CIPRA
LIVING IN
THE ALPS

WATERCOURSES AND HYDROPOWER IN THE ALPINE REGION

Areuabach (*Areua* Brook), Val Curciusa/CH. Photo: Eduardo Soteras

CIPRA position on the exploitation of Alpine rivers for hydropower production

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INTRODUCTION

This document describes CIPRA's position on the use of hydropower in the Alps. The topic must be considered in the broader context of decarbonization and denuclearization of energy production, which CIPRA supports. The transition to the use of energy exclusively produced from renewable sources must be carried out in a very reflective manner, so that environmental compatibility is guaranteed in the long term.

In this document CIPRA lays out a series of demands concerning the use of hydropower in the Alps. CIPRA's position relies on existing analyses and conclusions and is aligned with the official statements of the organizations and networks who have investigated and added to knowledge on the impact of hydropower. We share the same principles and explore their significance for the Alps, according to the Alpine Convention and its Protocols and Declarations, other Alpine processes, and the specific trends and risks that we witness in the Alps.

This document has two purposes. First, it guides the participation of CIPRA and like-minded entities in the European, national and regional processes that will affect hydropower and shape life in the Alps. Second, it contributes to the international debate on hydropower between regulators, operators and communities, as well as to exchanges with other mountain regions of the world.

With its five detailed demands, this document is a guide to addressing hydropower projects in a manner that is mindful of ecological values and careful planning, providing guidance so that rash construction decisions can be avoided. As both the natural and the industrial-commercial conditions are similar in other regions, this document may be of relevance beyond the Alps.

Summary

The water bodies of the Alpine region are ecologically damaged and intensively used. The greatest restraint, then, is required in the further development of hydropower. The state of the majority of Alpine rivers demonstrates that hydroelectricity has often been generated in a way that ignores complex issues on a variety of levels. The situation is characterized by perverse production incentives and ineffective regulations that do not adequately protect water resources and biodiversity. A number of European infringement procedures are ongoing. Alpine watercourses are also of great importance for fishing, recreation and water sports, which must be taken into account when weighing up their preservation and use. The main focus must be to repair ecological damage. The exploitation of the last remaining intact and ecologically sensitive watercourses must be avoided as a matter of principle. New installations on natural watercourses should be limited to situations where they do not pose a risk to, or compromise, the attainment of quality conditions according to the Water Framework Directive (2000/60/EC[1]), in a manner that truly ensures the full protection of rivers and streams.

[1] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32000L0060

The following five demands, which are explored in detail from p.11 of this document, are based on a careful consideration of important sources for the sustainable regulation of hydropower use in the Alpine region (see Annex III):

1st Plan ahead and reduce energy consumption before developing hydropower.

2nd Refurbish existing hydropower plants instead of building new ones.

3rd Leave the freshwater jewels of the Alps alone – stay away from still-intact rivers and river stretches as well as from small rivers and streams.[2]

4th Employ small hydropower plants for limited and isolated local needs only.

5th Expand knowledge and cooperation transnationally.

BACKGROUND

The use of hydropower is extensive. Today we have 21,000 active hydropower plants in Europe, with 300 under construction and over 8,500 in the planning[3]. It is no wonder that powerful critical positions have arisen, like the Manifesto 'No more new Hydropower in Europe'[4] signed in October 2020 by 150 organizations.

In the Alpine region, hydropower has a long history going back well over one hundred years. In Switzerland, for example, the first small hydropower station with a capacity of 7 kW was commissioned as early as 1879 to light the dining room of the Kulm Hotel in St. Moritz. Since then, the use of hydropower in the Alps has become increasingly widespread and economically important. It is the backbone of Alpine industry, and its development has been carefully documented. Sadly, the ecological condition of the water bodies upon which hydropower relies has not, even in 2020, been documented to a comparable standard.

Last rivers at stake

In the Alpine region, hydromorphological alterations due to hydropower production and flood protection measures can be considered as key pressures on water bodies – with a resulting loss of biodiversity and degradation of ecosystems and ecological processes.

[2] Catchment area < 10 km^2
[3] Hydropower Pressure on European Rivers, The Story in Numbers; FLUVIUS, WWF, GEOTA, RiverWatch, EuroNatur; 2019
[4] https://eeb.org/library/no-more-new-hydropower-in-europe-a-manifesto/

A comprehensive Alpine-wide study[5] demonstrated that only 14% (8,522 km of a total length of almost 60,000 km)[6] of the Alps river network is made up of rivers with intact aquatic biocoenoses – expressed by their *high ecological status.* While almost 20% of the smaller rivers and streams still have a high ecological status, only 2% of the large rivers retain such status.

Large rivers (catchment size >1000 km^2) have the highest share of *hydrologically or morphologically altered*[7] river stretches: 86% of their total length is impacted. The smallest share of impacted river stretches (31%) can be found in the category of small rivers or streams (10-100 km^2). Overall, at least 41% of all river stretches of the Alpine Arc (catchment size ≥ 10 km²) can be considered as hydrologically or morphologically altered.[8]

Relation between hydropower production and number of plants

The following two tables[9] provide information on the number of facilities and the contribution to the total electricity generated by hydropower for different size categories of hydropower stations within the Alpine area[10].

[5] Muhar, S.; Seliger, C.; Schinegger, R.; Scheikl, S.; Brändle, J.; Hayes, D. S.; Schmutz, S.; Status and Protection of Rivers - A pan-Alpine overview. In: Muhar, S.; Muhar, A.; Egger, G.; Siegrist, D., Rivers of the Alps: Diversity in Nature and Culture; Haupt; Bern, 2019; Chapter 6.1

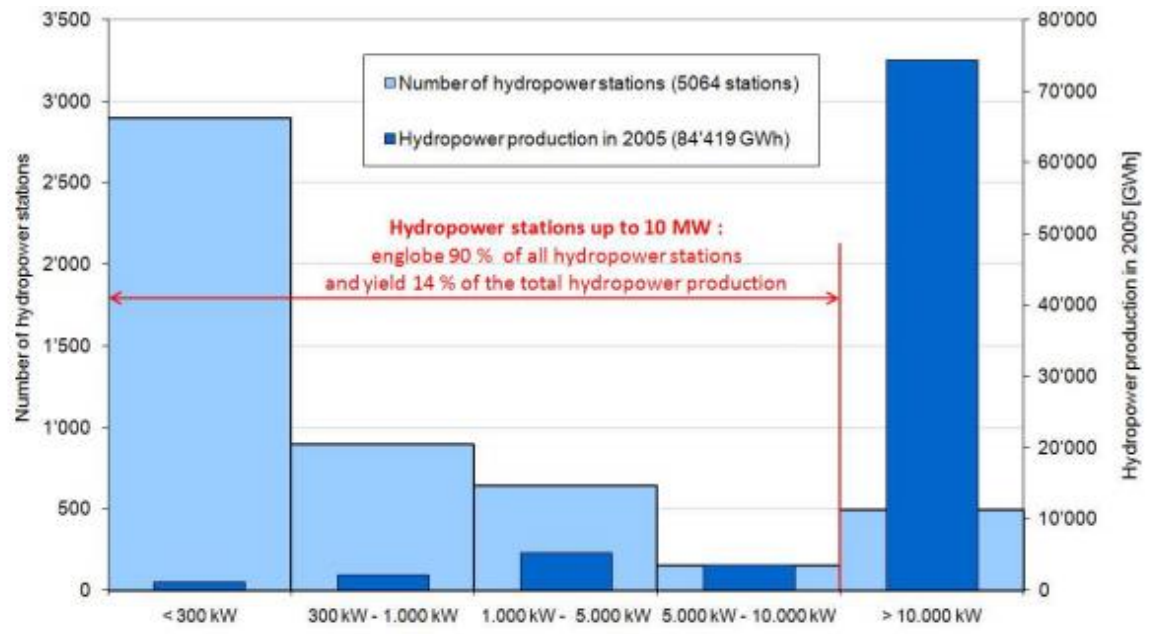
[6] Calculated within the perimeter of the Alpine Convention

