Nature-based Solutions and their Governance Structures for Climate Action in the Alpine Region
Appendix A.2

Nature-based Solutions Model Projects Factsheets

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Allgäuer Mooralliance

FACTS IN SHORT

Fostering cooperation between nature conservation, agriculture, regional development and tourism, the *Allgäuer Mooralliance* (Allgäu Moorland Alliance) aims to improve and conserve the rich biodiversity of the different moor types in the South German Allgäu region. It stresses the importance of their ecosystem services, in particular their contribution to mitigating climate change. Further aims are to strengthen the resilience of endangered bog and fen habitats and related species as well as to maintain ecosystem services under changing climatic conditions. The *Allgäuer Mooralliance* combines moorland protection with the adapted management of moorland landscapes, agriculture, rural development, tourism, environmental education and nature experience.

Key words	Allgäu region, moor, bog, fen, regional development, agriculture, tourism, restoration, adapted land management
Location	Germany, Schwaben, Ostallgäu (DE27B) and Oberallgäu (DE27E)
Link(s)	https://www.mooralliance.de/ueber-uns
Project period	Running continuously since 2007

DESCRIPTION, GOALS & FUNDING

Detailed description of project

The *Allgäuer Mooralliance* is an umbrella organisation realising different projects with various stakeholders and funds. Its main goal is to protect and restore endangered bog and fen habitats in the Allgäu region. It was founded within the scope of the federal competition *idee.natur* (idea nature) – later renamed *chance.natur* (chance nature) – launched in 2007 to develop innovative concepts for large-scale projects combining nature conservation and rural development. Originally a partnership of several South German administrative bodies – the government of Swabia, the *Bayerisches Landesamt für Umwelt* (Bavarian Environment Agency), the districts of Ostallgäu, Oberallgäu, and Lindau, the cities of Kempten and Kaufbeuren as well as the *Landschaftspflegeverbände* (landscape conservation associations) of Ostallgäu and Oberallgäu –, the *Allgäuer Mooralliance* was chosen as winner in the category 'Moors'. As a consequence, in 2009, the districts of Ostallgäu and Oberallgäu founded a special purpose association to implement specific projects within the model project *chance.natur*.

The aim of this project was to support rural regions, for the first time with state funding for nature conservation measures and for rural and regional development projects. Hence, its objective was to link nature conservation measures with regional development projects through policy integration across sectors and departments, with the intention of activating regional economic potential and benefiting from large-scale nature conservation programmes. The funding for the rural development part of the model project was granted for the period 2009 - 2016, that for the nature conservation part originally for 2009 - 2020.

The 186,667-ha project area of the *Allgäuer Moorallianz* – one of four model regions in Germany – features the moors in the Alpine foothills between the rivers Iller and Lech. 14,245 ha of moorland were assigned to five core areas. Measures and objectives for the project area were defined in a *Pflege- und Entwicklungsplan* (conservation and development plan, PEPL) based on nature conservation surveys. The planning and implementation of specific measures were discussed and coordinated with the different stakeholders involved, namely landowners, tour operators, regional development actors, etc.

The funds granted for the nature conservation part of the *chance.natur* model project were mainly used to purchase moorland, to compensate for any losses in value due to changes in land use or land management, and to finance restoration measures. Within the scope of the rural development part of the model project and in combination with further funding programmes, the *Allgäuer Moorallianz* launched numerous rural development projects, including the establishment of moorland experience zones in six municipalities, the training of moorland experience guides, the further training of the so-called *eMOORtionen* farms, the *50-Höfe-Prgramm* (50 farms programme), a project promoting sustainable ditch management for moorland bedding meadows (*Streuwiesen*, i.e. meadows mown once a year to produce animal bedding) as well as the marketing of peat-free potting soil and animal bedding as regional products (for details see "Activities carried out").

The implementation of the *chance.natur* model project was scientifically supervised by the *Thünen Institut*.

Since the *chance.natur* funding has been extended to 2030 and the *Allgäuer Moorallianz* has been able to acquire further funds from other funding programmes, the organisation continues to realise measures according to the PELP such as the rewetting and restoration of moors. As a large proportion of the fens in the Allgäu region lies fallow and is increasingly overgrown, important goals are also to maintain the agricultural use of bedding meadows and the areas surrounding the moors as well as to promote the use of locally-grown bedding on farms and to further develop landscape conservation as an additional mainstay for interested farmers.

The *Allgäuer Moorallianz* cooperates with several stakeholders, including the *Bayerische Staatsforsten* (public-law institution responsible for managing Bavaria's state forests) e.g. for restoration measures in the bog *Zinsenhalde*, with regional development agencies and LEADER groups (partnerships between municipal, economic and social stakeholders in the region), with farmers, etc.

The Allgäu's wetlands and moors as well as their ecosystem services have become an important asset for the regional community and for tourism.

Goals of the project

The *Allgäuer Moorallianz* pursues the following objectives:

- **Integrated development combining moorland protection, climate change adaption and mitigation, and rural economic development**:
  - Increasing acceptance of moorland protection in the region.
  - Fostering biodiversity, climate change mitigation, and natural flood protection through integrated peatland protection (see below).
  - Creating financial incentives: establishing new sources of income for farmers; attracting tourism and hospitality businesses as partners in moorland protection; developing regional sustainable financing instruments.
- **Nature conservation**:
  - **Hydrological and ecological optimisation of peatlands**: ensuring an intact water balance in near-natural peatland core areas; rewetting and restoring peatland complexes; allowing near-natural

development of watercourses; preserving, developing and protecting low-nutrient peat lakes; maintaining the biodiversity of peatlands; stopping peat decomposition.

  - **Peatland-adapted land use**: establishing different types of land use in the vicinity of peatland complexes and along watercourses; increasing the naturalness of forest stands at the edge and in the vicinity of peatlands and promoting indigenous plant stocking; maintaining and expanding moor-friendly grazing in the common pastures; varying the grazing intensity in the Alpine pastures of the *Kemptner Wald* (forest of Kempten).
  - **Overarching land use management**: analysing the current state of the moors in the Allgäu region, proposing site-specific conservation and development measures; integrating them into planning instruments; developing selected moorland areas for nature-friendly recreational use; avoiding negative impacts of recreational use in sensitive areas.

- **Creation of socio-economic benefits:**
  - **Maintaining traditional and moor-friendly pasture management**: safeguarding the use of bedding meadows; maintaining grazing on the existing common pastures; ensuring nature-friendly grazing, extending grazing to other wet and nutrient-poor areas, establishing mobile grazing concepts.
  - **Developing tourist offers and marketing concepts**: developing a 'Holiday on the moor farm' offer as a link in the value chain 'nature-friendly land use – authentic nature experience – tourist valorisation of the landscape'; monetarising moor landscapes by establishing value chains in tourism and local recreation, e.g. by recruiting guesthouses, mountain inns, Alpine huts, and spa hotels in the project area as partners; establishing a network for moor experience and environmental education; establishing joint marketing for hiking trails; developing an information and event programme; promoting the large-scale nature conservation project *Allgäuer Moorallianz* regionally and nationally.

Activities carried out

Since the *Allgäuer Moorallianz* is mainly funded as a large-scale nature conservation project by the federal funding programme *chance.natur*, the first step was to set up a PEPL. This was done between 2009 and 2012. For the PEPL, an inventory of moor species and habitats and a water balance assessment were carried out. Based on its subsequent evaluation, primary development objectives and corresponding measures for different habitat types and species were determined. The results were presented to and discussed with local stakeholders at so-called "moor tables" with a view to defining priority areas and measures for the implementation phase planned from 2012 to 2022.

The rewetting of raised bogs, the maintenance of bedding and wet meadows and the creation of protective buffer zones around the peatlands were prioritised. Implementation was carried out in close cooperation with farmers in the region.

Within the scope of the rural development part of the *chance.natur* funding programme, the *Allgäuer Moorallianz* implemented various projects and initiatives between 2010 and 2016, including the following:

- ***eMOORtionen* farms**: Several farms were recruited as partners for a specific *Holiday on the moor farm* offer as a link in the value chain 'nature-friendly land use – authentic nature experience – tourist valorisation of the landscape', sensitising tourists interested the region.
- ***50-Höfe-Programm* (50 farms programme)**: The programme promoted the optimised management of bedding meadows in terms of nature conservation. The funds were used to purchase machinery for mowing, removing the hay (for use as bedding) and manure, and for the storage and distribution of animal bedding in the project area, including newly developed special devices.

- ***Allgäuer Streueverwertung*** (Allgäu bedding project): This regional marketing programme realised within the framework of the EU LEADER programme included the following activities:
  - Establishing moorland bedding as a marketable product.
  - Setting up a contact point for marketing it as a straw substitute.
  - Informing farmers about its properties and possible uses.
  - Sensitising the population, decision-makers, and tourism stakeholders to the role of mowing bedding meadows for preserving the landscape.
  - Creating an Allgäu bedding/hay brand.
  - Promoting the management of traditional common pastures.
- **Sustainable ditch management**: A model project provided information on and tested techniques for the soil-conserving cultivation of wetlands.
- ***Allgäu peatfree potting soil***: Marketing of *Allgäu peat-free potting soil*, including a peat-free gardening campaign.
- **Overarching education and awareness-raising initiatives**:
  - In several municipalities, moorland experience areas were established, among others with moorland trails and railway stations allowing the moor landscape to be experienced at first hand. Moorland guides were trained, information platforms established, a programme for school excursions initiated, and the moorland topic integrated into various local tourist activities.
  - Besides campaigns addressing the general public, farmers were provided with specific information and cooperation offers.
  - The general public were informed about the project right from the start, with lectures, action days, a travelling exhibition, etc. organised. The press reported continuously.

As part of a vision workshop in 2013, a start was made on developing strategies to ensure the continuation of the initiatives launched and the further implementation of measures beyond the duration of the funding. This is essentially to be achieved by firmly establishing the rural development measures:

- Making Allgäu moorland landscapes permanently perceptible and tangible.
- Creating a high-quality moorland experience.
- Ensuring the adapted cultivation of moorland landscapes with partners from agriculture and forestry

Financing / Funding description

The Allgäuer Moorallianz primarily receives funding from *chance.natur* (formerly *idee.natur*), a funding programme set up by the *Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit* (German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety) in cooperation with the *Bundesamt für Naturschutz* (German Federal Agency for Nature Conservation). Between 2009 to 2022, the project received a total of €8.4 million, with a further €9.4 million granted until 2030. Of these sums, 75% are provided by the federal government, 15% by the Bavarian state and 10% by the districts of Ost- and Oberallgäu.

The *Amt für Ernährung, Landwirtschaft und Forsten* (Food, Agriculture and Forestry Agency, AELF) provided further funding (€ 330.000) for the purchase of special machinery for farmers to continue cultivating the bedding meadows.

Bedding marketing (*Streuebörse*) is funded by the EU LEADER programme.

Furthermore, the *Allgäuer Moorallianz* received some €2 million from the Bavarian climate protection programme *Klimaprogramm Bayern 2020*.

CHARACTERIZATION OF THE NATURE-BASED SOLUTION

Sectors addressed

Contribution to Alpine Climate Targets

Target abbreviation	Target description
T_W1	An Alpine-wide optimized water management as basis for controlling water availability under changing water resources is in place to avoid conflicts, including transnational river basin management as well as zones without any water extraction. Coordination and information concerning water consumption and water demand have considerably improved.
T_W2	The availability of high-quality drinking water for the Alpine population is secured under relevant climate change scenarios in a sustainable way. The qualitative and quantitative security of the water supply especially in areas threatened by water scarcity is increased by means of planning and technological measures.
T_S2	Alpine soil quality is improved. Especially wetlands and peatlands including riparian forests are re-established as CO2-sinks in the Alps. Soil erosion is avoided to maintain the function of Alpine soils for mountain agriculture and other sustainable uses.
T_Eco3	Alpine specific landscape management, including the maintenance of pasture areas and the limitation of scrub encroachment, safeguards high-quality landscapes and ensures the maintenance and restoration of ecosystem services. The crucial benefits provided by Alpine ecosystems for an improved adaptive capacity are taken into account in plans about climate change at various scales.
T_Eco4	Connectivity between protected areas and beyond is maintained and further developed, in order to increase ecosystems resilience and to enable favourable conditions for Alpine species, habitats, and ecological processes.
T_Agr2	Regional value chains/circular economy are established to reduce transport emissions (“food miles”, “product carbon footprint”).

Target abbreviation	Target description
T_Agr4	To cope with climate change impacts, mountain agriculture is based on diversified species and crops which suit local conditions, promoting the conservation of traditional crop varieties and animal breeds in regard of a broad pool for adaptation.
T-Tou2	Alpine tourism destinations provide all-season, diversified, and sustainable tourism services and offers – including cultural, health and wellness offers, meeting the challenge of climate change impacts and more fluctuating weather conditions.

Contribution to implementation pathways of the Climate Action Plan 2.0

Pathway abbreviation	Pathway description
IP_W3	Implementing of an Alpine-wide flood risk management, based on nature-based solutions
IP_S1	Preservation and sequestration of carbon in soil with a focus on peatlands, moorlands and wetlands
IP_S3	Supporting measures to preserve and enhance Alpine soil quality
IP_Eco1	Protection and management of vulnerable and Alpine-specific landscapes and ecosystems
IP_Eco2	Enhance transboundary cooperation on ecological connectivity
IP_Agr1	Promotion of Alpine products and increase in locally retained value added for a sustainable and climate-friendly agriculture
IP_Agr2	Moving to organic and climate-friendly methods in Alpine farming
IP_Tou2	Coaching and capacity building for climate proofing Alpine tourism

Type of nature-based solution

☐ Agriculture	☒ Built space	☒ De-Sealing
☒ Forests	☐ River and water management	☒ Wetlands

Benefit for biodiversity

Nowhere else in the entire Alpine region is the transition between the moors of the Alpine foothills and the Alps as well preserved as here. The protection of the Allgäu moorland network ranging across different altitudes is very important to safeguard its biological diversity, especially in view of changing climatic conditions.

The conservation activities of the *Allgäuer Moorallianz* contribute to safeguarding the long-term existence of fen and bog habitats under changing climatic conditions. The cooperation with farmers helps to safeguard habitats that need cultivation, such as bedding meadows (*Streuwiesen*).

The spatial extent of the *Allgäuer Moorallianz* enables a large-scale integrative concept protecting the habitat network between the individual moors. This facilitates migration of species and genetic exchange between the individual habitats – an important aspect, particularly in view of global warming.

Benefit for human well-being

Intact moors act as sponges able store large quantities of water. This makes them important contributors to a decentralised nature-based flood protection / drought mitigation system. Treating water naturally and promoting groundwater recharge, they contribute to the provision of valuable drinking water resources. With adapted and careful management, moors can be protected and simultaneously used for agricultural purposes. Furthermore, as nature experience and recreation areas, moorlands can be valorised for tourism (e. g. guided tours or the creation of a marketing label for holiday accommodation in moor regions).

Provision of ecosystem services

In particular, the project provides the following ecosystem services according to the CICES system (Haines-Young & Potschin 2018, CICES V5.1):

1. Provisioning ecosystem services (biotic and abiotic)

Code	Group	Class	Specification
Division	*Biomass*		
1.1.1.2	Cultivated terrestrial plants for nutrition, materials or energy	Fibres and other materials from cultivated plants, fungi, algae and bacteria for direct use or processing (excluding genetic materials)	Hay used as bedding in stables, fodder production; (potential use of reeds as insulation material)
1.1.1.3	Cultivated terrestrial plants for nutrition, materials or energy	Cultivated plants (including fungi, algae) grown as a source of energy	Potential biogas production, although unclear whether applied in the project area
1.1.4.1	Reared animals for nutrition, materials or energy	Animals reared for nutritional purposes	Grazing of site-adapted livestock for human consumption
1.1.5.2	Wild plants (terrestrial and aquatic) for nutrition, materials or energy	Fibres and other materials from wild plants for direct use or processing (excluding genetic materials)	Fodder and bedding for livestock

2. **cosystem services for regulation and maintenance (biotic and abiotic)**

Code	Group	Class	Specification
Division	*Transformation of biochemical or physical inputs to ecosystems*		
2.1.1.2	Mediation of wastes or toxic substances of anthropogenic origin by living processes	Filtration/sequestration/storage/accumulation by micro-organisms, algae, plants, and animals	Sequestration of carbon dioxide and methane; conversion of nitrogen inputs from the air and agriculture to harmless molecular nitrogen.
Division	*Regulation of physical, chemical, biological conditions*		
2.2.1.3	Regulation of baseline flows and extreme events	Hydrological cycle and water flow regulation (Including flood control, and coastal protection)	Discharge mitigation, precipitation retention
2.2.4.1	Regulation of soil quality	Weathering processes and their effect on soil quality	Build-up of organic material (humus)
2.2.4.2	Regulation of soil quality	Decomposition and fixing processes and their effect on soil quality	Fixation of nitrogen, carbon dioxide and methane
2.2.5.1	Water conditions	Regulation of the chemical condition of freshwaters by living processes	Change of water chemistry by bogs (e.g. enrichment with humic acids)
2.2.6.1	Atmospheric composition and conditions	Regulation of chemical composition of atmosphere and oceans	Binding of carbon dioxide and methane
2.2.6.2	Atmospheric composition and conditions	Regulation of temperature and humidity, including ventilation and transpiration	Cold air formation over moor- and wetlands
Division	*Regulation of physical, chemical, biological conditions*		
5.2.1.2	Regulation of baseline flows and extreme events	Liquid flows	Moors as natural flood protection through water retention / buffering

3. **Cultural ecosystem services (biotic and abiotic)**

Code	Group	Class	Specification
Division	*Direct, in-situ and outdoor interactions with living systems that depend on presence in the environmental setting*		
3.1.1.1	Physical and experiential interactions with natural environment	Characteristics of living systems that that enable activities promoting health, recuperation or enjoyment	Moors as recreational areas for walks and hikes;

Code	Group	Class	Specification
		through active or immersive interactions	participation in peatland restoration measures
3.1.1.2	Physical and experiential interactions with natural environment	Characteristics of living systems that enable activities promoting health, recuperation or enjoyment through passive or observational interactions	Moors as interesting places for e.g. animal observation
3.1.2.1	Intellectual and representative interactions with natural environment	Characteristics of living systems that enable scientific investigation or the creation of traditional ecological knowledge	Peatlands as research areas: e.g. climate change adaptation, adapted forms of cultivation (paludiculture), habitats for certain animals and plants; peatlands as a valuable archive (e.g. in view of pollen analysis)
3.1.2.2	Intellectual and representative interactions with natural environment	Characteristics of living systems that enable education and training	Moor nature trails, moor discovery kit
3.1.2.3	Characteristics of living systems that are resonant in terms of culture or heritage	Characteristics of living systems that are resonant in terms of culture or heritage	Intact / restored moors as tourist attractions
3.1.2.4	Characteristics of living systems that are resonant in terms of culture or heritage	Characteristics of living systems that enable aesthetic experiences	Intact / restored moors as tourist attractions
3.2.2.1	Other biotic characteristics that have a non-use value	Characteristics or features of living systems that have an existence value	Unused but intact / restored moors as "designated wilderness zones"
3.2.2.2	Other biotic characteristics that have a non-use value	Characteristics or features of living systems that have an option or bequest value	Peatlands as habitats for endangered species that are preserved as natural heritage

Impact on climate change mitigation or adaption

Intact peatlands store large quantities of carbon dioxide. However, once degraded, they become significant emitters of carbon dioxide and methane, as the trapped organic material decomposes rapidly in the absence of a permanently high water table (with ensuing oxic conditions). Additionally, in intact moors, nitrates are transformed into molecular atmospheric nitrogen (N_2). These would otherwise be released into the atmosphere as nitrogen oxides, contributing to the formation of ground-level ozone, for instance.

The protection and restoration of (degraded) peatlands therefore helps avoid emissions of carbon dioxide, methane and nitrous oxide emissions, thereby restoring their function as a carbon reservoir or long-term carbon sink.

The conservation of the moor landscapes has a significant effect on reducing climate change impacts and maintaining ecosystem services such as climate regulation.

GOVERNANCE ANALYSIS

Directly involved partners/institutions, etc.

☒ Administration	☒ Consultants	☐ General public
☐ NGOs	☒ Policy makers	☐ Private sector organisations
☐ Researchers	☒ Other / Specification: I.a., planning offices, district administrators	

Indirectly involved partners/institutions, etc.

☒ Administration	☒ Consultants	☒ General public
☒ NGOs	☐ Policy makers	☐ Private sector organisations
☐ Researchers	☒ Other / Specification: Communities in the Allgäu region	

Steering mechanisms established

Dating back to 2007, the project idea was conceived by stakeholders from district environmental agencies and landscape conservation associations. In the initial phase, various organisations, including some NGOs not involved in the later establishment of the project, were consulted.

