to the degradation of potential corridors....

Insufficient Integration of Climate Change

- ✓ **Static planning approaches:** Many connectivity plans are based on current environmental conditions and fail to account for future climate scenarios and shifting species ranges.
- ✓ **Lack of adaptive management:** Few incorporate flexibility to adapt to changing conditions or emerging threats, such as invasive species or altered water flow patterns.

Limited Stakeholder Engagement

- ✓ **Insufficient involvement of local communities:** Failure to include local stakeholders in planning can lead to opposition, especially if connectivity projects are perceived as restricting land use or economic opportunities.
- ✓ **Weak collaboration with private landowners:** Many potential corridors are on privately owned land, and lack of incentives or clear communication can hinder their participation.
- ✓ **Conflicts of interest:** Stakeholders with competing priorities (e.g., conservation vs. economic development) may resist or delay projects

Financial and Resource Constraints

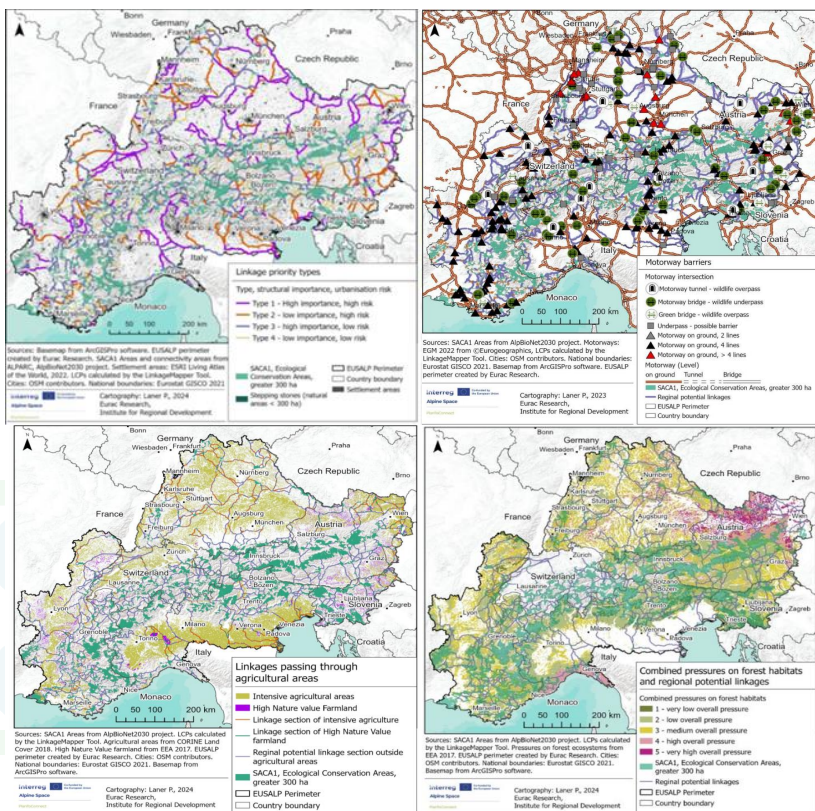
- ✓ **Inadequate funding:** Connectivity projects often rely on short-term or project-specific funding, limiting their long-term sustainability.
- ✓ **Understaffing and capacity gaps:** Many regions lack trained personnel to design, implement, and manage connectivity initiatives.

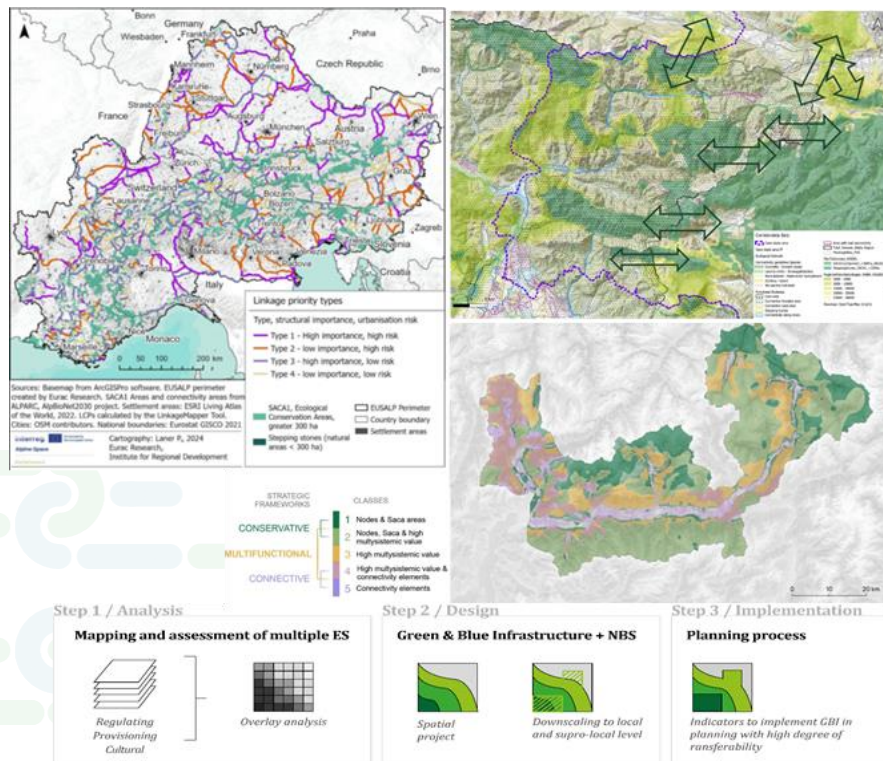


How to go further - harmonization

An Alpine planning strategy for **Ecological Connectivity** based on GBI networks planning at all levels including:

- ✓ **Strategic priority connectivity conservation and restoration areas** (potential to enlarge or buffering existing protected areas, connecting them)
- ✓ **Mapping main physical barriers**
- ✓ **Assessment of main typologies of threats and pressures** from land uses and land management practices
- ✓ **Guidance on mapping and integration into planning levels** (procedural steps and standard protocol)
- ✓ **AlpPlan network transnational working group on connectivity planning** (TCWG). Strategy implementation, cross-border cooperation





How to go further

An integrated planning approach, cross-border cooperation and governance models:

- ✓ **Case studies of integrated planning of GBI networks** in different legal frameworks, planning levels and ecosystem types (alpine, pre-alpine, continental, wetlands, coastal)
- ✓ **Design and integration of GBI networks** for connectivity in spatial plans, Impact assessment, key sector policies
- ✓ **Governance models** at the different planning levels by building on existing settings and available models (alpine planning protocols, environmental agreements, river contracts, tenure agreements ...)
- ✓ **Capacity building and training system** for practitioners in spatial planning and nature conservation.