[7] Muhar, S.; Seliger, C.; Schinegger, R.; Scheikl, S.; Brändle, J.; Hayes, D. S.; Schmutz, S.; Status and Protection of Rivers - A pan-Alpine overview. In: Muhar, S.; Muhar, A.; Egger, G.; Siegrist, D., Rivers of the Alps: Diversity in Nature and Culture; Haupt; Bern, 2019 Chapter 6.1

[8] Muhar, S.; Muhar, A.; Egger, G.; Siegrist, D., Rivers of the Alps: Diversity in Nature and Culture; Haupt; Bern, 2019 Chapter 6.1

[9] Alpine Convention Platform, Water management in the Alps; Situation report on hydropower generation in the Alpine region focusing on small hydropower; Innsbruck, 2011; Page 26 https://www.alpconv.org/fileadmin/user_upload/fotos/Banner/Topics/watermanagement/20111222_Situation_Report.pdf

[10] As mentioned in the original footnote 17 of these two tables: the Slovenian figures refer to the whole country



Relation between number of stations and hydropower production for the Alpine area[17] (available data)

	CATEGORY OF HYDROPOWER STATIONS (BOTTLENECK CAPACITY)				
	< 300 kW	300 - 1.000 kW	1.000 - 5.000 kW	5.000 - 10.000 kW	>10.000 kW
Production [%]	1,3%	2,5%	6,0%	4,2%	86,1%
Stations [%]	57,2%	17,6%	12,6%	2,9%	9,7%

Relation between number of hydropower stations and hydropower production for the Alpine area[17] (available data)

By far the most significant share (86.1%) of electricity is generated by large facilities (representing 10% of the total number of hydropower stations) with bottleneck capacities of more than 10 MW (see Table).

Good rules and regulations – lack of application

The **Alpine Convention**, signed by all 8 Alpine countries[11] and the European Union, came into effect in 1995 throughout the Alps. It is a binding multilateral agreement, complemented by Protocols and Declarations. The **Energy Protocol**[12], signed in 1998, is particularly relevant to hydropower and is of binding application. The Convention – as with any multilateral treaty – is the result of consensus between the signatories. As such, it is already

[11] Austria, France, Germany, Italy, Liechtenstein, Monaco, Slovenia, Switzerland
[12] Energy Protocol of the Alpine Convention (1998): https://www.alpconv.org/fileadmin/user_upload/Convention/EN/Protocol_Energy_EN.pdf

a product of compromise and possibly a step down from what would have been required in terms of river protection. It has, in fact, become clear that the Convention's provisions do not meet the ecological needs of the region, leading to a struggle for more stringent provisions and better mitigation of the negative impacts of key threats to biodiversity and ecosystems.

The **Alpine Convention instituted the Platform *Water Management in the Alps***[13] and adopted the **Action Plan on Climate Change in the Alps** in 2009 at the 10th Alpine Conference following the adoption of the **second Report on the State of the Alps, on Water and Water Management Issues**[14]. The objectives and recommendations identified in this report served as the guidelines for the work of the Water Platform. The Action Plan on Climate Change in the Alps addresses several issues related to water management, such as reinforcement of the implementation of the EU Water Framework Directive, prevention of water shortages and the development of hydropower plants which respect the ecology of watercourses. Moreover, it calls upon the Contracting Parties of the Alpine Convention to take prompt and collective action to limit the impact of climate change, particularly by developing guidelines for the construction, optimization and rehabilitation of small hydropower stations[15] while respecting aquatic environments and biodiversity.

In June 2018 the **7th Water Conference**[16] took place, which also addressed hydropower and its impact on river courses.

In April 2019 the **XV Alpine Conference approved the Alpine Climate Target System 2050**[17] that includes the following expectation with regards to what we can refer to as *climate-proofed* Alpine hydropower: "Alpine hydropower stations are managed and, if necessary, adjusted to meet the needs of a more fluctuating renewable energy system as well as the challenges of changing seasonal water availability, ecologically required residual water flow and the increasing need to balance different water uses." The implementation pathways of the Alpine Climate Target System were then adopted at the **XVI Alpine Conference in December 2020**, as part of what is also known as the **Alpine Climate Action Plan 2.0.**

[13] All documents and products of the Water Platform issued between 2009 and 2019 can be found here: https://www.alpconv.org/en/home/organisation/thematic-working-bodies/detail/water-management-in-the-alps-platform-2009-2019/

[14] Alpine Convention, 2nd Report on the State of the Alps, Water and Water Management Issues (2009): https://www.alpconv.org/en/home/news-publications/publications-multimedia/detail/rsa2-water-and-water-management-issues-summary/

[15] The common guidelines for small hydropower (2011): https://www.alpconv.org/en/home/news-publications/publications-multimedia/detail/as-focus-1-common-guidelines-for-the-use-of-small-hydropower-in-the-alpine-region/
A survey of the application of these common guidelines (2019): https://www.alpconv.org/fileadmin/user_upload/fotos/Banner/Topics/watermanagement/II_Application_of_the_Common_Guidelines_for_the_use_of_Small_Hydropower_in_the_Alpine_region.pdf

[16] Water in the Alps: Management of hydrological extremes and of sustainable hydropower use

[17] www.alpconv.org/fileadmin/user_upload/fotos/Banner/Topics/climate_change/20190404_ACB_AlpineClimateTargetSystem2050_en.pdf (See in there the Energy Targets – particularly ET5 – as well as the Natural Hazards and the Ecosystem and Biodiversity Targets addressing water related issues)

The same XVI Alpine Conference also agreed to the **Declaration on integrated and sustainable water management in the Alps**, the so-called **Water Declaration**[18]. It clearly states that the Contracting Parties to the Alpine Convention commit themselves to:

1. Protect the remaining naturally preserved river courses of the Alps, in due consideration of the part they play in the necessary conservation of a favourable quality and quantity of water in these sensitive mountain areas;
2. Foster improvement ("requalification") and restoration of the natural water course conditions based on the appropriate approaches available (including hydromorphology, hydrobiology, sediment transport, as well as hydraulic features of the river bodies), with the objective of securing functioning that is closest to the natural state, favourable to the preservation of water resources, biodiversity and associated ecosystem services, including at transboundary level;
3. Take into consideration the protection of the landscape and the ecosystems, and the relevant interests of local communities and communities downstream, as well as the necessity to protect remaining naturally preserved river courses and river stretches of the Alps in case of a further development of hydropower plants, which shall not entail any deterioration in water quality, water quantity, hydromorphology and ecosystem, nor compromise the achievement of good status of the water bodies they relate to;
4. Promote the common guidelines for the use of small hydropower in the Alpine Region:
   - considering the refurbishment of old facilities before building new ones and removing unused small hydropower stations;
   - considering small hydropower plants mainly as a localized solution to tackle local and specific energy needs rather than a means to achieve broader renewable energy targets;
   - identifying at the planning phase the sites to be considered as potentially most favourable at an environmental and technical level, in order to avoid an unplanned proliferation of new plants.

Full implementation of the **Water Framework Directive** in all European countries, and parallel water legislation in Switzerland, is necessary to ensure that critical issues relating to water are addressed. In fact, the Directive foresees the need to achieve at least the "good ecological and chemical status" of watercourses and states that "where good water status already exists, it should be maintained".

In 2018 the **European waters – Assessment of status and pressures**[19] stated that on a European scale only "around 40 % of the surface water bodies are in good or high ecological status or potential, with lakes and coastal waters having better status than rivers and transitional waters"[20]. The Alpine region too is substantially affected[21], including

[18] Declaration of the XVI Alpine Conference on integrated and sustainable water management in the Alps: https://www.alpconv.org/fileadmin/user_upload/Organization/AC/XVI/ACXVI_WaterDeclaration_en.pdf
[19] European Environment Agency, European waters – Assessment of status and pressures (2018): https://www.eea.europa.eu/publications/state-of-water
[20] Ibid; page 23
[21] ibid; Map 2.1, page 26;

Switzerland[22]. “Hydromorphological pressures affect around 40% of surface water bodies, with the highest proportion reported for rivers and transitional waters. They are subdivided into further categories of pressures: physical alterations in the channel, bed, riparian zone or shore (26%) affect the largest proportion of water bodies, followed by **structures that have an impact on longitudinal continuity (dams/barriers and locks, 24%**). Hydrological alterations affect a smaller proportion (7%)”[23].