The alliance of two districts (Landkreise Ostallgäu and Oberallgäu) was founded solely for the purpose of implementing this project and receiving funding. Operating as a special-purpose association, it is also the first-level steering mechanism. It holds annual meetings where the yearly goals are defined/reported on and where personnel and budget topics are decided, whereby it is very much orientated towards the financial planning of the current project.

Moreover, a working group/advisory board was created to supervise project content, with project leaders required to report to this body once a year on what has been accomplished in the past year and to provide an overview for the following year. The focus points and all other content-related topics can be discussed with this multidisciplinary advisory board made up of all authorities technically involved in this project, i.e. authorities for nature conservation, water management, forestry, agriculture, funding, etc.

The second level is the project's own steering mechanism. Four employees working on the project oversee the current project management, two of whom worked as project managers in the regional development programme funded until 2016 and a special feature of this project.

The association acts as a kind of advisory board, preparing and following up meetings, ensuring proper and targeted project implementation, monitoring and self-evaluation, the further development of the regional development concept, citizen information and public relations work as well as support, advice and training for potential stakeholders regarding project development and project management.

A further ongoing work package deals with nature conservation projects, with project office members involved in the implementation of the large-scale nature conservation project in accordance with the technical specifications in the PEPL.

After the confirmation of the grant was received, the contract between stakeholders was signed where they agreed to meet the conditions of the base programmes.

The financing programmes (at the level of federal and state authorities) have clear rules and controlling mechanisms which need to be respected to receive the financing. Included is a yearly reporting obligation and regular contact and exchange with the funding authorities. Specific authorities monitor the project.

Besides this, the project office needs to document the overall use of funds and document it in a written report once per year.

Process design developed

After the project concept was created and funding established, the project office – in accordance with the requirements of the funding programme – entered the 3-year planning phase (beginning in 2009). Its objective was the commissioning of a specialist consulting agency able to prepare a specialized plan based on the project concept. It is important to mention here that this agency covered the topic of moorland protection and could also be considered as a research agency. This phase also involved a two-year period of on-site investigations examining the areas earmarked for project implementation. The consulting agency addressed questions related to the approach and implementation of the project and drew up a management plan: a specialised botanical and zoological plan defining the objectives and measures decisive for project realisation. This management plan serves as a basis for everything that the project office implements. As the management plan was established beforehand, it was unable to foresee which areas would ultimately be available for purchase. In this respect, the progress of the project was and remains a process with an open outcome requiring a degree of flexibility. Additionally, a somewhat theoretical time and activity plan was created.

The preparation and implementation of the measures are carried out in close coordination between project management and the affected landowners, land users and municipalities to ensure acceptance of the nature conservation and rural development measures.

It is important to highlight that the rural communities in the area were crucial partners, even if only indirectly involved. The engagement with them was crucial from the very beginning, to secure the project's acceptance and gain access to the land.

The project office handled the publicity work from the start, keeping citizens informed through the press, especially in the communities where they aimed to become active.

External support hired

In the planning phase the employees took part in a coaching programme with an external facilitator where they learned about how to talk and discuss with different interest groups.

Though no further external support was hired, the office does receive advice from various levels and authorities on how they should act in certain cases or problem situations.

Main interests and conflicts of interests

The key interests of this project include the preservation of nature.

The following conflicts and obstacles occurred during project implementation:

Conflict 1 – Purchase of land: As the management plan was established beforehand, it was unable to foresee which areas would ultimately be available for purchase. It should be noted that nobody is forced to sell their land and that everything is based on the voluntary participation of private individuals. In this respect, the progress of the project was and remains a process with an open outcome requiring a degree of flexibility.

The purchase of land is quite complicated and hard work with a lot of steps. An additional challenge is that the most purchased areas are rather small.

Conflict 2 – Damage caused: Another problem were the conflicts with the owners of neighbouring land who were sometimes afraid that project implementation would impact their land and thus the associated activities (for example forage production). If any damage is caused, it should be compensated and measures planned to stop damaging. The conflict can also go in the opposite direction, with the actions of neighbouring owners impacting project land – for example when farmers use large quantities of fertilizers which get blown onto the habitat areas.

Conflict 3 – Landscape optics: Discussions over landscape optics –in certain cases the public feel concerned when a tree dies, or when beaver activities cause trees to fall down.

Level of conflicts

Conflict 1: Purchase of land	☒ Low	☐ Medium	☐ High
Conflict 2: Damage caused	☒ Low	☐ Medium	☐ High
Conflict 3: Landscape optics	☒ Low	☐ Medium	☐ High

Participatory or conflict management elements / methods used in terms of governance

The project office invested a lot of effort in the planning phase, establishing contacts with various associations, especially those from the agricultural sector. This was a kind of consultation process.

Regular communication across various levels and with different stakeholders helps prevent conflicts and facilitates the search for solutions. The project team also organized various events open to the public and published newspaper articles and interviews to disseminate information. An awareness-raising campaign targeting regional stakeholders and the local population was organised.

At a technical level, the project must ensure that no damage is done to the land of other owners. This and other issues were discussed bilaterally with the landowners. A very important aspect of the project, direct contacts with landowners occur on an almost daily basis.

Main achievements and results of negotiations in terms of governance

The main achievements are the purchase and restoration of large swathes of land, allowing a lot of habitats for different species to be protected and preserved. This is reflected in the record of (rare) plants and species tracked by the project.

Governance success factors, obstacles and how they were overcome

Among the project's success factors are a good planning phase and multidisciplinary collaboration and consultations as well as professional technical implementation. Engineers and planners are needed for implementing often creative solutions, especially as renaturation and revitalization are fields where there are as yet no technical standards or anything similar. Therefore, innovation is an important part and closely connected with research and knowledge exchange with other experts, for instance at conferences.

Additionally, the intensive PR work has proven a success factor: the general public was informed about the project right from the start through newsletters, the project website and flyers, and as part of various events (guided tours, excursions, project days).

The "volunteering principle" ensured that there were always people available to participate in the project.

The main limitation was the availability of (desired) land or the inability to purchase all the land that was initially planned (desired).

Policy fields mainly affected

☐ Agriculture	☐ Bio-economy	☒ Climate protection / mitigation
☒ Forestry	☒ Nature conservation	☒ Spatial planning
☒ Tourism	☒ Water management	

TRANSFERABILITY & SCALABILITY

Degree of innovation

☐ High (pioneer project)	☒ Medium	☐ Low (roll-out done)

Which aspects/elements of this project can be transferred to other regions/situations?

The following aspects can be transferred to other regions in the Alpine area:

- Cooperation between farmers, rural/regional development agencies and nature conservation organisations.
- Continuous information and involvement of the public.
- Transferability of technical solutions.

Which aspects/elements of this project can be scaled up?

- Stakeholder engagement and education: expand the "moor tables" initiative to include more frequent and diverse formats, such as digital forums or targeted workshops for specific stakeholder groups.
- Regional and international collaboration: broaden partnerships beyond the Allgäu region to include international conservation bodies and researchers for knowledge-sharing and joint projects.
- Tourism and environmental education: develop additional moorland experience areas and enhance ecotourism offerings, such as guided tours, educational exhibits and farm stays, with a view to attracting visitors and generating local revenue.

PROJECT SUCCESS FACTORS AND BARRIERS

Success factors

The following success factors contribute(d) significantly to the success of the *Allgäuer Moorallianz*:

- Close cooperation between users and nature conservation organisations (e.g. farmers, *Bayerische Staatsforsten*, *Forstbetrieb Sonthofen*, rural development agencies, LEADER groups).
- The link between the large-scale nature conservation project and rural development has brought significant added value for the Allgäu Moorland Alliance. Together with the local population, it was possible to develop projects going beyond nature conservation to create added value in the region and thus convey the economic benefits of the nature conservation measures.
- The professional and sound working environment ensured quality.

- The institutionalisation of the *Allgäuer Moorallianz* as a special-purpose association with its own office and staffing.
- Long-term funding within the *chance.natur* programme.
- Large area for implementing the project (possibilities).
- Visibility in the region through exhibitions, excursions, training of moor guides, environmental education (e.g. bog suitcases for school classes to borrow) etc., leading to positive perception (and possibly pride) in the local population.

Obstacles

Among the obstacles of this project were:

- Land acquisition challenges.
- Stakeholder concerns: neighbouring landowners were apprehensive about potential negative impacts on their land, such as waterlogging or reduced agricultural productivity.
- Complex implementation: the need for flexible planning due to the open-ended nature of land purchases and dynamic ecological conditions added to the complexity.
- Technical challenges in renaturation: lack of standardized methods for peatland restoration required innovative solutions and extensive knowledge exchange.

CONTACT DATA

Name of the institution	Allgäuer Moorallianz
Type of institution	☐ Association ☐ Non-Governmental Organisation ☐ Private enterprise ☐ Public administration ☒ Other: Corporation under public law in the form of a special-purpose association (*Zweckverband*)
Street	Schwabenstraße 11
ZIP-code	87616
City	Marktoberdorf
Country	Germany
Project website	https://www.moorallianz.de/ueber-uns

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Interview

Interview conducted by Maja Kogovšek (CIPRA International) with Mr Ulrich Weiland (project manager), on 07.08.2024 at 14:30 via the online platform Zoom.

Alternative rainwater management in the Parc Ouagadougou of Grenoble

FACTS IN SHORT

In the face of the predicted increase in hot weather conditions and sewer system overloads during heavy rainfall, the City of Grenoble realized an urban green infrastructure project with multiple functionalities: A former inner-urban brownfield, the *Parc Ouagadougou* now features four thematic gardens, a planted infiltration swale, a wetland, and water conveyance infrastructure. Surface runoff within the park and from surrounding surfaces is collected, partly purified by natural processes, and used for irrigation as well as the creation of wetland conditions. This saves drinking water, reduces the amount of water discharged into the sewer system, and provides a retention volume for heavy rainfall events. Moreover, the park contributes to the city's green space, thereby providing positive micro-climatic effects, e.g. evapotranspiration and shade, natural habitats, and a recreation area.

A successful example of a nature-based urban infrastructure in response to climate change, the project can serve as a model for other (Alpine) cities facing similar challenges.

Key words	Urban green infrastructure; rainwater management; natural rainwater treatment; biodiversity
Location	France, Rhône-Alpes, Isère (FRK24)
Link(s)	https://portal.osug.fr/Alternative-rainwater-management-in-the-Ouagadougou-Park-of-Grenoble https://www.adaptation-changement-climatique.gouv.fr/s-inspirer/projetotheque/mettre-en-place-une-gestion-alternative-des-eaux-pluviales-dans-cadre
Project period	2006 – 2008

DESCRIPTION, GOALS & FUNDING

Detailed description of project

The Ouagadougou-project was launched against a background of climate change studies predicting an increase of median temperatures of 2 – 5 °C in the Rhône-Alpes by the end of the century. This could lead to significantly higher temperatures in urban areas due to so-called heat island effects, as already experienced In Grenoble in the summers of 2006 and 2007 when temperature gradients of 3 to 5 °C at night were detected between densely populated areas and the surrounding rural areas. Moreover, the expected change in precipitation patterns, with longer dry periods alternating with more frequent heavy rain events calls for saving drinking water resources, providing retention volumes, and for decentralized rainwater management to avoid flooding and sewer system overloads. In the course of the urban renewal of the *Abbaye-Jouhaux*

and *Teissere* districts which began in 1998, the City of Grenoble transformed a former brownfield into the *Parc Ouagadougou*, creating an example of how to meet the aforementioned challenges:

The 7600 m^2 *Parc Ouagadougou* features four thematic gardens and a decentralized rainwater management system. The runoff from a street running alongside the park (*Rue Kaunas*) with a catchment area of 1300 m^2 is collected in open channels and discharged into an infiltration swale in the park with a 35 cm thick filter substrate planted with reeds to treat the water during infiltration. Considered as clean water, the runoff from pavements and roof-top terraces in the neighbouring quarter (*Zone d'Amenagement Concerté*), is collected in another open channel. During heavy rain, this water, draining from an area of 3350 m^2, is discharged into a concrete swale designed to redistribute the water to the gardens via small channels. In winter and during heavy rainfall events, excess water is discharged into a wetland created in the park which acts as both a retention basin and an element diversifying the environment. In total, an area of more than 1 ha is connected to the decentralized rainwater management system.

With this system, the use of drinking water resources to irrigate the park is greatly reduced, the natural water cycle is partly reconstructed through the local infiltration of naturally treated runoff (with positive effects on soil functions and groundwater resources), the sewer system is relieved, and heavy rain events are better handled.

In 2013, the project won an award at the *Novatech* conference "Strategies and solutions for sustainable urban water management".

Goals of the project

The project goals were the following:

- To combine alternative and sustainable rainwater management techniques to reduce the use of drinking water resources for irrigation purposes.
- To limit the volume of rainwater discharged into the combined sewer system (discharging wastewater and rainwater into a single sewer) to prevent overloads of the sewer system and wastewater treatment plant.
- To provide a retention volume for heavy rainfall events.
- To provide recreational and educational functions.

Activities carried out

In 2006, the project was discussed and planned with the involvement of the local population. The construction of the water conveyance infrastructure and the structural elements of the park took place during 2007 and 2008. Regarding the maintenance of the planted areas, the Green Spaces Department of the City of Grenoble cut back its maintenance activities to a minimum, allowing the small ecosystems to develop in line with their natural potential. The park was opened to the public in 2008.

In coordination with the Green Spaces Department, the Municipal Cleaning Department (responsible for road maintenance and runoff collection systems) adapted its practices, stopping the use of de-icing salts in winter to ensure the quality of the water flowing into the park.

In 2012, the development of the fauna and flora and their diversification were monitored.

Financing / Funding description

Costs:

- Construction costs for the park: 1.6 Mio €.
- Construction costs for the infrastructure for collecting and conveying rainwater from the pavements and roof-top-terrasses: 1.1 Mio €.
- Maintenance costs, including labour costs: app. 20,000 €/year.
- Human resources for maintenance works: ½ full-time equivalent.

The project was financed by the City of Grenoble and the *Agence nationale pour la renovation urbaine* (National Agency for Urban Renovation).

CHARACTERIZATION OF THE NATURE-BASED SOLUTION

Sectors addressed

Contribution to Alpine Climate Targets

Target abbreviation	Target description
T_W1	An Alpine-wide optimized water management as basis for controlling water availability under changing water resources is in place to avoid conflicts, including transnational river basin management as well as zones without any water extraction. Coordination and information concerning water consumption and water demand have considerably improved.
T_W2	The availability of high-quality drinking water for the Alpine population is secured under relevant climate change scenarios in a sustainable way. The qualitative and quantitative security of the water supply especially in areas threatened by water scarcity is increased by means of planning and technological measures.
T_W3	The availability of high-quality drinking water for the Alpine population is secured under relevant climate change scenarios in a sustainable way. The qualitative and quantitative security of the water supply especially in areas threatened by water scarcity is increased by means of planning and technological measures.
T_S1	There is no more additional (net) land-take and land sealing. Brown field re-development approaches have been strengthened to protect Alpine-specific soils and their services.

Contribution to implementation pathways of the Climate Action Plan 2.0

Pathway abbreviation	Pathway description
IP_W2	Tools and methods for drought management in the Alps
IP_W3	Implementing of an Alpine-wide flood risk management, based on nature-based solutions

Type of nature-based solution

☐ Agriculture ☒ Built space ☐ De-Sealing

☐ Forests ☒ River and water management ☒ Wetlands

Benefit for biodiversity

As Grenoble's Green Spaces Department decided to limit its interventions, species were able to develop in line with their natural potential. Four years after the park was opened, the range of plants in the wetland had already greatly diversified. In addition, aquatic insects, notonectids, dragonfly larvae and odonates, as well as frogs, are found in the canal in summer.

Benefit for human well-being

The park is a public area and a meeting place for all generations, in particular for the residents of the neighbouring districts *Teisseire* and *Jouhaux*. It offers an area for recreation, a playground for children, and the opportunity to experience a part of the water cycle and hence to develop an awareness of the importance of (rain)water as a resource. In addition, it provides local cooling effects by evaporation and transpiration in hot weather conditions.

The project also helps in integrating new residents (mainly first-time buyers) of the *Zone d'Aménagement Concerté Teisseire-Jeux-Olympiques*, whose roof water is collected, into the local community.

Provision of ecosystem services

In particular, the project provides the following ecosystem services according to the CICES system (CICES V5.1).

4. Provisioning ecosystem services (biotic and abiotic)

Code	Group	Class	Specification
Division	*Water*		
4.2.1.2	Surface water used for nutrition, materials, or energy	Surface water used as a material (non-drinking purposes)	Runoff collected and used for irrigation

Code	Group	Class	Specification
4.2.2.1	Ground water used for nutrition, materials, or energy	Ground (and subsurface) water for drinking	Use of drinking water resources for irrigation greatly reduced

5. Ecosystem services for regulation and maintenance (biotic and abiotic)

Code	Group	Class	Specification
Division	*Transformation of biochemical or physical inputs to ecosystems*		
2.1.1.1	Mediation of wastes or toxic substances of anthropogenic origin by living processes	Bioremediation by micro-organisms, algae, plants, and animals	Treatment of road runoff in a bioswale (soil filter, including biotic and abiotic cleaning mechanisms, e.g. decomposition of carbon hydroxides)
2.1.1.2	Mediation of wastes or toxic substances of anthropogenic origin by living processes	Filtration / storage / accumulation by micro-organisms, algae, plants, and animals	Treatment of road runoff in a bioswale (soil filter, including biotic and abiotic cleaning mechanisms, e.g. uptake of heavy metals by plants)
5.1.1.3	Mediation of waste, toxics, and other nuisances by non-living processes	Mediation by other chemical or physical means (e.g. via filtration, sequestration, storage, or accumulation)	Treatment of road runoff in a bioswale (soil filter) by physical (non-biological) processes, e.g. filtration, precipitation of heavy metals etc.
Division	*Regulation of physical, chemical, biological conditions*		
2.2.1.3	Regulation of baseline flows and extreme events	Hydrological cycle and water flow regulation (Including flood control, and coastal protection)	Retention of runoff, particularly in cases of heavy rain, to prevent flooding and sewer overflow and to enhance infiltration
2.2.2.1	Lifecycle maintenance, habitat, and gene pool protection	Pollination (or 'gamete' dispersal in a marine context)	Newly established vegetation left to natural succession, providing habitats for insects
2.2.5.1	Water conditions	Regulation of the chemical condition of freshwaters by living processes	Treatment of road runoff by a soil filter (including biotic and abiotic cleaning mechanisms) before further infiltration into groundwater

Code	Group	Class	Specification
2.2.6.2	Atmospheric composition and conditions	Regulation of temperature and humidity, including ventilation and transpiration	Microclimatic regulation by evapotranspiration from the green-blue infrastructure
5.2.1.1	Regulation of baseline flows and extreme events	Liquid flows	Retention volume for runoff, particularly in cases of heavy rain, to prevent flooding and sewer overflow and to enhance infiltration
5.2.2.1	Maintenance of physical, chemical, abiotic conditions	Maintenance and regulation by inorganic natural chemical and physical processes	Microclimatic regulation by enhanced evaporation

6. Cultural ecosystem services (biotic and abiotic)

Code	Group	Class	Specification
Division	*Direct, in-situ and outdoor interactions with living systems that depend on presence in the environmental setting*		
3.1.1.1	Physical and experiential interactions with natural environment	Characteristics of living systems that enable activities promoting health, recuperation, or enjoyment through active or immersive interactions	Design of the park for recreational purposes, including a playground for children, and integration of educational elements to promote an understanding of rainwater as a resource
3.1.1.2	Physical and experiential interactions with natural environment	Characteristics of living systems that enable activities promoting health, recuperation or enjoyment through passive or observational interactions	Design of the park for recreational purposes, including a playground for children, and integration of educational elements to promote an understanding of rainwater as a resource
6.1.1.1	Physical and experiential interactions with natural abiotic components of the environment	Natural, abiotic characteristics of nature that enable active or passive physical and experiential interactions	Design of the park for recreational purposes, including a playground for children, and integration of educational elements to promote an understanding of rainwater as a resource

Code	Group	Class	Specification
3.1.2.1	Intellectual and representative interactions with natural environment	Characteristics of living systems that enable scientific investigation or the creation of traditional ecological knowledge	Reduction of vegetation maintenance to a minimum, allowing natural succession processes to be observed and monitored
3.1.2.2	Intellectual and representative interactions with natural environment	Characteristics of living systems that enable education and training	Integration of educational elements in the park to understand the urban water cycle and the meaning of rainwater as a resource
3.1.2.3	Intellectual and representative interactions with natural environment	Characteristics of living systems that are resonant in terms of culture or heritage	*Parc Ouagadougou* as an intergenerational meeting point fostering social exchange among the neighbouring population
6.1.2.1	Intellectual and representative interactions with abiotic components of the natural environment	Natural, abiotic characteristics of nature that enable intellectual interactions	Design of the park for recreational purposes, including a playground for children, and integration of educational elements to promote an understanding of rainwater as a resource

Impact on climate change mitigation or adaption

The project contributes to Grenoble's adaption to climate change in several ways:

- The collection of rainwater and its use for irrigation saves drinking water resources.
- The retention and decentralized infiltration of runoff helps handle heavy rainfall events (expected to occur more frequently) and to reduce loads in the city's sewer system.
- The park has a local climatic balancing function which is particularly important during heatwaves and helps counteract urban heat island effects.
- It may enhance the population's awareness of rainwater as a valuable resource.