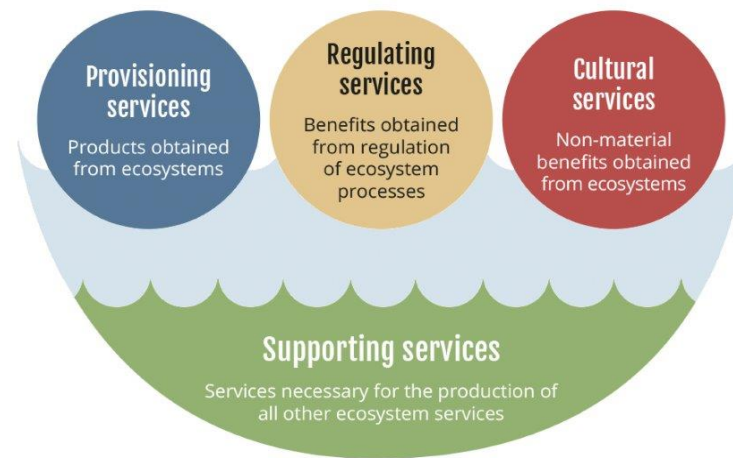
Strategic Green Infrastructure and Ecosystem Restoration (GBI networks for connectivity provision of priority Ecosystem Services)

Facilitates Ecosystem Resilience, Climate Adaptation, territorial attractiveness

Examples

- ✓ Forest corridors for connectivity allows species to migrate in response to shifting habitats due to climate change, preserving ecosystem functionality (Climate Change Mitigation).
- ✓ Connected wetlands and forests can buffer against floods and storms by dispersing water and reducing runoff (Disaster Resilience).
- ✓ Riparian corridors regulate water flow, reducing flood risks (regulating service).
- ✓ GBI network for connectivity ensure healthy habitats maintaining cultural and recreational values (cultural service).

ECOSYSTEM SERVICES

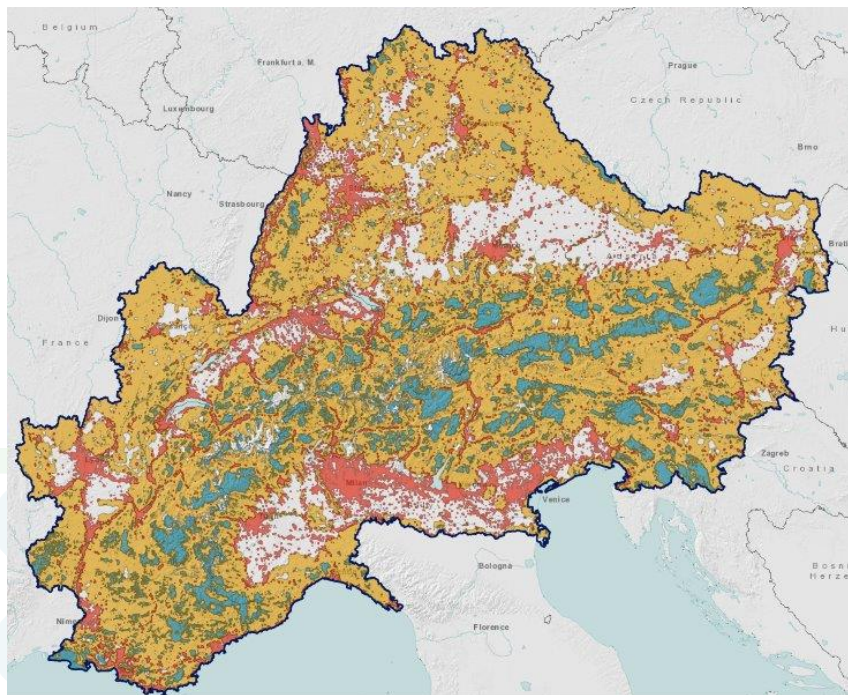


MEA, 2005



Priority corridors and barriers

Eurac Research

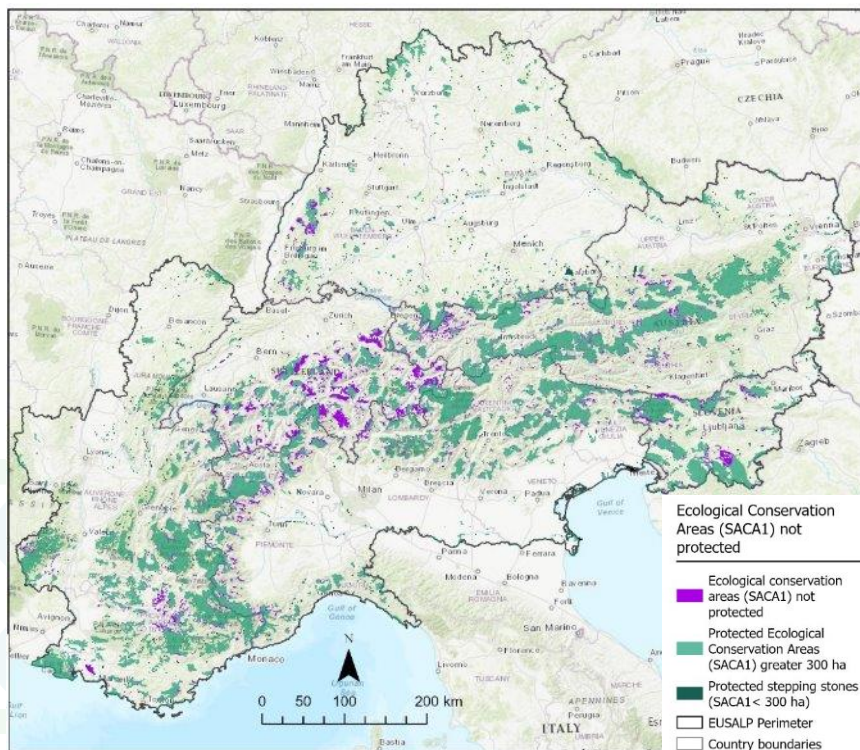


Landscape permeability model

- Structural model from AlpBioNet2030 project
- Continuum Suitability Index (CSI):

$$CSI = \frac{2*LAN + 2*POP + ENV + FRA + TOP}{7}$$

- Permeability range: 0 = low, 10 = high
- Strategic Alpine Connectivity Areas (SACAs)
 - $CSI \geq 8$ Ecological conservation areas(SACA1)
 - $5 \leq CSI < 8$ Development areas(SACA 2)
 - $CSI < 5$ Restoration areas/ Barriers (SACA 3)



SACA1 areas not protected → Creation of new sites?