We have reached an important phase with respect to these issues: at the European level, with the energy and climate package, policies for the promotion of renewable sources are being redefined. At the same time, the **European Biodiversity Strategy 2030** presents significant ambitions for ecosystems and biodiversity. A key component of this strategy is the restoration of 25,000 kilometres of rivers to a free-flowing state by 2030. Building additional small hydropower plants, and using EU funds to finance them, is clearly not aligned with this strategy.

The rigorous application of all existing regulations and strategies would guarantee the protection of river basins, thus ensuring that areas with a high degree of naturalness are excluded from development, while paying particular attention to the fragility of mountain river sections. Water resources would also be adequately protected by replacing the Minimum Vital Flow – which has proved ineffective in protecting river ecosystems – with the Ecological Flow.

CIPRA’s position on, and demands concerning, Alpine rivers and hydropower are based on a careful consideration of multilateral treaties, agreements, studies and experiences in the Alpine region. These are listed in Annex III. We consider these demands as forming the basis of indispensable frameworks that must be implemented.

The climate crisis increases pressure

Over the past 150 years, the *Alps* have experienced a temperature increase of 2°C: this is more than twice the average *for the entire planet*. Temperature increases of an additional 2 to 3°C are expected by 2050, and a further warming of 3 to 7°C is expected by the end of the century, depending on emission scenarios. This temperature increase is having a major impact on the hydrological cycle and on the frequency and intensity of extreme events. The rapid melting of ice and the degradation of permafrost are inducing **significant changes in the hydrological regime** of nivo-glacial and nivo-pluvial watercourses and thus in flow rates. Flow rates will increase during melting then decrease drastically once the glacial mass at high altitudes disappears. The entire hydrological cycle is being severely affected, with consequences for evaporation and precipitation that will have major impacts on runoff, soil moisture and aquifer recharge. There are strong indications that the availability of water resources in the Alps will decrease significantly in the coming years.

[22] for Switzerland: ibid; box 1.2, page 16
[23] ibid; page 35

The energy system perspective

While hydropower has been the dominant source of renewable generation in the Alpine region for decades, this position is expected to change in the future. A summary of the role of hydropower in the energy transition of Alpine countries can be found in Annex II. This energy system perspective is based on officially available figures and justifies the expansion of hydropower only to ensure a secure energy supply. Various stakeholders – including the member organizations of CIPRA – may have different views on the economic, ecological and social potential of hydropower and other renewable energy sources as well as energy efficiency. Long-term scenarios for the development of the energy system on a European and national level reveal a range of needs for the expansion of renewable energy. The future contribution of hydropower in the European electricity mix will be important, but not decisive. However, the pressure to derive additional energy production from hydropower will continue, thus bearing out the importance of the demands contained in the present position paper.

DEMANDS FOR SUSTAINABLE HYDROPOWER IN THE ALPINE REGION

1st Plan ahead and reduce energy consumption before developing hydropower

1.1 **Improve energy efficiency with binding measures including energy savings in industrial and private sectors**. Saving energy is economically more efficient, increases the profit of businesses, creates jobs and is the best and easiest way to protect the climate and the environment. Emphasis should be placed on educating energy sector stakeholders, according to the principle that energy demands can be managed (i.e. there is no obligation to fulfil all new demands).

1.2 **Develop and update overarching national energy plans**, taking into account efficiency, and – on the production side – location, considered not only on the basis of its potential and geomorphology but according to the urgent need to protect climate, biodiversity, freshwater resources and landscapes. In the case of transnational ecoregions, such as the Alps, national plans have to be developed in coordination with neighbouring countries.

1.3 **Promote and – where necessary – subsidize forms of renewable energy production other than hydropower**. Hydropower is technically advanced and already broadly used; solar (including photovoltaic and solar heating) and wind are lagging behind. Other forms of renewable energy production must be planned at national and regional levels to secure coordinated decisions. Plans have to come from participatory processes, where local communities and civil society organizations are a recognized part of decision making, and ensure the least possible impact on biodiversity, ecosystems and landscapes and ecological processes.

1.4 **Allow new pumped-storage power plants in the Alps only if they rely on existing artificial reservoirs.** Storage reservoirs entail a high consumption of land and encroach on the natural and cultural landscape of the Alps. They irreparably destroy the habitat of plants and animals (biodiversity), and fundamentally change the natural water balance.

2nd Refurbish existing hydropower plants instead of building new ones

2.1 **Prioritize and promote the improvement of existing hydropower plants** and include all measures to minimize their negative ecological impact and restore habitats and conserve biodiversity. Any plan to increase the production of existing plants has to pass a site-specific strategy of upgrading the power plant fleet, including ecological upgrading. We must look carefully to existing plants, in particular the larger ones, to ensure that hydroelectric production is maintained and improved in the coming years.

2.2 **Let Alpine communities share in the profits**[24]. Hydropower from the Alps is a precious commodity. Its high economic yield depends upon abundant precipitation and the Alpine topography with a high elevation gradient over relatively short distances. Since the municipalities in the Alpine region permit this use of their territories, they should also benefit. A description of **the Swiss solution, where a so-called water rent is paid to public authorities in mountain regions**, can be found in Annex I.

2.3 **Provide incentives to accelerate the fulfilment of legal requirements** or even go beyond them. Incentives are more cost-effective than having to compensate for the damage to people and the environment caused by the consequences of the climate crisis. Incentives may include national or regional support programmes to accelerate energy efficiency measures or the expansion of electricity production methods that are as environmentally friendly as possible (for example solar power production on existing buildings and facilities, such as parking areas). The same reasoning applies to speeding up the implementation of existing laws to protect water bodies, with the granting of increased residual flows, for example.

2.4 **Ensure that when existing plants are refurbished and upgraded they undergo the same assessment and admission procedures as new plants.** Work on existing plants may lead to further degradation. In many cases the operating methods of the plants – water diversion, sediment management practices – are incompatible with maintaining a good state of the watercourses upon which they are sited. In addition, some of the basins which host hydropower plants have now become protected areas, according to the Habitats or Birds Directives, which require special attention and precise criteria in their management. A profound revision of management practices is therefore necessary in these cases, along with structural modifications of the plants. The requirements for hydropower in relation to EU Nature legislation have to be taken in account [25].

[24] This corresponds to the demands of the Alpine Convention, see e.g. the preamble of the Energy Protocol (1998): "CONVINCED that the local population must be able to define its own social, cultural and economic development plan and take part in its implementation in the existing institutional framework; CONVINCED that certain problems can only be resolved in a cross-border framework and require joint measures on the part of the Alpine States and the local communities directly concerned; CONVINCED that meeting energy needs is an important factor in economic and social development, both within and outside the Alpine region; (…)"

[25] European Commission; Guidance document on the requirements for hydropower in relation to EU Nature legislation (2018): https://op.europa.eu/en/publication-detail/-/publication/b0279310-a5b4-11e8-99ee-01aa75ed71a1/language-en

2.5 **In the case of diversion power plants, enough water must remain in the river** to maintain or achieve the good ecological status of the watercourse (**residual water volumes**). In the case of weirs that are not bed-load permeable, reservoir management that ensures bed-load transport must be made obligatory.

2.6 **Remove redundant and dangerous hydropower plants**. Each country must be committed to a system of clear rules, environmental protection and proper management that may also include the dismantling of unnecessary, obsolete, dangerous or harmful installations, including those that impede international river continuity.

3rd Leave the freshwater jewels of the Alps alone – stay away from still intact rivers and river stretches as well as from small rivers and streams

3.1 **The provisions of the Alpine Convention must be observed**. Particular attention should be paid to Articles 10 and 11 of the Nature Conservation Protocol, concerning planned interventions in protected areas and special natural and near-natural landscape elements, biotopes, ecosystems and traditional cultural landscapes/balance of interests. In the Energy Protocol, Article 7 is of great relevance with regard to ensuring the ecological functionality of watercourses, and Article 11/para. 3 concerns a special conservation obligation for the water balance in areas of drinking water protection and nature conservation, in protection and rest zones, and in unspoiled near-natural areas and landscapes.

