Cross-sectoral energy governance

How cross-sectoral and integrated governance approaches can accelerate the transition towards climate-neutral and climate-resilient Alps

Alpine Climate Board
of the Alpine Convention

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ALPENKONVENTION
CONVENTION ALPINE
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CONVENZIONE DELLE ALPI

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Executive summary

Looking beyond sectoral scopes to accelerate the energy transition

The Avoid-Shift-Improve approach which prioritises demand-side action linked to avoidance of energy consumption and improvement of energy efficiency is the guiding logic of activities related to the energy transition at the level of the Alpine Convention. The Energy Protocol and the Climate Action Plan 2.0 (CAP 2.0) in particular serve as starting points at Alpine level. These are closely linked to the European Framework with the European Green Deal and the "Fit-for-55" package which are based on the "energy efficiency first" principle.

Looking at the current trends related to the energy transition, we need to accelerate our efforts. Advanced dynamics and alliances can be achieved with the help of new cross-sectoral and integrated governance approaches. Linking the energy transition to activities in other sectors can give new impulses to the energy transition and ensure a higher political and public acceptance. With this report, the Alpine Climate Board (ACB) explores opportunities for strengthening energy governance approaches to support the transition to climate-neutral and climate-resilient Alps.

Five "energy nexus" as spotlights for cross-sectoral energy governance

The report provides insights along five "energy nexus", showcasing interfaces between the energy sector and other sectors with high Alpine relevance. For each energy nexus, case studies and an analysis of ongoing governance challenges highlight common success factors and features with Alpine transfer potential:

- Nexus "Energy and Tourism": Even if stakeholders in the tourism sector see the need for action, they often lack the capacities/know-how to take the first steps to launch integrated transformation processes. Additional support is necessary, especially focusing on key stakeholders with a strong local knowledge and networks. Additionally, focusing on vulnerable tourism regions at lower and medium altitudes can help link the energy transition to broader regional transformation efforts.
- Nexus "Energy and Mountain Agriculture": The case studies illustrate the potential role of agrivoltaics and emphasise the importance of transregional and transnational coordination and knowledge transfer from pilot projects to facilitate policy-making. Also, the analysis highlights the effectiveness of a bottom-up approach that involve local farmers – supported by scientific and financial systems, demonstrating its potential for other regions.
- Nexus "Energy and Spatial Planning": Moving from spatial to integrated planning processes requires the involvement of many new stakeholders, including private actors and civil society. Participation and local know-how are crucial for developing win-win approaches and preventing acceptance issues. A consistent data set and common knowledge base are essential for integrating energy and spatial planning.
- Nexus "Energy and Water": The case studies provide insights into governance challenges linked to the development of hydropower projects – especially with respect to the design of participatory approaches. They highlight the need for real "open-ended" processes, the full and transparent disclosure of information as well as the objective to focus on projects with "win-win" characteristic for local territories.
- Nexus "Participation and Financing": Energy communities and financial participation models strengthen local acceptance of energy-efficiency and renewable energy projects. Knowledge transfer and common guidelines, supported by local energy advisories are crucial for initiating energy communities. Establishing network structures to facilitate the exchange of experiences is important, also to overcome challenges related to differing national framework conditions.

Recommendations and follow-up proposals for the ACB

The analysis of successful energy governance projects emphasises the importance of cross-sectoral collaboration and a stronger role of participatory approaches. The energy nexus give an indication as to the need for further action. For some activities, it seems to be especially important to deal with them at the level of the Alpine Convention as they are linked to other areas with a high relevance for the Convention. The following generic activities are relevant for all five energy nexus:

- Cross-sectoral governance is new for all stakeholders and a **continuous exchange on good practices, success elements, and lessons learned** provides added value at all policy levels and for stakeholders from the public and private spheres as well as civil society.
- The local and regional levels play an important role for all cross-sectoral activities, especially when it comes to designing co-creative and participatory approaches. Thus, the **municipal level needs to be better integrated into all activities of the Alpine Convention and the needs of local stakeholders need to be better reflected**.
- The **empowerment of key stakeholders** is a crucial step for initiating transformation processes. The Alpine Convention could work more closely with relevant stakeholder groups in terms of empowerment and information.

Detailed proposals for follow-up activities are provided in the full report and were considered for the new mandate of the ACB 2025-2026.

Political need for action: Support needs beyond the ACB

Looking at the main insights and follow-up proposals, the energy paper also reconfirms the need for action as defined in the CAP 2.0 and provides some insights into the need for political actions:

- **Energy coordinators:** The important role of a strong network of regional energy coordinators is reconfirmed as many activities require some sort of caretaker/moderator/project manager. As this network of regional energy coordinators is still struggling with developing a business model, a solution could be jointly developed at the level of the Alpine Convention.
- **Find a common voice at European level:** Many activities in the different energy nexus have a clear link to multi-level governance and especially the European framework. In this respect, it seems sensible to put more efforts into making the Alpine needs and Alpine viewpoints more visible at EU level. It would be sensible to further develop an Alpine-wide position on hydropower development and to make the Alpine needs more visible at European level. This could be embedded in a broader position with Alpine claims on the European energy system.
- **Regulatory and financial incentive frameworks:** Some success factors for improving cross-sectoral energy governance are related to regulatory or financial frameworks, which also need to be addressed at national or even EU scale. In this respect, the Alpine countries should further exchange best practices and solutions on how to improve both regulatory and market-based instruments. With a common top-runner approach, the Alpine countries can go beyond the existing European framework.
- **A crucial role for participatory approaches:** The governance analysis in this paper highlights that successful energy projects need to be developed in close collaboration between public and private stakeholders and civil society. Communication and capacity-building formats at level of the Alpine Convention should be further developed, with the explicit objective of strengthening the implementation community of the Alpine Climate Board and ensuring that new multipliers "beyond the existing bubble" are reached.

1 Starting point and need for action

Avoid – Shift – Improve: The guiding logic of the energy transition in the Alps

The term "energy transition" is often understood as a shift from a fossil-based towards a renewable energy system. According to the logic of the Avoid-Shift-Improve (ASI) approach, however, two strategies should be considered with higher priority – the *avoidance* of energy consumption as well as the *improvement* of the energy efficiency of existing technologies and energy services. The IPCC AR6 reiterates the need to take demand-side action and to consider all levels of the ASI-model (IPCC 2022a).

This ASI approach is indeed the guiding logic of activities related to the energy transition at the level of the Alpine Convention. The Energy Protocol and the Climate Action Plan 2.0 (CAP 2.0) in particular serve as starting points. With its Energy Protocol from 1998, the Alpine Convention was a frontrunner for implementing the principle of prioritising avoidance over shift and improvement. The hierarchy of the Energy Protocol is based on the approach "save energy – improve energy efficiency – develop a renewable energy system". The Contracting Parties want to promote more environmentally compatible energy use and focus on energy saving and the rational use of energy (Art. 5, paragraph 2, Energy Protocol). In addition, they have committed themselves to the promotion and preferential use of renewable energy sources under environmentally and landscape compatible conditions within the scope of their financial possibilities (Art. 6, paragraph 1, Energy Protocol). The topic of an overarching sustainable energy strategy in the Alps was given a stronger focus at the XII Alpine Conference in Poschiavo (September 2012) with the establishment of an Energy Platform for 2013-2014. This Platform came up with the vision "Renewable Alps".

Based on these starting points, the Climate Action Plan 2.0 (CAP 2.0), prepared by the Alpine Climate Board (ACB), proposes specific implementation activities in the field of energy with four dedicated implementation pathways (IP). As a priority, in 2020 the XVI Alpine Conference agreed to promote the creation of an Alpine-wide network of regional energy coordinators as well as pilot actions on climate-neutral lifestyles and business models. In addition, pathways to strengthen "Energy democracy" and the "Alpine administrations as forerunners and models for the energy transition" are included in the CAP 2.0. In combination, these pathways are also in line with the ASI approach. With the action on climate-neutral lifestyles and business models, the CAP 2.0 also considers *Avoid* strategies, which require more systemic changes and are thus more difficult to achieve (Novy & Barlow, 2022).

Embedding Alpine-wide action within the European framework

The activities developed at Alpine level support the European Union's ambitious framework for the energy transition. With the European Green Deal, adopted in 2019, the European Union committed itself to become a global leader in the fight against climate change. The overall goal is to make Europe the first climate-neutral continent by 2050.

To cut greenhouse gas emissions and to move towards a climate-neutral European energy system, reducing unnecessary energy consumption, switching to renewable energies, and improving energy efficiency are the key principles to be applied in policy and investment decisions. The European Green Deal and the "Fit-for-55" package which supports its implementation are strongly based on the "energy efficiency first" principle. The *Avoid* strategy is subsumed under this approach. The second pillar of the European framework is the decarbonisation of the energy system with a shift to renewable energies, including all energy consuming sectors.

Major targets for the deployment of renewables at national level, including sectoral targets and benchmarks, are defined by the revised Renewable Energy Directive (RED III), and efficiency targets are provided by the amended Energy Efficiency Directive. To deliver on the European Green Deal, the Commission proposed a revision of the Renewable Energy Directive in July 2021, raising the 2030 target to 40% (up from 32%) as part of the "Fit-for-55" package. Less than a year later, in

view of the Russian invasion of Ukraine and the need to further step up Europe's energy independence from fossil fuels, the Commission proposed to further increase this target to 45%. On 30 March 2023, a provisional agreement was reached on a binding target for 2030 of at least 42.5% but aiming for 45%. The new Directive (EU) 2023/2413, which makes these targets legally binding, entered into force in November 2023.

To speed up the roll-out of renewable energies, the European Council adopted an "Emergency Regulation" in November 2022 which aims at accelerating the permit-granting process and the deployment of renewable energy projects, with a focus on building-integrated solar installations and rooftop solar, repowering projects, heat pumps, and grid expansion projects (thus renewable energy projects on already sealed/developed land). This Emergency Regulation introduces the concept of "overriding public interest", which means that renewable energy projects could be presumed to have priority over other policy objectives when assessing the balance between the expansion of renewables and other environmental and societal interests, such as the protection of biodiversity or landscapes. This concept needs to be carefully interpreted – especially when considering the energy transition in sensitive environmental settings like the Alps, as the Emergency Regulation might have direct effects on the implementation of the Birds, Habitats and Environmental Assessment Directives (SEA, EIA). The frameworks established by the Emergency Regulation were prolonged for 12 months by the European Commission in November 2023 (valid until mid-2025).

The cross-cutting characteristics of the energy transition

Even if the complexity of decarbonisation and especially the energy transition as a key component is recognised, most of the time the energy system is still understood as a mono-sectoral and mostly technological 'single issue'. But looking at the many interfaces that accompany energy production, infrastructure and transport, storage and consumption, it is short-sighted to think about energy only in terms of a sectoral policy without considering the transformation of spatial and settlement structures, the consumption in buildings as well as mobility and transport, the distribution of activities in space (centralisation and dispersion), and the lifestyle themes linked to energy consumption.

When looking at the detailed steps of the pathways in the CAP 2.0, many interfaces with other sectors become visible. To support the implementation of the CAP 2.0, it thus seems crucial to take:

- A more detailed look at the interfaces between the sectors, identifying potentials for synergies (also with other environmental objectives) but also conflicts and trade-offs. Even if this cross-sectoral approach is relevant at the European scale, the need for action is especially high for the Alpine region, as an integrated energy transition affects many fields of action with specific Alpine characteristics: mountain agriculture and forests, water, tourism, transport and, of course, the links to spatial planning.
- A broader approach to energy governance and management of the energy transition: an integrated energy transition requires a more participative approach, as indicated in the pathway "Energy democracy". This collaborative approach also needs to be developed in view of the cross-sectoral interfaces.
- A closer look at synergies between the energy transition and climate adaptation measures, e.g. recognising that green infrastructure contributes to energy efficiency as well as energy saving or acknowledging that decentralised and small-scale renewable energy structures (like solar panels on buildings and sealed areas) increase climate resilience, disturbance tolerance, and security of supply.

Objectives of this input paper

The ACB has identified the energy transition as one hotspot for cross-sectoral climate action. During a first workshop held in March 2023, one discussion dealt with the topic of "governance" and

cooperation, i.e. which new structures – institutional ones but also loose associations and partnerships/alliances – are needed to implement the energy transition, especially at the interfaces with other sectors of relevance for the Alpine Convention. This input paper is the follow-up of this discussion and has the following objectives:

- Provide insights into the elements of an integrated energy governance which are most relevant for the Alpine Convention according to its past agreements and activities. These insights are presented along five "energy nexus", showcasing interfaces between the energy sector and other sectors with high Alpine relevance.
- Highlight case studies that successfully build new governance structures across sectors and policy levels in the Alps: What success factors can be identified? What barriers have to be dealt with along the way?
- Synthesise the main insights from the analysis, recommendations for further steps, and inputs for the political dialogue.

Energy transition in the Alps – Status quo: Where do the Alpine countries stand on the way to a climate-neutral energy system

For the European Union to become a carbon-neutral economy by 2050, decision-makers need reliable energy data to define, implement, and monitor the effectiveness of energy policies. The CERVINO platform has been created for this purpose to cover the Alpine region. It facilitates the exchange and visualisation of energy data within the Alpine territory. In this section, some of the main indicators of Alpine energy data – aggregated at EUSALP level – are highlighted.

Final energy consumption per country

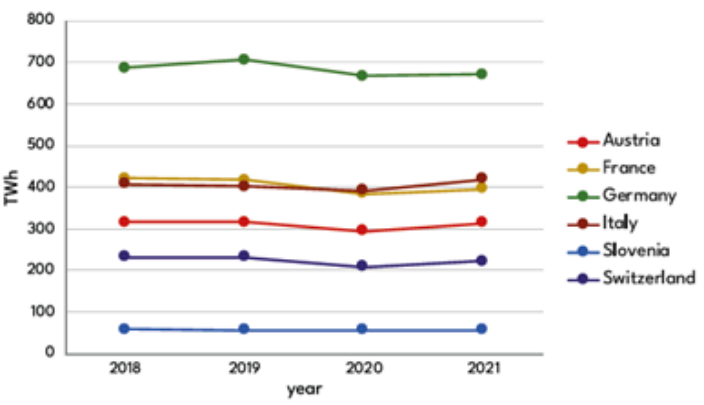


Figure 1: Final energy consumption per country in the Alpine region varies due to distinct economic structures and geographical factors. Despite the political efforts at European level, final energy consumption is not decreasing. More energy efficiency measures are required to meet the EU targets.

Renewable electricity capacity installed per country

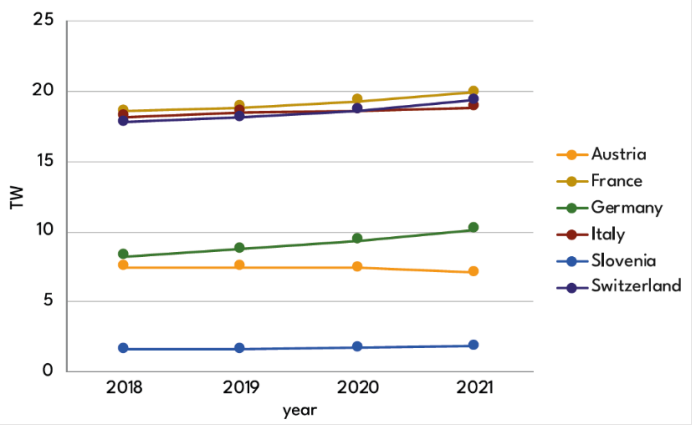


Figure 2: The Alpine region showcases a significant increase in electricity renewable capacity installed. The trend is promising and shows large political and financial support in the renewable sources throughout EUSALP.

Renewable electricity production by source

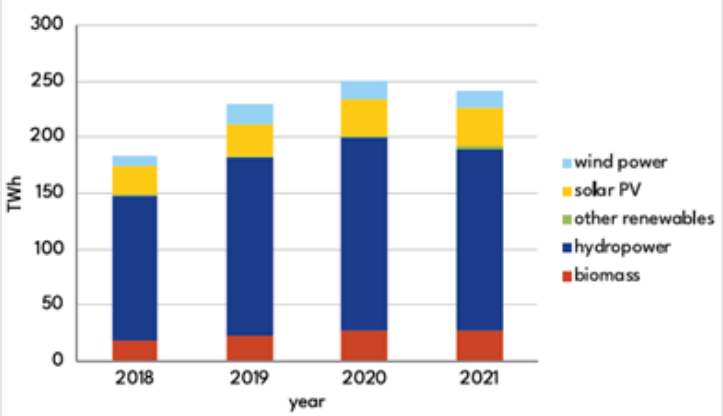


Figure 3: *Hydropower is the dominant renewable electricity source in the EUSALP perimeter, but further development is limited. Overall, the trend of renewable electricity production is positive, but seasonal fluctuations occur.*

The CERVINO platform has the potential to be used as an Alpine-wide decision-making tool to support decision-makers in their planning.

The energy data collection for the Alpine region 2023 was carried out as part of the CERVINO project, co-funded by the European Union. The data is accessible at:

https://alpine-energy-data.eu

cervino alpine energy data platform

2 Rethinking the energy governance frameworks in the Alps

The energy transition as complex problem

Over the last decades, increasing globalisation and connectivity, the need to deal with multiple crises as well as a shift between previously established geopolitical balances has increased complexity and thus uncertainty for stakeholders from all sectors and at all policy levels. As global megatrends are cross-cutting and affect economies, societies, and the environment in a far-reaching way, the development of strategic approaches cannot be addressed by a single organisation acting alone. Cross-sectoral and multi-level approaches are necessary to develop joint and coordinated approaches (Emerson & Nabatchi 2015, p. 7; Ansell & Gash 2007, p. 2; Buttkereit 2009, p. 17). Recent literature concludes that "the continuation of planning, policy-making, and negotiating for solutions within the existing set of institutionalised rules and habits complicates planning for an uncertain future" (Roggema 2020, p. 264-265).