- 8,1% of all SACA1 areas

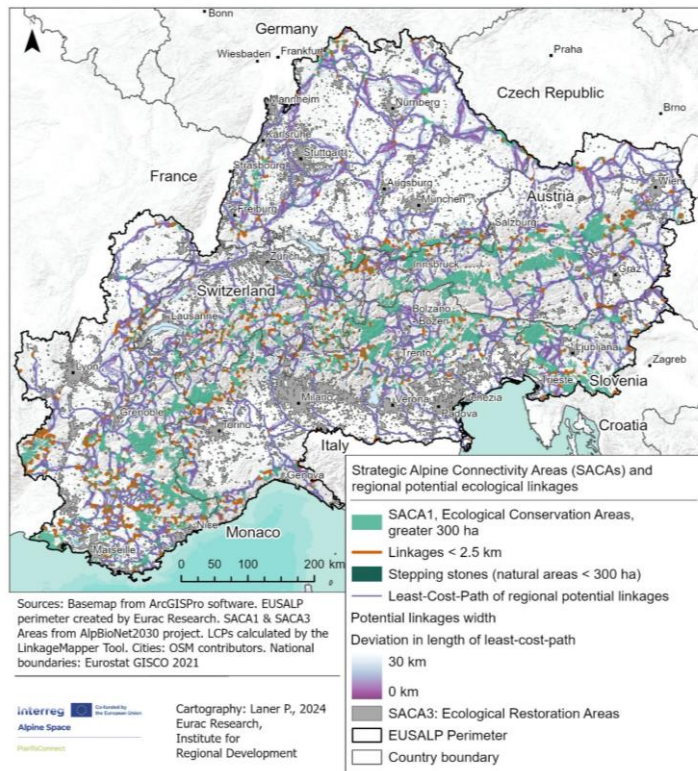
Country	Patches	km ²
Liechtenstein	2	0.2
Germany	282	266.7
Slovenia	261	347.3
France	710	411.5
Austria	903	505.5
Italy	1,064	580.1
Switzerland	596	1,729.2

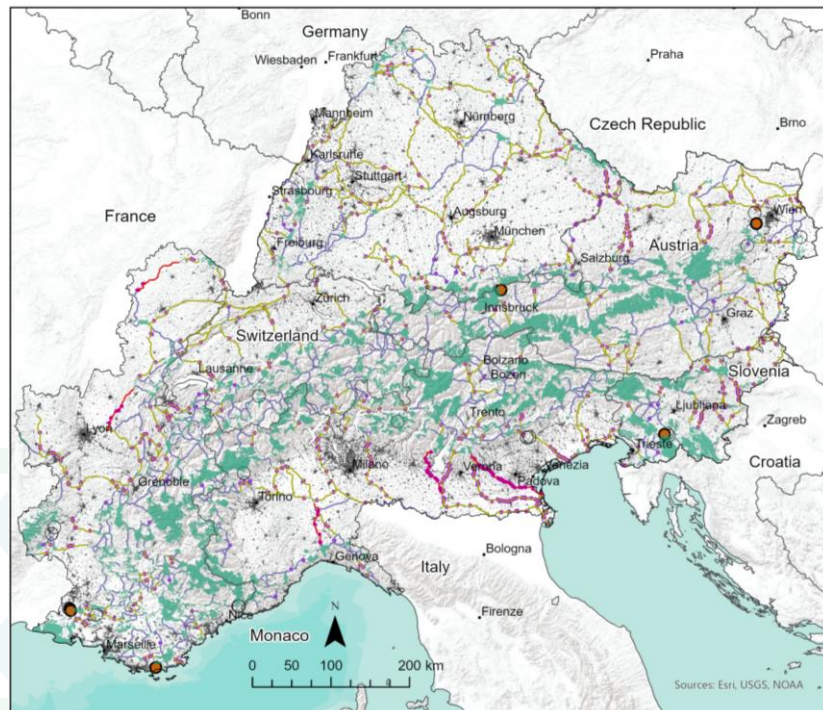


Identification of priority linkages

Alpine – wide landscape permeability model

- Least-cost- paths connecting SACA1 areas
- Check with existing connectivity concepts
- Result: 953 linkages
- + Linkages at macro-level connecting mostly protected areas, harmonized, priorities visible
- informal concept, not for local implementation
- Link: <https://www.jecami.eu/ptc/>





Settlement barriers and urbanization threats

SACA1, Ecological Conservation Areas, greater 300 ha

Urban barriers on short-distance linkages (< 2.5 km)

○ Urbanisation threat
● Settlement barrier

Regional potential linkages with urban barriers and threats

Urban Barriers

— No bottlenecks due to settlement development

— Urbanisation threat (bottleneck 50-300m)

— Settlement barrier (bottleneck <50m)

— Urban bottleneck < 300 m on regional linkages

■ Settlement areas

□ EUSALP Perimeter

□ Country boundary

Sources: Basemap from ArcGISPro software. EUSALP perimeter created by Eurac Research. SACA1 Areas from AlpBioNet2030 project. Settlement areas: ESRI Living Atlas of the World, 2022. LCPs calculated by the LinkageMapper Tool. Cities: OSM contributors. National boundaries: Eurostat GISCO 2021