GOVERNANCE ANALYSIS

Directly involved partners/institutions, etc.

☒ Administration ☒ Consultants ☐ General public

☐ NGOs ☒ Policy makers ☒ Private sector organisations

☐ Researchers ☒ Other / Specification: City planners, architects, landscape designers

Indirectly involved partners/institutions, etc.

☒ Administration	☐ Consultants	☒ General public
☐ NGOs	☒ Policy makers	☒ Private sector organisations
☐ Researchers	☒ Other / Specification: Construction company, real estate companies, architects, French government and Rhône-Alpes region (financing), technical services and managers of the City of Grenoble e.g. Green Spaces Department, Municipal Cleaning Department	

Steering mechanisms established

The project was realised as part of a political programme initiated by the French government in the 2000s with the aim of revitalising working-class neighbourhoods. The programme assigned funding to corresponding projects. The project included the construction of social housing and a park, a so-called *zone d'aménagement concertée* (joint development zone, ZAC). The Urban Projects Department of the City of Grenoble was responsible for project management, while the city's Technical Design Office was commissioned to design and construct all the public spaces within the project zone. The work was managed and supervised by a project management department with a project director and an operations management department with an operations manager. The project thus had a strong operational team. This team came up with an alternative rainwater management plan for the park – a practice still in its early days at that time – and issued a call for tenders to hire an external landscape architect office (*ADP Dubois paysage et urbanisme*) for its implementation.

The timeframe for the technical implementation was set up by the technical team in collaboration with the chief architect, the commissioned landscape architects and the city's Technical Design Office.

Process design developed

The project management team defined an approximate schedule at the start of the project. The detailed schedules for construction etc. were subsequently developed by the respective specialists in each area and coordinated with the other parties in the working group.

External support hired

There was no external support in terms of project management, mediation or governance.

Main interests and conflicts of interests

The primary objective of the City of Grenoble was the creation of a ZAC, with the intention of incorporating emerging concepts such as "nature in the city" and "water recovery". Innovative at the time, these concepts were considered beneficial for the city's image.

For the builders and developers, the authorisation to discharge rainwater into a public space was an interesting and positive aspect. Normally, Grenoble's town planning regulations require rainwater from new buildings to be treated on site. The option to direct rainwater to a public space and an external management system was beneficial for the developers in the face of constraints within their plots.

Turning to wastewater services, the separate rainwater management system also proved beneficial, as it only had to handle wastewater. It was also beneficial for the wastewater treatment plant, as it reduced the amount of water entering the plant and stopped any pollution of the nearly unpolluted rainwater.

Nowadays, the separate management of rainwater and wastewater is a common requirement in such projects to avoid these issues.

Conflict 1 – Parking: Residents were initially sceptical, questioning why the project team planned a park instead of parking spaces. Through information and awareness-raising measures, the park was eventually accepted by the residents. Prior to the park, the site had been taken up by a factory, meaning that it was an enclosed space not part of the local neighbourhood. Ultimately, the project's community involvement approach helped residents visualise the transformation of the vacant space into an inclusive community park providing several benefits for them.

Conflict 2 – Negative side effects: Residents also expressed concerns about potential natural disturbances, such as mosquitos and frogs croaking near the water ponds. These concerns were addressed through informative discussions and examples from similar successful projects elsewhere.

Conflict 3 – Maintenance: The main conflicts arose regarding park maintenance, as services like the Green Spaces Department and the Municipal Cleaning Department had to adapt their working methods in this area. For instance, the surface water management system meant that no de-icing salts were to be used during winter months on the streets and paths draining into the park, as they would damage the plants in the wetlands.

Conflict 4 – Vandalism: Another problem in the early stages following the park's opening to the public was vandalism, as park construction was completed before that of the nearby buildings. As a result, very few people visited the park initially, and it was damaged soon after it opened. But once the residents moved in, they quickly appropriated and appreciated the park.

Level of conflicts

Conflict 1: Parking	☐ Low	☒ Medium	☐ High
Conflict 2: Negative side effects	☐ Low	☒ Medium	☐ High
Conflict 3: Maintenance	☐ Low	☒ Medium	☐ High
Conflict 4: Vandalism	☐ Low	☒ Medium	☐ High

Participatory or conflict management elements / methods used in terms of governance

All conflicts were able to be resolved in a reasonable way through communication and presentation of facts and technical aspects. There were many meetings to find solutions and to explain the benefits of the project to the departments that would later manage it. The project is now a successful example for comprehensive project management, including design, explanation, discussion, rethink and realisation phases.

Main achievements and results of negotiations in terms of governance

The project demonstrates the great added value of an interdisciplinary approach – a necessary approach for innovative projects. However, this is not standard practice among French local authorities which typically operate in a highly compartmentalised manner. This collaborative approach proved to be a key strength.

Governance success factors, obstacles and how they were overcome

The main success factor of the project regarding governance aspects were the transdisciplinary and cross-departmental planning and implementation processes as well as the involvement of the public. This cooperative approach helped meet concerns and challenges in a solution-orientated way, as stated above. There is no information about further specific obstacles.

Policy fields mainly affected

☐ Agriculture	☐ Bio-economy	☒ Climate protection / mitigation
☐ Forestry	☐ Nature conservation	☒ Spatial planning
☐ Tourism	☒ Water management	☒ Other: Nature restoration

TRANSFERABILITY & SCALABILITY

Degree of innovation

☐ High (pioneer project)	☒ Medium	☐ Low (roll-out done)

Which aspects/elements of this project can be transferred to other regions/situations?

Rainwater harvesting infrastructure combined with natural treatment, decentralised infiltration and local use of the water (e.g. for irrigation purposes, small wetlands or small urban streams) can be transferred to all urban areas.

In particular, it should be considered or made mandatory when revitalising or building new urban districts. For successful implementation, it is important to involve all stakeholders, including the public administration, service providers and residents from the very beginning of the conceptualisation. The *Parc Ouagadougou* project can also serve as an example of this participatory process.

Which aspects/elements of this project can be scaled up?

Decentralised rainwater management systems like the one implemented in the *Parc Ouagadougou* are designed to collect, treat, and usually infiltrate runoff locally, with their spatial extent optimised to be integrated into urban areas. Hence, they are not meant to be scaled up in terms of size. However, their implementation frequency should be scaled up. An efficient way to achieve this goal is to integrate them into spatial planning instruments as obligatory urban water management elements (see above).

PROJECT SUCCESS FACTORS AND BARRIERS

Success factors

The key success factors of the project are related to the good cooperation with various stakeholders:

- Cooperation with property developers in advance to enable new buildings to be connected to the rainwater harvesting system.
- Consultation of and communication with residents to encourage them to take ownership of the site.
- Interdepartmental cooperation to maintain the park and the rainwater harvesting system.

Obstacles

No specific information on obstacles was provided.

CONTACT DATA

Name of the institution	City of Grenoble, Green Spaces Department of Grenoble	
Type of institution	☐ Association	☐ Non-Governmental Organisation
	☐ Private enterprise	☒ Public administration
Street	11, Boulevard Jean Pain	
ZIP-code	CS 91066 – 38021 Grenoble Cedex 1	
City	Grenoble	
Country	France	
Project website	–	

REFERENCES

Literature & Online Resources

Agence de l'environnement et de la maîtrise de l'énergie (Ed.) (o.J.): Mettre en place une gestion alternative des eaux pluviales dans le cadre d'un nouvel aménagement urbain: le parc Ouagadougou à Grenoble.

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Interview

Interview conducted by Sophie V. Mahlknecht (CIPRA International) with Mr Patrice Cantone (Municipality of Grenoble), on 04.09.2024 at 09:30 via the online platform Zoom.

LIFE Lech – Dynamic River System Lech

FACTS IN SHORT

The successor of a previous LIFE conservation project, *LIFE Lech - Dynamic River System Lech* (2016-2022), focused on thirteen river engineering and species protection measures along the Tyrolean Lech and its border with Germany. At the same time the deepening of the riverbed was halted, the groundwater level stabilised or raised and flood protection improved.

Key words	River restoration, flood protection, species and habitat protection, transnational project, nature experience sites
Location	Austria, Tirol, Außerfern (AT331); Germany, Schwaben, Ostallgäu (DE27B)
Link(s)	https://www.life-lech.at/
Project period	2016 – 2022

DESCRIPTION, GOALS & FUNDING

Detailed description of project

The Tyrolean Lech area is in the northern Limestone Alps, nestled between two mighty mountain ranges – the Lechtal Alps in the south-east and the Allgäu Alps in the north-west. The *Naturpark Tiroler Lech* (nature park Tyrolean Lech), a protected area belonging to the EU's Natura 2000 network, comprises wild stretches of the River Lech with its neighbouring flood zones and alluvial forests, the river's most important tributaries, and parts of mixed mountain forests.

In the 20th century the Lech was regulated to create space for settlements and agricultural land as well as to protect the population from damaging floods. The construction of debris traps across the Lech tributaries and the growing exploitation of gravel contributed to a continuous deepening of the riverbed and a lowering of the groundwater table, accompanied by negative consequences for the plant and animal species and habitats along the river and neighbouring areas. Nevertheless, the Tyrolean Lech still featured wild stretches, leading it to be declared a Natura 2000 area in 2000 and a nature park in 2004. The conservation project *Wild River Landscape Tyrolean Lech* funded by the EU's LIFE programme and implemented between 2001 and 2007 was a successful first step towards restoring natural dynamics in the river ecosystem.

The follow-up LIFE project *LIFE Lech – Dynamic River System Lech* focused on 13 hydraulic engineering measures to re-establish natural river dynamics, especially in the upper reaches of the Lech between Holzgau and Vorderhornbach as well as in selected stretches in the Lech's middle and lower part, particularly south of Füssen in Germany. The measures were based on the River Lech development concept compiled as part of the first LIFE project. To restore the river's natural dynamics, additional space was provided by removing riverbank stabilisation structures, widening the riverbed, creating side streams, and shortening groynes.

Goals of the project

The project pursued the following objectives:

- **To revitalise, restore and conserve the natural dynamics of the River Lech and its neighbouring riparian forests with their typical plant and animal species**: Special attention was to be paid to the gravel bank areas and pioneer sites. At the same time, the deepening of the riverbed was to be stopped. The measures were designed to support the typical habitats and species of the alluvial landscape, in particular ensuring the survival of highly endangered or specialised species like the German tamarisk, the common sandpiper or the dwarf bulrush.
- **To improve hydrological conditions:** The measures were designed to decrease flood risks and stabilise or raise the groundwater table.
- **To improve visitor guidance in the *Naturpark Tiroler Lech***: Targeted information and greater awareness-raising were aimed at better protecting the breeding areas of bird species sensitive to disturbance. At the same time, public acceptance of the Natura 2000 site *Tiroler Lech* was to be strengthened.
- **To develop a nature park management plan**: A *Naturpark Tiroler Lech* management plan was to be elaborated in a participatory process with stakeholders from different sectors.

Activities carried out

The following activities were carried out:

- **13 river restoration measures**: The 13 river stretches selected were particularly suitable for the restoration of gravel banks, being actively shaped by the river and providing sites for pioneer habitats. A total of 7 km of river obstructions and 72,000 m^3 of river stones were removed, three side arms created and 1,300 metres of river bars shortened.
- **Species protection measures**: These targeted the top 20 species resulting from an expert ranking of important species within the Lech's ecosystem. They include the stone crayfish, the dwarf bulrush, the German tamarisk, the natterjack toad, and several other threatened species. Among other measures, ponds were created in the groundwater area. They featured channels through which water flowed throughout the year and other parts which dried up in winter. Shallow water areas were formed, and in one existing pond, an overgrown bank was partially opened. Large gravel banks were constructed to serve as breeding grounds, for example for the little ringed plover. In the floodplains, spawning grounds were built and trees removed to create open gravel areas.
- **Visitor attraction**: At Forchach, the riverbed was widened from 40 m to 110 m, eliminating the last bottleneck on the middle Tyrolean Lech. The river is now several hundred metres wide over a stretch of 11 km. As part of this measure, the dilapidated pedestrian suspension bridge over the Lech was renewed and is now twice as long as before. A new footpath was also created along the right bank of the Lech from the bridge to the lower end of the project where a new experience and recreation centre for both locals and visitors has been set up. Providing an impressive presentation of the wild Lech and attracting many visitors, the centre is an ideal place to raise people's awareness of the need to protect the Lech. A further aim of this measure is to channel visitor flows with a view to protecting sensitive natural spaces.
- **Implementation of a monitoring programme**: This programme was set up to assess the river's morphological development, the re-establishment of the target species and the socio-economic impacts. Scientists studied the effects of the implemented measures in the period of 2018 to 2022.
- **Definition of a 10-year management plan for the nature park:** In a participatory process, including several working group meetings, stakeholders from the fields of nature conservation, forestry, agriculture, tourism, water management and fishing agreed on 175 individual measures

linked to nature conservation, environmental education, recreation, regional development and research. These are to be realized within the following 10 years and beyond, ensuring the positive development of the wild river landscape of the Tyrolean Lech.

- **Knowledge sharing:** The project was repeatedly presented as a model for a consensus-driven cooperation encompassing nature conservation and flood protection. As for the technical details, the successful measures to improve the sediment balance were added to the "River Restoration Toolbox" developed as part of an Interreg project in the Mur-Drava-Danube region, in the form of best-practice examples and hence made available to a large group of experts.

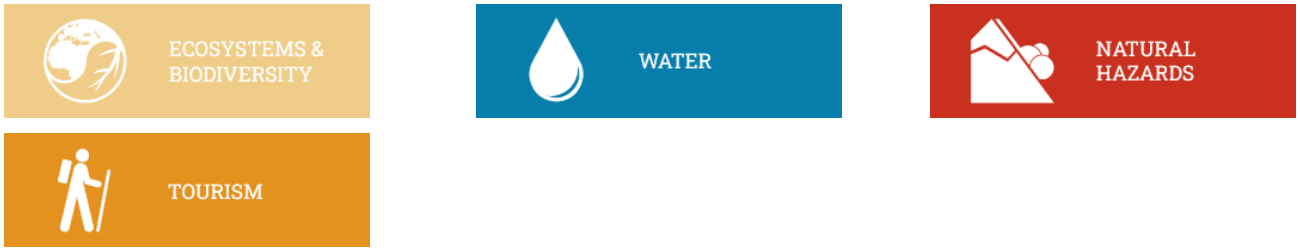
Financing / Funding description

The total funding of more than six million euros came from the following partners:

- European Union (LIFE Programme, financing share of 60%): 3.65 million €
- Austrian Federal Water Engineering Administration: 1.92 million €
- Tyrolean Regional Government, Department for Environmental Protection: 0.32 million €
- Water Management Administration Kempten: 0.17 million €

CHARACTERIZATION OF THE NATURE-BASED SOLUTION

Sectors addressed



Contribution to Alpine Climate Targets

Target abbreviation	Target description
T_W3	Alpine-wide sustainable flood risk management
T_Eco1	Preserved ecosystems and biodiversity
T_Eco3	Maintained and restored Alpine ecosystem services

Contribution to implementation pathways of the Climate Action Plan 2.0

Pathway abbreviation	Pathway description
IP_W3	Implementing of an Alpine-wide flood risk management, based on nature-based solutions
IP_Eco1	Protection and management of vulnerable and Alpine-specific landscapes and ecosystems

Type of nature-based solution

☐ Agriculture ☐ Built space ☐ De-Sealing

☐ Forests ☒ River and water management ☐ Wetlands

Benefit for biodiversity

A dynamically shaped river landscape with a broad variety of habitats (protected at European level as areas belonging to the Natura 2000 network) was restored. In the beginning, experts drew up a list of 108 threatened species for the *Naturpark Tiroler Lech* and ranked them according to criteria such as protection status, endangerment, regional importance and public appeal. Measures were proposed for the top 20 species and implemented either as species conservation measures within the scope of the LIFE programme or as part of the *Naturpark Tiroler Lech* management plan.

Benefit for human well-being

The project created various socio-economic benefits:

- **Benefits for the regional economy, particularly the job market**: More than 80% of the costs – about 5 million euros – were spent within the region, directly benefiting the regional economy. At the *Baubezirksamt* (Building District Office) Reutte alone, an average of 10 people worked on the project and were paid out of the project's budget. Another 900,000 euros in wages were spent in the local construction industry.
- **Flood protection**: In total, the river widening measures created an additional 200,000 m^2 of retention areas, acting as buffers during floods and reducing downstream flood risks.
- **Tourism**: The wild stretches of the River Lech have been key to shaping the region's touristic image for years. The LIFE project strengthens this aspect, while further increasing the Lech's visibility in Europe.
- **Increased awareness and public acceptance**: In an online survey, a large majority of 70% viewed the project's restoration and species conservation measures as important.

Provision of ecosystem services

In particular, the project provides the following ecosystem services according to the CICES system (CICES V5.1):

7. Provisioning ecosystem services (biotic and abiotic)

Code	Group	Class	Specification
Division	*Non-aqueous natural abiotic ecosystem outputs*		
4.2.1.2	Mineral substances used for nutrition, materials or energy	Mineral substances used for material purposes	Gravel extraction

8. Ecosystem services for regulation and maintenance (biotic and abiotic)

Code	Group	Class	Specification
Division	*Regulation of physical, chemical, biological conditions*		
2.2.2.3	Lifecycle maintenance, habitat and gene pool protection	Maintaining nursery populations and habitats (Including gene pool protection)	Habitat protection and creation, e.g. ponds and pools as spawning grounds, still water areas for rearing fish etc.
5.2.1.2	Regulation of baseline flows and extreme events	Liquid flows	Drainage regulation: partial restoration of natural drainage conditions at great technical expense; flood protection through large, reactivated retention areas
5.2.2.1	Maintenance of physical, chemical, abiotic conditions	Maintenance and regulation by inorganic natural chemical and physical processes	Restoration of the natural morphological and hydrodynamic river development, reducing erosion and improving the sediment balance

9. Cultural ecosystem services (biotic and abiotic)

Code	Group	Class	Specification
Division	*Direct, in-situ and outdoor interactions with living systems that depend on presence in the environmental setting*		
3.1.1.1	Physical and experiential interactions with natural environment	Characteristics of living systems that enable activities promoting health, recuperation or enjoyment through active or immersive interactions	Qualitative improvement of the Lech region as an area for recreation and physical activity (walking, hiking, biking, etc.)

Code	Group	Class	Specification
3.1.1.2	Physical and experiential interactions with natural environment	Characteristics of living systems that enable activities promoting health, recuperation or enjoyment through passive or observational interactions	Project region as an interesting place for e.g. animal observation
3.1.2.1	Intellectual and representative interactions with natural environment	Characteristics of living systems that enable scientific investigation or the creation of traditional ecological knowledge	Riparian forests and wild river stretched as research areas: e.g. habitats for certain animals and plants, natural river dynamics
3.1.2.2	Intellectual and representative interactions with natural environment	Characteristics of living systems that enable education and training	Offer of guided nature tours, nature park school excursions and projects; creation of an experience and information centre for visitors
3.1.2.3	Intellectual and representative interactions with natural environment	Characteristics of living systems that are resonant in terms of culture or heritage	Preserving the wild stretches of the river as a natural heritage site
3.1.2.4	Intellectual and representative interactions with natural environment	Characteristics of living systems that enable aesthetic experiences	Restored wild stretches of the Lech as an aesthetic experience space for locals and tourists
Division	*Indirect, remote, often indoor interactions with living systems that do not require presence in the environmental setting*		
3.2.1.1.	Spiritual, symbolic and other interactions with natural environment	Elements of living systems that have symbolic meaning	The wild river as a symbol for the whole region, influencing its image
3.2.2.1	Other biotic characteristics that have a non-use value	Characteristics or features of living systems that have an existence value	Intact / restored wild river as "area designated as wilderness" leading to "mental/moral well-being"
3.2.2.2	Other biotic characteristics that have a non-use value	Characteristics or features of living systems that have an option or bequest value	The wild river landscape as a habitat for endangered and highly specialised species, and preserved as natural heritage

Impact on climate change mitigation or adaption

As a result of climate change, extreme weather events, such as long-lasting rainfall events, drought periods or heavy downpours are expected to occur more frequently. To counteract their impacts, rivers need more space and intact alluvial landscapes to retar large volumes of water or store water over a longer period.

The restoration of a near-natural discharge regime and the re-creation of large alluvial retention areas in the LIFE Lech project contribute to flood prevention and to raising or stabilising the groundwater table. They

also improve the resilience of the river ecosystem to climate change impacts. Hence, the project provides a significant contribution to climate change adaption.