Indeed, the transition towards an efficient and renewable energy system can be seen as THE complex transformation process because it implies deep changes in structural framework conditions that determine our current ways of living, working, and economic activities (APCC 2022). It requires new governance approaches beyond "institutionalised" and traditional governance frameworks to make "transformation by design" happen.

Looking at the Alpine Climate Target System 2050 as well as the CAP 2.0, the energy transition is one major societal transformation process on the way towards reaching the objectives of climate-neutral and climate-resilient Alps. As energy has little value in itself and rather creates added value in the different sectors of energy consumption (transport, buildings, industry, agriculture, etc.), the energy sector is by definition closely interlinked with other sectors. As a strategic action field, the energy transition requires a "consensus-oriented" decision-making which enables the different stakeholders to contribute to the transition (see Fligstein & McAdam, 2011, pp. 3; Ansell & Gash 2007, p. 2). At the same time, the energy transition also requires an adjustment of frameworks and processes in the planning-related sectors: for instance, considerations of the energy transition need to be mainstreamed into spatial planning, but also into nature and landscape protection.

Good governance approaches for the energy transition, however, should not only keep an eye on potential synergies but also the relevant trade-offs and conflicts, and how these can be overcome. Shifting away from fossil fuels towards local renewable energy sources leads to considerable changes in the overall energy system. The energy transition means that we substitute the often imported non-renewable energy sources with renewable, ideally local ones. This process of internalisation can lead to conflicts if not governed wisely: we have to use more local resources to satisfy the energy needs of public, private, and economic actors. We will need more energy production plants and a change of economic structures from large-scale energy companies to more local/regional structures. And we will need to question structural framework conditions that generate excessive and constantly increasing energy demand. Especially in the sensitive Alpine environment, this requires smart solutions which are acceptable for all stakeholders – considering local *know-how*, the characteristics of specific sites and locations as well as the needs of economic and social stakeholders. Involvement of civil society thus becomes a crucial factor for a successful energy transition.

Understanding governance in the frame of the energy transition – governance concepts and mechanisms

In general terms, governance is the sum of the many ways in which individuals and institutions, public and private, manage their common affairs. It is a continuous process through which conflicting or diverse interests may be accommodated and cooperative action may be taken. It includes formal institutions and regimes empowered to enforce compliance, as well as informal arrangements that people and institutions have either agreed to or perceive to be in their interest

(Commission on Global Governance 1995). Governance thus involves the "steering and coordination" of socio-political processes with the aim of managing interdependencies between different actors, levels, and sectors. A governance system is composed of elements such as: actors (organisations, individuals; public, private, intermediate), structures (bodies, working groups, networks), levels (government, administration, territorial), sectors, institutions (rules, agreements, arrangements), resources (financial, human, knowledge), and the processes connecting them (e.g., information, communication, decision-making, financing, participation, implementation, reporting) (Pütz et al. 2019). Energy governance is linked to the way that energy-related decisions are made and implemented; it especially relates to the horizontal interplay of sectors and the vertical interplay of policy levels (Pütz et al., 2019; Knieling 2016; Okereke et al. 2009).

In comparison to "government", governance includes processes of steering and coordination which transcend organisational boundaries, including the boundaries of state and non-state actors. Governance does not substitute the more regulatory, hierarchical, top-down forms of traditional governmental decision-making and planning. Rather, it widens this understanding by putting a much stronger emphasis on non-hierarchical, collaborative, participatory, voluntary and informal modes of collective decision making and steering as well as on facilitating, enabling and empowering actors. Both approaches are complementary rather than exclusive (Lexer et al. 2022). Accomplishing the energy transition requires both "good governance" and "good government" and improving the ways government and governance act together (ÖROK 2021). "Transformation by design" needs both, broad alliances across different actors, interests and social groups, and the "will to coerce" (Bärnthaler forthcoming).

The literature in political science differentiates between different governance concepts, which are all relevant when looking at the energy transition in the Alpine region:

- Multi-level governance: Here, the focus is particularly on the interdependencies of different policy levels (EU, national, regional, local) and their institutional structures (Möltgen-Sicking and Winter 2019, p. 8). Multi-level governance thus relates to the ways that actors at various levels interact, communicate, cooperate, and coordinate their decisions and actions (Lexer et al. 2022). Vertical coordination is a main means of achieving multi-level governance.
- Cross-border governance: In the Alps, the cross-border aspect of multi-level governance takes on a specific importance, given the many challenges and solutions which need to be addressed through a common approach.
- Cross-sectoral governance: This includes governance mechanisms that aim at a horizontal coordination between different economic or societal sectors and stakeholders. The existing boundaries of the sectors need to be overcome to better consider synergies and trade-offs.
- Collaborative governance: A governing arrangement where one or more public agencies directly engage non-state stakeholders in a collective decision-making process that is formal, consensus-oriented, and deliberative and that aims to make or implement public policy or manage public programmes or assets (Ansell & Gash 2007, p. 3). This includes cross-sectoral governance and engaging stakeholders from different economic sectors as well as civil society.
- Institutionalism: Decision-making processes of actors are influenced by existing or developing formal and informal institutions. Formal institutions include legal frameworks and binding rules. Informal institutions, on the other hand, refer to social and societal norms that are used in decision-making processes.
- Governance of specific policy fields: Each policy field can be understood as a specific "policy arena" and has its own governance structures and mechanisms. The literature on environmental governance seems most relevant for the ACB and its work, and many of the

challenges connected with the energy transition can be explained by the specific characteristics of this policy field (e.g. the concept of public goods).

Expanding "government" through new forms of "governance" also requires innovative mechanisms of coordination and steering. "Hierarchy" mechanisms (i.e. political responsibility to establish framework conditions, rules, and specific policy instruments) alone are insufficient. This holds true for the process of the energy transition, as public policies alone have not been sufficient to achieve a comprehensive shift away from fossil fuels in the last twenty years. Also, the "market and competition" mechanism has so far failed to deliver an efficient solution, especially as it neglects to consider the specific needs of dealing with public goods and the many interlinkages with civil society.

The literature on collaborative governance identifies two other important governance mechanisms which, looking at the policy field of energy governance, seem highly relevant:

- "Knowledge" becomes a central resource in the governance discourse with regard to multi-level and collaborative governance. When dealing with complex problems, the extension of the knowledge base becomes crucial and "collaborative learning" appears important (Roggema 2020, p. 270)
- "Networks" can be understood as a "counter-model" to hierarchy and competition as they are based on trust, commitment, and reliability, with the focus on providing well-being for the group (Möltgen-Sicking and Winter 2019, p. 16). Roggema (2020, p. 280) states that "according to the multi-level perspective, change starts in the locus of radical innovations where novel configurations appear".

Management and leadership of collaborative governance processes

In accelerating the energy transition, the concept of collaborative governance allows the systematic analysis of the involvement of state and non-state actors in collective decision-making processes (Sedlacek et al. 2020, p. 2). As it includes initiatives which are introduced in a top-down manner (e.g. via regulations or financial incentives) as well as bottom-up initiated energy responses, the question of how to manage and lead collaborative governance processes arises. New formats, arrangements or mechanisms need to be developed to consider the different needs and cultures of the participating stakeholders because hierarchical leadership structures are not sufficient to enable a stronger participation of civil society and achieve broad social acceptance. At the same time, stakeholders from the public and private/economic spheres face difficulties in "tuning in" to specific participatory or co-creative approaches.

The literature on collaborative governance highlights the need to identify key stakeholders ("change agents") who can serve as mediators and moderators in the collaborative process (Sedlacek et al. 2020, p. 2). Also, coordinative facilitators are needed to better organise the multi-stakeholder communication and collaboration processes. In some cases, new structures may be needed, which can mean a reorganisation of existing structures or at least additional coordinative facilitators (Sedlacek at al. 2020, p. 10).

Leading questions for the ACB paper on energy governance

Considering this short background on energy governance, the specific challenges and characteristics, and the different governance types and mechanisms, the following three overall topics and leading questions can be formulated for guiding this paper of the ACB:

1. Moving from "government" to "governance" and improving their interplay in the field of the energy transition: With the illustration of the five "energy nexus" and especially the insights from the best practices, we want to gain a better understanding of success factors for new governance types.

- Which governance types and specific formats have proven successful to accelerate the energy transition in the Alps? What level of institutionalisation can be seen in these new formats?
- What success factors can be identified to improve multi-level and cross-border governance?
- How can collaborative governance contribute to the energy transition in the Alps? What role does the interaction between different economic sectors, public authorities and civil society play?

2. Governance mechanisms: Which mechanisms beyond the more classical mechanisms of "hierarchy" and "price and competition" are used in successful governance approaches in the Alps? Which specific insights can be derived on making use of the governance mechanisms "knowledge" and "networks"?
    - The role of knowledge: How is the mechanism of "knowledge" considered in the different government approaches? What role does collaborative learning play to enable a better use of the broad level of local and contextual know-how?
    - The role of networks: What role can the more informal and loose networks play? How can they be used effectively to improve local commitment and acceptance?
3. Management and leadership: What insights can be derived for successfully managing and leading collaborative energy governance, especially when it comes to integrated approaches across different sectors?

Contributions of the "spotlights" in this paper

This paper looks at five different "energy nexus", each of which constitutes an important interface between the energy sector and another sector with specific Alpine relevance: Energy and tourism, Energy and mountain agriculture, Energy and spatial planning, Energy and water as well as participation and financing of the energy transition.

For each "energy nexus", several case studies (grey boxes) provide insights into the above-mentioned leading questions and the overall objectives of the paper. In addition to the experiences from the case studies, information on ongoing "Governance Challenges" (blue boxes) provides insights into implementation barriers and solutions from experts and from recently initiated projects. The analysis highlights that finding suitable case studies differed between the energy nexus; it was particularly challenging for the ACB group to identify adequate case studies for the energy nexus where conflicts regarding nature and landscape play a role. This was especially the case for the energy and water nexus.

The case studies and "governance challenges" were selected on the basis of a survey with ACB members and the broader ACB community as well as desk research and selected expert interviews with the project team. The case studies were not selected on the basis of specific best practice criteria or thresholds. They need to be understood as "spotlights" on specific activities, highlighting many success factors, but also the difficulties in implementing cross-sectoral approaches.

For each nexus, the green boxes include additional information/food for thought.

Further inspiration on energy governance and its application in the Alpine region:
At Alpine level, several projects and activities have already analysed issues related to energy governance. Most of them focused on specific governance elements (e.g. participatory approaches or multi-level governance) but were still embedded in a broader and integrated perspective:

- Good practice examples for land use and nature conservation-compatible renewable energy projects in the Alps (https://www.alpconv.org/en/home/topics/energy/, 2016): This report analyses participatory processes that involve civil society and the general public and identifies factors for successful participatory formats.
- IMEAS ASP Project – Integrated and Multi-level Energy models for the Alpine Space (https://www.alpine-space.eu/project/imeas/): Managing the transition to sustainable energy plans holds many challenges for all governance levels. The interdisciplinary project team of IMEAS developed a methodology and practical guidance for the creation and integration of roadmaps based on multi-level approaches connecting actors from different economic sectors, governance levels, territories, and countries.
- INOLA Project – "Energiewende gemeinsam gestalten" (Shaping the energy transition together) (https://inola-region.de/hp1/Startseite.htm): This project develops a regional concept for an integrated energy transition in the German "Oberland" region.

If you are looking for some scientific background:
The following scientific articles are recommended for more detailed background information on collaborative governance in general and integrated energy governance in particular:

- Ansell & Gash (2007): Collaborative Governance in Theory and Practice. In: Journal of Public Administration Re-search and Theory 18 (4), p. 543–571.
- Roggema (2020): Planning for the Energy Transition and How to Overcome the Misfits of the Current Paradigm.
- Pütz, M. et al. (2019): Climate adaptation governance in the Alpine Space. Transnational synthesis report (WP1). Deliverable of the Interreg Alpine Space project GoApply.

3 Energy nexus 1: Energy and tourism

The CAP 2.0 already highlights the role of tourism as key economic activity for a large share of Alpine municipalities and illustrates its many interfaces with other sectors. Indeed, tourism itself is not a clearly defined sector of the economy, but rather a form of consumer demand that affects various sectors, in particular the hotel and gastronomy, transport, and retail industries in the destination regions. This means that energy demand in the tourism sector must also be considered through these sectoral perspectives, which has indeed already been done in the Alps in specific previous activities of the Alpine Convention:

- Energy demand in hotel and gastronomy: Under the German Presidency of the Alpine Convention 2015-2016, an "Alpine Energy" online platform for knowledge transfer on energy efficiency in the hotel and gastronomy businesses was developed, providing information on funding opportunities as well as many tips for energy savings. The "ClimaHost" contest, which was organised in 2019 and 2022, rewarded good practices in mitigation and energy management in Alpine accommodation and restauration structures.[1]
- Tourism mobility: The Transport Working Group developed several activities on sustainable mobility that included specific insights into tourism mobility. For example, the report "Reduction of Mobility Demand and Shift to Environmentally Sustainable modes"[2] from 2020 showcases many projects linked to tourism mobility. In addition, the 2022 report on the "Potential analysis of existing and new technologies for the promotion of a sustainable passenger transport in the Alpine region" illustrates the role of alternative vehicle technologies and information and communication technologies (ICT) in tourism mobility (e.g. electric buses, autonomous vehicles, integrated information and ticketing).[3]

However, these activities focused on the level of specific stakeholders, i.e. individual gastronomic businesses and mobility service providers or were limited to the sectoral approach. A holistic point of view on how the energy transition can be better achieved in Alpine tourism regions has not yet been investigated. With the case studies, we aim to shed some light on innovative approaches in model regions and highlight their main insights and lessons learned about how to improve energy governance at the interface of energy and tourism.

These insights will support further activities for bringing to life the implementation pathways of the CAP 2.0. For example, the case studies from the Pinzgau Region and Les Orres provide insights into developing the pathway "IP_Tou1: Development of a coordinated vision for climate-neutral and climate-resilient Alpine tourism". At the same time, they also support the energy pathways as they highlight specific solutions for setting up cross-sectoral energy management systems in tourism regions.

[1] Please refer to the latest stock-taking report of the ACB for more information on these activities ##Link##

[2] https://www.alpconv.org/fileadmin/user_upload/Organisation/TWB/Transport/Transport_Annex2_AT-CH_Reduction-of-mobility-demand.pdf

[3] https://www.alpconv.org/fileadmin/user_upload/Organisation/TWB/Transport/3-Report_technologies_FIN.pdf

Case study: "Towards 100% renewables in the Pinzgau tourism region"

The Pinzgau is a model region for achieving the energy transition in tourism regions. The main goal is to shift to a 100% renewable energy system by 2040. The model approach was developed through three steps which were each linked to funding programmes at national level in Austria: the first project "VorTeil" was a scoping study on transition processes in tourism regions with a strong focus on stakeholder analysis. The following research project "CleanEnergy4 tourism" (CE4T) focused on ski lift operators launching the transformation process. In particular, the project analysed the potential for maximising energy efficiency, utilising flexibility options, and optimising the integration of renewables. This project developed a new level of trust and information (e.g. energy scenarios and an energy monitoring dashboard) so that further stakeholders (local energy providers, a transport service company, municipalities, and regional authorities) were motivated to join the third project "100% Erneuerbarer Pinzgau" (100% renewable Pinzgau) under the programme "KEM-Modellregionen" (climate and energy model regions of the Austrian Climate and Energy Fund). In a fourth project, all stakeholders involved developed a scoping plan for implementing a living lab (under the Austrian TANZ programme).

Main insights/lessons learned for improving governance structures and mechanisms

- The governance mechanism "network/trust" was used effectively: Starting with a "core group" of key stakeholders with an important economic and political function in the region helped to develop a good level of trust and commitment.
- Collaborative governance played an important role throughout the activities: Co-learning and co-creation was at the heart of all activities, e.g. when developing relevant tools for better managing the regional energy system, developing a common narrative to guide activities or using methods of co-creation to identify potential activities for the living lab.
- The project also provides insights for successful multi-level governance: It shows that a starting point/initial impulse often depends on public programmes (at national or regional level). In the Pinzgau, the CE4T project provided a professional framework for stakeholders to approach the topic and to develop first strategic approaches. Moving towards implementation, the local level became more and more important as local knowledge was necessary to bring all relevant stakeholders on board and to develop customised activities.
- Cross-sectoral governance: A smart approach to improve understanding and co-learning between the different economic sectors but also between the public and private sphere was the development of business models for each of the identified activities: the business models give specific insights into the future role of different economic stakeholders and thus address the "fear" of economic uncertainties.
- Managing the governance structure: For the living lab, a new governance structure is proposed to provide a "caretaker function", i.e. a managing structure with a contact person foreseen as an "information hub".

"The stakeholder analysis is crucial for launching new cross-sectoral energy initiatives. You need to identify key stakeholders who can serve as a "crystallisation point" and door-opener. In our case, the ski lift operators were the key stakeholders who launched the regional transformation process."

Dr Tanja Tötzer, project manager, Austrian Institute of Technology

Managing obstacles along the way: Obstacles and barriers linked to stakeholder involvement were successfully overcome through the smart step-by-step approach of the activities. In the final step, however, funding is becoming a hurdle as the implementation of the living lab requires a considerable co-funding from the participating municipalities.

Activities with a link to the tourism pathways in the CAP 2.0: Offers real tests on the role of energy communities (for tourism operators), lead project on climate-neutral tourism packages, several training and capacity-building formats for tourism operators.