3.2 **When considering the building of new hydropower plants, assess this against an up-to-date map of national water body use and water body protection, including all kinds of protected areas**. All regions and districts should identify, within their spatial and sectoral planning tools, the areas that are not suitable for the construction of hydroelectric plants. This will contribute to protecting the remaining landscape and natural resources, watercourses whose degree of naturalness and function in the ecosystem are of regional or national importance. These may be protected areas, especially national and regional parks, protected areas of the Natura 2000 Network (and the Emerald Network in Switzerland), rivers and streams recognized as environmentally valuable or classified as high or good quality according to the Water Framework Directive, or for which these objectives are expected to be achieved in the future. The same assessment should be made at an eco(macro)regional scale for the entire Alpine region. In addition, new plants should not be constructed in landscapes exposed to high hydrogeological risk, including those with a high propensity of landslides and avalanches. Similarly, there must be no capturing of the waters of streams at their origin, at the point of melting of glaciers or in any case in moraine landscapes.

3.3 **Do not encroach on still-intact rivers and river stretches and keep away from small rivers.** These are of the highest importance for biodiversity, ecological processes, ecosystem services and resilience to global changes. The ecological function of each river stretch within the wider system needs to be considered and the protection needs of Alpine freshwater resources and their biota need to be balanced with the benefits of further hydropower development[26]. Once agreed, these strategies should be binding at national, regional and local level.

3.4 **Respect glacial forelands.** These are often little-noticed spaces, yet they are home to a variety of terrains and endangered pioneer species. Owing to the melting of glaciers caused by global warming they are now emerging in many places and are increasingly the

[26] As an example for Austria: C. Seliger, S. Scheikl , S. Schmutz , R. Schinegger , S. Fleck , J. Neubarth , C. Walder, S. Muhar; A strategic tool for balancing hydropower development and conservation needs (2015): https://www.researchgate.net/publication/285759948_HyCon_A_Strategic_Tool_For_Balancing_Hydropower_Development_And_Conservation_Needs/link/5664568608ae4931cd60777f/download

focus of attention for hydropower production. Like other Alpine sites that are full of dynamic development and rare species, they must be given the highest attention and the best possible protection.

3.5 **Think first about the most efficient hydropower plants with the relatively lowest environmental impact** and include all measures to mitigate their environmental impact, especially with regards to biodiversity. Most of the time this will lead to a preference for large plants with high output (> 10 MW).

3.6 **Ensure ecosystem restoration**. Include not only the maintenance of the ecological status quo but also its improvement. Follow the principles of ecosystem restoration of the UN Decade on Ecosystem Restoration 2021-2030[27] and consider:

- the immediate adjustment of releases to the established Minimum Vital Flow (MVF), with the necessary transition to Ecological Flow
- the revamp of structures and networks to limit impacts as much as possible
- the restoration of the river continuum and the insertion of backflow ladders, still practically absent in many hydropower plants
- the environmental restoration of the stretch subtended by the plant
- the application of special measures and experiments to reduce hydropeaking and thermal hydropeaking and thermopeaking
- the provision of particular releases in certain periods of the year to facilitate the reproduction of fish, or other management practices of this kind
- the provision of specific regulations for the management of reservoir levels and de-icing operations
- in the case of existing reservoirs that fall within protected areas, the provision of procedures for their management that are suitable for the protection of the ecosystems and habitats present, avoiding extension projects that would irreparably compromise species and habitats.

3.7 **Elaborate a transparent, structured and criteria-based** procedure that combines a variety of **points of view** (macro-regional, national, regional/local) and which includes enterprises and all departments of the government – bringing in the environmental impact assessment and other authorities, science and NGOs. The relevant stakeholders must be adequately involved by means of access to information and participation, and their views taken into account.

3.8 Limit the duration of **concessions and licences,** making them as short as possible without compromising the investment.

[27] https://www.decadeonrestoration.org

4th Use small hydropower for limited and isolated local needs only

New installations on watercourses should only be allowed where there is no risk of their having a deleterious effect on the ecological status within the meaning of the Water Framework Directive, so that the full protection of rivers and streams is genuinely guaranteed. In any case, it is necessary to guarantee the naturalness of watercourses as foreseen in the Energy Protocol of the Alpine Convention.

4.1 **Never include the use of any small rivers for hydropower in national energy supply plans**. **Small hydropower should not, therefore, receive subsidies** with the exception of addressing the local energy needs of remote communities with no grid connection, whose wellbeing and development would otherwise be compromised.

4.2 **Small hydropower plants of <10 MW do not fulfil high production demands and are therefore not suitable for national and regional energy plans. Energy production from small hydropower** would require such a large number of power plants that the cumulative environmental impact would be ecologically unbearable.

4.3 **Small hydropower substantially affects the local environment**[28]. Weigh up all positive and negative aspects in a comprehensive analysis[29]. Consider other renewable forms of energy production. Studies of longer-term ecological effects almost always show that the negative effects of interference in precious natural areas far outweigh the benefits of a limited increase in electricity production[30].

4.4 **Combined, infrastructure-related small hydropower plants are generally economically and ecologically favourable. Hydropower production is an added benefit of such plants, making use of water that is already used for the main purpose of the plant (drinking water pipelines, aqueducts and canalizations)**. New plants should aim to use existing artificial networks. To this end, authorization procedures must be simplified and specific incentives created. Clear and unambiguous rules are needed for hydropower production to ensure that there is no increase in the water flow beyond that required for the plant's primary purpose.

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[28] The Common guidelines for the use of small hydropower in the Alpine region (2011) aimed at providing general guidance for the identification of potentially favourable locations for small hydropower plants and for the subsequent authorization decision considering the principles of sustainable development in the Alps: https://www.alpconv.org/en/home/news-publications/publications-multimedia/detail/as-focus-1-common-guidelines-for-the-use-of-small-hydropower-in-the-alpine-region/
In 2019 the Water Platform of the Alpine Convention published a survey of the Application of these common guidelines:
https://www.alpconv.org/fileadmin/user_upload/fotos/Banner/Topics/watermanagement/II_Application_of_the_Common_Guidelines_for_the_use_of_Small_Hydropower_in_the_Alpine_region.pdf

[29] See the proceedings of a conference in 2016 focusing on small hydropower at the head of the alpine catchment areas: *La petite hydroélèctricité en montagne*. http://www.cen-haute-savoie.org/sites/ecrins-parcnational.com/files/files/reseaux/journees_techniques/Petite%20hydro%C3%A9lectricit%C3%A9/Actes_PetiteHydroelectricit%C3%A9_15-06-2017.pdf

[30] As described in this documentation focusing on the French Alps: https://www.rivieres-sauvages.fr/wp-content/uploads/sites/20/2020/11/2020_Plaquette_Rivieres_Alpines.pdf

4.5 **If the construction of a small hydropower plant is absolutely necessary, it should be part of a public sector process ensuring that the plant serves the limited needs of a specific community**. This may be the case where no other energy production is possible (e.g. solar or wind power), to meet the energy needs of remote locations where connection to the public grid would involve disproportionately high costs.

5th Expand transnational knowledge and cooperation

Nowadays, decisions regarding hydropower need to be made according to a broad transdisciplinary and geographically comprehensive perspective, going beyond the local scale and the single river section or watercourse. In the context of the Alpine region, this requires cross-border planning, especially along transnationally connected spaces and landscapes. All processes must involve civil society on an equal and fair footing.

5.1 **Undertake an assessment of the impact of hydropower on watercourses in Europe,** as part of an assessment of the Water Framework Directive. It should take place as soon as possible and could be carried out by the **Directorate-General for the Environment** of the EU Commission.

5.2 **Coordinate energy production planning in transnational processes**, taking the interests of the regions and nations both up- and downstream into account. The criteria adopted regionally to evaluate hydropower projects must comply with the Water Framework Directive or be even more stringent, with binding rules from the Ministries of Environment of individual countries. All projects should be subject to a basin analysis (including transnational analysis) to assess the choice of location, the upstream and downstream impact on water resources, and the environmental effectiveness of the solution adopted. Cumulative analysis with other projects and with plants already operating on a given body of water should be made mandatory everywhere. A holistic analysis is necessary, one that goes beyond an assessment of each project individually and beyond a consideration of the quality of the watercourse in relation solely to the stretch to be diverted. An assessment of the entire course and the sum of the impairments caused by the various installations and projects on the watercourse as a whole must be made. It must be established that no river or stream is subjected to new derivations in the form of numerous sections that follow one another, even if the water is returned to the riverbed for a short stretch.