Cartography: Laner P., 2023
Eurac Research,
Institute for Regional Development

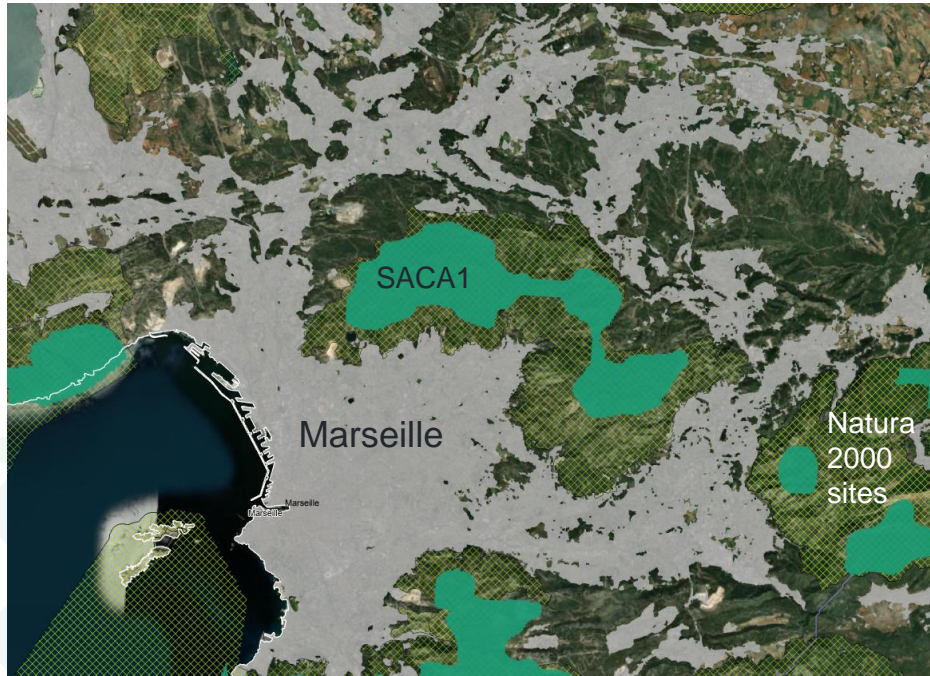
Urbanisation threat: urban and peri-urban areas

Settlement barriers

- Built-up areas > 0.5 ha
- Urbanisation threat:
Bottlenecks of 50 – 300 m

(Leitner et al., 2022)

→ 309 linkages (1/3 of all linkages)



Urbanisation threat: urban and peri-urban areas

Extreme example of almost isolated Natura 2000 site

Chaîne de l'Etoile- massif du Garlaban (FR9301603)

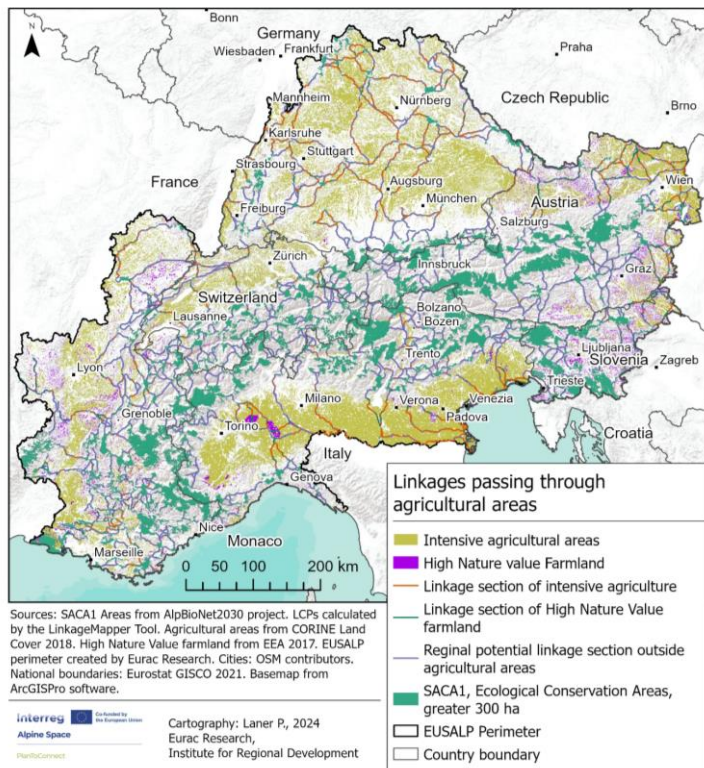
“The site is particularly exposed to...

- fire, urbanisation (foothills) and visitor numbers.”
- various developments (wind turbines, antennas, tracks, pylons, etc.).”



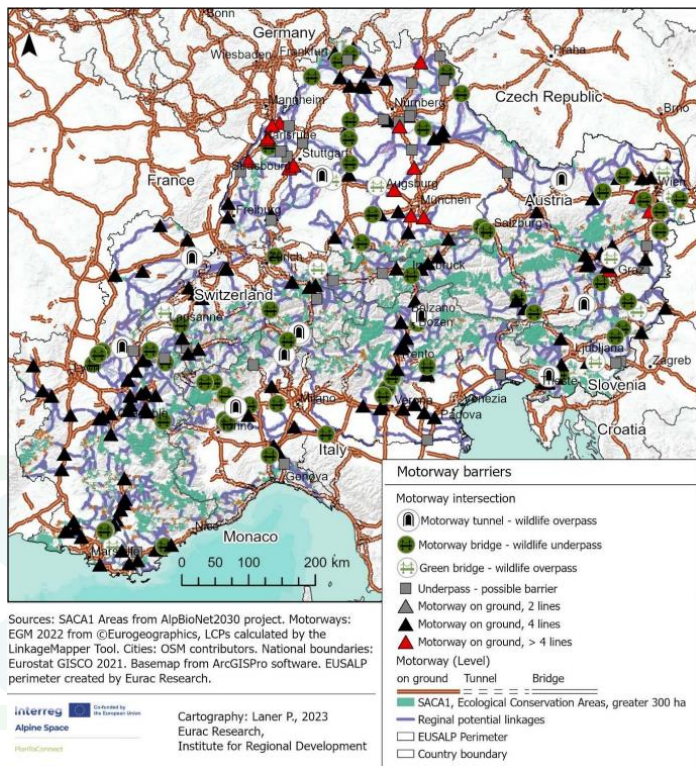
Agricultural barriers

- More than half of the potential linkages affected
- 2,473 km in total (12% of total network length)
- Median length of sections with intensive agriculture (without HNV) amounts **179 m**.
- Corridor distances > 3 km passing through intensive agricultural areas, in the **Po Valley (IT)**, and in **Lower Austria**.