GOVERNANCE ANALYSIS

Directly involved partners/institutions, etc.

☒ Administration	☐ Consultants	☐ General public
☒ NGOs	☐ Policy makers	☐ Private sector organisations
☐ Researchers		

Indirectly involved partners/institutions, etc.

☒ Administration	☐ Consultants	☒ General public
☒ NGOs	☐ Policy makers	☒ Private sector organisations
☒ Researchers		

Steering mechanisms established

Within the project, the partners were divided into a steering group and a project team. Part of the latter was also responsible for project management, supported by an external project coordinator.

Consisting of representatives from the project funders and a municipal representative, the steering group was responsible for the project's strategic and financial aspects, and hence made strategic and award decisions. The project team, consisting of the project partners, the project leader, the project coordinator, and a representative of the *Naturpark Tiroler Lech*, was responsible for planning and implementation in tune with the project schedule. The project leader and project coordinator informed the steering group several times a year about project progress. The steering group and project team met regularly (9 and 43 meetings, respectively, over the project period).

The Austrian federal government was the main provider of the national funding, providing the financial resources for the project's tendering phase. There was thus always an interface with the federal government in the different groups.

The project was continuously monitored by the EU. Its contact person attended several project team meetings, visited the different project sites and provided external advice from the EU's perspective.

Process design developed

The process design was developed in cooperation with the administrations involved by an external company (see below).

External support hired

Project management and project coordination were defined as separate work packages. For the latter, an external company was commissioned for the duration of the project. It provided one main contact person responsible for scheduling, taking minutes, documenting decisions and for the overall time management.

The project coordinator also generally chaired project meetings, supported by other project members in line with the thematic focus of the respective meeting. The external project coordinator supported decision-making processes and the coordination of internal activities as a neutral moderator.

In addition, the project coordinator was responsible for coordinating all documentation with the EU, processed everything in a structured manner and assigned the corresponding tasks.

Main interests and conflicts of interests

Conflict 1 – Nature conservation: These conflicts essentially arose from differing interests within the organisation. Nature conservation inherently involves a wide range of perspectives and interests, including those advocating ecological dynamism and those prioritising conservation. Consequently, it was necessary to establish a common framework accommodating both approaches. Overall, there were relatively strong synergies, as hydraulic engineering — at least in the case of the River Lech — proved to be relatively adaptable. This flexibility was largely due to the availability of extensive state-owned land, which facilitated the implementation of conservation measures.

Conflict 2 – Quarry pond Forchach: A number of local residents who used an existing historic quarry pond for fishing expressed doubts about the plan to let the river shape the future of this pond through natural dynamics. But thanks to good on-site networking, their doubts were allayed and they were convinced of the project's benefits.

Level of conflicts

Conflict 1: Nature conservation	☒ Low	☐ Medium	☐ High
Conflict 2: Quarry pond Forchach	☒ Low	☐ Medium	☐ High

Participatory or conflict management elements / methods used in terms of governance

No specific information was provided on participatory or conflict management methods used.

Main achievements and results of negotiations in terms of governance

The suspension bridge in Forchach as well as further revitalisation measures were not originally planned. They were made possible by the successful interdisciplinary project communication in combination with cost savings due to efficient project implementation. Moreover, a significant number of additional nature conservation measures were able to be implemented due to the efficient communication within the project team and with the involved parties.

Governance success factors, obstacles and how they were overcome

Initiating a large project like the LIFE Lech project presents significant challenges, particularly in the initial stages. One critical success factor is the establishment of a team with the requisite perseverance and methodological expertise. The first LIFE project at the Tyrolean Lech between 2001 and 2007 served as an exemplary pioneer in this regard. Similarly, the follow-up LIFE Lech project presented here can be highlighted as a positive example in several aspects. According to the stakeholders involved, the main reason for the relatively smooth running of the project was the small number of parties involved. This made it possible to work in a professional manner, without having to take into account the competing interests of (too) many stakeholders. Furthermore, the entire project management had a clear and pre-defined

framework, there were clear mechanisms for tendering and awarding contracts, and the framework of responsibilities and competences was clearly defined. The interdisciplinary approach promoted greater external acceptance. The cross-border cooperation also worked very well. The Austrian project team enjoyed working with their Bavarian counterparts.

An important lesson learned was that projects of this kind need a lot of space. Fortunately, this was available in the project area, facilitating implementation of the whole project.

Policy fields mainly affected

☐ Agriculture	☐ Bio-economy	☒ Climate protection / mitigation
☐ Forestry	☒ Nature conservation	☐ Spatial planning
☒ Tourism	☒ Water management	☐ Other: please describe it here

TRANSFERABILITY & SCALABILITY

Degree of innovation

☐ High (pioneer project)	☐ Medium	☒ Low (roll-out done)

Which aspects/elements of this project can be transferred to other regions/situations?

The successful governance mechanisms (relatively small project team, external project coordination, clearly defined project management framework, efficient cooperation and communication, provision of public information and awareness-raising events) can serve as an example for river restoration projects in general as well as for other projects requiring expertise from different fields.

The process for defining and realising the measures to be implemented in the project can similarly be transferred to other projects: In a participatory process, stakeholders from the fields of nature conservation, forestry, agriculture, tourism, water management and fisheries agreed on 175 individual measures linked to nature conservation, environmental education, recreation, regional development, and research and integrated these into a management plan extending beyond the project duration in order to ensure the project's long-term success. The scientific monitoring used to assess the specific effects of the implemented measures can also be used in other projects.

The first LIFE project involving the Tyrolean Lech (2002-2007) proved to be a motor for establishing the Natura 2000 area and the *Naturpark Tiroler Lech*. Further raising awareness, the follow-on project (2016-2022) is an excellent example for the economic, ecological and social opportunities arising from LIFE-funded projects for European protected areas in peripheral regions. It thus serves as a model for similar regions in the Tyrol and other Alpine river valleys where river landscapes and local populations share narrow spaces. This is particularly true for the Natura 2000 area "East Tyrolean glacier rivers Isel, Schwarzach und Kalserbach".

The project sites on the Tyrolean Lech have become popular for field trips by NGOs, universities, schools, and administrative experts, with the project thus serving as good example for the exchange of knowledge and experience.

Which aspects/elements of this project can be scaled up?

The project can already be considered a large-scale project. However, the success factors mentioned above, notably the efficient, lean and clearly defined project management structures as well as the implemented hydraulic and conservation measures, can be applied to even larger river restoration projects.

PROJECT SUCCESS FACTORS AND BARRIERS

Success factors

Since the first LIFE project at the Tyrolean Lech (2002-2007) had already been implemented and proven beneficial, the follow-up project was able to directly build upon its success.

As stated above, the main success factors with respect to governance were the relatively small number of partners involved and the interdisciplinary approach which promoted positive public perception and long-term acceptance by the local community.

Another success factor was the availability of state-owned land – where there is strong land use pressure, such projects are difficult to implement and encounter many conflicts of interest.

Finally, the project team was able to achieve a number of nature conservation benefits that were not initially anticipated but became apparent as the project progressed.

Obstacles

Apart from the general challenge of implementing such a large transnational project as described above and some interests of conflict which were successfully solved, no severe obstacles were encountered.

CONTACT DATA

Name of the institution	Bundeswasserbauverwaltung Tirol, Baubezirksamt Reutte	
Type of institution	☐ Association	❒ Non-Governmental Organisation
	❒ Private enterprise	☒ Public administration
Contact person	DDipl-Ing. Bernhard Kogelbauer – bernhard.kogelbauer@tirol.gv.at	
Street	Herrengasse 3	
ZIP-code	6020	
City	Innsbruck	
Country	Austria	
Project website	https://www.life-lech.at	

REFERENCES

Literature & Online Resources

ATL (Amt der Tiroler Landesregierung, Abteilung Wasserwirtschaft) (Ed.) (2022): LIFE Lech - Dynamic River System Lech. Final report 08/2022.

BWV (Bundeswasserbauverwaltung Tirol) (Ed.) (2022): Dynamic River System Lech. Final report 01/09/2016 - 30/09/2022. LIFE 15 NAT/AT/000167.

Interview

Interview conducted by Sophie V. Mahlknecht (CIPRA International) with Mr Bernhard Kogelbauer (Land Tirol, Department for Water Management), on 07.08.2024 at 10:00 via the online platform Zoom.

Zürcher Bachkonzept

FACTS IN SHORT

In the 1980s, Zurich developed the *Zürcher Bachkonzept,* a concept for rehabilitating the urban drainage network and reopening and revitalising culverted streams. The goal was to stop stream water flowing into the sewage system and thus to avoid mixing clean water with wastewater and unnecessarily loading wastewater treatment plants. Instead, the streams now flow openly in their own beds or in a separate conduit system. In addition to long-term cost savings, the opening of culverted streams has a positive impact on stream habitats and their animal and plant species as well as on human well-being through recreational benefits and the possibility to experience nature in everyday life.

Key words	Water management, stream revitalisation, stream opening, blue-green infrastructure, urban recreation
Location	Switzerland, Zurich, Zurich (CH040)
Link(s)	https://s1c56daba8dcc83be.jimcontent.com/download/version/1390415055/module/8993190497/name/DasBachkonzept%20Stadt%20Z%C3%BCrich.pdf https://sponge-city.info/projekte/albisriederdorfbach-zuerich/
Project period	Running continuously since 1988

DESCRIPTION, GOALS & FUNDING

Detailed description of project

In the middle of the 19th century, many streams in the urban area of Zurich were canalized or culverted to create more space, regulate flooding and counteract pollution, disposal problems and poor hygiene. In the 1980s, 80% of Zurich's drainage system consisted of a conventional combined system, in which all wastewater was discharged together with rainwater and possibly other unpolluted water such as stream water through a common conduit. This led to undesirable consequences, such as:

- A high load on wastewater treatment plants through non-polluted surface water – and thus high costs.
- Increased flooding of low-lying areas due to high runoff from sealed surfaces and to sewers overloaded by rainwater.
- Pollution of the receiving water bodies after sewer overflow.
- Reduced groundwater supply.
- The loss of habitats for flora and fauna.

In the 1980s, Zurich developed its so-called *Zürcher Bachkonzept* – a concept for rehabilitating the urban drainage network and promoting a natural water cycle by re-naturalising culverted and straightened streams. The new concept envisaged discharging urban surface waters directly into open streams or a separate conduit system and subsequently into a receiving watercourse (river, lake) instead of mixing it with wastewater in the sewage system and discharging it to wastewater treatment plants. The aim was to

increase the efficiency of wastewater treatment by reducing treatment plant loads, and thus treatment costs. Zurich also aimed to increase the recreational value of its streams for the population, to upgrade residential areas and to create habitats for wild animals and plants. Approved by the city council as a planning instrument and backed by the Water Protection Act, the concept came into force in 1991.

The *Bachteam* (the city's river team) is the interdisciplinary forum tasked with drafting plans and projects and fostering knowledge exchange. The main responsibility lies with *ERZ Entsorgung + Recycling Zürich* (Waste Management Department) as project manager, coordinator, and contractor. Other departments, including the *Tiefbauamt Zürich* (Civil Engineering Department), the *Amt für Städtebau* (Urban Planning Department), the *Grün Stadt Zürich* (Service Department of the Civil Engineering and Waste Disposal Department, responsible for Green Spaces) and the *Amt für Abfall, Wasser, Energie und Luft* (Department for Waste, Water, Energy and Air) are also involved.

By 2013, some 3 km of streams had been restored and over 18 km reopened. Around two-thirds of the maximum separable volume of clean external water, i.e. unpolluted water, had been eliminated from treatment, corresponding to around 300 l/s. This also improved flood protection and created habitats for animals and plants.

Goals of the project

The project pursues the following goals:

- Separating unpolluted stream water, well water, cooling water or rainwater from wastewater to reduce the load on wastewater treatment plants, while also reducing costs and improving treatment efficiency.
- Promoting the value of streams as elements of a blue-green urban infrastructure.
- Making the cityscape look better and promoting recreational elements.
- Creating habitats for flora and fauna.
- Fostering biodiversity and (re)establishing connectivity between streams by restoring the natural state of stream habitats.

Activities carried out

The following activities have been carried out:

- Stream development: Recultivating 3 km of streams to near-natural habitats for wild animals and plants and reopening 18 km of culverted streams.
- Separating the constant flow of clean external water from wastewater and directly discharging it into *Lake Zurich* or one of the three rivers *Limmat*, *Sihl* and *Glatt*.
- Developing and implementing a care and maintenance concept.
- Public relations work and raising the urban population's awareness of issues relating to the city's streams.

Financing / Funding description

The measures are financed by the city's waste management department *Entsorgung + Recycling Zürich* which invests over CHF 1 million per year in the planning and design of stream structures and their maintenance and restoration as well as in flood protection.

CHARACTERIZATION OF THE NATURE-BASED SOLUTION

Sectors addressed

Contribution to Alpine Climate Targets

Target abbreviation	Target description
T_NH3	Individual risk precaution measures are implemented by the Alpine population, including object and property related measures, based on improved risk awareness and Alpine-specific know-how and skills.
T_W3	The Alps and their population are effectively protected from floods and the impacts of heavy rain events, preferably through the development of green infrastructure (natural water retention measures, healthy riparian forests and lateral areas as well as protective forests in the watershed, peatland and wetland) or at least greener structural flood risk reduction measures.
T_Eco1	The loss of endangered species (flora and fauna) and habitats of the mountain zone (including glaciers) is reduced to a large extent. Existing invasive species are effectively managed and measures are enforced to prevent the development of new invasive species.

Contribution to implementation pathways of the Climate Action Plan 2.0

Pathway abbreviation	Pathway description
IP_NH3	Support measures to enhance individual risk precaution
IP_W3	Implementing of an Alpine-wide flood risk management, based on nature-based solutions
IP_Eco1	Protection and management of vulnerable and Alpine-specific landscapes and ecosystems

Type of nature-based solution

☐ Agriculture ☐ Built space ☒ De-Sealing

☐ Forests ☒ River and water management ☐ Wetlands

Benefit for biodiversity

The benefits for biodiversity are:

- Habitat creation and restoration through opening and revitalising streams.
- Re-introduction of native animal and plant species.
- Promotion of genetic exchange (migration and drift) through the development and promotion of networks between natural areas.

Benefit for human well-being

The benefits for human-wellbeing are:

- Avoidance of unnecessary wastewater treatment costs and improvement of treatment efficiency through separating non-polluted external water from wastewater.
- Higher quality of living through the creation and improvement of recreational areas.
- Green elements in the cityscape benefiting both children and adults.
- Greater awareness of the value of urban nature.
- Connection of recreational areas.
- Natural flood and drought management: Reduced risk of flooding and heat stress and related damage.
- Natural rainwater retention basins, such as meadows, as reservoirs for extinguishing water.

Provision of ecosystem services

In particular, the project provides the following ecosystem services according to the CICES system (CICES V5.1, Haines-Young & Potschin 2018):

10. Ecosystem services for regulation and maintenance (biotic and abiotic)

Code	Group	Class	Specification
Division	*Regulation of physical, chemical, biological conditions*		
2.2.1.3	Regulation of baseline flows and extreme events	Hydrological cycle and water flow regulation (Including flood control, and coastal protection)	Regulation of the water flow through the stream and conduit system in urban areas, promoting the natural water cycle and offering retention volumes in heavy rainfall
2.2.2.3	Lifecycle maintenance, habitat and gene pool protection	Maintaining nursery populations and habitats (Including gene pool protection)	Habitats for wild plants and animals
2.2.5.1	Water conditions	Regulation of the chemical condition of freshwaters by living processes	Banks of the restored streams serve as buffers, reducing the entry of contaminants through surface runoff

Code	Group	Class	Specification
2.2.6.2	Atmospheric composition and conditions	Regulation of temperature and humidity, including ventilation and transpiration	Evaporative cooling and increased transpiration through the revitalisation of stream areas leading to improved living conditions for the urban population
5.2.1.2	Regulation of baseline flows and extreme events	Liquid flows	Regulation of water runoff and prevention of flood events through near-natural, revitalised ecosystems
5.2.2.1	Maintenance of physical, chemical, abiotic conditions	Maintenance and regulation by inorganic natural chemical and physical processes	Maintenance of cooling effects that increase wellbeing or comfort

11. Cultural ecosystem services (biotic and abiotic)

Code	Group	Class	Specification
Division	*Direct, in-situ and outdoor interactions with living systems that depend on presence in the environmental setting*		
3.1.1.1	Physical and experiential interactions with natural environment	Characteristics of living systems that enable activities promoting health, recuperation or enjoyment through active or immersive interactions	Using stream environments for sport and recreation
3.1.1.2	Physical and experiential interactions with natural environment	Characteristics of living systems that enable activities promoting health, recuperation or enjoyment through passive or observational interactions	Watching or observing plants and animals and using stream areas to wind down
3.1.2.4	Intellectual and representative interactions with natural environment	Characteristics of living systems that enable aesthetic experiences	Enjoying the beauty of nature

Impact on climate change mitigation or adaption

The project contributes to climate change adaption in several ways:

- Regulating surface runoff and flooding caused by heavy precipitation in urban areas.
- Creating retention volumes for rainwater in revitalised green spaces.
- Reducing surface runoff through de-sealing and partially restoring the natural water balance, increasing evaporation, and improving groundwater recharge due to natural opened streams.

GOVERNANCE ANALYSIS

Directly involved partners/institutions, etc.

☒ Administration	☒ Consultants	☐ General public
☐ NGOs	☐ Policy makers	☐ Private sector organisations
☐ Researchers	☐ Other / Specification:	

Indirectly involved partners/institutions, etc.

☒ Administration	☒ Consultants	☒ General public
☒ NGOs	☒ Policy makers	☐ Private sector organisations
☒ Researchers	☐ Other / Specification:	

Steering mechanisms established

The *Zürcher Bachkonzept* is a flagship project for rehabilitating urban drainage networks and revitalising streams. To ensure good interdisciplinary work, the *Bachteam* (the city's river team) was founded. Many different departments are involved in the project, including *Entsorgung + Recycling Zürich*, the *Tiefbauamt Zürich*, the *Amt für Städtebau*, *Grün Stadt Zürich* and the *Amt für Abfall, Wasser, Energie und Luft*, as well as lawyers, geologists and other specialists. The project is coordinated by *Entsorgung + Recycling Zürich*.

It is important to emphasise that an interdisciplinary team and the contributions of various experts are crucial for the success of this type of project: collaboration between engineers, landscape architects, biologists, maintenance services, lawyers, geologists, etc. generates a comprehensive understanding, in turn enabling solution-orientated project implementation.

Process design developed

The preparatory phase of the project was thoroughly planned, supported by the interdisciplinary team. Prior to implementation, a list of 50 projects was compiled. Various aspects regarding the impact and potential of each project were considered, such as ecological effects, impacts on open spaces, and separation of water from the sewage system. Additionally, technical problems, spatial requirements and legal issues (land acquisition, transmission rights) were taken into account. The projects were evaluated and prioritised based on the information collected. The thorough evaluation enabled well-defined goals to be set.

External support hired

No external support was hired.

Main interests and conflicts of interests

The project involves several key interests, resulting in significant impacts:

The project fosters the protection of water resources, reduces the amount of wastewater to be treated, and enhances groundwater recharge. The re-opened streams and their surrounding areas provide a diverse habitat for many species, while the evaporation of water has a positive effect on the local urban climate. The project improves urban culture by promoting the connection between recreational areas and the natural

environment, thereby creating better integrated and accessible green spaces. These will be of great value to children and adults as recreational areas.

The project encountered few minor conflicts:

Conflict 1 – Lack of information and knowledge: Where the project was to be carried out on both public and private land, as was the case, for instance, at the *Albisrieder Dorfbach*, a lot of communication with landowners was necessary to gain acceptance and permission.

Conflict 2 – Private land ownership: Some landowners refused to give their consent to the planned measures.

There were also concerns about a possible increase in mosquitoes or the safety of children, as well as some technical and legal challenges.

Level of conflicts

Conflict 1: Lack of information and knowledge	☒ Low	☐ Medium	☐ High
Conflict 2: Private land ownership	☐ Low	☒ Medium	☐ High

Participatory or conflict management elements / methods used in terms of governance

The following participatory or conflict management aspects promoted the success of the project:

- Project implementation by a motivated and enthusiastic project team.
- Discussions with those directly involved or affected, e.g. landowners, residents or neighbourhood associations, about concerns, fears, obstacles, and opportunities.
- Delivery of validated information and examples from other areas as an important persuasive aspect.
- Positive attitude of the project team towards all unexpected issues.
- Public dedication of private land for the implementation of certain technical solutions without requiring the consent of the landowners (e.g. canal constructions).

Main achievements and results of negotiations in terms of governance

The project proves that good communication, knowledge transfer, and awareness-raising measures are key success factors. Interdisciplinary cooperation and knowledge transfer from different sectors as well as innovative approaches are also important.