5.3 **Initiate an independent study to assess the impact of incentive schemes and subsidies for hydropower plants.**

5.4 **Ensure easy and timely appeal procedures**. Free civil society from costly and time-consuming appeal processes.

ANNEX I

Water rent – the Swiss way for Alpine communities to share in the revenue from hydropower

Silva Semadeni, Member of the Board CIPRA Switzerland, Chur

In Switzerland, the right to use water has its price: water rents. This important revenue for mountain regions has been under severe pressure for years, although it is a revenue from one of the few resources in mountain regions. In the interest of such regions, water rents should be considered in all Alpine countries, not least for reasons of fair competition.

What are water rents and why do they exist?

Water rents are the price that power plants in Switzerland have to pay to the canton where they are located (and also, depending on cantonal regulations, to the municipality where they are located) for the use of hydropower, in order to be allowed to use the public resource of water for energy production.
The federal government has been stipulating for over 100 years how high the maximum water rents may be. Currently, water rents may not exceed CHF 110/kWbr (Kilowatt gross capacity). This regulation will apply until the end of 2024, after which a new regulation will be sought in the framework of a new electricity market model that has not yet been decided. The electricity producers (VSE – the Association of Swiss Electricity Utilities) want to radically reduce the water rent and preferably abolish it.

The water rent was introduced a good hundred years ago – and capped to ensure cheap electricity for industry and the railways. The mountain regions had to make do with a limited additional income and thus contributed to Switzerland's economic upswing. Small hydropower plants of up to 1,000 kWbr are exempt from water rents.

High economic significance for mountain areas

The majority of the large hydropower companies are not located in the mountain regions, but in the cantons and cities of the Swiss midlands, such as Zurich, Olten or Bern, where the profits from hydropower also accrue. Automation means that fewer and fewer people are needed on site in the mountains to operate the power plants, meaning that the direct economic significance (jobs) for mountain regions is declining. A fair water tariff is a means of allowing the siting regions to benefit economically from the hydropower plants.

In total, about 600 million Swiss francs in water rents are generated each year throughout Switzerland and may account for 12-22% of tax revenues in individual mountain cantons. They are therefore an important source of income for mountain regions.

Water rents are of little economic significance for the energy industry

The average cost price for a kWh of hydroelectricity in Switzerland is about 5 centimes (0.05 CHF). Of this the current water rents account for 1.1 centimes. Electricity producers tend to forget that the revenue or price for electricity from Swiss hydropower on the international electricity exchanges fluctuates between about 4 centimes/kWh and over 8 centimes/kWh in hours of high demand. Thanks to storage lakes, electricity producers can count on peak prices.

For years, the Association of Swiss Electricity Utilities (VSE) has maintained that the water rent further worsens the sometimes difficult economic situation of hydropower plants. However, the economic challenges of the water industry arise from other causes, related to the development of the national and international energy market. These developments are volatile and have changed again and again, especially recently. Their effects must not be borne by the cantons of location. Moreover, in the only partially liberalized Swiss electricity market, a large proportion of hydropower is destined for basic electricitysupply, whereby the entire production costs can be charged to the end consumer tied to the respective electricity supplier.

In the most profitable years (2000-2015), a large part of the billions in profits from electricity production went to the cantons in the Swiss midlands, which own the majority of the hydropower plants and where the hydropower plants have their tax domiciles.

Cantonal peculiarities in water rents

Valais: on the River Rhone, only the canton levies water rents, while on the tributaries to the Rhone 40% of the water-rent revenue goes to the municipalities and 60% to the canton.
Grisons: the canton and the concession-granting municipalities each receive half of the water rents.
Saint Gall: the canton collects the water rent, with half being passed on to the municipalities.
Uri: the canton as well as the corporation of Uri and the corporation of Urseren receive water rents, with the canton receiving a total of just under 90%.
Schwyz: the districts receive 4/9; the canton 2/9; and the municipalities 3/9 of the water rents.
Obwalden: water rents go to the canton, with 50% then passed on to the water cooperatives or residents' communities.
Glarus: under special regulations, water rents go to the canton (50%) and to the landowners of the properties adjoining the water bodies used.
Thurgau: water rents are only charged at the Schaffhausen international power plant on the River Rhine.
Appenzell Innerrhoden: no water rents are charged as there is no hydroelectric power plant with a gross capacity of more than 1 MW.

As a basic comparison with other types of electricity generation it should be noted that, in the case of solar electricity production, a rent must be paid everywhere to the respective roof owner for use for solar electricity generation.

The right to use water has its price

New regulations should not be made at the expense of mountain areas. It is true that electricity prices in Europe have fallen sharply. Moreover, since 2009 large electricity consumers have been able to buy freely on the European market. Like shopping tourists, they take advantage of the cheapest offers, including climate-damaging coal-fired electricity. However, water rents are not responsible for the deficits claimed by the electricity industry. Deficits at hydropower plants have not been transparently proven to date. Their causes are more likely to be found in the wrong business decisions of recent years.

Water rents concern one of the few resources of the mountain region and have their justification. The right to use the water has a price. Water rent ensures the sensible and fair participation of the public authorities in the Alpine region in one of the most valuable resources that they make available to the general public: it should be considered in all Alpine countries.

Sources (in German)

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ANNEX II

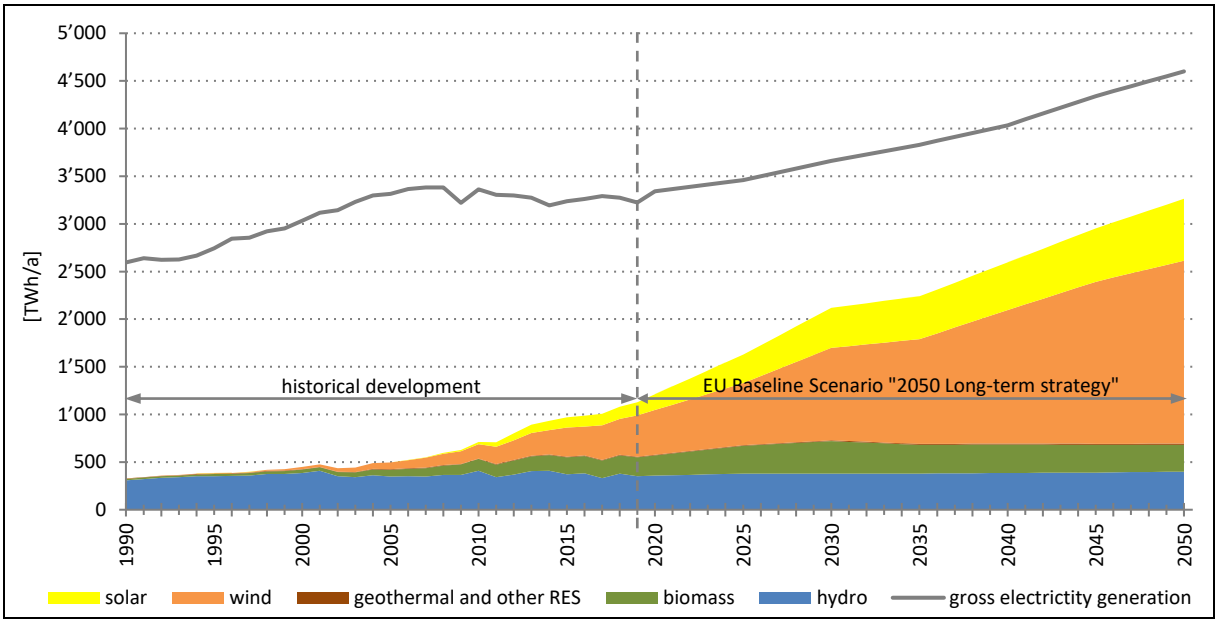
The role of hydropower in the energy transition of Alpine countries from an energy system perspective