Transport infrastructure barriers Motorway barriers



Type	Barrier effect	Number
Tunnel		12
Motorway bridge		58
Greenway bridge		10
Underpass		34
Motorway, 2 lines		2
Motorway, 4 lines		132
Motorway, > 4 lines		16



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Transport infrastructure barriers

Motorway barriers

Example of
motorway bridge





Transport infrastructure barriers

Railway barriers



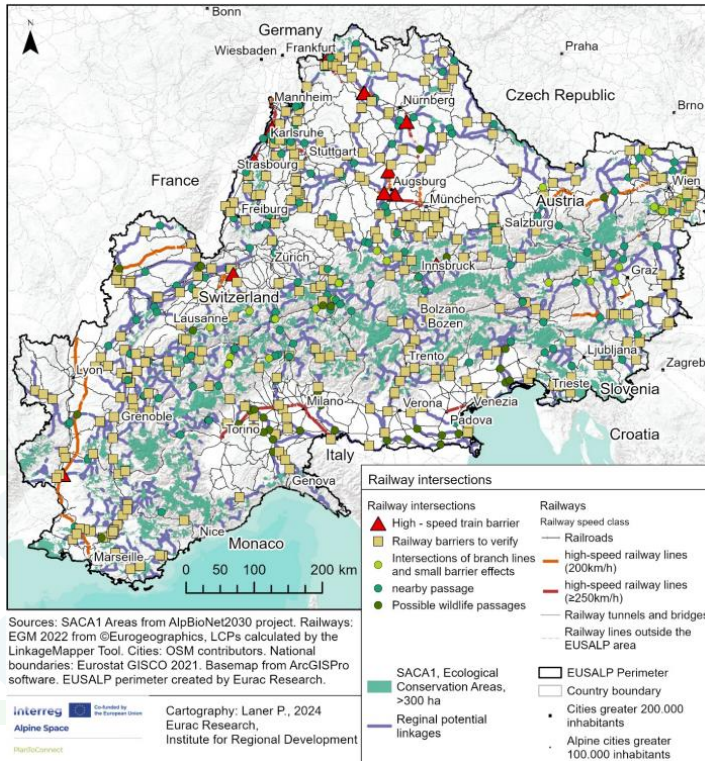
- Out of 31 intersections with **high-speed train lines** only 12 represent a real physical barrier.

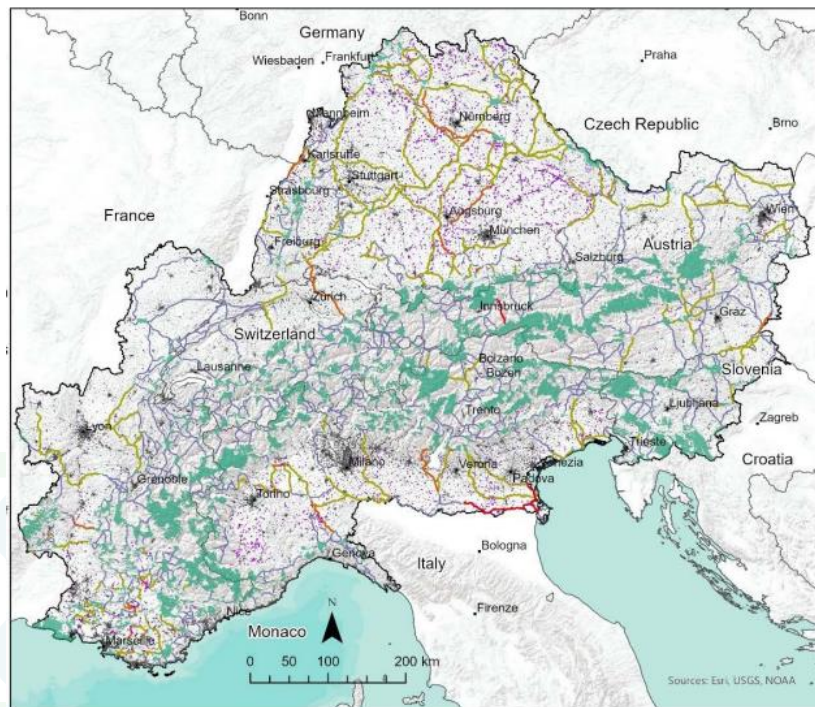


- Out of 33 intersections with **narrow-gauge railway lines**, only 3 represent a real barrier.



- The remaining 353 railway intersections must be further investigated.





Barrier effects of solar panel fields

SACA1, Ecological
Conservation Areas, greater
300 ha

Regional potential linkages with
solar panel field barriers

No solar panel field on
potential linkage

Solar panel field on potential
linkage

Bottleneck of less than
1.500m

Solar panel fields represent a
structural barrier

Solar panel fields (>1.000
m²) outside settlement areas

Settlement areas

Country boundary

EUSALP Perimeter

Sources: Solar panel fields and cities from
OpenStreetMap contributors. Basemap from
ArcGISPro software. EUSALP perimeter
created by Eurac Research. SACA1 Areas
from AlpBioNet2030 project. Settlement
areas extracted from the ESRI Living Atlas of
the World, 2022. LCPs calculated by the
LinkageMapper Tool. National boundaries
from Eurostat GISCO 2021.

Cartography: Laner P., 2023
Eurac Research,
Institute for Regional Development

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Solar panel fields

- Only 20 of 194 potential regional linkages are affected in a serious way:
- Structural barrier for 3 corridors
- 17 situations of structural bottlenecks identified:
 - 3 linkages have a bottleneck of less than 300 m.
 - 7 linkages have a bottleneck of 300 – 650 m.
 - 7 linkages have a bottleneck of 651 – 1.500 m.



Solar panel fields - Examples

Jenbach, Tyrol (AT)



Pourcleux, Provence-Alpes-Côte d'Azur (FR)





Cumulative barrier effects

General results:

- 160 sections of SACA3 areas of 1,5 km in average
- 238 km in total



(Foto: Adige Valley, Source: Laner , 2020)



Selected EU Policies

Ifuplan



EU Energy Policy - EU Renewable Energy Directive (RED)

Revision 2023 (RED III)

- Binding target of at least 42.5% RE share by 2030 (while aiming for 45%)
- Enhanced cross-border cooperation on renewables
- Strengthened bioenergy sustainability criteria (expanded to smaller installations > 7.5 MW) / excludes forest biomass sourced from areas with a particular importance for biodiversity

Key components for spatial planning

- Acceleration and simplified permitting procedures (overriding public interest for RE projects, “streamlining of EIA to the legally possible extent”)
- Obligation to designate acceleration areas for renewables (“Go-to-areas”)
- ➔ Mapping of domestic potential/spatial necessities for RE plants and related infrastructure
- ➔ mapping renewable acceleration areas by 2/2026



EU Renewable Energy Directive (RED) – Acceleration Areas

Commission recommendation on speeding up permit-granting procedures for renewable energy projects (C/2022/3219)

Planning level: The process to identify „Renewable Go-To-areas“ shall...