Governance success factors, obstacles and how they were overcome

Several success factors were ground-breaking at that time:

- **Intensive preparation of the project prior to the implementation phase**: The conceptual framework provided clear objectives and served as a guideline for the project's progress.
- **Interdisciplinary cooperation**: The cooperation of experts from different fields fostered innovative solutions and ensured that all aspects were considered.
- **Highly committed project team**: The team maintained a positive attitude to unplanned challenges and encountered them with team commitment and the search for innovative solutions, resulting in adaptability and continuous progress.

- **Active stakeholder involvement**: Transparent communication of objectives and the involvement of the local community slowly built trust and gained support. Initial scepticism, mistrust and concerns were overcome through clear communication and the provision of accurate information. It should be noted that the project was not initially organised in a participatory way – as is now the case.

The combination of strong communication and proactive problem-solving enabled the project team to successfully overcome the encountered obstacles and achieve its goals.

Policy fields mainly affected

☐ Agriculture	☐ Bio-economy	☒ Climate protection / mitigation
☐ Forestry	☒ Nature conservation	☒ Spatial planning
☐ Tourism	☒ Water management	

TRANSFERABILITY & SCALABILITY

Degree of innovation

☒ High (pioneer project)	☐ Medium	☐ Low (roll-out done)

Which aspects/elements of this project can be transferred to other regions/situations?

More than thirty years after its conception, the project remains relevant, with all further measures continuing to show positive effects. The concept can be transferred to any other Alpine city with (culverted) streams or with space for channelling rainwater into open streams.

It can also serve as example within Zurich itself: Recently, the city decided to extend some initial measures and further widen some stream sections.

Which aspects/elements of this project can be scaled up?

The participatory approach and the detailed planning can serve as model for other projects.

PROJECT SUCCESS FACTORS AND BARRIERS

Success factors

As stated above, the project's key success factors are the highly committed interdisciplinary project team, the precise and professional planning prior to the implementation of any measure, the transparent communication with stakeholders and the public, as well as the adaptive capacity and continuous striving for improvement, e.g. in terms of participatory approaches.

The following aspects demonstrate the great success of the *Zürcher Bachkonzept*:

- Swiss Water Prize awarded to the project in 2003.

- '*Numerous international study groups coming to Zurich from Canada and Japan, as well as the frequent mentions of the Zurich stream concept as a showcase model in the relevant specialist literature, also prove that something internationally unique has been achieved here.*' (ERZ 2003, p. 5)
- Acceptance among the urban population.

Obstacles

In some cases, the planned measures affected streams on private land: This obstacle was overcome by classifying these streams as part of the municipal sewer network, meaning that a right of passage applied and there were no private property restrictions.

The local population expressed concerns about the streams' opening and revitalisation (e.g. waste disposal in the streams, danger for children, waste of money, etc.). Good public relations work and a problem-solving approach acknowledging residents' needs fostered acceptance and allayed concerns.

CONTACT DATA

Name of the institution	Entsorgung + Recycling Zürich	
Type of institution	☐ Association	☐ Non-Governmental Organisation
	☐ Private enterprise	☒ Public administration
	☐ Other:	
Street	Hagenholzstrasse 110	
ZIP-code	8050	
City	Zürich	
Country	Switzerland	
Project website	https://www.stadt-zuerich.ch/ted/de/index/entsorgung_recycling.html	
Additional contact person	Stefan Hasler, Verband Schweizer Abwasser- und Gewässerschutzfachleute (VSA), stefan.hasler@vsa.ch	

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Interview

Interview conducted by Maja Kogovšek (CIPRA International) with Mr Stefan Hasler from the Verband Schweizer Abwasser- und Gewässerschutzfachleute, on 06.08.2024 at 09:30 via the online platform Zoom.

Bergwaldprojekt

FACTS IN SHORT

Founded in 1990 in Switzerland as *Stiftung Bergwaldprojekt* and in 1993 in Germany under the name *Bergwaldprojekt e.V.*, the *Bergwaldprojekt* is a voluntary association for protecting, restoring and preserving ecosystems primarily in Germany and Switzerland, though projects have also been conducted in Liechtenstein, Austria and Catalonia. The association aims to raise awareness for nature and its irreplaceability and invites people to actively participate in socio-ecological transformation. Financed by donations, membership fees, public funding or cooperation contributions from companies and project partners, the volunteer work takes place in forests, peatlands, open landscapes and protected areas.

Key words	Volunteer work, tree planting, peatland restoration, nature experience
Location	Germany, Bayern (DE21); Switzerland; Austria; Liechtenstein
Link(s)	https://www.bergwaldprojekt.de/
Project period	Ongoing

DESCRIPTION, GOALS & FUNDING

Detailed description of project

The project was launched in Switzerland in 1987 with the aim of combating forest dieback. In 1990, the voluntary association *Stiftung Bergwaldprojekt* was founded in Switzerland. Following its first mission in 1991 in St. Andreasberg in the Harz Mountains, the *Bergwaldprojekt e.V.* was founded in Germany. Working with volunteers, the association focuses on protecting, restoring, and preserving ecosystems. A further aim is to raise awareness for nature and its irreplaceability, with the public invited to actively participate in socio-ecological transformation. The association is transparently committed to socio-ecological transformation in line with the Paris Climate Agreement and the UN's 17 Sustainable Development Goals.

The volunteer work takes place in forests, peatlands, open landscapes, and protected areas throughout Germany. It includes the ecological conversion of conifer monocultures into climate-tolerant, functional forests, the restoration of drained peatland, the maintenance and development of open landscapes, and measures to protect habitats and species. In 2022, around 4,000 volunteers worked in 200 projects, for example in natural forest development, the rehabilitation of protective forests, or in maintaining and rewetting peatlands. Educational weeks with school classes, family weeks, youth weeks and inclusive projects are also organised.

The *Bergwaldprojekt e.V.* has project cooperation agreements with numerous companies, such as *Climate Partner GmbH*, *Deutsche Bahn AG* or *Fondation Yves Rocher*, as well as partnerships with various organisations throughout Germany, including forestry administrations, municipal or city administrations, national park administrations, or foundations.

The German association with its head office is in Würzburg is run by three board members (Stephen Wehner, Christoph Wehner, Peter Naumann) and employs 30 part-time and full-time staff. In 2022, the

Bergwaldprojekt e.V. employed a total of 203 volunteer group leaders and 34 interns, 34 project managers and 50 kitchen managers.

In Switzerland the association is focused more on forest conversion and protective forest restoration. In addition to Germany and Switzerland, the *Bergwaldprojekt* is also represented in Austria, Liechtenstein and Spain.

Goals of the project

The goals and the purpose of the association are defined in the statutes of the German *Bergwaldprojekt e.V.*:

§ 2 Purpose of the association: "The purpose of the association is to protect, preserve and maintain forests, in particular mountain forests and the countryside, and to promote an understanding of nature interrelationships, the interests of forests and human dependence on these foundations of life."

The association derives the following project goals from this:

- Protecting, restoring and preserving ecosystems and their functionality in terms of climate and nature protection.
- Raising awareness for nature, its irreplaceability and the importance and limited nature of resources.
- Promoting the prudent and sustainable use of resources through active cooperation.
- Informing the public about the ecological functions of forests and peatlands.

The association is transparently committed to the socio-ecological transformation process in line with the Paris Climate Agreement and the UN's 17 Sustainable Development Goals.

Activities carried out

The volunteer work takes place in forests and nature conservation areas in cooperation with local forestry administrations or nature associations. Activities include planting and maintenance measures, erosion control, path construction and biotope maintenance as well as peatland and stream restoration.

The main activities are organised as project weeks for adults and families, integrative weeks, one-week projects focusing on sufficiency, youth weeks and the "*Neihaufeschten*"(*Neihaufeschte* are one-day or weekend tree planting or maintenance assignments). In addition, the association offers corporate volunteer days and forest weeks for school classes. Participants can book online on the website. The project weeks are planned, prepared and supervised by qualified project leaders, supported by voluntary group leaders.

Together with the *Bundesverband Caritas Kinder- und Jugendhilfe e.V. (*Federal Association of Caritas Child and Youth Welfare*)*, the *Bergwaldprojekt* organises youth aid projects (forest weeks). Their aim is to familiarise children and young people with the topics of species, nature and climate protection and the socio-ecological transformation of society and to motivate them to act sustainably.

There are also special projects like the future forest in Unterschönau in Thuringia (outside the radius of the Alpine Convention) or the "*forest salon*". In 2011 and 2015 the association organised long-distance hikes in St. Andreasberg and Sonthofen. Present on Instagram, X, YouTube and Telegram, the association takes a stand on hunting, wind turbines in forests and CO_2 compensation. It organises forest cinema events and has stands at various events, such as the *Green World Tour* or the 2022 *Ökofete*.

The association also runs an online "forest store" on its homepage, where clothing and other textiles from its own collection can be purchased.

Financing / Funding description

The association is financed by donations, membership fees, (public) funding and corporations:

- One-off donations or fee-paying membership.
- Income from public funds for project- or location-related applications.
- Participation fees for the various project formats, e.g. forest school (192,60 €/participant) or family projects (Contribution towards expenses for one child: 100 €, additional sibling: 70 €).
- Corporate social responsibility (CSR) projects: Companies can provide support (donating trees, sponsorship, one-off donations), enter into long-term project cooperation agreements or support the association in the form of corporate volunteering (CV).
- Revenues from the forest shop.

CHARACTERIZATION OF THE NATURE-BASED SOLUTION

Sectors addressed

Contribution to Alpine Climate Targets

Target abbreviation	Target description
T_Fo1	The protective function of mountain forests is maintained, restored and enhanced (including adaptation of forest ecosystems to climate change through sustainable adaptive forest management).
T_Fo2	Mountain forests are adapted to climate change with the aim to maintain their positive role for the local climate and protect or, if possible, further strengthen their carbon sink role.
T_Fo3	Conversion of forest ecosystems to close-to-nature forests is achieved, using endemic forest species adapted to climate change.
T_W2	The availability of high-quality drinking water for the Alpine population is secured under relevant climate change scenarios in a sustainable way. The qualitative and quantitative security of the water supply especially in areas threatened by water scarcity is increased by means of planning and technological measures.

Target abbreviation	Target description
T_W3	The Alps and their population are effectively protected from floods and the impacts of heavy rain events, preferably through the development of green infrastructure (natural water retention measures, healthy riparian forests and lateral areas as well as protective forests in the watershed, peatland and wetland) or at least greener structural flood risk reduction measures.
T_NH3	Individual risk precaution measures are implemented by the Alpine population, including object and property related measures, based on improved risk awareness and alpine-specific know-how and skills.

Contribution to implementation pathways of the Climate Action Plan 2.0

Pathway abbreviation	Pathway description
IP_Fo1	Promoting the full use of the potential of Alpine protective mountain forests
IP_Fo2	Promoting Alpine forests as carbon sinks
IP_Fo3	Accelerate forest conversion to more resilient and close-to-nature ecosystems
IP_W2	Tools and methods for drought management in the Alps

Type of nature-based solution

☐ Agriculture	☐ Built space	☐ De-Sealing
☒ Forests	☐ River and water management	☒ Wetlands

Benefit for biodiversity

Benefits for biodiversity are:

- Conversion of coniferous monocultures to near-natural forests (natural forests are living communities for a variety of animal and plant species).
- Creation of new habitats in peatlands through restoring and rewetting degraded peatlands.
- Preservation or development of the biodiversity in the open countryside through protection measures, e.g. protecting habitats for nesting birds or rare plant species.

Benefit for human well-being

The benefits for human well-being are:

- Climate protection.
- Boosting activism, the ability to act and the sense of responsibility for nature and climate protection.

- Developing a greater awareness for nature, the importance of our living resources and the protection of our resources.
- Strengthening of the common good and the sense of community: People actively work together in sustainable activities.
- Property and personal protection through the restoration of protective mountainous forests.

Provision of ecosystem services

In particular, the project provides the following ecosystem services according to the CICES system (Haines-Young & Potschin 2018, CICES V5.1):

1. Provisioning ecosystem services (biotic and abiotic)

Code	Group	Class	Specification
Division	*Biomass*		
1.1.1.2	Cultivated terrestrial plants for nutrition, materials or energy	Fibres and other materials from cultivated plants, fungi, algae and bacteria for direct use or processing (excluding genetic materials)	Volume of processed timber
1.1.5.3	Wild plants (terrestrial and aquatic) for nutrition, materials or energy	Wild plants (terrestrial and aquatic, including fungi, algae) used as a source of energy	Volume of wood used for heating

12. Ecosystem services for regulation and maintenance (biotic and abiotic)

Code	Group	Class	Specification
Division	*Regulation of physical, chemical, biological conditions*		
2.2.1.1	Regulation of baseline flows and extreme events	Control of erosion rates	Control and prevention of soil loss
2.2.1.2	Regulation of baseline flows and extreme events	Buffering and attenuation of mass movement	The capacity of forest cover to prevent or mitigate the extent and force of avalanches
2.2.1.3	Regulation of baseline flows and extreme events	Hydrological cycle and water flow regulation (Including flood control, and coastal protection)	The capacity of forests to retain water and release it slowly
2.2.1.4	Regulation of baseline flows and extreme events	Wind protection	Reduction in the scale or frequency of damage to trees
2.2.2.2	Lifecycle maintenance, habitat and gene pool protection	Seed dispersal	Tree species regeneration in the forest

Code	Group	Class	Specification
2.2.2.3	Lifecycle maintenance, habitat and gene pool protection	Maintaining nursery populations and habitats (Including gene pool protection)	Maintaining nursery habitats and populations in forests, peatlands and the open countryside
2.2.3.1	Pest and disease control	Pest control (including invasive species)	Providing habitats for native pest control agents (e.g. against bark beetle)
2.2.3.2	Pest and disease control	Disease control	Reduction in disease damage due to tree harvesting
2.2.5.1	Water conditions	Regulation of the chemical condition of freshwaters by living processes	Water filtration in forests to preserve clean drinking water
2.2.6.1	Atmospheric composition and conditions	Regulation of chemical composition of atmosphere and oceans	Global climate regulation by reducing greenhouse gas concentrations through planting trees, converting forests, and re-naturalizing peatlands

13. Cultural ecosystem services (biotic and abiotic)

Code	Group	Class	Specification
Division	*Direct, in-situ and outdoor interactions with living systems that depend on presence in the environmental setting*		
3.1.2.1	Intellectual and representative interactions with natural environment	Characteristics of living systems that enable scientific investigation or the creation of traditional ecological knowledge	Researching nature, sites of special scientific interest, e.g. protection areas
3.1.2.1	Intellectual and representative interactions with natural environment	Characteristics of living systems that enable activities promoting health, recuperation or enjoyment through passive or observational interactions	Studying nature
Division	*Indirect, remote, often indoor interactions with living systems that do not require presence in the environmental setting*		
3.2.2.1	Other biotic characteristics that have a non-use value	Characteristics or features of living systems that have an existence value	The things in nature that we think should be conserved; mental/moral well-being
3.2.2.2	Other biotic characteristics that have a non-use value	Characteristics or features of living systems that have an option or bequest value	The things in nature that we want future generations to enjoy or use; moral well-being

Impact on climate change mitigation or adaption

The project provides the following benefits with respect to climate change mitigation and adaption:

- Restoration of degraded peatlands to prevent and mitigate CO_2, methane and nitrous oxide emissions and restore their functions as carbon sinks.
- Conversion of coniferous monocultures to healthy, near-natural mixed forests with long-term CO_2storage capacity (climate-adapted, near-natural mixed forests are more resilient to disturbances and thus have a longer CO_2 storage capacity).

GOVERNANCE ANALYSIS

Directly involved partners/institutions, etc.

☒ Administration	☐ Consultants	☒ General public
☒ NGOs	☐ Policy makers	☒ Private sector organisations
☐ Researchers	☒ Other/Specification: National parks, biosphere reserves	

Indirectly involved partners/institutions, etc.

☒ Administration	☐ Consultants	☒ General public
☒ NGOs	☒ Policy makers	☐ Private sector organisations
☐ Researchers	☒ Other: Public institutions (e.g. schools, universities)	

Steering mechanisms established

Headquartered in Würzburg and run by three board members, the non-profit association has supporting members and up to 25 members with voting rights. It employs 30 part-time and full-time staff with diverse backgrounds and knowledge. Volunteers play an important role.

The association has a binding code of conduct that applies to everyone involved in its projects. Before the *Bergwaldprojekt* collaborates with private sector organisations, the projects, their goals and visions are explained. Companies receive a project / communication guide and a contract is signed.

Process design developed

The organisation creates a strategic plan at the beginning of each year.

A clear division of tasks is established: a project coordinator is responsible for planning the measures with the project partners, guiding implementation and monitoring progress; project leaders (foresters, landscape engineers) are responsible for the volunteers and work on site. As experienced professionals, they offer volunteers advice and support; group leaders (volunteers who have been with the association for many years) help in the implementation of individual projects, supervising volunteers on site, supporting project and kitchen management, and sharing their substantial knowledge of forestry and the countryside.

In weeks where several projects run in parallel, they have at their sides a coordinator for inter-project coordination.

An important part of each project is the weekly documentation of the work and long-term monitoring. Newly planted forests are monitored for 3 years to ensure their initial growth.

The final pillar of any project is the associated public relations (PR) work.

As each project requires a lot of logistical coordination, project coordinators have to prepare plans including the mission statements of project leaders, the availability of cars and tools, etc. There are also weekly plans for public relations and project coordination.

Regular team meetings ensure alignment with overall goals and provide a platform for discussion.

External support hired

No external support was hired.

Main interests and conflicts of interests

The main interests of the *Bergwaldprojekt* association are:

- Environmental impact: protecting, preserving and restoring biodiversity and the multiple functions of ecosystems.
- Impact on corporate behaviour by raising awareness.
- Proof of effectiveness, feasibility, reliability and sustainability.

The main interests of private donors are business opportunities and tax benefits.

The interests of the general public and people involved in the project are:

- Educational impact and personal development
- Social benefits such as physical well-being through time spent outdoors and in action
- Support for community development, promotion of social cohesion through joint environmental action, ethical and moral fulfilment.

Conflict – Understanding: In the context of donations from private players, the question arises about what taking care of the environment means and how it is defined. There may be different understandings, e.g. the idea that planting trees compensates for CO_2 emissions or that high emission levels can be reduced by planting trees rather than trying to reduce emissions.

As working in private forests can lead to transparency problems, the *Bergwaldprojekt* does not plant trees on private land, thereby avoiding any impression that it plants trees with private-sector money or via corporate social responsibility projects providing a personal benefit to a private owner. This may change in the future, as the ecological status of many privately-owned forests is also critical.

Level of conflicts

Conflict: Understanding	☒ Low	☐ Medium	☐ High

Participatory or conflict management elements / methods used in terms of governance

Conflicts are reduced by the framework conditions which are transparent from the start and clearly defined in the contract signed at the beginning of every collaboration project.

Private-sector organisations have to show the *Bergwaldprojekt* their PR publications to ensure there is no misinformation.

Main achievements and results of negotiations in terms of governance

The main achievements and results of *Bergwaldprojekt* are:

- Many years of successful work for biodiversity and ecosystems – many planted trees.
- Increased awareness among the people and companies involved.

Governance success factors, obstacles and how they were overcome

The governance success factors are:

- Competence, experience, evidence-based approach, transparency.
- Clear leadership.
- Clear communication about the purpose of and reason for working together (e.g. CSR). All important things are defined in guidelines.
- Reciprocity: opportunity for private companies to help rebuild the ecosystem, yet with a "personal" benefit (tax breaks).

The *Bergwaldprojekt* does not currently face any obstacles.

Policy fields mainly affected

☐ Agriculture	☐ Bio-economy	☒ Climate protection / mitigation
☒ Forestry	☒ Nature conservation	☐ Spatial planning
☐ Tourism	☒ Water management	☐ Other: please describe it here

TRANSFERABILITY & SCALABILITY

Degree of innovation

☐ High (pioneer project)	☐ Medium	☒ Low (roll-out done)

Which aspects/elements of this project can be transferred to other regions/situations?

The following aspects are highly transferable to other regions in the Alps:

- The mountain forest project was founded as an association in Switzerland and later in Germany. Projects have also been carried out in Austria and the Principality of Liechtenstein.
- Forest conversion in times of climate change is possible wherever there are damaged, non-natural forest ecosystems in the Alpine region.

Which aspects/elements of this project can be scaled up?

The projects can be extended to larger areas. The limiting factors are financial resources, as the association relies on public funding or donations from companies or private persons.

PROJECT SUCCESS FACTORS AND BARRIERS

Success factors

The following success factors contribute(d) significantly to the success of the *Bergwaldprojekt*:

- The association acts in accordance with social and ecological values.
- The association's concept: people are actively motivated to participate in projects, giving them a sense of contributing to the fight against climate change. Success is reflected in the high demand for participation in the projects – the project weeks are usually fully booked long in advance.
- The constant public presence of the association at green events or its positioning on political issues (e.g. hunting, climate change, wind energy), which helps attract new members with the same values.
- Awards in competitions: The *Bergwaldprojekt e.V.* has won the UN Decade Project Competition as one of the top 3 projects in the "Forests" category.