Sources:
Interview with Tanja Tötzer (25.07.2023), Project manager, Austrian Institute of Technology (Mail: tanja.toetzer@ait.ac.at)
Project websites: VorTeil (ffg.at), CE4T (ffg.at), 100% erneuerbarer Pinzgau » Klima- und Energie-Modellregionen (klimaundenergiemodellregionen.at) and TANZ (ffg.at)

Case study: "Developing a smart grid for tourism regions – the Living Lab "Les Orres"

Les Orres is one of the major ski resorts in the Southern French Alps and was the first resort to conduct a full energy audit of a ski resort and develop an integrated energy management system for ski operations (as part of the Interreg ALPSTAR project). When joining the Smart Altitude actions in Les Orres, new actors benefit from some financial incentives, which is important to lower barriers to participation. However, it is even more critical to demonstrate that the business model is sustainable even without such incentives. To enable this approach, Les Orres and its partner, the energy company EDF, placed a strong focus on providing the initial technical set-up for a smart grid approach: with the help of the smart grid, energy production and energy demand in the resort can be balanced, and peak demand (with high energy prices) can be reduced through demand management (load shedding) measures (e.g. by slightly reducing the speed of the ski lifts, or by temporarily disconnecting the base heating in administrative buildings without affecting staff comfort). The smart grid approach required the bringing additional stakeholders on board to create more flexibility in the system. This process, as part of the Smart Altitude project, brought many insights for energy governance.

Energy key facts:
- Electricity consumption reduced by 20% (i.e. 121 MWh/year)
- Savings of up to 25% of energy bills (and even higher in specific fields such as public lighting)

Main insights/lessons learned for improving governance structures and mechanisms

- Multi-level governance: At a local level, there is often a gap between the interest in getting involved in energy management and the technical capacity. To overcome this gap, programmes/projects at EU or national level are necessary – the Interreg projects ALPSTAR and Smart Altitude made this possible for Les Orres and the other participating tourism resorts. After the initial starting point, the projects "on the ground" can then deliver insights back to national and EU level about relevant barriers and recommendations for overcoming them. For example, in Les Orres, the specific regulation on the self-consumption of electricity was seen as hurdle and recommendations were addressed to national-level decision-makers.
- Cross-sectoral governance: The smart grid approach requires the inclusion of stakeholders from different sectors: the more energy consumers are included in the grid, the higher the flexibility. This, however, required a strong level of understanding to be built about the different stakeholders. In Les Orres, especially the interface between the energy system and housing/buildings needed smart approaches for engagement (see obstacles below).
- Mechanisms: The governance model in Les Orres builds strongly on the "price" mechanism with the development of business models and the financial argument as a first entry point. Once stakeholders have joined the approach, additional tools are used to strengthen engagement and trust.
- Managing the governance structure: Due to the technical approach in the "Les Orres" case study, the operator of the smart grid SEMLORE is the main manager of the governance structure.

"Setting up an Alpine mountain id is a complex task. The more energy consumers and producers are included in the grid, the higher the flexibility. But as the inclusion of additional stakeholders brings with it new hurdles, the management of the project becomes more and more challenging."
Yann Bidault (YB Solutions)

Managing obstacles along the way: The project allowed the identification of a number of barriers to the creation of a full mountain smart grid: 1) setting up green energy production (PV, hydropower) was initiated, but exceeded the timeline of the project; 2) regulatory constraints – at least in France – in self-consumption settings made it impossible to adopt a fully operational smart grid approach; 3) private collective housing in ski resorts (a major energy consumption sector in French ski resorts) requires a decision by the board of owners to join the proposed participation in a "smart grid" project – something very difficult to obtain. Single housing operators and the municipality (public buildings and premises) were integrated, allowing the benefits to be measured that could be expected from a smart grid approach.

Activities with a link to the tourism pathways in the CAP 2.0: Les Orres is a case study for the pathway IP_E3 "Supporting low-carbon/low-energy Alpine lifestyles and business models" and insights for IP_Tou2 "Coaching and capacity building for climate proofing Alpine tourism".

Sources:
Interview with Yann Bidault, YB solutions (01.08.2023), Project manager of Smart Altitude (Mail: ybsolution@sfr.fr)
Deliverable on Activity A.T2.3 "Smart Mountain Grid" Living Lab (Les Orres) Online: https://www.alpine-space.eu/project/smart-altitude/ and toolbox: https://smartaltitude.eu/

Insights into "governance challenges": Developing the Smart Ski Resort approach
Thoughts from Stephan Juen, founder of the Smart Community association

The Smart Community Association wants to transfer the Smart City approach to ski resorts and tourism areas under the term Smart Ski Resort. On the way there, one has to deal with a multitude of obstacles. Some solutions and thoughts on innovative/pragmatic approaches are presented in this short interview with Stephan Juen.

ACB: What new challenges did you encounter when you transferred the smart city approach to the ski resort level?

Stephan Juen: The economic perspective plays a very strong role at the ski resort level. A commitment must be financially attractive in the short term. That's why we initially focused on renewable energy generation projects. Ski resorts have a very high potential here. Short-term financial support, e.g. in the form of seed capital, would help overcome the initial phase with high demand for external support.

ACB: What are the main obstacles in introducing the Smart Ski Resort approach?

Stephan Juen: In addition to the financial obstacles, we encounter many regulatory obstacles. For example, the framework conditions for renewable energy communities in Austria do not allow the involvement of large companies. Since many destinations fall under the definition of a large ski resort, players that have a particularly high potential are excluded.

ACB: In one of your case study regions - the small ski resort in Heuberge/Grisons - you tested a co-design process as a starting point for a Smart Ski Resort. What was your experience with this process?

Stephan Juen: In this co-design process, project ideas are further developed with the local stakeholders. After the process, the most important pillars on which a project submission can be prepared are identified. For example, with the Heuberge we were able to develop two project ideas together with all relevant stakeholders: small wind turbines on the poles of a ski lift and the conversion of diesel shuttle buses to new electric buses, combined with a local energy community to generate the necessary electricity. We have already received a funding commitment for the e-mobility project from the responsible Federal Office of Transport.

ACB: What innovative solutions are necessary – from your point of view – to overcome the barriers?

Stephan Juen: Above all, we need a more targeted framework for the development of new energy communities in ski resorts – also allowing energy communities that reach across municipal boundaries. But we also need to work on social innovation, e.g. to better enable pioneers to develop their ideas. People feel pressure to act and need better support to take the first steps, especially in smaller ski resorts and in lower and medium altitude areas, which are already facing the effects of less snow. Financial support for the elaboration of these first steps would be very beneficial. Fortunately, the co-design process for Heuberge was funded by the Innovationbooster Swiss Smart Cities. Without seed money funding, it is hardly possible to bring together the relevant stakeholders and work with them to collect ideas and formulate a project from them. There is potential co-funding of several hundred thousand euros at the EU level, but it is (almost) impossible to get 20,000 euros in a simple way to build a project foundation at local level. An already existing willingness to commit to a project could be developed further, as in the case of the ski resort Heuberge/Grisons.

Source: Interview with Stephan Juen, founder of Smart Community (13.9.2023)
(Mail: stephan@smartcommunitysuisse.ch)

Main insights: common success factors and features with Alpine transfer potential

The case studies and analysis of ongoing "governance challenges" provide some insights into common success factors with the potential for transferability throughout the Alpine region. Some first insights can also be gained into how the Alpine Convention can support this transfer:

- Initial impulse through national/EU programmes: Even if stakeholders see the need for action, they often lack the capacities/know-how to take the first steps to launch integrated transformation processes. In the case studies, national and/or European funding programmes have provided a "safe space" for starting cooperations, accompanied by experts from the field.
  → Initial coaching sessions would be necessary to help tourism regions along their way
- Start with key stakeholders: In both analysed case studies, the cable car operators as key economic stakeholders were the starting point for the cooperation. They have a comprehensive knowledge of the local context and a strong network and can thus serve as facilitators and moderators for the further process.
  → To roll-out activities at Alpine level, work more strongly with cable car operators and enable exchange between them
- Look at vulnerable territories: Many Alpine regions at lower and medium altitudes that already face challenges from reduced snow levels have launched strategic approaches for their regional transformation. These regions could be supported by the Alpine Convention, especially to identify the territorial added value of linking the energy transition to other transformation processes.

Some highlights from activities in Alpine towns:
The members of the Alpine Town of the Year Association are committed to the energy transformation and have also launched activities related to the decarbonisation of their tourism activities:

- Brixen: Certification of the Global Sustainable Tourism Council, including the annual calculation of the carbon footprint and the organisation of major events as "Green Events" (further information is available here).
- Tolmin, Soča Valley: Received the Slovenia Green Destination Gold label; the sustainability report highlights many measures dealing with tourism mobility and energy use.

Further inspiration and food for thought:
If you are interested in learning more about successful energy governance at the interface between energy and tourism, these initiatives and projects can offer additional information and impulses:

- Climate-neutral tourism region Grisons: Information on how to put tourism destinations on a path towards climate-neutrality, including guidelines and step-by-step information: https://klimdest.fhgr.ch/
- Results from an online workshop on renewable energies in ski resorts (only in German): https://www.smartcommunity.pro/smartskiresort
- The project "Percorsi itineranti intorno al Monte Bianco": where a public-private partnership realised a project to discover and travel around the Espace Mont-Blanc in an environmentally sustainable way: https://www.grandcombin.vda.it/ProgettiedIniziative/ProgettiEuropei/Itinerance/Presentazioneservizio/tabid/4207/Default.aspx

If you are looking for some scientific background:
The following paper provides a good overview on energy governance in tourism areas:

- Sedlacek et al. (2020): Collaborative governance in energy regions - Experiences from an Austrian region. In: Journal of Cleaner Production 256 (2020).

4 Energy nexus 2: Energy and mountain agriculture

The CAP 2.0 underlines the importance of moving mountain agriculture towards an innovative "laboratory" in which climate-neutral farming and production techniques are being tested. In this context, the Alpine Conference has recognised the importance of further linking mountain agriculture with other sectors to ensure synergies. Energy efficiency and the expansion of renewable energy is crucial in this context.

The Working Group on Mountain Agriculture and Mountain Forestry has contributed to the concrete operationalisation of the Alpine Climate Target System 2050 and the CAP 2.0 in the last few years and has already taken an ambitious cross-sectoral approach in its activities. One past activity looked at the definition of new connections and interactions between sustainable mountain agriculture, the sustainable management of mountain forests, tourism, and biodiversity in an Alpine context, as well as developing sustainable urban-rural relationships. The Working Group also aimed to analyse and strengthen sustainable value chains in the forestry and farming sectors by involving the relevant actors, thus taking a collaborative governance approach. A focus was also placed on linkages between mountain farming and forestry and the urban centres.

Agricultural activities, by nature, interact with the atmosphere in multiple ways: they are sources of greenhouse gases due to the use of fossil fuels as energy and emissions from livestock, and are linked to chemical processes in plants and soils. At the same time, agricultural lands can also act as sinks of greenhouse gases in overground and underground biomass.

Mountain agriculture and renewable energy are often intertwined in the Alpine region: mountain farming combined with the installation of renewable energy system (RES) plants ("prosumers" = simultaneous producers and consumers of energy) can improve, in terms of technical and financial viability, energy supply in remote regions through the establishment of off-grid systems, microgrids, and energy storage solutions. Beyond self-consumption, the energy produced can be fed into the grid to reduce the carbon intensity of the regional/national electricity mix.

Additionally, farmers in mountainous regions can introduce energy-efficient agricultural equipment, such as electric tractors or farm machinery, which can be powered by renewable energy sources. This reduces the environmental impact of farming operations and lowers operational costs.

The decentralised energy production of RES contributes to the economic development and attractiveness of mountain regions through skilled job creation and the diversification of income.

The following case studies were chosen to shed light on ongoing governance practices as well as challenges in the nexus of "energy and mountain agriculture". In particular, the examples aim to raise interest in diving further into the complexity of local energy production in the hands of mountain farmers. This approach could strengthen the autonomy of Alpine regions with the ultimate goal of lowering the energy dependency of mountain areas and fostering their resilience vis-à-vis external energy shocks.

The insights ought to give inputs into the implementation of the pathways of the CAP 2.0 in a cross-sectoral manner. In particular, the examples demonstrate how climate-neutrality in agriculture can be nudged through concerted efforts. Also, the case study of the governance challenge to accommodate "agrivoltaics" into existing policies intends to point out new possible fields of actions in the framework of the CAP 2.0. This is especially applicable for the intended support for pilot actions for decentralised energy solutions in the Alps connected with the piloting of low carbon business models as envisaged in the "energy pathway".

Case study: Climate-neutral agriculture in the Canton of Grisons

The project "Klimaneutrale Landwirtschaft Graubünden" (climate-neutral agriculture Grisons) is a pioneering initiative focusing on the development and implementation of sustainable agricultural practices in the Swiss canton of Graubünden. The main aim of the project is to introduce and test innovative practices and technologies to reduce greenhouse gas emissions in the agricultural sector.

A wide variety of innovative agricultural practices are being tested, reflecting the multiple ways in which agricultural activities and the climate interact.

With specific reference to the energy nexus, the pilot farms are implementing, for instance, measures to substitute diesel fuels with sustainable fuels; install combined heat and power (CHP) plants for heat and electricity; test innovative PV power plants and biogas facilities; produce plant coal; acquire electricity-driven machines; optimise energy consumption when using machines. The experiences collected from these projects allow a proper evaluation under consideration of environmental, technical, and economic viability.

Energy key facts:

Agriculture contributes 12% to the Canton's greenhouse gas emissions. Considering current and projected trends in industry and traffic sectors, agriculture could become the biggest greenhouse gas emitter in the future.

Main insights/lessons learned for improving governance structures and mechanisms

- Multi-level governance: The initiative joins forces with institutions from different levels: farmers, agricultural support organisations, cantonal government, academia. All of them contribute to the steering of the project and support it within their specific fields of competence. The cantonal government provides the policy framework and vital funding for the initiative.
- Collaborative governance: The bottom-up approach from the start of the initiative proved to be crucial for the success and broad acceptance of the project; the impetus for the project came from the grassroots, in particular from committed organic farmers in the canton. This commitment fitted well with the climate strategy of the canton of Graubünden, which was developed at the same time, which is why the project was positively received and financially supported. Communication, education, and knowledge exchange were central in ensuring broad participation – in fact, 130 farms competed for 50 spots to become pilot enterprises.
- Cross-sectoral governance: Throughout all activities, the various actors involved exchange ideas and experiences and directly feed into the project steering. Activities are clustered along two main areas: compulsory area A includes five days of training per year, for which farmers receive financial compensation. In optional area B, planning and implementation of pioneer projects are carried out on the test farms. It is important that these are selected by the enterprises themselves. Communication and public relations work are also an integral part of the project.
- Mechanisms: The project is successful by creating partnerships between farmers, farmers' associations, government agencies, research institutions and other relevant stakeholders to support the implementation of the measures and mobilise resources for the project. Capacity building is strengthened through training, and a strong engagement from farmers is ensured by adopting a consistent bottom-up approach and the competitive selection process. Financial compensation for enterprises is crucial.

"We let the pilot enterprises test new practices in absolute freedom. We want to see whether practices that show promising results in theory do work in practice. Failure is permitted."

Gianluca Giuliani, project manager "Klimaneutrale Landwirtschaft Graubünden", Flury & Giuliani GmbH

Managing obstacles along the way: Monitoring the effectiveness of pilot actions in terms of greenhouse gas emissions saved, or energy saved, is not always easy. The implementation of the pilot

projects exhibits significant variations in both their nature and effectiveness. Rather than assessing them solely in terms of numerical emissions reductions, their evaluation should be based on factors such as feasibility assessment, socio-economic sustainability, know-how improvement and transfer, and other relevant criteria.

Activities with a link to the agriculture pathways in the CAP 2.0: The case study highlights how a bottom-up approach and a network of local and small-scale farmers can implement the pathways "IP_Agr2: Moving to organic and climate-friendly methods in Alpine farming".

Sources:

Catalogue of ideas "Klimaneutrale Landwirtschaft Graubünden" (German language only): https://www.klimabauern.ch/ideenkatalog

Pioneer enterprises: https://www.klimabauern.ch/portraits

Interview with Gianluca Giuliani, project manager "Klimaneutrale Landwirtschaft Graubünden", Flury & Giuliani GmbH (07.09.2023) (Mail: gianluca.giuliani@flury-giuliani.ch)

"It is crucial to recognise that emissions reduction from agricultural activities represents just one aspect of a more comprehensive perspective. We must also emphasise the interconnectedness between agriculture and factors like biodiversity, landscape protection and preservation, climate resilience, and more."

Gianluca Giuliani, project manager "Klimaneutrale Landwirtschaft Graubünden", Flury & Giuliani GmbH

Case study: Agricultural chambers as knowledge providers and facilitators of the energy transition

The "energy efficiency in agriculture" platform is an initiative by Energie Steiermark and the Chamber of Agriculture of the Land Steiermark (Styria). The objective of the cooperation is to advise agricultural businesses on how to become more energy and resource efficient by making greater use of renewable energy technologies and advancing the energy autarchy principle. The platform also focuses on the green mobility transition in agriculture, a sector that will play a key role in shifting the agricultural sector towards climate neutrality.

Transregional governance: The regional chambers of agriculture in Austria collaborate in a close network. In the energy field, they focus on the creation of synergies to diffuse good practices and knowledge through the creation of joint communication materials within the network (brochures, videos, social media content). The network is also a pool of actors to start common cooperation and research projects.

Collaborative governance: Chambers of agriculture act as facilitators of working groups. Between 20 and 40 farmers from the same branch of agriculture cluster together to form a working group. The working group leader is a professional figure working in the chamber of agriculture. The working groups serve as "safe havens" to discuss obstacles and problems and to find common solutions. The networking of the farmers is an important tool to transfer knowledge. Site visits, seminars and conferences with a technical focus on specific areas of agriculture play a very important role.