DI Dr. techn. Jürgen Neubarth, e3 consult GmbH, Innsbruck

While hydropower has been the dominant source of renewable generation in the Alpine region for decades, this position is expected to change in the future. On the one hand, the already high degree of hydropower utilization achieved in most Alpine countries only allows for comparably limited capacity additions. On the other hand, European climate targets require a massive growth of electricity production from renewable energies, which will result in a significant increase in the proportion of wind and solar in the European and national electricity systems, since not only hydropower but also biomass has only limited additional potentials in most countries. For example, if overall EU climate and energy objectives[31] [32] [33] are to be met, the share of renewable energies in the total electricity production of EU member states would need to be increased from 16% in 2005 to 55-60% in 2030, which corresponds to an expansion of renewable electricity from 500 TWh/a in 2005 to about 2,000 – 2,200 TWh/a in 2030. Until 2050, the share of renewable energies in the EU's electricity production could amount to 80-85% (3,700 – 3,900 TWh/a) if the Commission's strategic long-term vision for a prosperous, modern, competitive and climate-neutral economy by 2050 was to be achieved.[34] And, even in the more conservative so-called Baseline Scenario of the EU "2050 long-term strategy", renewable energies would provide more than 70% of the electricity production in the EU by 2050 (about 3,300 TWh/a; cf. Figure). According to the Baseline Scenario, wind and solar would provide about 2,700 TWh/a in 2050.[35] In contrast to the massive expansion of wind and solar and despite noticeable higher remaining potentials of hydropower in the EU[36], the scenario only considers a comparatively small expansion of electricity generation from hydropower of about 50 TWh/a between 2005 (350 TWh/a) and 2050 (400 TWh/a). In this context it has to be noted that different actors and stakeholders may have different views on economic, ecological and social potentials of hydropower and other renewable energy sources as well as energy efficiency potentials. Hence, long-term scenarios for the development of the energy system on a European and national level can show different needs for the expansion of renewable energies.

[31] European Commission (2014): 2030 climate and energy goals for a competitive, secure and low-carbon EU economy.
[32] European Commission: A Roadmap for moving to a competitive low carbon economy in 2050 (Energy Roadmap 2050). COM (2011) 885/2.
[33] European Commission (2018): A Clean Planet for all. A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy (COM (2018) 773 final).
[34] European Commission (2019): A European Green Deal - Striving to be the first climate-neutral continent
[35] c.f. European Commission (2018): In-depth analysis in support of the Commission communication COM (2018) 773.
[36] For example, the 2011 Eurelectric report "Hydro in Europe: Powering Renewables" shows a remaining technically feasible hydropower potential for the EU-27 of 276 TWh/a, https://www.yumpu.com/en/document/view/19557789/hydro-in-europe-powering-renewables-full-report-eurelectric

Figure: Historical and projected electricity generation from renewable energies within the EU-28



Source: European Commission: Energy datasheets EU28 countries – update as of 05 February 2011; e3 consult analysis based on European Commission: In-depth analysis in support of the Commission communication COM(2018) 773

Even if the importance of hydropower decreases in the light of a massive expansion of wind and solar PV, an overall assessment of renewable technologies based on energy economic aspects shows that storage hydropower in particular can provide significant advantages to the electricity supply system. With capacity credits[37] above 90%, storage hydropower is not only at the top of all renewable energies but comparable to conventional thermal generation. The capacity credit of run-of-river hydropower is about 20-45% but still considerably above the capacity credits of wind power and solar PV, which is typically below 10%. Additionally, the balancing demand[38] for the integration of run-of-river hydropower is much lower compared to wind power and solar PV. Hence, the system integration costs (i.e. costs for balancing, grid expansion and costs related to the interaction with the overall generation portfolio) of hydropower usually amount to only 20-50% of the system integration costs of wind power and solar PV.[39]

[37] The capacity credit refers to the capacity in a power system that can be replaced by renewable capacity while maintaining the same level of system security. The capacity credit is typically given as a percentage of the installed renewable capacity,

[38] Balancing demand is the amount of electricity needed in a certain period of time to balance the fluctuating energy production of different types of energy production in order to achieve the necessary grid stability.

[39] Neubarth, J. (2020): Social and economic drivers for hydropower development in Danube countries. Study on behalf of International Commission for the Protection of the Danube River (ICPDR), https://www.e3-consult.at/referenzen/studien/social_and_economic_drivers_for_hydropower_development_in_danube_countries_2019_2020

Against this background, the expansion of hydropower capacities can seem reasonable from an overall energy system perspective even if the quantitative contribution to the European climate and energy targets is comparatively small. However, since the remaining economically attractive hydropower potentials in Europe are mostly located in mountainous regions that often have limited options for wind and solar installations, the importance of an expansion of hydropower on a regional level may also differ from a European perspective. Hence, hydropower potentials in the Alpine region can provide a considerable contribution to the energy transition on a regional level. For example, the so-called integrative reasonable hydropower potential in Tyrol (i.e. techno-economical potential outside protected river stretches) amounts to 7 TWh/a, which is of the same order of magnitude as the potentials already in use.[40] According to the Tyrolean state government, 40% or 2.8 TWh/a of the remaining potentials in Tyrol are to be exploited by 2036. In contrast, the Swiss Energy Perspectives 2050+ only considers a moderate expansion of renewable hydropower (i.e. excluding pumped storage hydropower) from 35.3 TWh/a in 2020 to 37.5 TWh/a in 2050 in its scenarios for reaching a long-term climate goal of net-zero greenhouse gas emissions by 2050.[41]

However, not only in Tyrol but also in other Alpine regions and countries, respectively, the strategic need for additional hydropower capacities and therefore the exploitation of the remaining hydropower potentials has not been defined in an overall power system planning process but rather at a political level. The development of hydropower however requires interaction with the overall power system planning at country level but also at a broader regional electricity market level in order to verify the actual need and value of any additional hydropower capacity. An essential objective of such a planning process should be the development of a robust and climate-resilient generation portfolio. Accordingly, those countries that already have a significant share of hydropower should put a stronger focus on non-hydro renewable technologies to diversify the country's generation portfolio and make it less vulnerable to e.g. seasonal and yearly fluctuations of water runoffs. In this context, storage hydropower, as one of several options to provide flexible generation and ancillary services[42], could receive greater emphasis for the integration of volatile renewables. And finally, site selection and project assessment for hydropower should be based on common frameworks and guidelines so as to identify the "best" available projects from an energy-economic and ecological perspective.

[40] ILF (2011): Study on hydropower potentials in Tyrol (on behalf of the Tyrolean state government; only available in German), https://www.tirol.gv.at/umwelt/wasser/kriterienkatalog-wasserkraft/.
[41] Prognos AG, INFRAS AG, TEP Energy GmbH and Ecoplan AG (2020): Energieperspektiven 2050+ (on behalf of Bundesamt für Energie BFE), https://www.bfe.admin.ch/bfe/en/home/policy/energy-perspectives-2050-plus.html.
[42] Other options are for example large-scale and household battery storage, Power-to-Gas and thermal energy storage.

ANNEX III

Compilation of important sources for the sustainable regulation of hydropower use in the Alpine region

A - Protocols and Declarations of the Alpine Convention

Nature Conservation Protocol (Protocol Nature Protection and Landscape Conservation)[43]

The following articles in particular are central in this context[44]:

Article 10 Basic protection

1. The Contracting Parties shall aim to reduce the environmental impact and impairments undermining nature and landscape in the entire Alpine territory, while also taking account of the interests of the local population. They shall take steps to ensure that all the significant uses of the territory are with due care for nature and landscape. They shall also adopt all the measures necessary for preserving and, to the extent necessary, restoring special structural, natural and near-natural elements of the landscapes, biotopes, ecosystems and traditional rural landscapes.

2. In view of the decisive role of agriculture and forestry economy when producing measures for the conservation of nature and landscape, protecting, preserving and managing near-natural biotopes worthy of protection should be undertaken by the correct and appropriate agricultural and forestry exploitation, on the basis of agreements with the owners or managers of the land, wherever appropriate. In this respect, control instruments borrowed from the market economy, such as incentives and financial compensation, are particularly opportune.

3. To augment the means available for protecting nature, it will be necessary that the use of incentives and measures for supporting the agricultural and forestry economy, as well as other types of exploitation of the territory, is further applied to achieve these objectives.

Article 11 Protected areas

1. The Contracting Parties undertake to preserve, manage and, where necessary, to extend the existing protected areas, in keeping with their protective function, and also to define, where possible, new protected areas. They shall take all appropriate measures to avoid impairing or destroying these areas.