Obstacles

In the past, the problem was insufficient funding. The association had to change its management to bring private-sector money into the project.

CONTACT DATA

Name of the institution	Bergwaldprojekt e.V.	
Type of institution	☒ Association	☐ Non-Governmental Organisation
	☐ Private enterprise	☐ Public administration
Street	Veitshöchheimer Str. 1b	
ZIP-code	97080	
City	Würzburg	
Country	Germany	
Project website	https://www.bergwaldprojekt.de/	

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Interview

Interview conducted by Maja Kogovšek (CIPRA International) with Mr. Peter Naumann (https://www.bergwaldprojekt.de/ueber-uns/team/vorstand), on 07.08.2024 at 10:30 via the online platform Zoom.

I-SWAMP – Integrated small wetlands of the Alps monitoring and protection

FACTS IN SHORT

The project *Integrated-Small-Wetlands of the Alps Monitoring and Protection* (*I-SWAMP*) is dedicated to restoring and preserving small Alpine wetlands (swamps, wet meadows, marshes, fens, bogs, and shallow water bodies/ponds) with the support of local populations. The reason for the project is the fact that ponds and other small wetlands have been widely destroyed or modified in the Alpine region and are often not properly managed.

The three project partners – the *Territorio e Sistemi Agro-Forestali* (TESAF) department of the University of Padova (lead), the *EGTC Geopark Karawanken-Karavanke* (supported by the *E.C.O. Institute for Ecology*), and the *Institute of the Republic of Slovenia for Nature Conservation* (IRSNC) – selected five to six wetland sites each in Austria, Italy and Slovenia, analysed the existing fauna and flora as well as the factors endangering the wetlands, and carried out appropriate restoration measures with the involvement of volunteers. Based on scientific findings and the outcomes of the measures implemented, the project team members drew up guidelines for biodiversity monitoring and the conservation of small Alpine wetlands targeting local decision-makers, stakeholders and local populations. Alongside these activities, they organised various seminars and workshops, including with teachers and pupils, and published a booklet for children to improve general knowledge about wetlands. This integrated approach helps to protect and restore wetlands at a regional scale and to avoid further loss of biodiversity, habitats and ecosystem services.

The project is embedded in the *Interreg Alpine Space programme*.

Key words	Wetland restoration, biodiversity monitoring, educational measures
Location	Austria, Kärnten, Klagenfurt-Villach (AT211); Italy, Veneto, Belluno (ITH33); Slovenia, Vzhodna Slovenija, Koroška (SI033) and Savinjska (SI034)
Link(s)	https://www.alpine-space.eu/project/i-swamp/ https://www.youtube.com/results?search_query=i-swamp+project
Project period	2022 – 2024

DESCRIPTION, GOALS & FUNDING

Detailed description of project

The *I-SWAMP* project tackles the ongoing degradation of Alpine wetlands in terms of their number and ecological features. It focuses explicitly on small wetlands whose importance for the habitat network and for conserving rare species is often underestimated due to their sometimes very specific site conditions. As a consequence, they are often not properly managed and not covered by regulations and monitoring

activities. The main causes of the poor condition of many small wetlands are related to human activity: direct destruction to make room for new buildings or infrastructure; the abandonment of traditional mowing and management of pastures and ponds, leading to overgrowth or excessive shading and isolation; excessive or unregulated cattle grazing causing eutrophication; the drainage of peatlands for peat extraction or land reclamation; the introduction of invasive species sometimes leading to local extinction of native species.

Against this background, the project focuses on educational measures and on motivating local populations to participate in conservation and restoration measures, accompanied by pilot measures as showcase examples and bases for scientific research. It is an international cooperation project between the *Territorio e Sistemi Agro-Forestali* (TESAF) department of the University of Padova (lead), the *EGTC Geopark Karawanken-Karavanke* (supported by the *E.C.O. Institute for Ecology*), and the *Institute of the Republic of Slovenia for Nature Conservation* (IRSNC). The project team selected five to six degraded wetland sites each in Austria, Italy, and Slovenia, including different types of wetlands (swamps, wet meadows, marshes, fens, bogs, and shallow water bodies):

- **Austrian sites**: ***Wildensteiner Moor*** (fen); ***Sonnegger Moor*****,** Tichoja, Sittersdorf (fen); ***Kleinzapfen***, Sittersdorf (wet meadow); ***Pirkdorfersee*** (lake); ***Lavamünder Badesee*** (lake); ***Bleiburg*** / ***Einersdorf*** (shallow water body, i.e. pond).
- **Italian sites**: ***Pozze di Costa della Spina*** (shallow water bodies, i.e. ponds); ***Torbiera di Polget-Fontanabona*** (peatland with a mosaic of bogs, fens, and wet meadows); ***Laghetto delle Sepolture*** (shallow water body, i.e. pond); ***Laghetto di Vedorcia*** (shallow water body, i.e. pond); ***Risorgive di Mosigo*** (shallow water bodies, i.e. ponds and streams; wet meadow); ***Biotopo umido di La Zopa*** (shallow water bodies, i.e. ponds and streams; wet meadow).
- **Slovenian sites**: ***Dolga Brda*** (wet meadows, shallow water bodies, i.e. ponds, bog fragments); ***Upper and lower part of the Helenski potok – povirje*** (swamp meadows, bog fragments); ***Zadnji travnik*** – ***Olševa*** (high bog); ***Šumec*** (swamp); ***Smrekovec*** (bogs).

At all sites, existing vegetation and species were recorded and the site-specific causes for their poor status analysed. Based on these findings, site-specific measures to counteract wetland degradation were proposed. This procedure ensured that interventions were adapted to the habitats' potential and avoided harm to species or habitats of interest.

The extent of conservation and restoration activities varied from site to site. At all sites, the project team members sensitised landowners to the value of the wetlands, their characteristic needs, and the threats they faced. Measures ranged from fencing off ponds or other sensitive areas to removing invasive species, mowing, partially removing shrubs and woody vegetation, or digging ponds – mostly conducted with the help of volunteers – as well as elaborating long-term maintenance plans. To sensitise landowners, other stakeholders and the public at large to the importance of (small) wetlands and provide them with knowledge about the topic, project team members held various seminars and workshops, including with teachers and pupils, as well as organising field trips with students. In this context, they also published a booklet for children aged 6 to 14 about the topic. Based on the scientific findings, they drew up "Guidelines for biodiversity monitoring and conservation of small Alpine wetlands", providing information on the various types of wetlands, their differences and characteristics, providing guidance on the monitoring of important taxonomic groups of fauna and flora, and presenting proposals for conserving and restoring wetlands, categorised by the wetland types and their main threats. These guidelines are specifically designed for small wetlands (less than 2 hectares) within the Alpine environment, where the primary pressures are easily identifiable and where no complex interventions are required.

The project is a good example of successful cooperation measures between different stakeholders, including the scientific community, landowners, planners, pupils and students, as well as different

authorities (e. g. the Slovenian Forest Service, the Farmland and Forest fund of the Republic of Slovenia, the Slovenian Water Agency, and the Centre of Cartography of Fauna and Flora for the implementation of measures at the *Helenski potok povirje* and *Dolga brda*.

Goals of the project

The *I-SWAMP* project pursues the following goals:

1. Elaborating a method for conserving small Alpine wetlands that are not properly managed or neglected, focusing on science-based decision-making and the responsibilisation of local communities, including:
   a. Provision of knowledge about the characteristics and importance of small Alpine wetlands for landowners, authorities, teachers, and pupils.
   b. Provision of information on (easy-to-implement) conservation measures for different wetland types and typical threats to landowners and local authorities.
2. Studying the occurrence of plant and animal species in several small Alpine wetlands selected as pilot sites.
3. Elaborating and (partially) implementing site-specific conservation measures on pilot sites, involving volunteers.

Activities carried out

The following activities have been carried out so far:

1. **Biodiversity monitoring and analysis of site-specific threats:**
   - Carried out between May and August 2023 in Austria, between April and October 2023 in Italy, and between April and November 2023 in Slovenia.
   - Studying vegetation, amphibians, butterflies, dragonflies, and birds to understand the ecological status of the pilot sites and the main causes for their degradation.
   - Documentation: Biodiversity report, Conservation report.

2. **Proposal and implementation of site-specific conservation and restoration activities 2023 – 2024, involving volunteers:**
   - Carried out between December 2022 (starting with sensitisation measures) and February 2024.
   - Implemented measures at Austrian sites: sensitisation of landowners and local stakeholders at all sites; removal of invasive species, cutting bushes, excavation of ponds.
   - Implemented measures at Italian sites: sensitisation of landowners at all sites; fencing off ponds, mowing, partial removal of shrubs, woody vegetation, and invasive species.
   - Implemented measures at Slovenian sites: Sensitisation of the landowners or managers at all sites; removal of forest vegetation, long-term mowing and grazing plans presented to owners, improvement of water dynamics in a silted pond.
   - Documentation: Conservation report.

For several project sites, follow-up activities are planned.

3. **Educational material and activities:**

- Main output: "**Guidelines for biodiversity monitoring and conservation of small Alpine wetlands**":

  The document summarises and generalises the findings of the fieldwork and from scientific literature in an easily understandable way. The first section explains the different types of wetlands present in the Alpine Region. The second section presents (simplified) monitoring protocols for each of the species groups considered of interest for wetland conservation (vegetation, amphibians, dragonflies, butterflies). These groups were chosen in view of the feasibility of monitoring, their importance to wetlands, and their rarity or protection status. The third section provides guidelines for the conservation and restoration of the different wetland types, presenting several possible ecological threats (namely excessive livestock trampling, eutrophication, invasive plant species, introduced fish, tree or shrub overgrowth, low water levels or other hydro-morphological changes) and one or more promising solutions for each of them.
- **Didactic booklet** for children aged 6 to 14, available in English, French, German, Italian, and Slovene (with the possibility to practice another language as the booklets are bilingual).
- **Webinars, seminars, and workshops** (partially available online)
  - 23.02.2024: "Conoscere e proteggere le zone umide alpine - Seminar for Italian stakeholders (virtual and physical meeting, organised by the TESAF department of the University of Padova).
  - 16.02.2024: Seminar in collaboration with CAI Calalzo (physical meeting, organised by the TESAF department of the University of Padova and the C.A.I. Sezione di Calalzo di Cadore).
  - 15.02.2024: Final webinar about the project's activities and outcomes.
  - 25.10.2023: Seminar for German- and Slovenian-speaking teachers and educators (virtual event, organised by the Geopark Karawanken and the Institute of the Republic of Slovenia for Nature Conservation (IRSNC).
  - 13.10.2023: "Can you teach wetland ecology to kids?" – Seminar for Italian-speaking teachers and educators (virtual and physical meeting, organised by the TESAF department of the University of Padova).
  - 25.05.2023: Workshop to present the activities about wetlands to teachers and educators in Austria (organised by the EGTC Geopark Karawanken-Karavanke).
  - 22.04.2023: Pilot event with schools on World Earth Day about Alpine wetlands, dedicated to schools and parents (organised by the TESAF department of the University of Padova).
  - 11.04.2023: Webinar for the professional training of Registered Foresters and Agronomists of Veneto (virtual event, organised by the FODAF Veneto and the TESAF department of the University of Padova).
  - 13. – 14.09.2022: Kick-off meeting at the University of Padova (physical meeting).

Financing / Funding description

Total eligible costs:	€404,600
European Regional Development Fund (ERDF) grants: (EU co-funding as part of the Interreg Alpine Space programme)	€303,450

CHARACTERIZATION OF THE NATURE-BASED SOLUTION

Sectors addressed

Contribution to Alpine Climate Targets

Target abbreviation	Target description
T_S2	Alpine soil quality is improved. Especially wetlands and peatlands including riparian forests, are re-established as CO2-sinks in the Alps. Soil erosion is avoided to maintain the function of Alpine soils for mountain agriculture and other sustainable uses.
T_Eco1	The loss of endangered species (flora and fauna) and habitats of the mountain zone (including glaciers) is reduced to a large extent. Existing invasive species are effectively managed and measures are enforced to prevent the development of new invasive species.
T_Eco3	Alpine specific landscape management, including the maintenance of pasture areas and the limitation of scrub encroachment, safeguards high-quality landscapes and ensures the maintenance and restoration of ecosystem services. The crucial benefits provided by Alpine ecosystems for an improved adaptive capacity are taken into account in plans about climate change at various scales.
T_Eco4	Connectivity between protected areas and beyond is maintained and further developed, in order to increase ecosystems resilience and to enable favourable conditions for Alpine species, habitats, and ecological processes.

Contribution to implementation pathways of the Climate Action Plan 2.0

Pathway abbreviation	Pathway description
IP_S1	Preservation and sequestration of carbon in soil with a focus on peatlands, moorlands and wetlands

Pathway abbreviation	Pathway description
IP_S3	Supporting measures to preserve and enhance Alpine soil quality
IP_Eco1	Protection and management of vulnerable and Alpine-specific landscapes and ecosystems

Type of nature-based solution

☐ Agriculture ☐ Built space ☐ De-Sealing

☐ Forests ☐ River and water management ☒ Wetlands

Benefit for biodiversity

The *I-SWAMP* project has several positive effects on biodiversity:

The protection and restoration measures implemented at the selected wetland sites conserve or re-establish specific habitat conditions, such as water with low pH in peatlands or alternating wet and dry conditions in wet meadows and marshes. These conditions are essential for species particularly adapted to wetland habitats, like certain dragonflies, butterflies or amphibia, including endangered or very rare species, e.g. Wood horsetail (*Equisetum sylvaticum*) or the Marsh fritillary (*Euphydryas aurinia*).

The focus on small wetlands is particularly valuable in view of the need to preserve or recreate a comprehensive habitat network in the Alpine Region, promoting gene pool exchange and landscape diversification. These effects, in return, enhance the resilience of Alpine wetland ecosystems to human or climate change-related disturbances.

The proposed and partially implemented measures address the following ecological threats to small wetlands: excessive livestock trampling, eutrophication, invasive plant species, introduced fish, tree or shrub overgrowth, low water levels, and other hydro-morphological changes. Due to the continuous involvement of landowners and other local stakeholders and the proposal of long-term conservation plans (e.g. regarding grazing or mowing), there is hope that the wetlands will be preserved in the long term.

Benefit for human well-being

The project provides knowledge on the characteristics and the value of different types of wetlands for the ecosystem, while sensitising stakeholders in this respect on an individual basis. Specific solutions are proposed to counteract various ecological threats to small Alpine wetlands. In particular, the project highlights strategies on how to continue human activities, e. g. livestock grazing, without interfering with or degrading sensitive ecosystems.

The educational material, developed by the project team, provides teachers with ideas on how they can inspire their pupils' interest in wetlands.

The field trips, workshops and voluntary actions carried out during the project promote community-building, exchanges between various stakeholders, and the mutual understanding of different interests and opinions.

Finally, the project helps to preserve rare and endangered species as natural heritage.

Provision of ecosystem services

In particular, the project provides the following ecosystem services according to the CICES system (Haines-Young & Potschin 2018, CICES V5.1):

14. Provisioning ecosystem services (biotic and abiotic)

None

15. Ecosystem services for regulation and maintenance (biotic and abiotic)

Code	Group	Class	Specification
Division	*Transformation of biochemical or physical inputs to ecosystems*		
2.1.1.2	Mediation of wastes or toxic substances of anthropogenic origin by living processes	Filtration/sequestration/ storage/accumulation by micro-organisms, algae, plants, and animals	Storage of carbon dioxide and methane in peatlands
Division	*Regulation of physical, chemical, biological conditions*		
2.2.1.3	Regulation of baseline flows and extreme events	Hydrological cycle and water flow regulation (Including flood control, and coastal protection)	Retention of water, small-scale reduction of overland flow, preservation of natural water cycles
2.2.2.3	Lifecycle maintenance, habitat and gene pool protection	Maintaining nursery populations and habitats (Including gene pool protection)	Protection of typical, sometimes rare or endangered wetland species with specific habitat requirements
2.2.4.2	Regulation of soil quality	Decomposition and fixing processes and their effect on soil quality	Enrichment of soil with organic matter, fixing of carbon dioxide and methane in peatlands
2.2.5.1	Water conditions	Regulation of the chemical condition of freshwaters by living processes	Acidic conditions of water and soil in peatlands due to lacking degradation of organic material in anoxic conditions
2.2.6.2	Atmospheric composition and conditions	Regulation of temperature and humidity, including ventilation and transpiration	Microclimatic effect in the vicinity of the wetlands due to evaporation and transpiration

16. Cultural ecosystem services (biotic and abiotic)

Code	Group	Class	Specification
Division	*Direct, in-situ and outdoor interactions with living systems that depend on presence in the environmental setting*		
3.1.1.1	Physical and experiential interactions with natural environment	Characteristics of living systems that enable activities promoting health, recuperation, or enjoyment	Sports (leisure) activity by implementing restoration measures with volunteers

Code	Group	Class	Specification
		through active or immersive interactions	
3.1.1.2	Physical and experiential interactions with natural environment	Characteristics of living systems that enable activities promoting health, recuperation or enjoyment through passive or observational interactions	Opportunity to observe rare wetland-specific plants and animals for people interested in flora and fauna
3.1.2.1	Intellectual and representative interactions with natural environment	Characteristics of living systems that enable scientific investigation or the creation of traditional ecological knowledge	Promotion of continuous ecological monitoring and guidelines for future monitoring
3.1.2.2	Intellectual and representative interactions with natural environment	Characteristics of living systems that enable education and training	Project sites, visited in field trips, as showcases for local authorities, students and pupils
Division	*Indirect, remote, often indoor interactions with physical systems that do not require presence in the environmental setting*		
3.2.2.2	Other biotic characteristics that have a non-use value	Characteristics or features of living systems that have an option or bequest value	Protection and fostering of rare and endangered species

Impact on climate change mitigation or adaption

Peatlands can store carbon very efficiently due to their anoxic conditions hindering the degradation of organic material. The conservation and restoration of peatlands are therefore prime examples of measures that can achieve a relatively large reduction in carbon dioxide and methane emissions in small areas.

GOVERNANCE ANALYSIS

Directly involved partners/institutions, etc.

☒ Administration ☐ Consultants ☐ General public

☐ NGOs ☒ Policy makers ☐ Private sector organisations

☒ Researchers ☒ Other/Specification: Public institutions: EGTC Geopark Karawanken, University of Padova, IRSNC

Indirectly involved partners/institutions, etc.

☐ Administration	☒ Consultants	☒ General public
☐ NGOs	☐ Policy makers	☒ Private sector organisations
☐ Researchers	☒ Other/Specification: Private landowners / communities, educational institutions	

Steering mechanisms established

Since the project is an Interreg Alpine Space project, the three partners had to come from three different Alpine countries. The partners are the TESAF department of the University of Padova, Italy, as lead partner, the *EGTC Geopark Karawanken-Karavanke* (a cross-border Austrian-Slovenian park, representing Austria), and the IRSNC as the Slovenian partner.

As it was a small-scale project, there was no need for complex steering mechanisms between the partners. At the beginning, they officially appointed one representative from each organisation to oversee and manage project activities. This person was also part of the three-person management team. Another representative from each organisation was responsible for communication.

In reality, the number of people involved in the project was so limited that meetings were organised *ad hoc*, with participants able to bring in their own contributions. It was decided that the activities on the ground should be carried out by each partner for its own national territory and that the common parts should be shared according to the different competences existing within project members. As the working group was quite small, it was easy to divide the tasks according to competences.

Furthermore, cooperation was facilitated by the fact that the *Geopark Karawanken* and the IRSNC had been working together in the border region Austria-Slovenia for many years. It was noticeable that they shared a lot of common ground and were used to working together. The work package for training and education in schools and other places was carried out in cooperation between the two organisations. This was very valuable for the lead partner as it did not have to oversee every step of the process.

Process design developed

In a first physical partner meeting, the process design was developed in joint agreement for the main tasks and activities. The timetable was not always 100% adhered to, as needs sometimes changed and activities had to be carried out later or earlier than planned. Nevertheless, the planned activities were carried out within the given timeframe. Most of the activities built on each other, which was helpful as it was always clear to everyone that step two could not be started before step one had been completed.

Country-specific activities were planned within each partner organisation. Activities were planned in advance: a timetable was drawn up and the plan was followed during implementation. Different local stakeholders were involved in the activities and invited to participate. The partner organisation took care of obtaining permits and communicating with landowners. Local stakeholders, including external experts and people who helped with implementation, were invited to field trips to assess the situation. Further steps were taken in a participatory approach.

External support hired

No external support was hired.

Main interests and conflicts of interests

There were no major conflicts of interests between the partners.

Obviously, in conservation projects there are sometimes conflicts with proposed areas. All three partners were able to choose intervention points where major conflicts could be avoided, so that, in a year and a half, there were no major problems.