"Three important priorities will emerge in the coming years in the intersection of agriculture and energy: Increasing the energy efficiency of farms by taking a closer look at the overall energy concept, the practical and technical implementation of regional energy communities and the mobility transition for commercial vehicles.

Thomas Loibnegger, Chamber of Agriculture, Land Steiermark

Sources:

Interview: Thomas Loibnegger, Chamber of Agriculture Land Steiermark, head of project "Energieeffizienz in der Landwirtschaft"
Contact: Thomas.Loibnegger@lk-stmk.at
Further details: http://www.e-landwirtschaft.at/

Insights into governance challenges: Accommodation of agrivoltaics in a cross-sectoral and multi-level policy design

Agrivoltaics is a multi-land use method that combines agriculture with the production of solar energy. Some test areas have been installed over the last years. Yet there is no clear definition of agrivoltaics in regional, national, and European legislation. Agrivoltaics regulation is complex due to the interlinkages of agriculture, energy, and economic policies and their matching with landscape protection and resource management. PV panels can have a positive impact on the yield of crops and plants as well as soil quality and contribute to a more efficient water management due to their protective shading effects and shielding from extreme weather events. At the same time, Agri-PV diversifies the income of local farmers that sell the electric energy to the grid and shows untapped potentials for local smart grid development in rural and mountain areas.

Agrivoltaics creates conflicts of interests regarding the reconciliation of landscape protection. This is even more the case for sensitive Alpine landscapes. The Agri-PV sector needs further research and piloting and a common vision to prevent greenwashing and to create acceptance in affected societies.

"The pivot conflict in agrivoltaic policies concerns the combinatorial possibilities of technology applications in agriculture and their effects on the landscape".

Wolfram Sparber, Head, Institute for Renewable Energy, EURAC

Sources:

Interview with Wolfram Sparber, Head, Institute for Renewable Energy, EURAC.
Fraunhofer ISE, Agrivoltaics: Opportunities for Agriculture and Energy Transition, A guideline for Germany, April 2022.
Chatzipanagi, A., Taylor, N. and Jaeger-Waldau, A., Overview of the potential and challenges for Agri-Photovoltaics in the European Union., EUR 31482 EN, Publications Office of the European Union, Luxembourg, 2023, ISBN 978-92-68-02431-7, doi:10.2760/208702, JRC132879.
Technologie- und Förderzentrum im Kompetenzzentrum für Nachwachsende Rohstoffe (TFZ): Agri-Photovoltaik – Stand und offene Fragen, Berichte aus dem FTZ 73, 2021.

Insights into governance challenges: Integrating innovative energy solutions in traditional agricultural buildings – The Alpine pasture Monte Fontana Secca Col de Spadaròt

The Alpine pasture Monte Fontana Secca and Col de Spadaròt – a 150-hectare mountain meadow in the Monte Grappa massif is currently being restored to once again take up its productive, ecological and historic-cultural function. The project is being implemented by the Fondo per l'Ambiente Italiano, the National Trust for Italy – thus including an educational function at the heart of the project. From 2025 the pasture will serve as an educational and training centre for the public, pupils and students dedicated to mountain agriculture and pastoralism: a heritage of culture, knowledge and practices, which the FAI intends to preserve and recount. The restoration not only includes the reactivation of the landscape and historical buildings (bringing the typical Burline cows back to pasture), but it will also serve as lighthouse projects for an autonomous energy and water supply in mountain agriculture.

Innovative energy solutions – Building-Integrated PV

As the site will be restored to its historic-cultural function, the visual impact of a self-sustaining energy system should be minimised. After a detailed evaluation, the project will now build on Building-Integrated-Photovoltaics (BIPV) applied to the roof (250 square metres of PV "film" on the

roof, 29.4 kWp), an integrated battery for storage and an additional generator for electricity production.

Cross-sectoral governance – Agriculture, energy, and nature protection go hand-in-hand

- **Multi-level governance:** Regarding governance, the project followed a territorial multi-level approach, creating a territorial relationship between the main subjects and stakeholders in the area with the objective of enhancing the Grappa area through the recovery and promotion of local mountain pasture activities. The National Trust for Italy (FAI) together with the Municipality of Quero Vas developed a strong visionary picture for the mountain pasture that also mobilised actors and funding beyond the affected area.
- **Including local knowledge is key:** The National Trust for Italy (FAI) has chosen to include in its working group local professionals who have a profound knowledge of the issues involved in intervening at high altitudes and the importance of a design that starts from the local context. This has enabled FAI to approach restoration work with a wealth of indirectly acquired skills that has been fundamental for an effective intervention that respects the area.

Sources: https://fondoambiente.it/news/monte-fontana-secca-il-progetto-di-restauro-e-valorizzazione

Main insights: common success factors and features with Alpine transfer potential

The case studies and "insights into governance challenges" shed some light on common success factors with potential for transferability throughout the Alpine region. Also, some first insights can be gained on how the Alpine Convention can support this transfer:

- The agri-PV case study illustrates the challenges of the further expansion of renewable energies in cross-sectoral governance structures. Increased coordination at the trans-regional and transnational levels can contribute to solving the governance challenge of accommodating agri-PV into a shared legislative and normative framework. In particular, the transfer of knowledge between technical pilot projects appears to be of the utmost importance. Technical certainty gained through piloting and testing in this area will facilitate policy-making and legislative processes.
- The case study "Climate-neutral agriculture" illustrates the single steps required to set up a successful cooperation project from the bottom up, and the challenges which are encountered in a complex field such as mountain agriculture. The success of the bottom-up approach from farmers, coupled with the scientific and financial support system in place, showcases the potential for transfer to other mountain regions.
- The case study on the Alpine pasture on Monte Grappa highlights some questions that emerge at the interface between the energy transition and the conversation of cultural and natural heritage.

Further inspiration and food for thought:

- If you are interested in learning more about pilot applications linked to Agri-PV, follow this project:
  SYMBIOSYST investigates innovative systems that go beyond the idea of solar energy production and agriculture as two separate sectors and find a new synergy where land and crops and PV can have a mutually beneficial relationship. The project develops different PV solutions for open field and greenhouse agriculture and their demonstration in four agricultural scenarios in three different countries.
  www.sybmiosyst.eu
  Contact: david.moser@eurac.edu
- If you are interested in a study regarding the expected benefits, advantages and disadvantages of Agri-PV, read the scientific output of this small-scale study in Bavaria:
  Agri-Photovoltaik – Stand und offene Fragen, TFZ-Bericht 73, 2021. https://www.tfz.bayern.de/rohstoffpflanzen/projekte/252975/index.php

5 Energy nexus 3: Energy and spatial planning

Spatial development and spatial planning on all levels have a considerable influence on every dimension of the energy transition. This comprises energy demand, energy consumption and energy efficiency of settlement and mobility systems, the utilisation of spatial potentials for decarbonised energy production, storage and transmission, the opportunities for supply with renewable energies, and the climate resilience and sustainability of the energy system. Indeed, the consideration of energy in formal and informal planning processes and instruments (from local development planning to urban planning, urban design competitions and infrastructure planning) has been an important topic at national and European level (Rehbogen und Strasser 2021, p. 1).

However, the way to ensure a true "mainstreaming" of energy into spatial planning processes remained relatively unclear for a long time, and it is only recently that some successful activities have become visible. These illustrate that spatial planning can contribute to the energy transition via the following mechanisms:

- Reducing the energy demand and energy intensity of spatial structures and mobility systems through sustainable settlement development: Spatial planning can become a considerable lever for reducing energy consumption through compact and mixed-use settlement structures, but also through providing standards for energy efficiency in buildings or the use of green roofs and facades. Avoiding excessive land take, urban sprawl and dispersed settlement patterns, and forcing inward-oriented settlement development reduces the energy consumption of buildings, technical infrastructure, and mobility. Moreover, higher settlement densities favour a cost-effective centralised renewable energy supply (e.g., building-integrated solar facilities, district heating and cooling systems), and generate density-related efficiency gains (APCC 2023; ARL 2021). Achieving such energy-optimised settlement structures requires the coherent and coordinated use of spatial planning instruments from regional to local levels.
- Spatial planning at local level to fully exploit de-centralised renewable energy production potentials on already intensively used land: The maximum possible utilisation of renewable energy potential on buildings (roofs, facades), other built objects and already sealed areas (e.g. parking spaces, streets) should be given priority in the deployment of renewables in green and open spaces. This is possible through a stronger use of zoning and building development plans and can be supported by the amendment of building regulations. Strategies to mobilise such renewable energy potentials within existing settlement areas require new and specific governance approaches.
- Designating priority areas and "Renewable Acceleration Areas" for deployment of renewable energy sources through spatial planning at regional level: Based on the identification and assessment of renewable energy production potentials, the "zoning" of suitable areas and priority areas for renewable energy production in regional plans plays a crucial role for the deployment of renewable energies. The requirements of the RED III are in line with the aforementioned zoning criteria. Similarly, it is an important energy-related task of spatial planning at regional, or even higher levels to identify and secure areas needed for electricity transmission corridors and storage facilities (ÖROK 2021). Moreover, the use of biomass for renewable heating networks needs to be planned at regional level, considering regional energy production and consumption. The impacts of climate change on renewable energy production potentials, on the demand for land and on the suitability of areas should be considered in assessments of spatial energy potentials.
- Designation of exclusion zones for renewable energy production: Before designating priority zones for renewable energy deployment, it is important to identify and rule out "No Go" areas. These are, in particular, ecologically sensitive areas and protected areas of high ecological value (e.g., IUCN categories I – IV). RED III makes it possible to exclude certain regions or technologies from the application of the directive under certain conditions.

- Securing multi-functionality of green spaces in planning decisions: Consideration of different functions of green and open spaces and balancing diverse, and often competing or conflicting interests in the use of land, are core tasks of spatial planning. Against the background of climate change, pressures are increasing on green and open spaces for various uses as is the importance of their multi-functionality. "Zoning" of priority areas for renewable energy production should thus carefully consider the different functions delivered by green spaces, including other functions of high public interest. This requires the further development of robust and transparent criteria, methods, and procedures for evaluating, selecting, and balancing different functions of green spaces as well as of competing interests in their use (ÖROK 2021).
- Considering climate-resilience in energy-related spatial planning: The energy transition creates substantial additional land demand for energy production, transmission, and storage infrastructure. In order to ensure that the necessary public investments in new energy infrastructure do not become "sunk investments" over the next decades, they should undergo climate-proofing. The selection of sites, locations, and transport corridors for critical renewable energy infrastructure should thus involve an assessment of climate change impacts to safeguard climate resilience and safety against extreme weather risks, climate-induced natural hazards, and cascading impacts.

The specific characteristics of the Alps pose additional challenges to mainstreaming the energy transition into spatial planning. The topography, the limited availability of usable land, and the needs of the sensitive mountain environment and landscape can be additionally challenging. Cross-border spatial planning also needs to be considered. An overview on how cross-border spatial planning is organised is provided in the latest report of the Spatial Planning and Sustainable Development Working Group (WG SPSD) of the Alpine Convention, titled "Cross-border spatial development in the Alpine Convention area".[4]

Since its establishment in 2020, the WG SPSD has been working very concretely on the implementation steps of various pathways of the CAP 2.0. In the current mandate 2023-2024, the following steps, among others, are being prioritised: IP_SP1: Step 1a: Definition and provision of data on the impacts of climate scenarios on land use; IP_SP1: Step 1c: Discussion paper on growth and shrinking for climate-sensitive spatial structures in the Alps and workshop on growth and shrinking processes in the Alps; IP_SP1: Step 3: Alpine-wide survey on the challenges for the land-saving targets in the Alpine countries (based on the survey of land-saving targets carried out in the mandate period 2021/2022); IP_SP1: Step 4: Guide for municipalities to assess and activate intra-municipal development potentials.

The ACB aims to continue and intensify its strong cooperation with the WG SPSD. The next mandate period could open a window of opportunity to work on the nexus "energy and spatial planning".

Besides the close cooperation with this WG, the ACB has also joined forces with CIPRA AT on the topic of NIMBY ("Not in my backyard"). In 2024, a workshop was organised, bringing together stakeholders from different interest groups dealing with energy-related issues (energy suppliers, NGOs, renewable energy entrepreneurs, scientists etc.). The workshop was guided by a moderator and a mediator, aiming at enabling a profound discussion of different interests concerning the change in energy supply, development needs, and planning processes.

The following case studies highlight some successful projects where the energy transition was successfully integrated into spatial development processes or larger territorial transformation processes. They all provide insights for further developing the implementation pathways of the CAP 2.0, especially IP_SP1: Alpine-wide concept "Spatial planning for climate action". Also, some

[4] https://www.alpconv.org/fileadmin/user_upload/Organisation/TWB/SPSD/Assessment_study_Cross-border_Cooperation.pdf

case studies as well as the short interview point out some specific challenges for the Alpine region, especially the trade-offs between energy planning and nature and landscape.

Case study: a territorial approach to the energy transition:
TEPOS -CV– Territoires à énergie positive pour la croissance verte

The national network of Positive Energy Territories (TEPOS) was led at the national level by the French environmental association "CLER-Network for energy transition/Réseau pour la transition énergétique" (https://cler.org/), which brings together more than 150 actors committed to the energy transition in their territory (communities, project leaders and local actors).

In the Auvergne-Rhône-Alpes region, the TEPOS-CV network (Territories with positive energy for green growth) brought together, until 2021, around forty territories recognised for their exemplary actions in terms of the energy transition. Their efforts were supported in part by a subsidy programme from the State, ADEME, and the Region. The network included 41 territories representing 56% of the region's overall population, including certain large cities (Saint-Etienne, Grenoble, Geneva metropolitan area). The continuation of this territorial animation is currently being redefined to include the main lessons learned.

Energy key facts:
- 56 % of the regional population of Auvergne-Rhône-Alpes now lives in a TEPOS-CV region
- Up to 30% energy reduction was achieved in some TEPOS regions

Main insights/lessons learned for improving governance structures and mechanisms

- Multi-level governance: The energy transition requires shared responsibility between the state and local authorities. As a starting point, specific funding must be provided to support local actors in initiating and managing the local transition process.
- Cross-sectoral governance: An integrated approach must include all sectors concerned in the territorial approach, taking into account the specific characteristics and needs of the region (e.g. agriculture, forestry).
- Collaborative governance: Bringing together actors from different sectors and different territories strengthens the dynamic of collective learning, making it possible, in particular, to take into account social aspects (for example linked to housing).

Activities with a link to the tourism pathways in the CAP 2.0: TEPOS can be seen as example for implementing the pathway IP_SP1: Alpine-wide concept "Spatial planning for climate action".

Sources: TEPOS Factsheet by Auvergne-Rhône-Alpes, Article with first assessment of TEPOS (Balaye et al. 2018)

"Above all, this initiative has improved coordination: at local level between urban and rural areas for example, and at regional level, with common and shared objectives, regular meetings with all the territories, technical support, experience sharing, skills development, etc."

Catherine Premat, Head of Territorial Projects, Auvergne-Rhône-Alpes Region

Case study: Spatial energy planning for the new heating age:
SEP – Spatial Energy Planning

In the lighthouse project "SEP – Spatial Energy Planning", the provinces of Vienna, Styria, and Salzburg worked together since 2017 on developing the basis for planning for a spatially optimised development of heat supply infrastructures, taking into account the local conditions such as the existing energy infrastructure, land use, and energy resources available from renewable sources or waste heat. This project was developed under the leadership of the SIR (Salzburg Institute for Spatial Planning) in the frame of the research initiative "Green Energy Lab" and together with more than 20 partners from three Austrian regions, among them the regional governments, cities, universities, energy agencies, and the regional energy suppliers.

The building blocks that were created were then incorporated into the digital HEATatlas – cartographic information layers on energy demand, energy supply infrastructures and renewable energy supply potentials – and the automated analyses for defined administrative processes. The atlas shows the complex interconnectedness of energy systems, facilitating the long-term planning of energy and infrastructure coupled with higher investment security. This data can be used for the smallest spatial individual building as well as consistently for other units such as areas, municipalities, regions, and countries. In addition, a HEATapp prototype was developed that allows for automated queries and can be used in three specific application forms of public administration: area development, spatial planning, and monitoring of energy strategies.

A concrete product in this project is an inventory of energy and spatial data for each municipality, resulting in a document of 40 pages including 87 graphs/values/map excerpts. In a first step, the team figured out for which energy planning issues the municipalities has its own decision-making authority and what questions arise from there. In a next step, models were developed. Results are then shown in the inventory. Together, this inventory document and the offer to discuss the content with experts at SIR supports municipalities in their spatial planning processes. An important step taken in parallel was the addition of a clause on the need to consider energy-related topics when taking relevant spatial planning decisions, e.g. new local development concept (clause in the new building law in Salzburg and in the spatial planning law).

Main insights/lessons learned for improving governance structures and mechanisms

- One of the overall aims was the standardising and efficient provision of data: to ease the comparability, the update of models, and the roll-out (entry points into legal instruments).
- Supporting municipalities with well-developed and manageable information applicable to the local level is crucial to make use of the project results. In addition, it makes sense to realise such a project at the provincial (or a higher) level and to assure that the data is collected and stored in one specific place (GIS of provincial state).

Managing obstacles along the way:

- High dependency on decision-making processes at regional/national level; lack of national legislation
- High dependency on available human resources and competencies to establish a project within a manageable time frame; efforts toward the project aim must be constant and long term
- Recognising the impossibility of perfect data (both quality and availability) and challenges with GDPR (e.g. due to different interpretation across countries)
- Models (scenarios) are central and at the same time very complex; challenge of bringing complexity to the ground in science in such a way that individuals can make a political decision based on it (translation work is needed)

"The integration of our findings in relevant spatial decisions must not be an expense for the municipalities."
Alexander Rehbogen, SIR

Activities with a link to our pathways in the CAP 2.0: Insiders can be used to further develop activities for the pathway IP_E4 "Alpine administrations as forerunners".