[43] https://www.alpconv.org/fileadmin/user_upload/Convention/EN/Protocol_Conservation_of_Nature_EN.pdf
[44] For a detailed consideration, see the exemplary statement of the Legal Service Office of the Alpine Convention in Vienna on the run-of-river power plant on the Inn River near Telfs/Austria (Special Protection Area Mieminger-Rietzinger Innauen) of October 21st 2010 / ZVR number 255345915.

2. They shall also promote the instituting and management of national parks.

3. They shall set aside areas of respect and tranquillity that ensure giving priority to the wild animal and plant species over other interests. They shall ensure that, in these areas, there is the peace necessary for the ecological process typical of the species to take place undisturbed, and shall reduce or prohibit any form of use incompatible with the ecological processes of these areas.

4. The Contracting Parties shall examine the compensation terms of the special services provided by the local population, in compliance with national law.

Energy Protocol (Protocol on the implementation of the Alpine Convention of 1991 in the field of energy)[45]

The following articles in particular are central in this context:

Article 2 – Basic Commitments; Article 3 – Conformity with international law and other policies; Article 4 – Participation of regional and local authorities; Article 5 – Energy saving and rational use; Article 6 – Renewable energy resources;

Article 7 – Hydroelectric power

1. The Contracting Parties shall ensure that the ecological functions of watercourses and the integrity of the landscape are maintained through appropriate measures, such as establishing minimum flows, implementing standards for the reduction of artificial fluctuations in water level and shall guarantee animal migration in the case of new hydroelectric plants, and existing ones where possible.
2. The Contracting Parties may adopt measures aimed at improving the competitiveness of existing hydroelectric plants, subject to compliance with their safety and environmental standards.
3. They shall also undertake to protect water resources in areas reserved for drinking water, in protected areas and their buffer zones, other protected and quiet zones as well as areas of unspoilt nature and countryside.
4. The Contracting Parties shall recommend reopening disused hydroelectric plants rather than building new ones. The provision under paragraph (1) on the protection of aquatic ecosystems and other related systems shall also be applied to the reopening of existing hydroelectric plants.
5. The Contracting Parties may, in the framework of their national legislation, examine how they can make end-consumers of Alpine resources pay market-related prices, and the extent to which the local population can be fairly compensated for services supplied in the general interest.

Article 11 – Renaturalization and environmental engineering; Article 12 – Environmental impact analysis; Article 13 – Dialogue; Article 15 – Research and observation

[45] www.alpconv.org/fileadmin/user_upload/Convention/EN/Protocol_Energy_EN.pdf

Water Declaration (Declaration of the XVI Alpine Conference on integrated and sustainable water management in the Alps; 2020)[46]

The following articles in particular are central in this context:

1. **Protect the remaining naturally preserved river courses of the Alps**, in due consideration of the part they play in the necessary conservation of a favourable quality and quantity of water in these sensitive mountain areas;

2. **Foster improvement ("requalification") and restoration of the natural water courses** to conditions based on the appropriate approaches available (including hydromorphology, hydrobiology, sediment transport, as well as hydraulic features of the river bodies), with the objective of securing closest to natural functioning, favourable to the preservation of water resources, biodiversity and associated ecosystem services, including at transboundary level;

6**. Take into consideration the protection of the landscape and the ecosystems**, and the relevant interests of local communities and communities downstream, as well as the necessity to protect remaining naturally preserved river courses and river stretches of the Alps in case of a further development of hydropower plants, which shall not entail any deterioration in water quality, water quantity, hydromorphology and ecosystem, nor compromise the achievement of good status of the water bodies they relate to;

7. **Promote the common guidelines for the use of small hydropower in the Alpine Region**:
- considering the refurbishment of old facilities before building new ones and removing unused small hydropower stations;
- considering small hydropower plants mainly as a localized solution to tackle local and specific energy needs rather than a means to achieve broader renewable energy targets;
- identifying already from the planning phase the sites to be considered as potentially most favourable at an environmental and technical level, in order to avoid an unplanned proliferation of new plants;

8. Foster the further **development of monitoring networks at the higher altitudes** (water quality, water quantity, flow of water courses, sediment transport, ice and permafrost, nivo-meteo monitoring) and complement them with remote sensing where applicable;

9. **Enhance bottom-up governance tools aimed at improving voluntary cooperation, public participation and acceptance of measures,** such as river contracts, river dialogues, river fora, including at a transboundary level;

10**. Continue the dialogue and the transnational cooperation on water management issues**, particularly when it comes to transboundary waters and pursuant to the Water Convention, as well as to the relevant legislation in force in the Parties to the Alpine Convention;

[46] https://www.alpconv.org/fileadmin/user_upload/Organization/AC/XVI/ACXVI_WaterDeclaration_en.pdf

11. **Acknowledge that local and transnational cooperation helps to increase territorial cohesion**, building trust across borders and institutions, sharing experiences and knowledge, tackling common challenges, and that the Alpine Convention is a relevant instrument to facilitate dialogue and cooperation in the water sector.

B - Documents by the Water Platform of the Alpine Convention (2009-2019), published by the Permanent Secretariat of the Alpine Convention

1) **Situation report on hydropower generation in the Alps focusing on small hydropower (2011, 59pp.)**
   Background document showing the level of exploitation of Alpine rivers.

2) **Common Guidelines for the use of small hydropower in the Alpine region (2011, Alpine Signals FOCUS 1, available in all Alpine languages + English)**

- Prepared by the AC Platform *Water management in the Alps*, approved at the XI Alpine Conference (Brdo pri Kranju, Slovenia, March 2011), published by the Permanent Secretariat of the Alpine Convention in 2011
- Focusses generally on small hydropower, whatever its definition may be in various Alpine countries
- Includes common principles and recommendations, a framework and criteria for evaluation, some good practices.
- The Common Guidelines must be taken into consideration together with existing national and regional legislation. They are not binding but express recommendations.
- The general objectives for the use of small hydropower are: 1) increasing the production of renewable energy from hydropower generation; 2) minimizing the impairment of the aquatic ecosystem and landscape. Need to address the conflict between the two.
- Specific objective of the Common Guidelines: **to provide general guidance for the identification of potentially favourable locations for small hydropower plants and for the subsequent authorization decision considering the principles of sustainable development in the Alps** – in line with the Energy Protocol of the AC. The Common Guidelines apply to the entire Alps and aim to support public authorities in charge of small hydropower authorizations, spatial planning and integrated management of water resources. They can be extrapolated to large hydropower.

Four principles, formulated as recommendations:

- Recommendation 1: **To strike a balance between an increase in hydropower generation and environmental protection, a transparent weighing of the interests based on sustainability criteria is required** (other national or regional objectives and constraints (social, legal, economic, financial); general environmental aspects including objectives regarding climate protection (e.g. ecosystem services); other water uses (e.g. water supply, irrigation etc.); socio-economic aspects:

allocation of revenues, decentralized approaches, employment, social development of the region, tourism etc.).

- Recommendation 2: **National / regional approaches dealing with small hydropower in the Alps should be built on the basis of common principles, general considerations and standard aspects for the whole Alpine region, but should also consider specific national and regional factors.**

- Recommendation 3: **When assessing the ecological value of river stretches, not only the status quo needs to be taken into account, but also foreseeable changes to the ecological conditions if e.g. rehabilitation projects are foreseen** (i.e. take the potential into account, particularly important now that we are in the UN Decade on Ecosystem Restoration).

- **Recommendation 4: When assessing the ecological value of a river stretch, it is important to consider whether it has a specific ecological importance for the other stretches in the river basin** (consider the ecological function of each stretch within the wider river system).