Conflict 1 – Landowners: In the *Cadore* region, for example, there were some minor conflicts of interest with landowners. Most of the land is privately owned – not by a single person but by communities. This form of ownership is very old. While the communities and their members own the land privately, they are required to manage it in the public interest, not deriving any economic profit from the activities carried out there. One of these communities that had previously agreed to the intervention on its land, suddenly revoked its decision without explanation, possibly due to internal disagreements.

Conflict 2 – Distorted image: In another case, a municipality agreed to an intervention on its land. At some point, they announced that they were planning to build a tourist village on a bog on their territory. This contradicted the self-perception and image of the project. Therefore, the lead partner stopped working with this municipality.

Level of conflicts

Conflict 1: Landowners	☒ Low	☐ Medium	☐ High
Conflict 2: Distorted image	☒ Low	☐ Medium	☐ High

Participatory or conflict management elements / methods used in terms of governance

In general, the idea of protecting and managing land, especially in mountainous areas, is more widespread than it might seem – including among local communities. At the same time, people often need to be convinced that a specific intervention is worthwhile and will not cause any problems in other regards. Through discussions and explanation, this conviction work was successful.

For the lead partner in Italy, there were no major problems or conflicts. Any conflicts were managed by telephone or face-to-face conversations with those concerned.

The partners in Slovenia and Austria organised field trips and explained their activities to landowners and clarified open questions. Interested parties were always informed and briefed in advance about the specific timeframe and activities to be carried out, in order to avoid conflicts.

Main achievements and results of negotiations in terms of governance

In most cases, the active conviction work proved successful and motivated those affected to co-operate.

Governance success factors, obstacles and how they were overcome

One minor obstacle was certainly the communication between the partners, as no one could speak their mother tongue at the meetings. However, this is a common challenge in all international projects and nevertheless, everything was communicated in a clear way.

Another obstacle were the difficult terrain and weather conditions, which meant that excursions had to be postponed several times. The project ran from September 2022 to February 2024. This meant that there was only one summer during the project period when field actions could be carried out. In hindsight, the project team recommends that such projects be run from spring to autumn.

One of the success factors was the participatory approach in planning the activities with different stakeholders and the good communication of project interests to stakeholders and vice versa.

Other success factors were the flexibility of the project partners (e.g. changing the dates of the activities), the rising awareness of public visitors, and the organisation of several joint seminars for stakeholders in a specific area.

The small scale of the project also facilitated the work. Furthermore, the fact that the Austrian and Slovenian partners had already been working together for some time was an advantage. It also helped that the team members had very different skills. This made it possible to divide the work packages in a sensible way.

Policy fields mainly affected

☐ Agriculture	☐ Bio-economy	☒ Climate protection / mitigation
☐ Forestry	☒ Nature conservation	☐ Spatial planning
☐ Tourism	☐ Water management	☒ Other: Education

TRANSFERABILITY & SCALABILITY

Degree of innovation

☐ High (pioneer project)	☒ Medium	☐ Low (roll-out done)

Which aspects/elements of this project can be transferred to other regions/situations?

The following aspects of the project can be easily transferred:

- **Educational outreach**: The project's educational tools, such as workshops, webinars, and bilingual children's booklets, can be adapted to various regions to raise awareness about wetland conservation.
- **Tailored conservation efforts**: The methodology of analysing site-specific threats and implementing localised restoration measures is universally applicable to different wetland types and ecosystems.
- **Volunteer and stakeholder engagement**: Involving local volunteers and a wide range of stakeholders creates a model for community-driven conservation that can be replicated globally.
- **Addressing common threats**: Solutions to problems such as invasive species, eutrophication, and water level changes can be adapted to other wetland ecosystems.

Which aspects/elements of this project can be scaled up?

The project could be extended to other mountain regions or wetland ecosystems. Furthermore, the educational programmes developed in this project could serve as an example for other projects of this type; by scaling up the educational outreach, awareness and community involvement could be improved on a larger scale.

Additionally, by extending biodiversity monitoring efforts to larger areas, a more comprehensive understanding of wetland ecosystems could be achieved.

If such projects draft guidelines and policy recommendations, the path towards standardised conservation practices could be influenced.

PROJECT SUCCESS FACTORS AND BARRIERS

Success factors

The main success factors of the project were the following:

- Involvement of stakeholders and volunteers.
- Cooperation between scientific community and practitioners.

Obstacles

As the project period only covered one summer, the poor weather conditions made field activities considerably more difficult. Excursions had to be postponed several times. In hindsight, the project teams recommends that such projects be run from spring to autumn.

CONTACT DATA

Name of the institution	Territorio e Sistemi Agro-Forestali (Land, Forestry and Agriculture, TESAF) department of the University of Padova (lead partner)	
Type of institution	☐ Association	❒ Non-Governmental Organisation
	❒ Private enterprise	☐ Public administration
	☒ Other: University	
Street	Via 8 Febbraio, 2	
ZIP-code	35122	
City	Padova	
Country	Italy	
Contact person	Giulio Menegus – giulio.menegus@unipd.it	
Name of the institution	EGTC Geopark Karawanken-Karavanke	
Type of institution	☐ Association	❒ Non-Governmental Organisation
	☐ Private enterprise	❒ Public administration
	☒ Other: European grouping of territorial cooperation	
Street	Hauptplatz 7	
ZIP-code	A-9135	
City	Bad Eisenkappel	
Country	Austria	
Name of the institution	Institute of the Republic of Slovenia for Nature Conservation (IRSNC)	
Type of institution	☐ Association	❒ Non-Governmental Organisation
	❒ Private enterprise	☒ Public administration
Street	Tobačna ulica 5	
ZIP-code	1000	
City	Ljubljana	
Country	Slovenia	
Project website	https://www.alpine-space.eu/project/i-swamp/	

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TESAF (Università degli Studi di Padova, Dipartimento Territorio e Sistemi Agro-Forestali) (Ed.) (2024): Guidelines for biodiversity monitoring and conservation of small Alpine wetlands.

Interview

Interview conducted by Sophie V. Mahlknecht (CIPRA International) with Mr Giulio Menegus (University of Padova), on 12.08.2024 at 11:00 via the online platform Zoom.

LIFE PASTORALP

FACTS IN SHORT

Alpine permanent grasslands react very sensitively to changes in climate and land use, acting as an early indicator of climate change. At the same time, they are valuable habitats and cultural heritage. The LIFE project *PASTORALP*, coordinated by the Department of Agriculture, Food, Environment and Forestry (DAGRI) of the University of Florence and supported by six other partners, combined biophysical and socio-economic approaches to address the vulnerability of Alpine pastures and to enhance their resilience, along with improving the capacity of shepherds and farmers to adapt to climate change. Areas in two national parks representative of Western Alpine environments served as pilot regions: the *Parc National des Ecrins* in France and the *Parco Nazionale del Gran Paradiso* in Italy. Based on a detailed analysis of climate change-related impacts on Alpine pastures, the project team came up with specific management adaption measures and established a monitoring system to analyse project impacts. The publication of promising adaption measures and the development of web-based tools should ensure the replicability of the methodology and its transferability to other Alpine communities or European mountain regions. To ensure the sustainability of the project impacts, the project team has set up an After-LIFE plan.

Key words	Alpine pastures, agriculture, climate change
Location	Ecrins: France, Rhône-Alpes, Isère (FRK24) Gran Paradiso: Italy, Piemonte, Torino (ITC11)
Link(s)	https://www.pastoralp.eu/homepage/
Project period	2017 – 2022

DESCRIPTION, GOALS & FUNDING

Detailed description of project

The aim of *PASTORALP* (Pasture vulnerability and adaption to climate change impact in the Alps) is to mitigate the impacts of climate change on Alpine pastoral systems and to increase their resilience on the basis of a multidisciplinary and participatory science-based approach developed and applied in two case studies, one in the *Parco Nazionale Gran Paradiso* (IT) and the other in the *Parc National des Ecrins* (FR). The project team comprised the *Dipartimento Di Scienze e Tecnologie, Agrarie, Alimentrai, Ambientalí e forestal* (Department of Agriculture, food, environment, and forestry, DAGRI) of the University of Florence, the *Agenzia Regionale Protezione Ambiente Valle d'Aosta* (Regional Environmental Protection Agency Valle d'Aost, ARPA VDA), the *Centre national de la recherche scientifique* (National Centre for Scientific Research, CNRS); the *Institut Agricole Régional* (Regional Agricultural Institute, IAR), the *Institut National de Recherche pour l'Agriculture, l'Alimentation et l'Environment* (National Research Institute for Agriculture, Food and the Environment, INRAE); the *Parc National des Ecrins* (Ecrins National Park, PNE), and the *Ente Parco Nazionale Gran Paradiso* (Gran Paradiso National Park Authority, PNGP).

The project started with mapping pastures in the pilot areas. Innovative methods were developed, enabling rapid updates as well as replication in other Alpine contexts. The mapping was an essential basis for developing specific pastoral plans as well as for monitoring and funding options.

Another important step was to analyse the bio-physical and the socio-economic aspects of vulnerability. The bio-physical analysis focused on low-, medium-, and high-altitude pastoral systems, seeking to quantify future variations in terms of biomass peak, productivity, phenology and carbon storage, taking into account several adaptation measures. The socio-economic analysis included interviews, questionnaires, workshops as well as modelling, with a focus on assessing the socio-economic impact of the *PASTORALP* project on the local economy.

Based on the analyses, several adaption measures were proposed to specifically tackle the identified climate risks, such as measures to maintain forage production, optimise water use, improve the management of animals on the pastures and conserve biodiversity. The measures were implemented in the two pilot areas. To evaluate the impacts of the adaptive management on local fauna and flora, monitoring systems were established.

Furthermore, policy recommendations at different governance levels were proposed, such as pasture management or a silvio-pastoral system. A platform was created to serve as a decision support system. This includes a WebGIS section with climate, pastoral and vegetation maps. The tools are intended to facilitate the transfer of methods and strategies, a further project focus. A replication and transfer plan describes the main geographic areas for replication (Alps, Pyrenees, and Apennines), the transferrable results and methods, as well as the target audience and respective stakeholders. It also addresses key elements for transferability to other mountain contexts.

To support the transfer and sustainability of the project outcomes, some of the adaption strategies have already been included in regional and national policies.

Goals of the project

The *PASTORALP* project focused on increasing the resilience of Alpine permanent pastures at higher altitudes to climate change through the following approaches:

- Analysing the impacts of climate change on Alpine pastures in the two pilot regions using modelling processes.
- Assessing environmental and social vulnerability to climate change.
- Identifying management measures and adaption policies to mitigate the expected impacts of climate change.
- Defining an integrated strategic adaptation plan.
- Implementing tools to support decision-making processes.
- Raising awareness for climate change-related challenges and capacity-building to cope with them.

Activities carried out

The following activities were carried out:

- Purchase of two improperly managed grazing areas in the *Orco* valley of the *Parco Nazionale Gran Paradiso* which were already exposed to forest and scrub encroachment. These areas were established as permanent demonstration areas for pasture recovery and adaptation measures.

- Development of an innovative method, based on remote sensing, expeditive field surveys and modelling, to map pastoral resources.
- Mapping of about 8,000 hectares of mountain pastures in the *Parco Nazionale Gran Paradiso* and updating the mapping of about 2,500 hectares of pastures in the *Parc National des Ecrins* with a homogeneous classification.
- Assessment of the impacts of climate change on grassland production and phenology using remote sensing and simulation models, specifying the vulnerability of pastures with respect to bio-physical and socio-economic aspects.
- Elaboration and publication of specific management adaption strategies for the two pilot sites (pastoral plans).
- Establishment of flora and fauna monitoring systems to assess the effects of adaptation measures on biodiversity, including the installation of phenocams and NDVI (Normalised Difference Vegetation Index) sensors providing real-time data used to i) infer canopy phenology, ii) analyse the interactions between mowing/grazing and canopy dynamics, and iii) estimate functional and structural properties.
- Evaluation of the effects of adopted management strategies regarding climate change-related and socio-economic challenges.
- Development, optimization, and demonstration of web-based tools to support the transferability of the project outcomes and to facilitate decision-making.
- Proposal of adaption measures to be promoted and supported within the framework of a joint adaption plan and to be transferred to other pastoral systems in the Alps.
    - Identification and publication of technical adaption measures (in the sense of adapted management) to counteract the various climate change-related risks identified.
    - Elaboration and publication of recommendations for policy adaption measures.
- Raising awareness regarding the vulnerability of pastures and the mitigation approaches through participation and demonstration events, seminars, conferences, (scientific) publications, videos, leaflets, etc.
- Networking with other LIFE and non-LIFE projects.

Financing / Funding description

The project was funded with a total of €2.31 million from the LIFE programme.

("The LIFE programme is the EU's funding instrument for the environment and climate action. The general objective of LIFE is to contribute to the implementation, updating and development of EU environmental and climate policy and legislation by co-financing projects with European added value. LIFE began in 1992 and until now it has co-financed about 4,000 projects across the EU, contributing with more than 3 billion € to the protection of the environment. The European Commission manages the LIFE programme but the implementation of many components of the LIFE programme were delegated to the Executive Agency for Small and Medium-sized Enterprises (EASME)." (https://www.pastoralp.eu/whatss-life/))

CHARACTERIZATION OF THE NATURE-BASED SOLUTION

Sectors addressed

Contribution to Alpine Climate Targets

Target abbreviation	Target description
T_Eco3	Alpine specific landscape management, including the maintenance of pasture areas and the limitation of scrub encroachment, safeguards high-quality landscapes and ensures the maintenance and restoration of ecosystem services. The crucial benefits provided by Alpine ecosystems for an improved adaptive capacity are taken into account in plans about climate change at various scales.
T_Agr4	To cope with climate change impacts, mountain agriculture is based on diversified species and crops, which suit local conditions, promoting the conservation of traditional crop varieties and animal breeds in regard of a broad pool for adaptation.

Contribution to implementation pathways of the Climate Action Plan 2.0

Pathway abbreviation	Pathway description
IP_Eco1	Protection and management of vulnerable and Alpine-specific landscapes and ecosystems

Type of nature-based solution

☒ Agriculture ☐ Built spaces ☐ De-Sealing

☐ Forests ☐ River and water management ☐ Wetlands

Benefit for biodiversity

One of the project's primary aims was to conduct a scientific survey of the status quo of Alpine pastures in the project areas, assessing their vulnerability to climate change and developing climate change-resilient adaptation options. Another focus was to preserve the biodiversity of these mountain-specific habitats. However, as the project duration was limited to four summers, the impact of the measures on biodiversity cannot yet be finally assessed. Monitoring has been established so that well-founded statements can be expected in the coming years.

Due to the fact that biodiversity declines when grazing areas are no longer managed, as demonstrated in the project on the basis of vegetation surveys and fauna mapping, the re-establishment and conservation of proper management will have a positive effect on biodiversity.

Benefit for human well-being

The preservation of Alpine pasture farming at higher altitudes is not only in the interests of the farmers who graze their livestock there, but also in the interests of the general public, as transhumance and Alpine pasture farming are part of our cultural heritage. These traditions and the specific biodiversity of the pastures can only be preserved for future generations if adaption to climate changes succeeds. The *PASTORALP* project supports this adaption by proposing specific management strategies. In more general terms, the project fosters the provision of ecosystem services.

Enter ecosystem services provided by the nature-based solution; use names of the CICES system?

In particular, the project provides the following ecosystem services according to the CICES system (Haines-Young & Potschin 2018, CICES V5.1):

17. Provisioning ecosystem services (biotic and abiotic)

Code	Group	Class	Specification
Division	*Biomass*		
1.1.3.1	Reared animals for nutrition, materials or energy	Animals reared for nutritional purposes	Dairy products and meat
Division	*Other types of provisioning service from biotic sources*		
1.3.X.X	Other	Other	Wild plants on pastures

18. Ecosystem services for regulation and maintenance (biotic and abiotic)

Code	Group	Class	Specification
Division	*Regulation of physical, chemical, biological conditions*		
2.2.2.2	Lifecycle maintenance, habitat and gene pool protection	Seed dispersal	Seed spreading by migratory grazing animals (via faeces, fur, etc.) and thus connection of different habitats, especially in the case of long-distance grazing like the so-called transhumance

19. Cultural ecosystem services (biotic and abiotic)

Code	Group	Class	Specification
Division	*Direct, in-situ and outdoor interactions with living systems that depend on presence in the environmental setting*		
3.1.1.1	Physical and experiential interactions with natural environment	Characteristics of living systems that that enable activities promoting health, recuperation or enjoyment through active or immersive interactions	Hiking, walking, and recreation in pasture landscapes with positive effects on physical and mental health

Code	Group	Class	Specification
3.1.1.2	Physical and experiential interactions with natural environment	Characteristics of living systems that enable activities promoting health, recuperation or enjoyment through passive or observational interactions	Wildlife watching on mountain pastures
3.1.2.1	Intellectual and representative interactions with natural environment	Characteristics of living systems that enable scientific investigation or the creation of traditional ecological knowledge	Mountain pastures as sites of special scientific interest
3.1.2.3	Intellectual and representative interactions with natural environment	Characteristics of living systems that are resonant in terms of culture or heritage	Alpine pasture management as a tradition and part of the local identity; tourist attraction
Division	*Indirect, remote, often indoor interactions with living systems that do not require presence in the environmental setting*		
3.2.2.2	Other biotic characteristics that have a non-use value	Characteristics or features of living systems that have an option or bequest value	Mountain pastures and their traditional management and characteristic biodiversity as cultural heritage to be preserved for future generations

Impact on climate change mitigation or adaption

The vulnerability analysis informed on various risks and challenges linked to climate change. The project team members developed specific adaption methods and tools to support implementation. They also published recommendations for policymakers on how to support the adaption methods. All these outcomes enable the capacity-building of local communities and actors to cope with climate change impacts.

GOVERNANCE ANALYSIS

Directly involved partners/institutions, etc.

☐ Administration	☒ Consultants	☐ General public
☒ NGOs	☐ Policy makers	☐ Private sector organisations
☒ Researchers	☒ Other/Specification: Nature parks	

Indirectly involved partners/institutions, etc.

☐ Administration	☐ Consultants	☒ General public
☐ NGOs	☒ Policy makers	☐ Private sector organisations
☐ Researchers	☒ Other/Specification: Local stakeholders, e.g. shepherds	

Steering mechanisms established

The actions to be carried out and the distribution of tasks were done by the lead partner (University of Florence) before the start of the project, since LIFE proposals require a fairly detailed plan of the funded project in advance.

Although the University of Florence as lead partner was in charge of project coordination and some actions, many of the activities were under the direct responsibility of the individual partners, who got very involved and did a good job. Even though staff fluctuation at the beginning complicated things a bit (see section “Main interests and conflicts of interests” for more details), cooperation between the partners was strong, leading to overall optimal achievement of project objectives.

The project team did a lot of desk research and studied and tested different approaches and methods of climate change adaptation for the pilot regions, i.e. the two national parks. Results were presented to the European Commission (the Directorate-General for Agriculture and Rural Development (DG AGRI, and the Directorate-General for Environment (DG ENV)) as well as other stakeholders (see section “Participatory or conflict management elements...” for more details).

Process design developed

Each action within the project is directly linked to a certain budget position. For each action a responsible person was chosen. Nevertheless, all partners were very involved in the different actions. Nevertheless, as is always the case, some were more involved than others.

The project meetings were all held in English and all the relevant documents for the European Commission had to be in English.

External support hired

There was no external support hired in terms of project management.

As usual in LIFE projects, there was an external supervisor (changed three times during the project) from the European Commission to monitor project progress. At least once a year, this person requested administrative documents and visited the pilot areas. He or she always came to meetings and monitoring visits, where the project team showed him/her what had been done, either via slide presentations or field visits. He/she also informed the project team about administrative issues that needed to be resolved and

gave suggestions on how to solve certain problems. The project team considered this person as an external evaluator who acted as a link between the consortium and the European Commission.

Main interests and conflicts of interests

There were three main interests and project objectives:

- Increasing knowledge about the biophysical and socio-economic impacts of climate change on pastoral resources, as both parks, despite having large expanses of pastureland, have never before been the subject of an in-depth study on this aspect.
- Providing technical and decision-making tools.
- Awareness-raising and capacity-building on the part of local communities on this issue.

The following conflicts occurred during project implementation, although they can be considered rather as challenges than as controversies:

Conflict 1 – Staff turnover: At the beginning of the funding period, there was a high turnover of staff within the partner organisations, which meant that the start-up phase was somewhat difficult as new team members had to be trained and familiarised with the project's administrative structures.

Conflict 2 – Change of partners: One of the partners, CNRS, joined the project after it had already started, so the LIFE agreements had to be amended. Later on, two French partners merged, resulting in the original number of 7 partners and a further amendment to the agreements. This was quite a lot of work for the lead partner, as the structure within the project application was very clear at the beginning but had to be changed several times – also in terms of budget, objectives and tasks.