Sources:
Interview with Alexander Rehbogen, SIR - Salzburg Institute for Regional Planning and Housing; Homepage https://greenenergylab.at/en/projects/spatial-energy-planning/

Project website: https://waermeplanung.at/; https://greenenergylab.at/en/projects/spatial-energy-planning/

Insights into "governance challenges": Accelerating the development of wind energy in Bavaria – the "wind caretakers" and their role in multi-level energy planning

Main messages from an expert exchange with Stefan Drexlmeier, Energiewende Oberland

Especially in the southern part of Germany, the expansion of wind energy has been stalled for several years. This is often due to conflicting viewpoints on how to prioritise the use of scarce and valuable land and on low acceptance from the public. Local know-how, about both the spatial planning and the relevant stakeholders and their needs and critical viewpoints, is needed to overcome this hurdle and to bring forward project proposals for wind energy which find support at local level. The Bavarian Ministry for the Economy has launched the initiative of "wind caretakers" (WindKümmerer) which support the development of wind projects at the county level ("Landkreis").
Stefan Drexlmeier from Energiewende Oberland has supported the set-up of the "wind care-takers" and provides some insights into key success factors but also difficulties:
ACB: What was your motivation to support the "wind caretaker" concept? Where do you see the added value of this approach?
Stefan Drexlmeier: The "wind caretakers" are important to bring more local knowledge into the planning of wind energy. They also serve as a model for other renewable energy sources and for the energy transition in other sectors. For me, one success factor lies in the fact that the "wind caretakers" are represented, in most cases, by the regional energy agencies. This guarantees that they can build on their local knowledge and are already well accepted at regional level due to their neutral position. Also, it should be noted that the specific regulations for the "wind caretakers" are rather flexible, so they can support municipalities in a targeted way, depending on actual needs.

ACB: What are the difficulties that the caretakers have to deal with?
Stefan Drexlmeier: The situation in Bavaria, especially in the Alpine region, is more difficult than in other German areas. For example, in my region, a large share of the land is dedicated as a nature-protection area and smart solutions have to be developed to deal with conflicting land uses.

ACB: Are the "wind caretakers" also in charge of implementing the new "Wind-an-Land" law which foresees a designation of 2% of the area as a wind priority area? (see below for further information)
Stefan Drexlmeier: No, the "Wind-an-Land" law has to be implemented by the regional planning associations ("Regionale Planungsverbände") which are another governmental entity. This brings along some difficulties as different stakeholders work on a similar target. Also, we are looking at the frameworks of the new EU mechanism "Go-To areas for renewables" [further described as "Renewable Acceleration Areas"] which will also lead to new requirements in prioritising specific areas. Here we see the need for a better integrated multi-level governance that ensures that the local and regional entities can focus on their job without dealing with too many different reporting and financing frameworks.

Background:
Development targets for onshore wind energy have been more than tripled by the German government for the coming years in the frame of the new EEG 2023. Recently, the main obstacle to expansion has been that too few areas have been designated for wind turbines. This dilemma is linked to the German federal structure and the different responsibilities of the federal and regional level. While the national level is responsible for the strategic coordination of the energy transition, the regional level ("Bundesländer") has to provide the necessary frameworks for spatial planning and for the designation of relevant areas. And here, the regional level often encounters conflicts, as negative trade-offs are considered at regional/local level while the benefits of the wind projects often go beyond the regional level and profit stakeholders outside the region.

In order to solve the land problem, the federal government recently launched a new so-called "Wind-an-Land-Gesetz" (WaLG), the core of which is a Wind Energy Land Requirements Act

(WindBG) (BGBl. I p. 1353). The goal of the law is to provide a total of 2% of Germany's land area for onshore wind energy by the end of 2032, with an interim goal of 1.4% by the end of 2027 (Bundesregierung, 2022). To this end, the federal states are given specific requirements as to what proportion of their land area they must designate for onshore wind energy by the end of 2027 and the end of 2032 (Annex 1 WindBG).

Sources:
Information by the German Ministry for Economic Affair and Climate Action:
https://www.bmwk.de/Redaktion/DE/Dossier/ErneuerbareEnergien/wind-an-land.html
Article by "Wirtschaftsdienst" with background on the new national regulation with assessment
Further information on the "Wind caretakers"
https://www.lenk.bayern.de/themen/energiewende/doc/Infos_Windkuemmerer_20.pdf
Interview with Stefan Drexlmeier, Energiewende Oberland (10.10.2023) (drexlmeier@energiewende-oberland.de)

Insights into governance challenges: Renewable energies in Alpine protected areas Thoughts from the ALPARC network – ALPARC Team (Michelle Geringer, Project Manager)

Plans at EU level to accelerate the energy transition by defining the development of RES as an "overriding public interest" have led to numerous energy-related amendments, particularly in Germany, Austria, and Switzerland. In the Alps, such developments have created uncertainties regarding possible land-use conflicts between the expansion of infrastructure for renewable energy production and nature conservation – in particular in protected areas.

The network of protected areas ALPARC has launched a survey to obtain information on the status quo and the potential of renewable energy sources in protected areas as well as the conflicts that came up during the realisation of projects. The survey also provided insights into how to improve governance and planning mechanisms in protected areas. Most of the Protected Areas (PAs) that were surveyed are nature parks and national parks.

- Planning instruments: With respect to energy governance in protected areas, the survey revealed that spatial planning instruments have proven to be key in protecting PAs from the new development of energy infrastructure. At the same time, the results of this study also showed that the lack of spatial planning options can lead to an uncontrolled expansion of RES. This can be seen in the fact that most hydroelectric power plants located in PAs today were mostly built before the park's establishment.
- Zoning of PAs is an important feature: Only national parks and biosphere reserves have specific zones that allow a graduation of protection objectives. Nature parks, on the other hand, do not have any zoning models. RE installations are generally not permitted in core and buffer zones, and only under strict regulations in the development zones of biosphere parks. PA managers in Austria see problems with the expansion of wind power in mountainous areas, as there has been very high pressure for the construction of wind farms in the vicinity of some PAs. The introduction of new zoning instruments (e.g. minimal distance between PAs and wind parks) would help to avoid conflicts. Further measures may include the governance of PAs with transboundary areas and the need for strict environmental impact assessments (EIAs), etc.
- Participatory approaches: Furthermore, the results of the survey suggested that participatory approaches around the RE development in protected areas need to be organised in a new way. The nature parks/PAs as key stakeholders should be involved in the project at the earliest stage possible or should even initiate the first information event. This would ensure a discussion of crucial questions that come up with RE development in natural parks such as: 1) How do we want to develop the area (tourism, energy production, etc.) and how is this compatible with the strategic orientation of the different protected areas? 2) How do we address the inherent conflict between RE development and landscape protection, and 3) What can the protected areas contribute themselves to improve energy efficiency and what measures are necessary to reach this?

The survey also highlights specific "points of conflict" and ongoing discussions which need to be addressed in governance:

- Self-supply vs. larger projects with feed-in potential: Almost all surveyed PAs are producing electricity from RE sources in the park perimeter and are generally in favour of the transition to REs. However, it is important to differentiate as most renewable electricity comes from small installations (PV systems or mini hydropower plants) for self-supply. The construction of energy infrastructure that goes beyond self-supply is seen as critical in the survey and should be excluded in national parks. The difficulty and complexity can be seen in recent initiatives, for example in Switzerland. Accelerated by a recent decision of the Swiss government, photovoltaic systems on open spaces are subsidised by up to 60% by the state. As only those systems that feed some of their electricity into the grid by the end of 2025 will benefit from

these subsidies, there is a great rush to finalise projects and there is only limited time for participation. In the canton of Valais, for example, the expansion of Grengiolssolar was approved in December 2023. If the project goes ahead, the Binntal Landscape Park could lose two park communities and thus also its park status.

- **Finding a balance between the different objectives:** The interests of PAs including biodiversity conservation and the energy transition towards renewable energy should not be played off against each other. On the contrary, sustainable solutions can be found through good governance, the early involvement of all key stakeholders in the planning process, and focusing not only on economic benefits. In this sense, the first priority has to be the protection of PAs and biodiversity and then expanding RE in coordination with this.

From our point of view, good governance is needed for a fast transition towards renewable energy without compromising on other important objectives such as the conservation of biodiversity and the protection of protected areas. We also see the need to consider the whole Avoid-Shift-Improve approach: prioritising energy savings and energy efficiency is essential before implementing new infrastructures, especially in protected areas.

Source: ALPARC (2023): Renewable Energies in Alpine Protected Areas - Technical Report, https://www.alparc.org/alpine-resources/renewable-energies-in-alpine-protected-areas

Main insights: common success factors and features with Alpine transfer potential

The case studies and analysis of ongoing "governance challenges" provide some insights into common success factors with potential for transferability throughout the Alpine region. Also, some first insights can be gained into how the Alpine Convention can support this transfer:

- Mainstreaming the energy transition into spatial planning processes requires the consideration of many new stakeholders. Indeed, spatial planning becomes integrated planning (as in the TEPOS case study), involving private actors and civil society.
  → This also needs to be reflected in the activities of the AC.
- Moving from spatial to integrated planning processes (i.e. planning processes that deliberately consider the interfaces between sectors) increases complexity for all stakeholders. The analysis both from TEPOS as well as the German experience with the 2% wind target show that "regional caretakers" could be helpful in facilitating the process (here we have a direct link to the pathway with the energy coordinators).
- Participation is key to developing territorial win-win approaches: the insights from both Bavaria and the ALPARC survey highlight the need for participatory approaches and the consideration of local know-how. It seems important to develop a joint local or regional vision on how further renewable energy development can be integrated into nature and landscape and how spatial planning instruments can build on such a vision (e.g. including "Renewable Acceleration Areas" or "No Go" areas/topics and some frameworks for developing specific projects). This also prevents each project facing acceptance difficulties at a later stage due to the "NIMBY" (not in my backyard) phenomenon.
- The case studies and governance insights also highlight that a consistent set of data and a common knowledge base (as shown in the SEP project) are important for further integrating energy and spatial planning. This needs to include different spatial dimensions as well as the interfaces between the different sectors.
- As a further critical aspect, the case studies provide some insights into multi-level governance in the frame of spatial planning for renewable energies: in some countries, development targets are defined at national level, but the regions are responsible for implementation – without considering the different characteristics and needs of the regions. In this

respect, the specific frameworks of the Alpine regions could be better highlighted to take away some pressure from the Alpine regions and to identify projects which are acceptable.

Further inspiration and food for thought:
If you are interested in learning more about successful energy governance at the interface between energy and tourism, these initiatives and projects can offer additional information and impulses:

- The IMEAS project (Integrated and Multi-level Energy models for the Alpine Space) under the Alpine Space Programme developed a dedicated web platform, building a community of people and institutions that share tools and experience to support successful low-carbon energy transition strategies.
- The RegEnergy project - Renewable Energy Regions under the Interreg North-West Europe Programme takes a similar approach as TEPOS and provides a detailed guide for developing Renewable Energy Partnerships.

If you are looking for some scientific background:
The following papers provide a good overview of the interface between energy and spatial planning

- De Pascali, P. and A. Bagaini (2018): Energy Transition and Urban Planning for Local Development. A Critical Review of the Evolution of Integrated Spatial and Energy Planning
- Roggema R. (2020): Planning for the Energy Transition and How to Overcome the Misfits of the Current Paradigm.
- Rehbogen A. and H. Strasser (2021): Energie und Klimaschutz in hoheitlichen Planungsprozessen berücksichtigen

6 Energy nexus 4: Energy and water

The Alpine water system takes on an important cross-sectoral, cross-boundary, and cross-cutting function in mitigation as well as adaptation strategies. Water systems are extremely interlinked, and many Alpine river systems are transboundary. This leads to specific challenges for an integrated water and flood management, which are multiplied due to the close interlinkage of Alpine waters with the energy system – indeed hydropower is by far the main source of renewable energy in the Alps. In 2020, there were more than 5.000 hydropower stations in the Alpine area – producing about 85.000 GWh of electricity. In Austria (70%) and Switzerland (60%), the major share of electricity stems from hydropower (CIPRA International 2021, p. 6). Switzerland has already exhausted 95% of its hydropower potential and only has around five per cent of unused water bodies left.[5]

The balance between the positive aspects of clean hydropower and its negative impacts on water quality, nature and landscape is a difficult one and became very obvious during the development of this chapter. The stakeholders involved in the Alpine Climate Board and other Thematic Working Bodies of the Alpine Convention, but also the interview partners and experts involved in developing the chapter, had very different viewpoints on the economic, ecological, and social potential and related impacts of hydropower and good solutions to deal with them. It proved extremely difficult to find acceptable case studies and conclusions for this energy nexus on energy and water and there seems to be a great need for further consolidation.

A framework for the discussion is provided by the relevant guidelines and statements as developed by the Alpine Convention and its working bodies and should also guide the discussion on energy governance related to hydropower:

- The "Water Management in the Alps" Platform of the Alpine Convention (2009-2019) had a strong focus on the topic of hydropower. It developed a "Situation report on the hydropower generation in the Alps" with a focus on small hydropower (2011) and, on this basis, specific guidelines for the use of small hydropower plants in the Alpine region, the application of which was evaluated in 2019.
- The Water Management Platform also organised bi-annual international conferences on "Water in the Alps", some of which focused on hydropower and the conflicts around water management in the Alps (2016, 2018, 2020).
- The Water Declaration as adopted by the XVI Alpine Conference in 2020 reconfirms the agreement to develop hydropower in line with different upstream and downstream interests along the waterbodies, with the protection of remaining naturally preserved river courses and river stretches of the Alps and, of course, fully in line with implementing the objectives of the EU Water Framework Directive. Regarding small hydropower plants, the Water Declaration reconfirms the main recommendations of the "Guidelines on small hydropower". It also calls for an intensification of cross-border cooperation in water management, which will be crucial for finding a compromise between the different water utilisation interests upstream and downstream with differencing interests throughout the year. This approach is also highlighted in the Alpine Climate Action Plan 2.0.

With the growing need to accelerate the energy transition, the further development of hydropower capacity in the Alps is also being investigated and explored by different stakeholders. Given the already high relevance and capacities of hydropower generation, the remaining potential is estimated to be rather limited, and new projects or extensions of existing infrastructures need to be carefully developed. Indeed, the EUSALP Energy Survey (Eurac 2017, p.40) summarises that in most of the Alpine territories, there is a low expectation of additional production from hydropower (52%). Only 6% of the Alpine territories see a large remaining potential in hydropower generation. But pressures to develop additional hydropower capacities are high, especially as hydropower not

[5] https://aquaviva.ch/de/news/was-hat-die-globale-biodiversitaetskrise-mit-der-trift-zu-tun

only has a specific relevance in the Alps themselves but also contributes to the functioning of the European energy system. Pumped hydro storage in particular has the potential to bring more flexibility to a renewables-based European electricity grid. This is highlighted by the updated list of Projects of Common Interest (PCIs) in the field of trans-European energy infrastructure which was published by the European Commission in 2021.[6] This list includes, for example, the capacity increase of hydro-pumped electricity storage in Kaunertal (AT; as part of the priority corridor North-South electricity interconnections – which is a highly controversial project at local and regional level). As is already the case, however, this function can also be achieved by a variety of other energy storage and load management methods. It thus seems important to analyse the needs and capacities of hydropower for the European energy system in a broader context and to ensure that this European dimension is considered in discussions at Alpine level. A good balance needs to be found between the benefits of hydropower, potential alternative flexibility options, and the negative impacts on Alpine nature, biodiversity and landscape.

The development of this chapter and discussions with the members of the Alpine Climate Board reflected the large challenges around the topic of hydropower and of bringing together the stakeholders and interests of both the energy system and the environment. It proved difficult to find acceptable case studies to be highlighted in this report as many infrastructure projects cannot be seen as successful in terms of energy governance in the Alps. It was eventually decided to highlight the hydropower plant in Stanzertal as good practice in terms of municipal participation and local embeddedness. The case study of the Swiss Roundtable on Hydropower shows what a participatory approach could look like in the development of new large-scale infrastructure, but also analyses some of the shortcomings and lessons learned. This case specifically demonstrates the challenges of finding common solutions that support both the energy transition and nature protection/the preservation of biodiversity. In addition, the case study from Annecy demonstrates that water has many more roles in the Alpine energy system beyond hydropower and shows how Alpine waters can be integrated into local heating and cooling systems.

The contents of this chapter thus need to be interpreted in a slightly different way than the other chapters. They are not sufficient to come to final conclusions or even recommendations on the topic but rather provide insights into governance challenges and topics that need to be discussed in more detail at the level of the Alpine Convention.

Case study: A collaborative approach to hydropower planning and development. The Municipal Power Plant Stanzertal in Tyrol (Gemeindekraftwerk Stanzertal)

Hydropower is the backbone of reliable electricity generation in Tyrol. Around 6.500 GWh of energy is currently generated from hydropower every year. This corresponds to around 26% of the current final energy demand in Tyrol[7]. The "Energy Autonomous Tyrol 2050" strategy foresees the installation of additional hydropower capacity to meet the growing needs of renewable electricity. The "Stanzertal Municipal Power Plant" can be seen as a good practice example as the project was developed in a participatory approach including all municipalities of the territory and including all local information available on potential negative impacts. Thanks to an effective sharing of responsibility and tasks in the planning and construction phase, it was possible to develop the power plant in a very short timeframe – only five years between the initial discussions and the start of the operation of the power plant.

Energy key facts:
- Electrical production: 52 GWh/year
- Green electricity for 15.000 households
- Flexibility option with storage tunnel

[6] European Commission (2021): COMMISSION DELEGATED REGULATION (EU) 2022/564 of 19 November 2021 amending Regulation (EU) No 347/2013 of the European Parliament and of the Council as regards the Union list of projects of common interest.