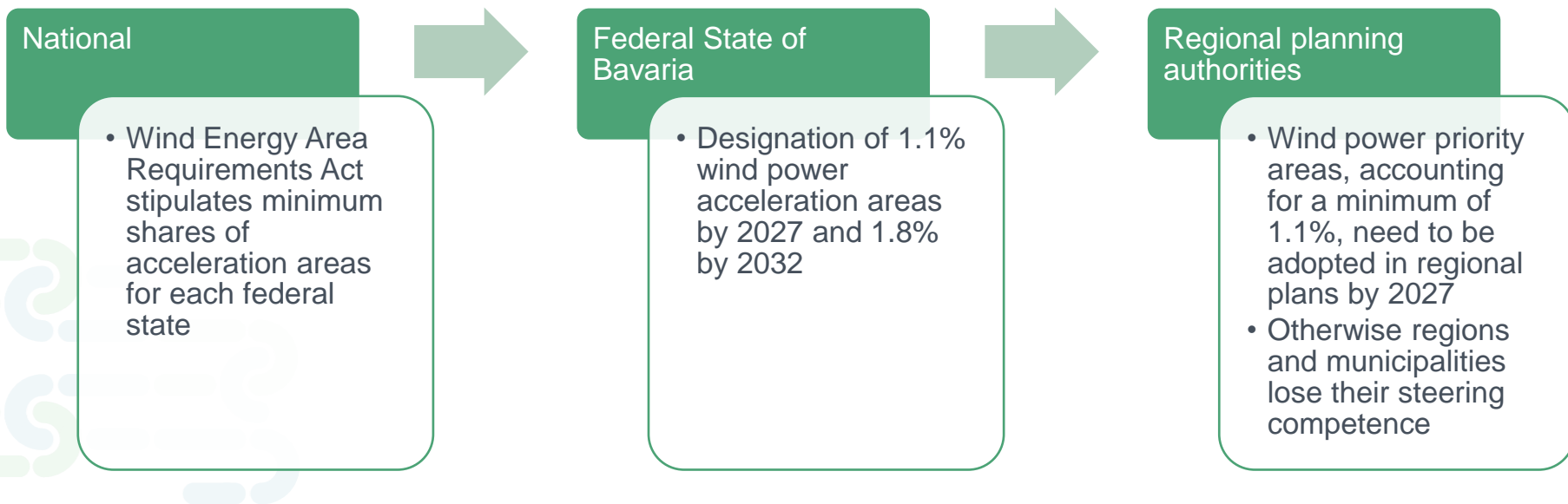
- prioritise artificial and built surfaces*
- exclude Natura 2000 and other protected sites **as well as other areas identified based on sensitivity maps** and the tools referred to in the next point,
- use all appropriate tools and datasets (e.g. EU Energy and Industry Geography Lab) to identify the **areas where the renewable energy plants would not have a significant environmental impact**, including wildlife sensitivity mapping

Permitting level: „Presumption of environmental compatibility“

- In acceleration areas → Environmental impact assessment and FFH-compatibility assessments no longer required for RE installations, repowering, storage facilities, grid connections



Implementation of RED III at national and federal state level – Example of wind power in Germany





EU Nature Protection Policies - Nature Restoration Law

Goals

- 20% of EU's land and sea areas to be restored by 2030, 30% of Annex I ecosystems (incl. rivers, floodplains, grasslands, wetlands) that are currently in poor condition by 2030 (focus on Natura 2000 sites), 60% by 2040, 90% by 2050)

Ecosystem-specific obligations:

- Agriculture: Increase in 2 of 3 indicators (GBI index, agricultural land with HDLF, organic carbon in cropland soil)
- Forest ecosystems: Increase in deadwood, common forest bird index)
- Urban ecosystems: No net loss of urban green areas and urban tree canopy
- River connectivity: Restore 25,000 km of free-flowing rivers and maintain river connectivity

Elements of the Nature Restoration Law

- Regular submission, monitoring and progress reporting of **National Restoration Plans (NRP)**, first by 9/2026, review in 2032 and every following decade
- **Voluntary approach** → Financing measures



EU Nature Restoration Plans - Elements

Quantification and mapping of relevant areas:

- Criteria-based quantification of the area that needs to be restored (including connectivity between habitats).

Outline of envisaged measures to achieve restoration goals

- Identification of areas that need to be restored, particularly intensively used areas in need of enhanced connectivity (incl. CC requirements)

Nature Restoration Plans

Timeline for measures

Specification of barriers to be removed and „removal plan“



Outlook in regard to the policy framework

- **Renewable Energy Directive III** implementation a **major driver for land take and increased conflicts of interest**, but also an **option for synergies** (managed sites and corridors)
- **Acceleration areas** bear the **risk of downscaling environmental concerns**, but too early to judge
- **Planning** efforts to safeguard and expand **connectivity** and corridors **need to step up** (in terms of speed and spatial concretisation)
- **Nature Restoration Law** offers opportunities to **align** (prioritise?) **restoration efforts with ecological corridors**



A reflection on ecological connectivity planning in the alpine macro-region

**"Alpine Ecological Networks: Integrating Connectivity
into Spatial Planning"**

Ifuplan, Eurac Research



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Ecological network in the Alps – Policy references



**PROTOCOL ON THE IMPLEMENTATION OF THE
ALPINE CONVENTION OF 1991 RELATING TO NATURE
PROTECTION AND LANDSCAPE CONSERVATION**

Art. 12 Ecological network:

- Creating a national and cross-border network of protected areas, biotopes and other environmental assets protected or acknowledge as worthy of protection.
- Harmonise objectives with cross-border protected areas.