General recommendations:

- Recommendation 5: **Infrastructure-related hydropower plants, exploiting only the water that is already used for the primary purpose of the plant, are in general not additionally affecting aquatic ecosystems and are economically favourable. Thus, from an environmental point of view, such multipurpose small hydropower plants are in general considered appropriate and desirable.**

- Recommendation 6: For small HP plants off-grid: **In the weighing of interests, the purpose of the small hydropower plant needs to be given due consideration. In particular, the provision of electric self-supply, where connection to the public grid would be at disproportionate cost and no better environmental options are given, constitutes a strong argument in favour of building SHP in remote individual locations, such as Alpine huts and farms.**

- Recommendation 7: **Refurbishment of existing operating plants and reopening of disused plants to optimize the production of hydropower while minimizing ecological impacts should be promoted and prioritized. However, there should be a periodic examination as to whether further mitigation of negative impacts and better compliance with existing environmental legislation can be achieved by the application of best practice without entailing disproportionate costs.**

- Recommendation 8: **Ecological upgrading of existing operating plants to mitigate the impacts on an area's ecological status and landscape should be promoted by means of incentives to accelerate the fulfilment of legal requirements earlier or even to go beyond these minimal requirements.**

- Recommendation 9: **Renewal of concessions or licences can be considered appropriate where it complies with the existing environmental legislation. Nevertheless, the ecological potential of the site should be considered, and concessions or licences should be limited in time, being as short as possible without compromising the investment.** (Significant refurbishment and upgrades may lead to further degradation, and therefore need to undergo the same procedure as new plants).

Two-level procedure to define “where” and “how” to develop small hydropower:

- Recommendation 10: **To answer the questions about the “where”, with respect to the most favourable sites to reach growth objectives for hydroelectric production, and the “how”, with respect to the individual project, a transparent, structured and criteria-based procedure that combines a regional/strategic point of view with a local, project-specific assessment should be applied.** (If HP concessions and spatial planning are in the hands of different authorities, these both need to be included in the strategic process).

- Recommendation 11: **The development of the regional strategy is a process triggered by the competent authority. In order to ensure transparency and find a solution that takes account of the different interests at stake, the relevant stakeholders’ views must be adequately considered by means of a participative procedure** (see art. 4 of the Energy protocol on the participation of local and regional entities).

1st level – Strategic planning on a regional level (regional strategy):

- Recommendation 12: **On a regional level, a transparent evaluation and classification of the potential appropriateness of river stretches for hydropower use shall be carried out (considering hydro-electric potential, ecological and landscape value and areas under special protection)** (to save the few remaining unexploited stretches of river).

- Recommendation 13: **As part of the regional strategy, the designation of areas to be deliberately kept free from any exploitation, avoiding irreversible impacts, should be considered. This must be based on a broad participation of relevant stakeholders as outlined in Recommendation 11** (once agreed, the regional strategy must be binding).

- Recommendation 14: **Ways to integrate the results of the strategic planning in existing national / regional instruments shall be examined (e.g. river basin management plans or spatial planning instruments)** (regional strategy as per the Water Directive; pre-planning at regional level).

2nd level – Decision at the local level (for specific projects):

- Recommendation 15: **The second level of the proposed evaluation procedure is a local in-depth assessment of the concrete project application, considering installation- and detailed site-specific criteria and further socio-economic aspects such that a holistic weighing of all relevant criteria is carried out. The authorization is not just about judging whether or not projects should be allowed in certain areas, but also about how projects should be realized.**

- Recommendation 16: **As it is a prerequisite for the local assessment and decision on individual project applications, the regional strategy /planning should be carried out as soon as possible**.

Guidelines / recommendations for the evaluation of new plants, or significant refurbishment and upgrade:

- criteria to assess the hydropower potential at regional level
- criteria to assess the ecological value of river stretches at regional level
- criteria to identify areas "non-suitable for hydropower"
- criteria to assess at local level

3) Report "Application of the Common Guidelines for the use of Small Hydropower in the Alpine region" (2019)

- The introduction (pp. 4-6) provides a useful overview of AC work on hydropower.
- The conclusions are somewhat significant but – in the opinion of the platform observers, CIPRA and WWF – incomplete and lacking recommendations. This is reflected in Chapter 4. Conclusions, lessons learned and way forward (pp. 20-21).
- A survey of the use of the AC Common guidelines was undertaken. But respondents were very few and not representative of the Alpine region and the Alpine states.
- Conclusions:
    - 60% of respondents not aware of the Common Guidelines.
    - 50% said the recommendations of the Common Guidelines are not applied in their country, for various reasons; 25% said parts of the Common Guidelines were taken into some consideration.
    - The Common Guidelines are still valid and there is no need to revise them.

    - Binding national instruments have often replaced or surpassed the Common Guidelines.
    - An analysis of the national instruments was undertaken, country by country. But no comparison with the Common Guidelines. So we do not know the extent to which the Common Guidelines are reflected in national legislation; thus, we do not know if the principles/recommendations that the AC had deemed important are indeed reflected in the national/regional hydropower strategies.
    - We do not know which countries are closer to the principles and values of the Common Guidelines, and which are further away. The Water Platform was

under the impression that countries did not want to be told what they had to do.
- We do not know the state of the Alpine rivers in 2020 vis-à-vis hydropower.
- These weaknesses are acknowledged and listed in the "way forward" (p. 21).

4) ForumAlpinum 2018 "Alpine Waters: common good or source of conflicts?" held together with the 7th Water Conference on 5 June 2018: Water in the Alps – Management of hydrological extremes and of sustainable hydropower use[47]

Contributions from Monica Camuffo, Giovanna Deppi, Luigina Malvestio and Lucia Ruffato representing the University of Venice, Belluno Committee for Water as a Common Good, and Free Rivers Italia. They began their presentation with the statement "Small hydropower is not (always) a good thing" and proceeded by explaining why. This contribution was translated into Case study #3 by Giovanna Deppi and Lucia Ruffato, on p. 53 of the **Conference Proceedings (see link above)

5) 2nd Report on the State of the Alps (2009)[48]
with summaries in all Alpine languages
Chapter 4: Energy. Sub-chapters 4.5 – 4.9 on hydropower

6) Best practice examples for land use and nature conservation-compatible renewable energy projects in the Alps (2016), co-authored by CIPRA

- See Hydropower practices (Chapter 4.4) + conclusions and recommendations, some specifically on hydropower (Chapter 5)
- Italian version: Esempi di best practice di progetti di energie rinnovabili a basso consumo di suolo e a basso impatto ambientale[49]
- German version: Best-Practice-Beispiele für landnutzungsund naturschutzverträgliche ErneuerbareEnergien-Projekte im Alpenraum https://www.alpconv.org/fileadmin/user_upload/fotos/Banner/Topics/BP--Energy_DE.pdf
- French version: Exemples de bonnes pratiques pour des projets d'énergies renouvelables respectant la nature et l'utilisation des sols dans l'espace alpin https://www.alpconv.org/fileadmin/user_upload/fotos/Banner/Topics/BP-Energy_FR.pdf

[47] http://forumalpinum.org/wp-content/uploads/2019/02/0_Proceedings_final.pdf
[48] https://www.alpconv.org/fileadmin/user_upload/Publications/RSA/RSA2_summary_EN.pdf (there are also summaries in all Alpine languages on the website available)
[49] https://www.alpconv.org/fileadmin/user_upload/fotos/Banner/Topics/BP-Energy_IT_AC14.pdf

C – Other documents referring to the Alpine situation

- Alpine Climate Target System and the Pathways on Energy
In there the following 4 pathways: Pathway 1 – Network of regional energy coordinators; Pathway 2 – Enable energy democracy in the Alps; Pathway 3 – Support low-carbon lifestyle & business models; Pathway 4 – Alpine administrations as forerunners

- L'idroelettrico, impatti e nuove sfide al tempo dei cambiamenti climatici; Legambiente; 2018

- Energy (R)evolution, Eine nachhaltige Energieversorgung für die Schweiz; Greenpeace Schweiz; 2013

- Gewässerperlen – Die schönsten Flusslandschaften der Schweiz; Martin Arnold, Urs Fitze; WWF Schweiz; 2018

- Rivers of the Alps, Diversity in Nature and Culture; S. Muhar, A. Muhar, D. Siegrist, G. Egger; 2019
The most comprehensive, fully illustrated scientific and cultural description of all the rivers in the Alpine region[50]

D – Overarching sources with a European perspective

- Hydropower Pressure on European Rivers, The Story in Numbers; FLUVIUS, WWF, GEOTA, RiverWatch, EuroNatur; 2019

- The EU Water Framework Directive – integrated river basin management for Europe (2000)

[50] www.haupt.ch/buecher/natur-garten/rivers-of-the-alps.html