[7] Strategie "TIROL 2050 energieautonom": https://www.tirol2050.at/unser-ziel/erneuerbare-energien/wasser/

Today, the Stanzertal hydropower plant, as a diversion power plant on the Rosanna River in West Tyrol, provides a standard annual capacity of 52 GWh and supplies green and regional electricity to 15.000 households in Tyrol. The financial participation model guarantees that the added value of the power plant remains in the region. From a technical point of view, the power plant can also be seen as good practice as it provides a feature to meet the rising flexibility needs of a renewable energy system: a storage tunnel with a volume of around 48.000 m³ allows it to shift the production of almost 8 GWh from times of low demand to times of high demand.

Main insights/lessons learned for improving governance structures and mechanisms

- Collaborative governance: The project can be seen as a success factor in terms of participation and involvement. All local municipalities were included from the initial planning steps and different options were openly discussed in the beginning. The municipalities also profit from the financial participation, thus offering the potential to achieve a real win-win for the different stakeholders.
- Cross-sectoral governance: Compensation measures were developed with the support of environmental planners and consultants. The measures are designed in a way to minimise the impact on agricultural land – thus avoiding conflicts with this sector.
- Managing the governance process: The aim of joint project development is to utilise the strengths of each partner. The municipalities are best placed to assess which projects are possible and sensible in the region. The project developer brings their expertise in the technical, economical, and ecological design of the project. The financial strength and expertise for operational management and electricity marketing is provided by the energy suppliers.
- Governance mechanisms: The success of the project crucially depends on the "knowledge" mechanism as all local know-how and expertise is bundled in the joint project development team.

Pictures: Power plant (left) and fish ladder (right)

Activities with a link to the water pathways in the CAP 2.0: Even if the case study has no transboundary character, insights from the planning process of the municipal power plant Stanzertal can be seen as a case study for the pathway "IP_W1: Implementation of an Alpine-wide approach for mainstreaming climate change into transboundary water management" as it provides insights into successful collaborative governance approaches related to water management

Sources: Wasserkraftwerk Stanzertal (2015): Festschrift zur Inbetriebnahme – Wasserkraft aus dem Stanzertal für das Stanzertal; http://www.wasserkraft-stanzertal.at/index.php/downloads.html

Case study: Roundtable Hydropower – The Swiss approach to a coordinated hydropower planning

Energy key facts:
- 16 priority projects for hydropower production in Switzerland were shortlisted (result of the Roundtable Hydropower and the subsequent parliamentary resolutions)
- Total capacity: 2 TWh/a

To support the Energy Strategy 2050, the net zero climate target, and the security of supply, the former Swiss Federal Councillor Simonetta Sommaruga initiated a Roundtable on hydropower in summer 2020. This Roundtable was composed of decision-makers from environmental associations (WWF Switzerland, Pro Natura Switzerland, the Swiss Fishing Association SFV, and the Foundation for Landscape Protection), the Cantonal Conferences (BPUK, RKGK, and EnDK), and industry (Swisspower, Swiss Small Hydro, Axpo, VSE, and SWV). All parties involved were prepared to discuss the topic and set up a working group to develop the basic principles. Initially, the mandate for the working group was formulated in a manner that all stakeholders could see the added value in participating, i.e. it included both objectives related to biodiversity and landscape protection and the restoration of existing infrastructures but also openness to identify potential new sites for hydropower development. In the second stage of the process, the mandate for the working group was specified and the expansion target for seasonal storage production of 2 TWh/a, including compensation measures, was defined.

Keeping to a tough deadline in the second stage of the process (August – October 2021), the working group developed a transparent evaluation methodology, collected all available data and evaluated a total of 33 potential hydropower projects. Evaluation indicators were related to nature and biodiversity protection as well as to the energy system. For the final joint statement published in December 2021, a shortlist of priority projects was developed. With their signatures, the participants of the Roundtable committed themselves to support the further process: for the short-listed projects, in-depth energy, economic and ecological clarifications are to be carried out and negotiations are to be initiated between the environmental associations, the operators, and the Cantons. For these in-depth clarifications, the joint statement includes framework conditions regarding ecological criteria and relevant “No Gos”.

Politically, the Roundtable was successful as it resulted in a joint statement and a common basis for further project development. The opportunity to fully participate in the further process of hydropower development and the establishment of a binding set of framework conditions for ecological compensation measures was also welcomed by the environmental associations. Only towards the very end of the process was the group of environmental associations unable to speak with one voice.

Two short interviews with Kurt Fluri (President of the Swiss Foundation for Landscape Protection, as a participant of the Roundtable) and Julia Brändle (WWF Switzerland, as a participant of the working group) highlight major success factors but also difficulties of the governance approach. The lessons learned from the Swiss Roundtable provide some insights for similar processes in other Alpine regions and countries.

ACB: The Roundtable started as a promising approach supported by all environmental organisations. What was your initial motivation to join?

Kurt Fluri: We initially warmly welcomed the approach of the Roundtable. Instead of providing a proposal on new hydropower projects and relevant compensation measures in a top-down manner, the Roundtable had the objective of finding a common solution on the basis of a participatory approach.

Julia Brändle: We welcomed that the initial invitation aimed at a dialogue to improve both energy supply security and biodiversity aspects. We saw it as an opportunity to lead the highly politicised debate on hydropower expansion in a more fact-based way. In a setting where most water bodies suffer heavily from over-exploitation, we wanted to ensure that further hydropower development focuses on low-impact locations and that ecological criteria for hydropower development and for restoration of existing infrastructures are included in political recommendations. Beyond short-listing power plants, our aim was to develop a common understanding of framework conditions and approaches under which the further expansion of hydropower could be acceptable – for people and nature. Also, contributing learnings from prior stakeholder processes and finding support for measures reducing the cumulative negative effects of hydropower on Swiss water bodies was an important motivation.

"The Roundtable provided the opportunity to work with all relevant stakeholders towards a common framework regarding further hydropower development. We were able to develop (1) an accepted methodology for a joint assessment of projects including "No Go" criteria, (2) some shared recommendations on biodiversity and landscape protection including restoration of existing hydropower plants, and (3) an approach for additional measures to reduce cumulative impacts of hydropower use. For us, this package is what counts – much more than the shortlist of projects which found high media interest."

Julia Brändle, WWF Switzerland

ACB: From your point of view, what were the major success factors of the Roundtable approach?

Kurt Fluri: The Roundtable was supported by a "neutral" mediator with significant expertise in high-level negotiations. This was a success factor in this difficult setting and given the tough timeline.

Julia Brändle: A focus on common "societal" goals on which most participants could agree in principle, and a clear mandate that included both biodiversity and energy aspects. The experienced, independent mediator was essential in helping reach agreement on a set of rules for collaboration and communication and a methodological approach. Also, the solution to have two layers with a more political Roundtable and a working group composed of technical experts was a smart approach. The high level of combined subject and methodological expertise, and available experience with similar planning approaches at cantonal level, helped us to develop "neutral" evaluation approaches within a relatively short time frame – for the discussed projects as well as for measures for biodiversity and landscape protection. These can also be used for future discussions.

ACB: What were the more critical aspects related to the final joint statement and the different attitudes towards it?

Kurt Fluri: Even if we fully supported the approach of the Roundtable, as the Swiss Foundation for Landscape Protection we ultimately decided not to sign the joint statement, as one very critical project was included as a main cornerstone of the shortlist. The project "Gorner" (in Valais, above Zermatt) is the largest project included in the shortlist but has the greatest negative impact on nature and landscape. The rest of the shortlisted projects are supported by us, so a compromise on this project would have led to a different situation.

Julia Brändle: The signatory NGOs were also very critical about including the Gorner project due to its potential impact. Therefore, the declaration included a cautionary statement that more in-depth assessments and a consideration of lower impact alternatives are needed before any decisions are made. Some more time in the final fine-tuning and decision phase would have been helpful to work towards a statement shared by all participants. The pre-defined quantitative hydropower target also remained disputed. Finally, the declaration only painted part of the picture:

what did not make it onto the shortlist, and why it was only published at a later time, leaving unnecessary room for interpretation. Overall, however, we think the package paints a way forward for a more balanced hydropower development that minimises impacts and accelerates restoring already affected ecosystems.

ACB: What framework conditions need to be considered when assessing the governance approach of the Roundtable?

Kurt Fluri: This decision needs to be seen in a generally critical situation where the development of renewable energy projects is being accelerated in Switzerland (with the Mantelerlass Energie) and environmental NGOs see a risk that their rights to appeal are weakened.

Julia Brändle: The Roundtable took place amidst high political pressure to expand hydropower – despite significant existing damage to Swiss water bodies and a very low remaining unexploited potential. Originally, it aimed at identifying projects that could benefit from a new financial support system. Also, there is no planning power at federal level for either energy or biodiversity conservation. A stakeholder agreement in such a setting can provide valuable guidance for subsidy design, regional planning, and permitting procedures. However, the Roundtable focused narrowly on supply security targets. How Switzerland can maintain a minimum "net of life" for biodiversity was not covered, despite the pressing biodiversity crisis. From our point of view as environmental organisations we thus see a need for a process with the same political weight and urgency to delineate priority areas or projects for nature protection and restoration.

"The approach of the Roundtable was a promising attempt: instead of developing a proposal for additional hydropower in a top-down manner, the participatory approach was aimed at finding a compromise and at identifying projects with the least environmental impact. But the pre-defined quantified target for additional hydropower capacity can now be seen as "disruptive factor" in this approach as it put a high pressure on finding large-scale projects."

Kurt Fluri, President of the Swiss Foundation for Landscape Protection

ACB: From your perspective, what are the lessons learned from the Roundtable regarding collaborative governance? What elements could be interesting to transfer to other Alpine regions and countries?

Kurt Fluri: From our point of view some framework conditions for the Roundtable could be improved: 1) The timeline for the process was too dense and there was a lot of pressure to come to a result. Some more time could have helped to answer the open questions and to come to a joint solution fitting for all participants. 2) The pre-defined target was a barrier to a good compromise. It would have been easier to develop a target within the cooperation, after reviewing all the details, 3) The shortlist of projects could have been better prioritised according to legal and environmental feasibility.

Julia Brändle: The Roundtable shows that a participative approach can be promising to reach balanced solutions on contentious issues, such as large infrastructure or energy planning. For it to work, a willingness and commitment to include and listen to relevant perspectives, and finding shared objectives around which collaboration can happen is essential. A clear timeline and mandate may help if it covers all relevant viewpoints. Developing a shared and balanced "system view" helps to reach accepted solutions and requires respective expertise and data. Developing shared frameworks, criteria, and approaches may provide benefits beyond the immediate outputs. In this

regard, I consider building understanding and trust and learning from each other to be an underestimated benefit of such processes. They might prove equally valuable further down the line as a joint declaration itself. If I would do it again, I would place a stronger focus on how results could or should (not) inform policy-making, and work towards strengthening respective commitments of participants.

Sources:

https://energeiaplus.com/2023/03/30/der-begleitgruppen-prozess-zum-runden-tisch-wasserkraft/?translateto=en

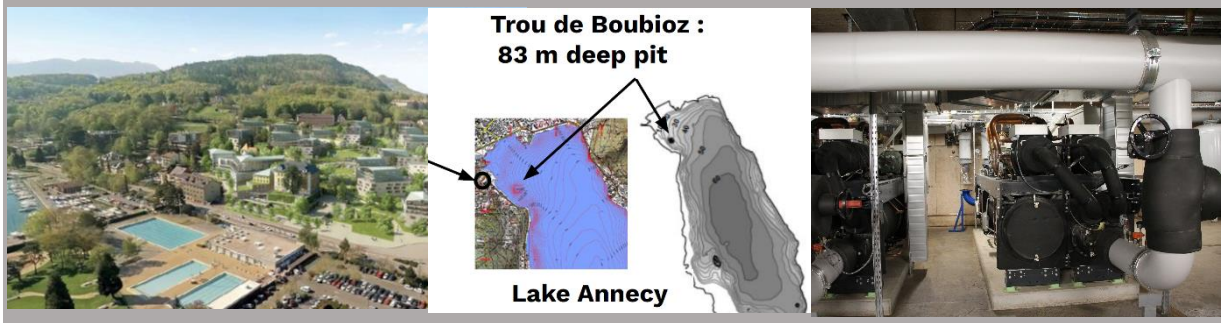
Joint statement of the Roundtable: https://www.newsd.admin.ch/newsd/message/attachments/69601.pdf

Interviews with Kurt Fluri (Swiss Foundation for Landscape Protection, 6.12.2023) and Julia Brändle (WWF Switzerland, 14.12.2023).

Latest developments in September 2024:
- In addition to the 16 prioritised projects resulting from the Roundtable on Hydropower and the subsequent parliamentary resolutions, the Canton of Valais has proposed a further nine hydropower plants.
- From the point of view of environmental organisations, this is not compatible with the joint declaration of the Roundtable. They argue that the aim of the agreements is to concentrate on the prioritized projects instead of including additional projects.
- The Roundtable declaration envisages that more thorough energy and environmental analyses will now be carried out for the priority projects. If an evaluation of this work shows that certain projects cannot be realised, contrary to previous assumptions, the Roundtable will be reconvened to examine the question of the need for additional hydropower projects and, if necessary, decide on further projects.

Case study: Using lake water in the frame of regional heat planning – An innovative approach from Annecy

In Annecy, a smart approach for innovative heating and cooling solutions was developed for the Trésums district located right on the lake front. A large development area for housing, hotels, and a senior residence led to a large additional source of heating (and partly cooling) demand. At the same time a "deep pit" with very cold lake water was available in the close vicinity. This opportunity was used by the regional energy provide Idex Group to develop an efficient and fossil-free heating and cooling solution.



Left: the site in Annecy, middle: deep pit "Trou de Boubioz, right: heat pump in underground power plant

The installation went into operation in 2023 as a flexible installation based on a water loop supplied by the lake. It covers 95% of the heating and domestic hot water needs of the Trésums district (with 600 housing units and the Pélican Hotel). The technical set-up is based on three heat pumps with a total capacity of 3 MW as well as a heat exchanger that provides "freecooling" (i.e. geocooling without the need of using operational energy). In the first year of operation, the local heat network was fully sufficient to cover the energy needs of the residents and additional gas boilers that were installed as a back-up were not needed. The network will also be used for the operation of the new municipal nautical centre with a swimming pool which is still under construction – an extension to further users is foreseen. Thanks to the flexible set-up of the power plants, the network can adjust its operation to actual energy demand and allows for a cost-efficient operation.

This first lake heating and cooling network in France can thus provide a fully decarbonised heating and cooling solution. Compared to a heating solution based on natural gas, it prevents the release of 2,600 tons of CO_2 per year.

Energy key facts:
- Provision of fossil-free heating and cooling for 507 housing units, a senior residence and hotel, 13 GWh of heating demand
- Freecooling solution that is transferable to other Alpine lake sites

Main insights/lessons learned for improving governance structures and mechanisms

- Cross-sectoral governance: From the beginning, the project was developed in a joint project between the Idex Group as the energy provider and Crédit Agricole Immobilier as the investor in the residential area. Crédit Agricole was interested in using a fossil-free energy solution for its new development project which is situated at a highly visible location and can thus serve as "lighthouse" project – also for Crédit Agricole. Moreover, the city of Annecy was closely involved in the project as the heating network can support the city's local Climate and Energy Plan – thus a win-win on several levels.
- Collaborative governance: As the project is situated right on the lakefront, several acceptance issues were raised. Regarding the technical solutions, it was important to find an option without an "industrial" character as this would have led to negative impacts on tourism and recreation. For example, a biomass plant would not be possible directly by the lakeside. Also, environmental groups and stakeholders from local fisheries raised several concerns, but compromise solutions were found for all relevant points (e.g. to avoid negative impacts on lake vegetation).
- Transfer and model character: The project can be seen as a model project for many other sites and is currently visited by interested stakeholders from other French regions as well as other Alpine countries.

"The lake water heating network was a great solution considering the specific local situation: it offers an innovative approach to meet additional energy demand from new housing and the swimming pool with a local, geothermal source. The specific characteristics of the Annecy lake with the deep pit close to the city of-

Sources:

For an overview: https://www.idex.fr/nos-realisations/ali-energie-annecy

More information in this news broadcast (in French): https://www.idex.fr/nos-actualites/la-boucle-deau-dannecy-lhonneur-sur-bfm-business

Interview with Olivier Eck, Idex Group, Chef de projets (02.02.2024) (Mail: contact@idex.fr)

Case study: The project "Application of second life batteries for Energy storage in renewable energy plants – Bess-2L" in the Valle d'Aosta region

The project "Application of second life batteries for energy storage in renewable energy plants – Bess-2L", funded by the Investment Programme for Growth and Employment 2014/20 ERDF of the

Valle d'Aosta region, aims to test the possibility of reusing second life batteries for energy storage in a stationary environment.

C.V.A. S.p.A. (as Lead Partner), Podium Engineering s.r.l. and the Polytechnic University of Turin presented a research project called BESS in response to the 'Bando Aggregazioni R&S'', whose purpose was to encourage the implementation of industrial research and experimental development projects by industrial companies, either individually or in collaboration with each other and/or with research centres.

The project has a total cost of €1,156,645.75 and a public contribution of €829,578.49. It runs from 2022 to 2024.

Project summary:

To promote the roll-out of Non-Programmable Renewable Sources (FRNP), it is necessary to associate such generation plants with storage systems that guarantee grid stability and allow generation and demand to be aligned, improving the overall efficiency of the plant.

The project plans to connect a 1 MWh electrochemical storage system to a run of the river hydroelectric power plant owned by CVA, which can simulate the behaviour of other FNPR plants (where a small pilot would be more complex).

The system will consist of 500 kWh of new batteries and 500 kWh of second-life, automotive-derived batteries with 20% reduced residual capacity.