Art. 3 International cooperation:

- Parties cooperate in interconnecting a network of biotopes



EU Macro-regional strategy
for the Alpine region

Action 7 To develop ecological connectivity in the whole EUSALP territory

Promotion of ecological corridors and also of green infrastructures in unprotected areas is currently largely missing

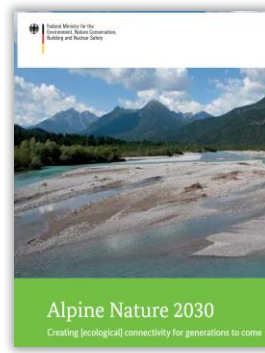
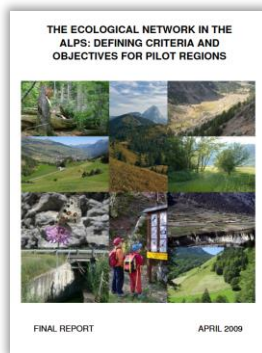
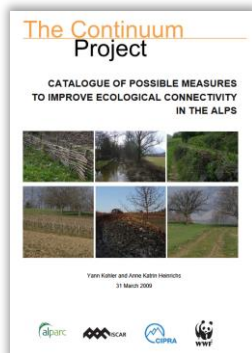
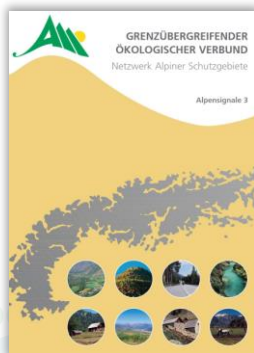


EU Biodiversity
Strategy for 2030

Coherent Trans-European Nature Network to be accompanied by ecological corridors (investments in GI and cooperation across borders) → **see NaturaConnect contribution**



Ecological connectivity planning – What has already been elaborated?



Alpine
Convention
2004

Ecological
Continuum
Initiative 2006-
2010

CIPRA 2009

BMU 2016

AC Platform
Ecological
Network 2019



Ecological connectivity planning Interreg-Alpine Space-projects, 2009 - today

Econnect
2009 - 2012



*“Enhancement of
ecological connectivity
across the Alpine range”*

AlpBioNet2030
2016-2019



*“Integrative Alpine
wildlife and habitat
management for the
next generation”*

LUIGI,
OpenSpaceAlps
2019-2022



*“Linking Urban and Inner-Alpine
Green Infrastructure -
Multifunctional Ecosystem
Services”*

*“Sustainable development
of alpine open spaces by
enhancing spatial planning
governance”*



PlanToConnect
2022-2025

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*“Mainstreaming
ecological connectivity in
spatial planning systems”*



ESPON Targeted Analysis Alps 2050

- Scenario development: Elaboration of spatial perspectives based on territorial analyses (protected areas, soil sealing, RE potential), participatory elements and political frameworks
- Informative depiction of existing protected areas (IUCN categories), no analysis or modelling of ecological connectivity

4 scenarios



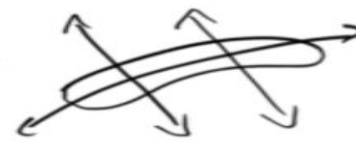
Status quo (trend scenario) > national policies, little progress towards sustainability



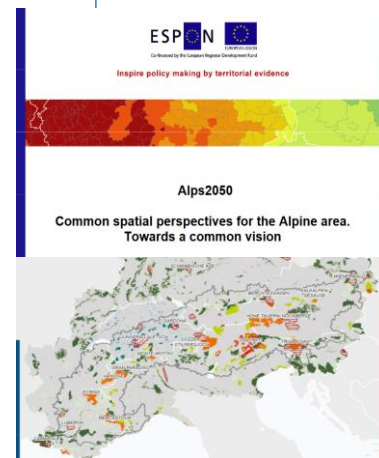
Protected Alps > strengthened protection regimes within and dynamic "metropolitan ring" surrounding the Alps



Functional space > improved linkages between subregions and across borders



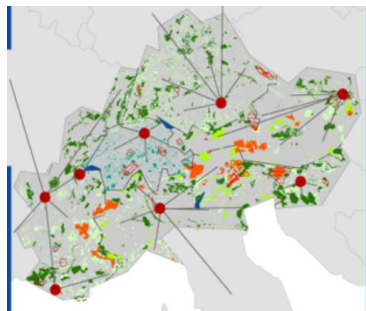
European core > Metropolitan hubs and corridors as basis for dynamic economic development





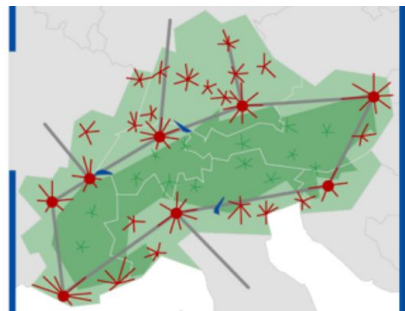
ESPON Targeted Analysis Alps 2050 – Perspective III

Environment



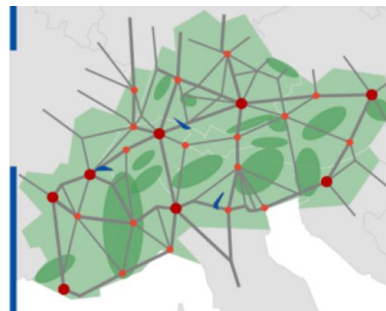
Status quo

- Perspective III not elaborated by Alps 2050



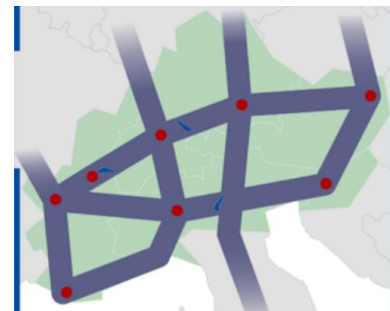
Protected Alps >

Ecological connectivity is a major objective, [...]
Approaches: "smart conceptions" of area protection and systematic implementation of spatial planning objectives and sectoral biodiversity policies.



Functional space >

Protected areas as intermunicipal, transregional or transnational functional areas. Importance of reinforced ecological connectivity between parks and new connections.



European core >

Safeguarding large scale area protection in places without significantly competing land uses. Large scale zoning for biodiversity and protection objectives.