Conflict 3 – Language of study visits: As the project involved work in France and Italy, there was no common language during the study visits. Translations had to be provided throughout the visits.

Level of conflicts

Conflict 1: Staff fluctuation	☒ Low	☐ Medium	☐ High
Conflict 2: Changing partners	☐ Low	☒ Medium	☐ High
Conflict 3: Language of study visits	☒ Low	☐ Medium	☐ High

Participatory or conflict management elements / methods used in terms of governance

The technical activities were co-designed together with targeted stakeholders under participatory approaches. Desk research was carried out by the research units, with results presented later to various stakeholders in a workshop where participants had the opportunity to give feedback and reformulate the proposals to make them acceptable to the stakeholders. These proposals included technical and policy measures to be implemented in relation to climate change adaptation. These participatory elements worked well each time and did not cause any problems.

One field of conflict that the project leaders noticed during these workshops was the criticism of EU policies which are structured in a way not rewarding small farmers, but big industries. This had nothing to do with the work of the project teams and the strong willingness to participate and to be promoters.

The proposed solutions were also presented to the local stakeholders in the parks, such as breeders, technicians, veterinary researchers, local politicians, etc. Many meetings were held to discuss the results

and whether the project team was moving in the right direction. These meetings took place in France and in Italy and included study visits from both sides. This helped to steer the direction so that the solutions were not implemented top-down but co-decided and co-structured together with local people. In this way, there was a mutual knowledge of the people, issues and problems.

Main achievements and results of negotiations in terms of governance

Unexpectedly, interest in the project beyond the project area was strong. This prompted stakeholders to develop plans to replicate and adopt the adaptation measures and methodological approaches deployed in *PASTORALP* to monitor the pastoral system for the entire region (especially on the Italian side).

The project also resonated strongly at European level. At the final scientific conference on the topic of climate change and mountain pastoral systems, the project team organised working tables and invited decision-makers and scientists from different parts of Europe to elaborate a joint position paper for the European Commission. This paper outlined priorities and which measures should be funded to protect these ecosystems. It also included recommendations for action, taking into account the findings and resources of other EU-funded projects and how these could be used and activated for more specific governance on this issue.

Two main publications were compiled. These included recommendations on how these technical and political measures and strategies could be translated into hands-on management mechanisms for dealing with climate change. In the medium to long term, they could be applied to governance.

Governance success factors, obstacles and how they were overcome

One obstacle right from the start was the high turnover of staff within the partner organisations. This caused some difficulties in communication and reporting. As mentioned above, one of the partners, CNRS, joined the project after it had already started, which meant that the LIFE agreements had to be amended. Later on, two French partners merged, which led to the original number of 7 partners and another amendment of the agreements. This was quite a lot of work for the lead partner, as the structure within the project application was very clear at the beginning but had to be changed several times, also in terms of budget, objectives and tasks. The lead partner had to be very careful not to make any mistakes in reporting and collecting signatures and forms from each of the partners for the European Commission.

Not all the partners involved were used to the rigorous reporting and administrative processes that a LIFE project requires.

Fortunately, these obstacles were mostly confined to the initial phase of the project and were resolved in a timely manner.

As the project involved work in France and Italy, there was no common language during the study visits. Though most people in *Val d'Aosta* have a good knowledge of French, translation had to be provided throughout these encounters.

Policy fields mainly affected

☒ Agriculture	☒ Bio-economy	☒ Climate protection / mitigation
☐ Forestry	☒ Nature conservation	☒ Spatial planning
☐ Tourism	☐ Water management	☒ Other: Education (through seminars)

TRANSFERABILITY & SCALABILITY

Degree of innovation

☒ High (pioneer project) ☐ Medium ☐ Low (roll-out done)

Which aspects/elements of this project can be transferred to other regions/situations?

The project team developed a replication and transfer plan, describing the main geographical areas to which replication and transfer might be possible. It also described which results and methods could be transferred:

Transfer of results is possible, because the *PASTORALP* platform is open to all, allowing easy access to all results, tools, and methods and facilitates easy replication and transfer to other regions.

Which aspects/elements of this project can be scaled up?

The integrated adaptation strategy plan is the main tool developed by the project to help pastoral communities adapt to climate change. The open access web platform (https://www.pastoralp.eu/tools/) provides comprehensive information and tools on various climate risks in the Alpine region and offers specific adaption measures and adaption policies for pastoral systems that can be used by others. It also provides recommendations for decision-makers and policymakers at all levels.

PROJECT SUCCESS FACTORS AND BARRIERS

Success factors

The project's reliance on multidisciplinary expertise and active collaboration between scientific, technical, and local stakeholders ensured that the solutions were comprehensive, context-specific, and widely accepted. The development and effective use of innovative tools and methods enabled accurate data collection, replication and transferability of results to other contexts. Finally, the stakeholder engagement and participatory governance approach ensured that the adaptation strategies were co-designed, practical to implement and had a strong local perspective. This facilitated the adoption of measures on the ground.

Obstacles

High staff turnover and the change of partner institutions at the beginning of the project period can be highlighted here.

CONTACT DATA

Name of the institution (Lead partner)	University of Florence (Department of Agriculture, food, environment, and forestry, DAGRI)	
Type of institution	☐ Association	☐ Non-Governmental Organisation
	☐ Private enterprise	☐ Public administration
	☒ Other: University	
Street	18, Piazzale delle Cascine	
ZIP-code	50144	
City	Florence	
Country	Italy	
Project website	https://www.pastoralp.eu	
Contact person	Prof. Marco Bindi	

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Pastoralp (Ed.) (2023e): Pastures vulnerability and adaptation strategies to climate change impacts in the Alps. Deliverable E.3 Proceedings of the international scientific conference.

Pastoralp (Ed.) (2023f): Pastures vulnerability and adaptation strategies to climate change impacts in the Alps. Deliverable E.4 Replication and transfer plan.

Interview

Interview conducted by Sophie V. Mahlknecht (CIPRA International) with Camilla Dibari and Giovanni Argenti (University of Florence), on 18.09.2024 at 09:00 via the online platform Zoom.

Rotational pasture management to increase the sustainability of mountain livestock farms in the Alpine region

FACTS IN SHORT

Agricultural and livestock practices, including pasture management, have an impact on long-term soil health and soil functions. Over-grazing may lead to the siltation of pastures and soil compaction, while under-grazing results in selective grazing by livestock and hence a "waste" of forage with respect to the optimal utilisation of the biomass produced by the pastures as fodder. Adequate management of herbivore livestock is therefore important to maintain good soil coverage and the botanical composition of alpine meadows. The research project *Rotational pasture management to increase the sustainability of mountain livestock farms in the Alpine region* compared and evaluated the impacts of continuous grazing with those of rotational grazing on an organic dairy donkey farm. The study assessed the effect of the different agroecological practices in terms of soil disturbance, soil (organic) carbon contents as well as greenhouse gas fluxes and budget. The results showed that rotational grazing reduces soil compaction and disturbance as well as greenhouse gas emissions from the soil, while increasing its water infiltration capacity. The practice therefore has clear benefits regarding soil protection and climate change mitigation and adaption compared to continuous grazing.

Key words	Agroecology, pasture management, rotational grazing, soil health, soil functions
Location	Italy, Provincia Autonoma die Trento, Trento, Italia (ITH20)
Link(s)	https://link.springer.com/article/10.1007/s10113-022-01896-1 https://www.agrilife.bio/it/ https://www.instagram.com/agrilife.bio/ https://www.progettoinversion.it/portfolio/agrilife/
Project period	2017 – 2019

DESCRIPTION, GOALS & FUNDING

Detailed description of project

The project was embedded in *INVERSION*, a project in which animal husbandry models were tested to improve soil functions and biodiversity. The rotational pasture management was one sub-project. It took place on the *AgriLife* farm, an organic donkey dairy farm in *Comano Terme* within the UNESCO Biosphere Reserve *Ledro Alps* and *Judicaria* at an elevation of 508 m a.s.l. on the valley floor. The farm had around 40 dairy donkeys grazing continuously on two hectares of pasture from May to October, resulting in high grazing pressure and a deterioration of soil and grassland quality.

For the study, the two hectares of pasture were divided into two experimental plots. One plot was further divided into five paddocks of 2.000 m^2 each, on which rotational grazing (RG) was tested. Every 4 days, the

animals were moved from one paddock to the next. Every 20 days, two operations were conducted under the pasture plan: the upper soil layer (0-5 cm) was groomed with manure and pasture residuals were topped in the growing season (May to September) to maintain pasture quality. The second one-hectare plot was managed as before in the form of continuous grazing. Due to the presence of drinking and feeding stations it included a visibly degraded area. Therefore, two sub-sections of about 0.5 hectares each were differentiated in this plot, although not physically separated. The section with the most visibly degraded patches was considered as a pasture with continuous stepped grazing (CSG), while the other section was considered as a pasture with continuous grazing (CG). The animals could move freely between them.

The herd of donkeys, with their respective foals, were split into three groups of 12 animals which were assigned to the different grazing systems over two years. Each group grazed for 8 h/day in summer and 4 h/day in springtime (May). The RG group fed only on pasture, while the second and the third group (CG and CSG respectively) were fed with 4 kg of hay per head and day in addition to outdoor grazing.

The pasture areas and their soil qualities were regularly monitored in order to compare the effects of the different pasture management systems. The final results clearly show the beneficial effects of rotating grazing areas according to a pastoral plan, in terms of increasing pasture production and reducing soil compaction and greenhouse gas emissions from the soil.

The study was conducted by a group of researchers from different organisations based in Florence: the *Institute of BioEconomy – National research Council;* the *Consiglio Per La Ricerca in Agricoltura E L'analisi Dell'Economia Agraria* (Council for Agricultural Research And Analysis Of Agricultural Economics), the *Research Centre Agriculture and Environment;* the *Agricultural European Innovation Partnership-(EIP-Agri) Operational Group "Agroecologia Per Il Trentino"* (Agroecology for Trentino).

Goals of the project

The objective of the project was to compare the effects of three different types of pasture management – rotational grazing, continuous stepped grazing and continuous grazing – on pasture production (biomass), greenhouse gas fluxes (carbon dioxide, methane and nitrous oxide), as well as physical and chemical soil parameters (water infiltration capacity, bulk density, organic and total carbon contents, total nitrogen contents).

Activities carried out

As described above, the three different types of grazing systems (RG, CSG, and CG) of interest were implemented on different plots. During the 2-year project period, the saturated hydraulic conductivity was measured in the different (sub-)plots, biomass samples collected every month between May and October, soil samples taken in autumn (October – November), and greenhouse gas fluxes from soil measured four times between May and October each year. Chemical analyses were carried out to determine the parameters stated above. All measured and calculated values were analysed statistically for possible significant differences between the three grazing systems.

Financing / Funding description

There is no information available on funding. The study was supported by *Agroecological Innovations to Increase the Resilience and Sustainability of Mountain Livestock Farms Project* (INVERSION EIP-AGRI Project GRANT N.2017IT06RDEI052, 2017-2020).

CHARACTERIZATION OF THE NATURE-BASED SOLUTION

Sectors addressed

Contribution to Alpine Climate Targets

Target abbreviation	Target description
T_S2	Enhanced Alpine soil quality
T_Agr3	Mountain agriculture takes on a model role for a shift towards organic farming. The predominant share of Alpine farms is managed on the basis of the principles of organic farming and is certified by relevant labels (incl. aspects of artificial fertilisation, import of fodder etc.)

Contribution to implementation pathways of the Climate Action Plan 2.0

Pathway abbreviation	Pathway description
IP_S3	Supporting measures to preserve and enhance Alpine soil quality
IP_Agr2	Moving to organic and climate-friendly methods in Alpine farming

Type of nature-based solution

☒ Agriculture ☐ Built space ☐ De-Sealing

☐ Forests ☐ River and water management ☐ Wetlands

Benefit for biodiversity

At the beginning of the study in April 2018, biomass production on the RG and CG plots was similar. But after just four months (August 2018), production in the RG had increased by 34% as shown by the summer sampling. By autumn, it had doubled. These differences were also observed in the following year. From the observation that very intensive grazing may lead to reduced primary net production and result in the loss of palatable, larger-leaved species and a domination of unpalatable small-leaved species producing forage of low quality for soil microbes and fauna, it can be concluded that higher biomass production has positive effects on soil organisms and fauna. Although the effects of the different grazing systems on biodiversity were not explicitly assessed (not the main objective of the study), the positive effects of RG compared to CG and CSG measured in in the study (lower soil compaction, higher biomass production) suggest that biodiversity (e.g. regarding soil organism diversity, grass variety) may also benefit from the adapted grazing management.

Benefit for human well-being

An important benefit for the farm owners in this project was that there was no need for to supplement feeding in the RG systems, resulting in lower costs. The increase in biomass production and the improvement of soil quality also ensure the longevity of the pastures and may strengthen their resilience to changing climatic conditions.

Provision of ecosystem services

In particular, the project provides the following ecosystem services according to the CICES system (Haines-Young & Potschin 2018, CICES V5.1):

20. Provisioning ecosystem services (biotic and abiotic)

Code	Group	Class	Specification
Division	*Biomass*		
1.1.3.1	Reared animals for nutrition, materials or energy	Animals reared for nutritional purposes	Dairy products from donkey milk

21. Ecosystem services for regulation and maintenance (biotic and abiotic)

Code	Group	Class	Specification
Division	*Regulation of physical, chemical, biological conditions*		
5.2.1.2	Regulation of baseline flows and extreme events	Liquid flows	Higher water infiltration capacity of the soil in rotational grazing systems as compared to continuous grazing systems due to less soil compaction

22. Cultural ecosystem services (biotic and abiotic)

Code	Group	Class	Specification
Division	*Direct, in-situ and outdoor interactions with living systems that depend on presence in the environmental setting*		
3.1.1.1	Physical and experiential interactions with natural environment	Characteristics of living systems that enable activities promoting health, recuperation or enjoyment through active or immersive interactions	Visiting the farm, getting in touch with donkeys as a special experience
3.1.2.1	Intellectual and representative interactions with natural environment	Characteristics of living systems that enable scientific investigation or the creation of traditional ecological knowledge	Studying impacts of different pasture systems on natural assets such as soil, plants

Code	Group	Class	Specification
3.1.2.3	Intellectual and representative interactions with natural environment	Characteristics of living systems that are resonant in terms of culture or heritage	Traditional use of dairy products from donkeys

Impact on climate change mitigation or adaption

The results of the study confirmed (as observed earlier) that mechanical disturbances of soil such as compaction due to livestock trampling significantly influence gaseous flows from soils. The fluxes of the three greenhouse gases analysed (carbon dioxide, methane and nitrous oxide) were more than one order of magnitude higher in the plot with continuous stepped grazing than in the others, indicating a strong effect of either soil compaction or manure patch accumulation. Regarding the influence of the different grazing systems on the carbon soil stock, no clear trend could be observed. This may be due to the short project period, as a change in soil organic carbon may not be detectable in the first ten years after the implementation of the new management practice but is assumed to increase significantly in the long term.

Since about 25 % of the global greenhouse gas emissions come from intensive agricultural practices, management practices like rotational grazing that reduce emissions from soils or promote their fixing capacity regarding greenhouse gases are a key element for climate change mitigation.

GOVERNANCE ANALYSIS

Directly involved partners/institutions, etc.

☒ Administration	☒ Consultants	☐ General public
☐ NGOs	☐ Policy makers	☒ Private sector organisations
☒ Researchers		

Indirectly involved partners/institutions, etc.

☐ Administration	☐ Consultants	☒ General public
☐ NGOs	☒ Policy makers	☐ Private sector organisations
☐ Researchers		

Steering mechanisms established

The idea for the *INVERSION* project was born from the will of a small group of young farmers in the Trentino region to improve the sustainability of their territory and their farms. It is therefore a bottom-up participatory approach. The main objective of the project was to find out how the territory could be used in the best way

- in terms of the ecological well-being of the soil and livestock
- and in terms of sustainable agro-ecological practices in the context of mountain livestock farming promoting the economic well-being of the farms.

This also meant reducing external dependencies (e.g. on purchased feed) and promoting the respective internal capacities of each farm to provide these resources. In most cases this is possible, but not yet known, as it requires a change in practices.

As the project was bottom-up but required a lot of scientific research, meetings were held with all partners involved at the beginning, at midterm and towards the end of the project.

The farms worked in close cooperation with the veterinarian (not in a strictly veterinary sense but more in the role of a consultant at the level of agro-ecological practices) and the Sant'Anna University of Pisa to discuss, analyse, and establish more sustainable and self-sustaining livestock farming practices. This was done through interviews with the farm owners carried out by the Sant'Anna University and animal health studies carried out by the veterinarian.

The *Consiglio Nazionale delle Ricerche of Florence* (National Research Council of Florence) studied the changes in soil health and composition.

Process design developed

The process design was very clearly defined at the beginning and divided into 5 stages:

1. **Research:** Farmers were asked about their priority needs. Specific agro-ecological solutions were then researched and proposed to the partners.
2. **Experimentation:** The livestock farmers identified and tested the technological solutions inherent in the livestock, horticultural and agro-ecological innovations according to their needs.
3. **Sustainability:** The livestock farmers identified indicators to monitor the performance of the adopted agro-ecological solutions.
4. **Training:** Experiential agro-ecological training activities were organised in the livestock, horticultural and management sectors. They were carried out ad hoc according to the training needs expressed by the farms themselves.
5. **Dissemination:** The obtained results were evaluated and potential new technological and organisational solutions formulated.

Furthermore, there were three meetings with all involved partners – at the beginning, midterm and towards the end of the project. During the summer months, some members of the team, including the veterinarian, visited the farms once a month to assess the situation by taking samples, conducting interviews, and checking on the animals.

Due to the outbreak of Covid19 pandemic in 2020, the project was completed one year later. Fortunately, the work planned for this period was focused on data processing and analysis, as field visits were not possible.

External support hired

There was no external support hired.

Main interests and conflicts of interests

At the beginning of the project, the objectives were very general and the aim was to increase the fertility and sustainability of the farms, without giving fixed guidelines and targets, but through agro-ecological

approaches. The land was to be used in the most efficient way. At the same time, the idea was to reduce external inputs and increase internal value creation (of which many farms were not even aware).

Level of conflicts

There is no information available on specific conflicts during the project.

Participatory or conflict management elements / methods used in terms of governance

There is no information available on specific governance mechanisms applied.

Main achievements and results of negotiations in terms of governance

There is no information available on specific governance mechanisms applied.

Governance success factors, obstacles and how they were overcome

There is no information available on specific governance mechanisms applied.

Policy fields mainly affected

☒ Agriculture	☒ Bio-economy	☒ Climate protection / mitigation
☐ Forestry	☒ Nature conservation	☒ Spatial planning
☐ Tourism	☐ Water management	

TRANSFERABILITY & SCALABILITY

Degree of innovation

☐ High (pioneer project)	☒ Medium	☐ Low (roll-out done)

Which aspects/elements of this project can be transferred to other regions/situations?

The rotational pasture management can be transferred to other farms with pasture farming, even with limited grazing expansion.

Which aspects/elements of this project can be scaled up?

The project covered only 2 hectares of existing pasture because it analysed in depth the impact of rotation on soil, pasture production and greenhouse gas fluxes. Without these in-depth analyses, pasture rotation is easily scalable.

Depending on the size of the farm and the number of animals, implementing a rotational grazing system (assuming an increase in pasture production) may not only eliminate the need for supplemental feeding but may even provide more biomass than the animals need, giving rise to additional economic value through hay production.

PROJECT SUCCESS FACTORS AND BARRIERS

Success factors

The bottom-up design of the project empowered local farmers to actively participate in identifying needs and testing agro-ecological solutions, promoting ownership and practical relevance. Close collaboration with experts (e.g., veterinarians and researchers) enabled the right balance to be found between scientific rigour and practical implementation.

The project was structured into distinct phases (research, experimentation, sustainability, training, dissemination) to ensure clarity and focus. Regular monitoring and feedback loops through meetings and field visits allowed for adaptive management of practices based on emerging results.

Measurable results, such as reduced soil compaction and greenhouse gas emissions, provided strong evidence to support rotational grazing as a sustainable model. Ongoing data collection and statistical analysis ensured credibility and actionable insights.

Obstacles

Although external support was not considered as necessary, the lack of additional funding and professional facilitators may have posed challenges in scaling up the project or integrating different stakeholder needs.

The COVID-19 pandemic delayed the project timeline.

CONTACT DATA

Name of the institution	Institute of BioEconomy - National Research Council of Italy	
Type of institution	☐ Association	☐ Non-Governmental Organisation
	☐ Private enterprise	☐ Public administration
	☒ Other: Research Institute	
Street	Via Madonna del Piano 10	
ZIP-code	50019	
City	Firenze	
Country	Italy	
Project website	–	

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Interview

Interview conducted by Sophie V. Mahlknecht (CIPRA International) with Mr Giulio Menegus (University of Padova), on 12.09.2024 at 15:00 via the online platform Zoom.