The project will make it possible to study how to regulate energy flows in the presence of electrochemical storage, to understand how to use second-life batteries in FNRP systems, to identify charge and discharge profiles, and to monitor the mechanical state of the entire production plant with predictive maintenance techniques.

It will also make it possible to implement the communication and management of, as well as the control system for this type of application, and thus assess the technical-economic feasibility and replicability for other plants.

Insights into the governance aspect of the project:

The pilot project presented aims to test, under appropriate conditions, an innovative, complex technological process potentially applicable at a larger scale. Currently, the governance of the project includes a publicly owned company acting a leader in the green and renewable energy production industry, a university, and the regional government of the Valle d'Aosta Autonomous Region as the issuer of the financial support for the project development and small-scale implementation.

In the future, the process tested within the project could be extended across the regional territory and beyond, with specific governance arrangements that would be defined only at a later stage.

Sources: https://www.cvaspa.it/progetto-bess-2l

Contact: Project Manager Giampaolo Canestri (innovation@cvaspa.it)

Main insights: Success factors and barriers to cross-sectoral governance in the energy-water nexus

The case studies provide some insights about the challenges around governance systems and mechanisms linked to the nexus of energy and water. Given the comprehensive risks of negative environmental impacts of hydropower on water systems and nature, the use of water as a renewable electricity source needs to be carefully developed – while taking a balanced approach that also considers the needs of a European renewable energy system. The following aspects can be highlighted from the case studies and the discussions with the members of the ACB:

- New, large-scale projects are often situated in formerly untouched landscapes where it is most critical to find a compromise. The example of the Swiss roundtable highlights that even a participatory approach has limits for such projects and that they need to be assessed in a real "open-ended" process.
- In terms of developing local acceptance and support, it seems critical to develop solutions with a "win-win" character i.e. with multiple benefits for the local territory. This requires that all relevant stakeholders are involved, starting with the planning process up to a participation in financial revenues.
- Full transparency and the disclosure of all information is crucial for successful energy governance at the interface to water: a strong basis of trust needs to be developed as a first step for any participatory process. This requires developing a common knowledge base and agreeing on a common methodology for assessing positive and negative effects of a project. In this respect, the Alpine Convention could support the development of a joint methodology, e.g. supported by an EU funding programme. Keeping in mind the expectations at European level and the commitment of the Alpine Convention to the "Renewable Alps" vision, it seems important to further discuss the governance challenges between the energy and the water system and to find a common position on acceptable infrastructures.
- For all discussions on hydropower, it seems critical to always develop frameworks, targets, and specific project proposals for environmental compensation measures in the same logic than assessing hydropower infrastructures (i.e. measures that are implemented to compensate for negative environmental impacts of a new/expanded hydropower plant that cannot be mitigated and for residual impacts of the project after implementation of mitigation measures). Here, special consideration needs to be given to the equivalence of compensation measures, especially in territories facing economic and social challenges.

Further inspiration and food for thought:
If you are interested in learning more about successful energy governance at the interface between energy and water, these initiatives and projects can offer additional information and impulses:

- An interesting project on the river Inn is the Innsieme project which brings together different stakeholders to improve biodiversity and nature conservation along the Inn, taking into account the many hydropower plants. WWF Austria, Observer to the ACB and the Alpine Convention, is part of this project.
- The CIPRA position paper "Watercourses and Hydropower in the Alpine Region" is available here and includes five demands for sustainable hydropower in the Alps.
- Some best practice examples for hydropower are also included in the best practice collection for land use and nature conservation-compatible renewable energy projects in the Alps (2016) (https://www.alpconv.org/en/home/topics/energy/)

7 Energy nexus 5: Participation and financing of the energy transition

The CAP 2.0 includes "Energy democracy" as one of its implementation pathways – comprising energy communities as well as other formats for financial participation in (local) energy projects. Indeed, citizen participation models have established themselves as effective governance tools for the roll-out of renewable energy projects at the local level. Citizen participation models are manifold and diverse. At regional level, citizen participation projects are more difficult to locate, although the regions play a key role as an intermediate governance level in energy policy implementation. The regional level has far-reaching competences and implementation duties in energy policies. At the same time, it is close to the citizens and possesses the territorial expertise and knowledge necessary for the successful realisation of energy projects in line with the socio-economic and ecological ecosystem by taking into account the local "stakes".

With our case studies in this energy nexus, we shed some light on how energy cooperatives have been successfully launched and managed at local and regional level. Specific cross-sectoral and collaborative approaches are also highlighted. An additional case study illustrates the role of energy advisory services as an entry point in developing new energy solutions – which can also be taken up with the help of innovative financing solutions.

These insights can be used for developing follow-up activities to help the ACB in implementing the "Energy democracy" pathway in particular, as well as the other pathways focusing on lifestyles/business models and the Alpine administrations as forerunners.

Case study: Energy cooperatives in South Tyrol – a pioneer for financial participation

Energy cooperatives played a significant role in the early industrialisation of remote mountain regions in northern Italy, for example in South Tyrol. They offered a form of self-help adapted to local needs: in the 1920s, farmers, craftsmen, merchants, and entrepreneurs joined together to form cooperatives in order to supply neglected areas in rural areas with autonomously produced electricity. In 1921, the first cooperative electric power plant was connected to the grid in the mountain village of Stilfs.

In the valley of Villnöss (ital.: Funes), for example, three farmers and a craftsman founded the "St. Magdalena Electricity Company" in 1921 to generate and utilise electrical energy for lighting and power for its members, thereby uplifting the economy and promoting the material well-being of its members by installing saws, mills, workshops for wood and other industries. Today, the energy cooperative Villnöss provides its 700 members in the Villnöss valley with renewable electricity and, partly, district heating from local biomass.

Due to their established role in bringing progress to formerly isolated areas, these so-called "historical" cooperatives in Italy are exempt from levies and can offer electricity at lower rates than privately run companies. Cooperatives have the possibility to combine production and distribution under one roof and work according to the "cost-price" principle. The members become owners – the profits are passed on to the end consumers through favourable prices. During the peak in energy prices at the end of 2022, this was strongly felt by members of the Villnöss cooperative, as prices for members were roughly 1/3 of average market prices (source: Energy Cooperative Villnöss).

Energy key facts:

As of 2022, there are 54 energy cooperatives in South Tyrol with over 20.000 members

Raiffeisenverband Südtirol

The biomass district heating plant. Source: Energy cooperative Villnöss

Benefits of energy cooperatives include:

- *Renewable energy adoption and energy autonomy*: Energy cooperatives in South Tyrol have been instrumental in promoting the adoption of renewable energy sources such as biomass, solar and (small-scale) hydroelectric power from local projects. Except for the winter months, or periods of exceptional drought, the energy cooperative can cover all the members' energy needs with locally produced renewable energy. Any profits are reinvested in its energy infrastructure with the goal to reduce dependency on non-locally produced energy.
- *Local economic development*: Energy cooperatives have generated economic benefits for the region by creating job opportunities in the renewable energy sector in small communities. By locally awarding construction and maintenance works, as well as purchasing all wood biomass from farmers in the valley, the economic activity and local value chain in the community is stimulated. Of every euro that consumers pay for locally produced electricity and district heating, 70 cents remain locally (European Academy of Bolzano, EURAC).
- *Community engagement*: Second homes are excluded from the cooperative's services. It actively engages with the local community, fostering a sense of ownership and responsibility for energy production. This involvement helps build trust and commitment among community members, making them more receptive to renewable energy initiatives. The reinvestment of returns in community projects, such as the connection of the higher mountain areas to the electricity and sewage grids or the expansion of the broadband network, strengthens the role in the community.

Main insights/lessons learned for improving governance structures and mechanisms

- Collaborative governance: Cooperative governance mechanisms have promoted mutual exchange and joint creation among stakeholders. The partnerships established with the municipality, telecommunication companies, the energy association SEV, and the Raiffeisen association, and with similar energy cooperatives across the Alpine area, have led to a fruitful exchange of experiences.
- Multi-level governance: Albeit financially independent, the coordination with institutions at municipal and provincial level is fundamental for the realisation of specific projects. National and regional-level funding programmes are leveraged to launch initiatives. At the same time, a localised approach is adopted, aligning efforts with the specific needs and knowledge of the community.

"As a small energy cooperative strongly rooted in the community of the Villnöss valley, we ensure that our work is in favour of local cycles. We rely on support in favour of local value chains."

Hannes Messner, Energy Cooperative Villnöss

- Cross-sectoral collaboration: Due to the tightly woven integration with the local community, the energy cooperative encourages collaboration between different economic sectors, including manufacturing and tourism.

Activities with a link to the pathways in the CAP 2.0: Insights can be used to further develop activities in the pathway IP_E2 "Energy democracy".

Sources:
Information on the Energy Cooperative Villnöss obtained by interview with Hannes Messner, director of the Energy Cooperative (6.10.2023), (Mail: info@energie-villnoess.it)

SEV - Südtiroler Energieverband: https://www.sev.bz.it/
EURAC Research – Institute for renewable energy: https://www.eurac.edu/it/institutes-centers/istituto-per-le-energie-rinnovabili

Case study: Taking a broader approach –
Citizen participation at regional level with the "Sonnenkraftwerk NÖ"

The Federal State of Lower Austria launched the citizen participation project "Sonnenkraftwerk NÖ" to take up the pioneering role in the energy transition. The project is the largest citizen participation project in Europe. Its goal is to equip all suitable publicly owned buildings with solar energy with the help of the citizen participation project, thus overcoming the obstacles posed by restrained public funding. By the end of the project implementation phase, the PV panels will cover the electricity needs of about 5.000 households. The project is based on a 'sale-and-lease back' principle. The government sells the PV modules to its citizens. The collected money is used to install the power plants, which are then leased by the government from the citizens to produce energy. For the lease, the citizen receives an interest rate. Currently, 3.000 individuals have invested in the project.

Main insights/lessons learned for improving governance structures and mechanisms

- Multi-level governance and change agents: The regional energy and environment agency (eNU) developed the project idea based on already existing citizen participation projects at the local level in the region. The idea was that the regional administration should play an active part in the energy transition to achieve the energy goals that it had set itself. After a technical inventory of the public buildings to determine the potential for PV expansion, the project concept was created. For the implementation of the project, political support was crucial. The regional government also supported the project because of the communication effects with its citizens. Financial aspects were secondary. In fact, the participatory approach is more costly than the simple construction of PV systems through bank loans.
- Governance mechanisms: The case study illustrates the balance between the mechanism "price" and other, more intrinsic, motivations – also related to local networks and communities. Citizens invest in local projects because they want to invest sustainably in their immediate environment. Nevertheless, citizen participation projects need to be oriented towards the interest rates of current conservative investment products in order to remain attractive. They define the benchmark. Changes in the European interest rate policy do not go unnoticed by medium-term citizen participation projects. This should be taken into account in the design of citizen participation projects.

Managing obstacles along the way:

Regional governments and administrations shall demonstrate commitment for the energy transition by implementing renewable energy projects hand-in-hand with citizens. We have learned that citizens' projects are influenced by external effects that are not in our hands and need to be taken into account in the process design.

Daniel Berger, eNu

Consumer protection played a major role in the implementation of the project. Several technical barriers slowed down rapid implementation. These included, e.g., fire protection and sanitation requirements that PV systems must meet when installed on public buildings such as hospitals and nursing homes. An additional problem affecting the project implementation was the general high demand for PV panels. The lack of skilled workers for the installations drove up the costs of the project as the market is oversaturated. These different external effects have led to the consequence that despite the high demand from private households, the project progress is delayed. Still, the project is seen as a big step forward in integrating citizens in the energy transition.

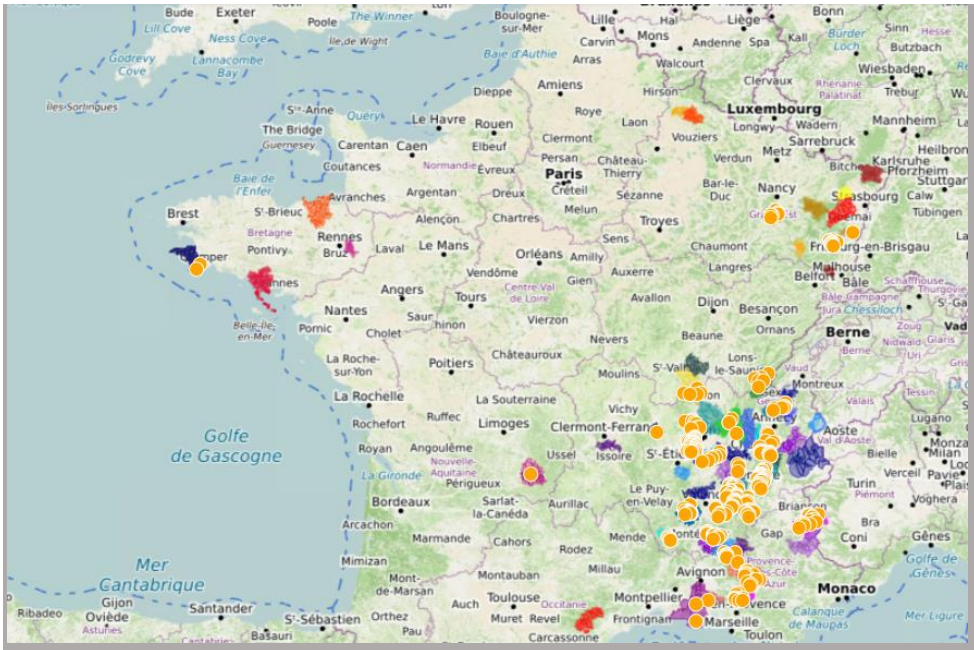
Activities with a link to the pathways in the CAP 2.0: Insights can be used to further develop activities for the pathway IP_E2 "Energy democracy".

Sources:

Interview with Daniel Berger, eNu, Coordinator PV projects, citizen participation (Mail: daniel.berger@enu.at)
Project website: https://www.sonnenkraftwerk-noe.at/

Case study: Centrales Villageoises (village power plants) Association: Replication through modelling

The "Centrales Villageoises" concept was developed in the frame of an EU-funded project coordinated from 2010 to 2014 by the regional energy and environment agency in Auvergne-Rhône-Alpes (AURA-EE) in collaboration with five regional nature parks. Within the project, eight local citizen-owned companies were formed to develop and finance PV plants. The technical and legal knowledge gained through the pilot projects was used to develop a standardised model that allowed the replication of the energy community set-up in other territories. The model of "Centrales Villageoises" quickly spread all over the AURA region and was replicated in seven other French regions. In 2023, the Centrales Villageoises Association was a network of 66 energy communities, counting 6.700 citizens, 275 municipalities and a few enterprises as their members. Together, the local energy communities installed 470 PV plants that produce about 10 MW. All Centrales Villageoises are based on the same model and baseline.



Consult the interactive map on: https://www.centralesvillageoises.fr/

The association is currently working on collective self-consumption projects in order to share the energy produced by its power plants with local consumers. It is looking into possibilities to advance the model for sector coupling by matching it with electric vehicle sharing concepts. The knowledge gathered in the PV projects will be used as a blueprint for other renewable energy project conceptualisations in the field of hydroelectric and wind power. Within an Interreg ALCOTRA FR-IT project, the transfer of the model to the Italian region of Piedmont is being tested.

Main insights/lessons learned for improving governance structures and mechanisms

- Cooperative governance: The Centrales Villageoises model is based on a cooperative governance model. Irrespective of the institutional or financial standing of the member, everyone has the same weight in decision-making processes. The model is directly linked to the local municipalities' energy plans and it is an instrument for local development to assure that the earnings from locally invested money remain in the area. In the planning phase of each plant, all local stakes such as landscape protection, economic development, and social aspects are taken into consideration thus creating acceptance, commitment, and trust in the local communities.
- Governance mechanisms: The coming-together within an association allows for the pooling of resources and the development of shared services. The association offers training and provides expertise for financial and business planning, as well as technical matters. Direct exchange between the members is facilitated to transfer knowledge between energy communities. This unites the energy communities into one association, provides it with political standing at the national level, and influences decision-making processes.

Activities with a link to the pathways in the CAP 2.0: Insights can be used to further develop activities for the pathway IP_E2 "Energy democracy".

Sources:

Interview with Etienne Jouin, Network Coordinator, Association des Centrales Villageoises, 22.09.2023 and internet website; https://www.centralesvillageoises.fr/

Case study: The Slovenian Energy Advisory Network ENSVET – A model for the broad roll-out of customised energy advice

The Energy Advisory Network for households, legal entities, and the public sector (ENSVET) is coordinated by the Slovenian Eco Fund and is part of a series of measures that were introduced as part of the National Energy Efficiency Action Plan 2014-2020. The main goal of ENSVET is to increase interest in private and public investment in renewable energy sources and the rational use of energy through a network of regional advisory offices. ENSVET provides citizens with free, expert and independent energy advice and is engaged in a wide range of awareness raising activities across the country.

Main insights/lessons learned for improving governance structures and mechanisms

- Cooperative governance: Information and services need to be customised to local needs and each specific case. Advice provided by ENSVET is tailored to each case based on the information received from the owner or tenant and is offered free of charge to all citizens. This serves as a starting point for initiating successful energy projects.
- Accessibility: To engage stakeholders to act, services need to be easily accessible – also in terms of physical distances. In Slovenia, ENSVET offices are deployed throughout the country to optimise the average distance between the customer and their closest ENSVET. There are currently 59 offices which employ 48 qualified energy advisers.
- Visibility as an entry point: ENSVET is also engaged in educational activities in the field of the rational use of energy and renewable energy sources, such as offering public lectures (local communities, schools, etc.), publishing articles, and organising awareness raising activities in national and local broadcasting media.