ESPON Targeted Analysis Alps 2050 – Vision Alps 2050

Settlements and Centrality

Current size of municipality

- > 100.000
- > 50.000 - 100.000
- > 10.000 - 50.000

Linkages and transport

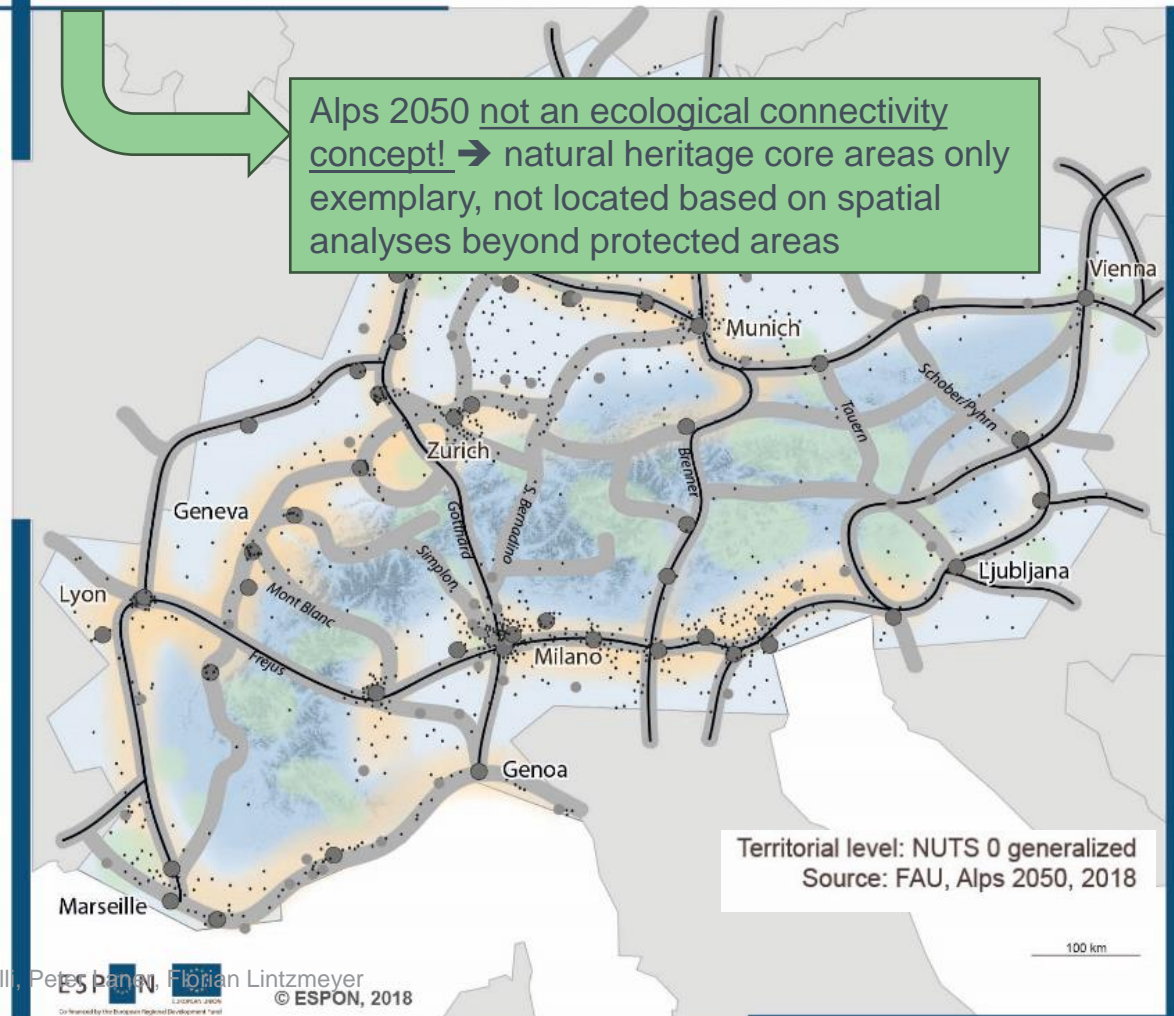
- Backbone linkages
- TEN-T

Territories

- (Urban) growth corridor
- Mountain rural
- Lowland rural
- Natural heritage core areas

"Natural heritage core areas" prioritize action to protect and develop natural heritage

Vision Alps 2050





Ecological connectivity as part of Alpine-wide concepts



Policy recommendations:

- Identifying common strategies and methods at transnational level to **plan a shared ecological network**

Pilot activities e.g.

- ➔ on **harmonization of ecological networks at cross-border level**
- ➔ Establishing a pan-Alpine platform to coordinate EU Biodiversity Strategy implementation and target-achievement in the Alps



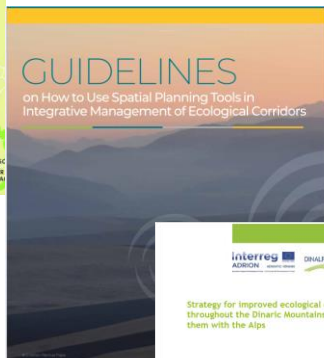
Ongoing elaboration of an Alpine Spatial Development Perspective
Currently, the first round of thematic input papers has been wrapped up



Examples of neighbouring EC initiatives and projects



© European Green Belt Initiative



European Green Belt Initiative

- Established in 2003, 23 organisations from 14 countries along the former “iron curtain”, partly considering the Alpine Space
- Joint cross-border activities in nature conservation and sustainable development

Interreg Danube ConnectGREEN project

- Guidelines developed for the Carpathians, together with a decision support system before elaborating action plans

Interreg ADRION DINALPCONNECT project

- (Informal) Strategy for improved EC throughout the Dinaric Mountains and connecting them with the Alps



Concluding reflections

- Multitude of existing methodological considerations and pilots
- An alpine planning strategy for ecological connectivity (Output O1.1) could be useful ...
 - to **concretise** existing alpine strategies
 - to feed the Alpine Spatial Development Perspective and reach a higher significance in spatial planning processes.
 - to **complement** macro-regional strategies on connectivity, next to the strategies of the Carpathians and Dinaric Alps
 - for consolidating existing knowledge into a **coherent** network



Thank you for your attention!
Danke für Ihre Aufmerksamkeit!
Hvala za pozornost!
Merci pour votre attention!
Grazie per l'attenzione!