ENSVET delivers an average of 7.500 advisory sessions per year and aims to increase this figure to 9.000 per year by 2024. Measurable results that the ENSVET network has achieved include, among others, reduced CO_2 emissions, and end-use energy efficiency savings, as well as an increase in the number of clients that have received advice, the number of investments financed by Eco Fund subsidies and loans, and the number of older houses that have been comprehensively renovated based on ENSVET advice. ENSVET is financed from earmarked sources collected from the energy efficiency fee paid by final energy consumers.

Activities with a link to the pathways in the CAP 2.0: Insights can be used to further develop activities for the pathways IP_E1 "Regional Energy Coordinators", IP_E3: "Supporting low-carbon/low-energy Alpine lifestyles and business models", and IP_E4 "Supporting Alpine administrations as forerunners".

Sources:

Short project summary of the Interreg portal: https://projects2014-2020.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/file_1540905584.pdf

Main insights: common success factors and features with Alpine transfer potential

- The case studies on energy communities and innovative financing models in the frame of the energy transition provide some insights about common success factors with potential for transferability to the Alpine region. Also, some first insights can be gained into how the Alpine Convention can support this transfer.

- Involvement in energy communities and other financial participation models helps provide a better understanding of the balance between "rational choice" financial investments and the intrinsic benefits for people to invest in sensible local projects. The case studies highlight that the financing models of local and regional citizen participation projects must be able to adapt to changes in the international and European markets. Benchmarks for returns need to reflect the standard low-risk financial products (e.g. fixed deposits, governments bonds etc.) in order to not lose attractiveness and investors. At the same time, many people still invest in local projects with lower interest rates.
  → In order to further develop the pathway "Energy democracy" it will be interesting to get a better understanding of this balance and to explore if there are specific Alpine considerations.
- There is a need for knowledge transfer and guidance. Already elaborated guidelines based on piloting exercises could help actors as an orientational start-up aid to become active in the energy transition and to establish energy communities. A strong network of local energy advisories can support first steps and help to identify suitable projects.
- The further establishment of network structures to support the exchange of experiences and facilitate the realisation of central support structures for network members would be important. In this respect, Interreg projects already play an important role in facilitating and piloting projects in the Alpine area. The roll-out of such activities that support the local energy transition could be embedded in activities of the Alpine Convention (but also EUSALP).
- Challenges for transferability are evident in notable differences in national regulations across the Alpine region. Any further analysis of best practices and decision-making aid should take into account these differences in the respective national normative and legal framework.

  → Further support and information could be provided through activities of the ACB or Alpine Convention, focusing on specific Alpine stakeholders.

Further inspiration and food for thought:

- Some new rules have been recently introduced in Italy in support of renewable energy communities across the whole country: on January 24, 2024, the Italian Ministry of the Environment and Energy Security published a decree which promotes the creation and development of renewable energy communities and widespread self-consumption in Italy (the decree provides two types of incentives which can be combined: a non-repayable contribution of up to 40% of the eligible costs, financed by the PNRR and aimed at communities whose plants are built in municipalities under five thousand inhabitants, which will support the development of two gigawatts overall; and an incentive tariff on renewable energy produced and shared throughout the national territory).
  The provision will therefore encourage the development of a total of five gigawatts of renewable energy production plants.
  More information can be found on the GSE website: https://www.gse.it/servizi-per-te/attuazione-misure-pnrr/comunit%C3%A0-energetiche-5000abitanti

8 Synthesis: main lessons for the Alpine region and proposals for follow-up activities

Main insights from the spotlights in this paper

The illustrations in the five "energy nexus" provide some main insights into how to improve cross-sectoral energy governance in the Alps:

- Cross-sectoral and collaborative governance is a new challenge for all stakeholders: the current set-up of institutional frameworks and organisational structures often does not foresee activities across sectors. New formats for collaboration and co-creation are needed. Here, the case studies highlight some success factors, especially how key stakeholders can become "gravitational centres" to launch regional transformation processes.
- The "participation and financing" energy nexus has interfaces with all other energy nexus and needs to be seen as a crosscutting topic to accelerate the energy transition in the Alps. The inclusion of civil society organisations and the public to create a high level of commitment, acceptance, and support from the very beginning is a key success factor. Many processes start with a smart compromise/a solution that lies outside the spectrum of the initial ideas (e.g. include new technical solutions and compensation measures in hydropower projects to improve acceptance).
- Financial bottlenecks and the need for easier access to financial support/programmes have been addressed in nearly all case studies of this paper. In many cases, regulatory restrictions pose barriers to innovative financing solutions. In this respect, there is a strong need for action to better support the energy transition in the Alps. The case studies make it clear that economic considerations are still the crucial "entry point" for motivating new stakeholders; intrinsic motivation mostly comes as a secondary consideration.
- A success factor is to look at territorial win-wins that go beyond the short-term financial effects of energy and energy cost savings. For example, the transformation processes in tourism regions can also be used to develop more diverse tourism offers (climate adaptation); the sharing and provision of data (in the project SEP) can also create win-win solutions. Success factors for developing territorial win-wins could, however, be better communicated.

Follow-up proposals: Activities for the ACB and the other Thematic Working Bodies of the Alpine Convention

The case studies as well as the short syntheses in the five energy nexus give an indication as to the need for further action. For some activities, it seems to be of especially important to deal with them at the level of the Alpine Convention as they are linked to other areas with a high relevance for the Convention. The following generic activities are relevant for all five energy nexus:

- Cross-sectoral governance is new for all stakeholders and a continuous exchange on good practices, success elements, and lessons learned provides added value at all policy levels (from local to transnational) and for stakeholders from the public and private spheres as well as civil society.
- The local and regional levels play an important role for all cross-sectoral activities, especially when it comes to designing co-creative and participatory approaches. Thus, the municipal level needs to be better integrated into all activities of the Alpine Convention and the needs of local stakeholders need to be better reflected.
- The empowerment of key stakeholders is a crucial step for initiating transformation processes. The Alpine Convention could work more closely with relevant stakeholder groups in terms of empowerment and information.

The table below provides some specific proposals and illustrates how the activities can be implemented at the level of the Alpine Convention and together with other external stakeholders.

Insights from the energy governance analysis on potential follow-up activities for the ACB and Alpine Convention			
Energy nexus	**Proposal for further specific activities**	**Who could implement this activity at the level of the Alpine Convention?**	**Which stakeholders need to be involved?**
Energy and tourism	**Empowerment of tourism stakeholders: exchanging good practices and peer learning** Experiences from case studies in the energy and tourism nexus highlight the importance of key stakeholders as facilitators and moderators for collaborative governance processes. As tourism is a key economic activity for many Alpine regions, the Alpine Convention could actively support transformation processes in tourism regions in terms of empowerment and information. Here, the ACB and/or the other Thematic Working Bodies could contribute in terms of empowerment and information: - Information and exchange events for specific stakeholder groups (e.g. cable car operators as key stakeholders for the energy transition in tourism regions) - Setting up peer-learning groups with key stakeholders from tourism regions	Implementation Communities of the ACB: – Tourism – Energy	- Cable car operators - Tourism destination management - Representatives from municipalities with high tourism relevance - Stakeholders from regional associations - Regional energy coordinators/planners - Stakeholders that are already involved in AC related initiatives (Mountaineering Villages, Alpine Pearls etc.); they can be seen as forerunners
Energy and mountain agriculture	**Fostering knowledge about pilot activities in the field of agrivoltaics in the Alpine area** Developments in the agrivoltaics sector could be important for the Alpine Convention. The expansion of agrivoltaics will have direct effects on spatial planning, biodiversity, and landscape protection issues in the Alps. Studies show that agrivoltaics has effects on soil (positive and negative) and therefore needs to be further studied as a possible instrument of climate change adaptation in agriculture. Until now, there exists no common framework, guidelines or strategy for agrivoltaics at regional, national, and European level. → With its expertise, the Alpine Convention could significantly contribute to a definition of agrivoltaics (e.g. regarding the inclusion of pas-	Thematic Working Bodies: – Mountain Agriculture & Mountain Forestry Working Group With links to: – Spatial Planning and Sustainable Development Working Group – Soil Protection Working Group Implementation Communities of the ACB	- EUSALP AG6 - Farmers (best practices or learnings from failures) - Representatives from municipalities - Stakeholders from regional associations - Agricultural chambers - Scientific network: Peatland Science Center (Weihenstephan Uni)

Insights from the energy governance analysis on potential follow-up activities for the ACB and Alpine Convention			
Energy nexus	**Proposal for further specific activities**	**Who could implement this activity at the level of the Alpine Convention?**	**Which stakeholders need to be involved?**
	tures as agricultural land or not) and the development of a shared vision, to exchange on results gained from piloting projects in the Alpine area and to gather technical know-how that is necessary to assess agrivoltaics and its impacts on the different policies and regulatory frameworks relevant to the Alpine Convention. A common position could also explore transfer potentials, e.g. towards peatland PV as further Alpine-specific topic. → A first step forward could be a dedicated workshop jointly organised by the ACB and the Working Group on Mountain Agriculture & Mountain Forestry.	– Mountain Agriculture – Spatial planning – Energy – Soil – Water	
Energy and spatial planning	**From spatial planning to integrated planning: intensify the strong cooperation with the Spatial Planning and Sustainable Development Working Group and also target the nexus "Energy and spatial planning"?** *The case studies in the energy nexus highlight several topics with further need for action that could be developed in the frame of an intensified cooperation, leading to a better consideration of cross-cutting and integrated governance aspects:* • *Towards a common spatial vision on RES development: Development of a framework for spatial energy planning, including information on all relevant framework conditions related to nature and landscape protection. This could include information for potential "development scenarios", including "Go-To" areas and projects but also "No Go" aspects. For projects Lin between this bandwidth, a common spatial vision could provide insights into a potential toolbox of compensatory measures. Based on this common vision, specific guidelines (e.g. regarding the implementation of "Go-To" and "No Go" areas) could be developed as a next step.*	- Alpine Climate Board - Spatial Planning and Sustainable Development Working Group	- EUSALP AG9 - Regional spatial planners - All stakeholders that were already involved in the developing the idea of the network of regional energy coordinators - CIPRA AT

Insights from the energy governance analysis on potential follow-up activities for the ACB and Alpine Convention			
Energy nexus	**Proposal for further specific activities**	**Who could implement this activity at the level of the Alpine Convention?**	**Which stakeholders need to be involved?**
	• *Common data basis and information flow: An integrated spatial and energy planning requires a new and more integrated data base. Here, the interfaces between different data sets and mapping tools (e.g. Cervino, Spatial Energy Planning, EU Energy and Industry Geography Lab) could be explored and additional information needs could be identified.* • *NIMBY: As many renewable energy projects face barriers related to the "not in my backyard" phenomenon, trainings and information on this topic could be further developed in a cooperation between the ACB and the WG SPSD.*		
Energy and water	***A common Alpine voice on hydropower development and a further exchange on good practices for participatory planning of hydropower projects*** *The case studies highlighted in the energy nexus "Energy and water" show the conflict-prone situation with local environmental interests on the one hand and the need to decarbonise the European energy system on the other. But it also shows how intelligent participatory approaches can lead to compromises and even win-win solutions. In this paper we could only provide some first glances at the relevant success factors; a systematic in-depth analysis could provide further insights into e.g. the following questions:* • *What models of participatory approaches are most successful to come to promising results?* • *Which stakeholders need to be included in these approaches and which elements are part of successful compromises?* • *What is necessary to overcome existing situations of mistrust and conflict in such governance structures?* • *Are all environmental concerns duly reflected in the participatory processes? What environmental aspects could become part of a*	Thematic Working Bodies: - Alpine Climate Board - Alpine Biodiversity Board	- All Observer organisations of the AC - Experts that have supported participatory approaches so far

Insights from the energy governance analysis on potential follow-up activities for the ACB and Alpine Convention			
Energy nexus	**Proposal for further specific activities**	**Who could implement this activity at the level of the Alpine Convention?**	**Which stakeholders need to be involved?**
	joint methodology to assess environmental impacts and compensation measures? *Also, the chapter "Energy and water" highlights the role of Alpine hydropower in the European energy system and the role of participation in the current European framework which aims at accelerating large-scale projects.*		
Participation & innovative financing	**Focus activity on the role of energy communities in the Alps – implementing the pathway "Energy democracy"** *The case studies in the "energy communities" energy nexus highlight some success factors for developing energy communities and other innovative financing solutions. A focus activity on this topic could include the following working steps:* – *In-depth analysis and exchange on Alpine-specific success factors for energy communities: what is relevant to motivate citizens to put their money into local energy projects? Are there any differences between Alpine regions and other regions when it comes to investment decisions?* – *Best-practice exchange on 1) success factors, 2) the role of different stakeholders (e.g. how can the regional level support activities at local level) and 3) how to make citizen participation projects more resilient to external shocks (to improve credibility of local investment projects).* – *Exchange on different regulatory frameworks for energy communities in the different Alpine countries and the use of other innovative financing solutions* ➔ *Develop a common guideline on energy communities for stakeholders in the Alps*	Implementation communities of the ACB: - Energy	- EUSALP AG9 - All stakeholders that are involved in the EUSALP cross-cutting initiative "Energy"

Political need for action: Where we need support beyond the responsibilities of the Thematic Working Bodies

In general, the insights from this analysis underline the feasibility of the Avoid-Shift-Improve approach as embedded in both the Energy Protocol and the Alpine Climate Action Plan 2.0 and highlight how cross-sectoral approaches are crucial for promoting projects that focus on energy savings and energy efficiency. In many cases, the explicit consideration of interfaces between the sectors improves acceptance and helps to develop innovative solutions for the energy transition. The case studies and "governance challenges" showcase many scalable examples and experiences that can be used for developing further activities at the level of the Alpine Convention – including approaches to change lifestyles and business models as well as systemic transformations. The analysis also shows the role of cross-sectoral approaches for decarbonising the energy system and for leaving fossil fuels behind in the Alpine area as soon as possible.

Looking at the main insights and follow-up proposals, the energy paper also reconfirms the need for action as defined in the CAP 2.0 and provides some insights into the need for political actions:

1. Energy coordinators: The important role of a strong network of regional energy coordinators (implementation pathway IP_E1) becomes especially clear as many activities require some sort of caretaker/moderator/project manager. In particular, the following specific roles for regional energy coordinators have become clearer in the frame of this paper:

- Regional energy coordinators can ensure that the energy transition is more consistently embedded in spatial planning processes. For example, they can build on their local know-how and expertise in developing zoning plans and in implementing a special vision on RES development (including "Renewable Acceleration Areas" as well as "No Go" areas).
- Moreover, energy coordinators can serve as an interface to improve coordination on RES development between countries to find an overall optimal/win-win solution for the Alpine region (e.g. balancing between countries with different potential regarding hydro, PV, and wind power).

→ As this network of regional energy coordinators is still struggling with developing a business model, a solution could be jointly developed at the level of the Alpine Convention.

2. Find a common voice at European level: Many activities in the different energy nexus have a clear link to multi-level governance and especially the European framework. In this respect, it seems sensible to put more efforts into making the Alpine needs and Alpine viewpoints more visible at EU level, ensuring that relevant legislative frameworks serve the objectives of the Alpine Convention in general and the Alpine Climate Action Plan 2.0 in particular.

- Alpine claims regarding EU framework: Many activities related to cross-sectoral energy governance require a good balance between simplification and a consideration of the specific needs in Alpine regions. In this respect, it would be helpful to develop common solutions at the level of the Alpine Convention – linked to the Energy Protocol, but with a clear view to ongoing discussions at European level.
- Joint position on further developing hydropower: The further development of hydropower is closely linked to the European discussion, especially as some large-scale projects are defined as Projects of Common Interest at EU level.

→ It would be sensible to further develop an Alpine-wide position on hydropower development and to make the Alpine needs more visible at European level. This could be embedded in a broader position with Alpine claims on the European energy system.

3. Regulatory and financial incentive frameworks: Some success factors for improving cross-sectoral energy governance are linked to regulatory or financial frameworks which need to be addressed at national or even EU scale too.

- Strengthen financial incentives: The case studies again highlight the role of financial incentives and economic considerations. These include both a strong CO_2-price signal that sets incentives for energy savings and energy efficiency but also targeted support schemes and programmes, e.g. to launch a transformation process at regional level.

→ In this respect, the Alpine countries should further exchange best practices and solutions on how to improve both regulatory and market-based instruments. With a common top-runner approach, the Alpine countries can go beyond the existing European framework, e.g. by developing financial incentives that strengthen the CO_2 price ambition as currently extended at EU level with the new EU Emissions Trading System for buildings and transport.

→ The case studies show that many successful initiatives could only be developed with an initial funding from national as well as transnational level. Here, the Alpine Convention could also play a stronger role, either through facilitating the access to seed money or by developing a closer link to the Alpine Space Programme and its governance activities.

4. A crucial role for participatory approaches: The governance analysis in this paper highlights that successful energy projects need to be developed in close collaboration between public and private stakeholders and civil society. Here, the Alpine countries need to critically reflect recent developments at EU level which partially weaken the participatory approach.

- Capacity building and training: In this respect, the energy paper underlines the need for further supporting multipliers in developing relevant skills, as offered by the ACB through its training sessions on stakeholder engagement. The implementation pathways included in the Alpine Climate Action Plan 2.0 require strong support from all levels of stakeholders, and we need broad social alliances to improve visibility and accelerate action.
- Further exchange between multipliers: The case studies also highlight the critical role of trade-offs and conflicts that come along with the energy transition, especially when the development of renewable energy systems affects sensitive Alpine nature and landscapes. Participatory exchange formats, guided by a skilled mediator and/or negotiator seem to be the key to overcoming conflicts and finding acceptable solutions.

→ In this respect, the communication and capacity-building formats at level of the Alpine Convention should be further developed, with the explicit objective of strengthening the implementation community of the Alpine Climate Board and ensuring that new multipliers "beyond the existing bubble" are reached.

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