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Policy Brief

Action needed to prevent future conflict over the use and management of water in the Alpine region in times of climate change and growing demand

Key messages from the ForumAlpinum 2018 & the 7th Water Conference (June 4-6, Breitenwang, Austria)

Expected future changes in climatic conditions as well as the availability of and demand for water in the Alpine region will result in novel stakeholder constellations in water use and lead to new social and legal requirements for water management. This policy brief highlights the major challenges for the use and management of water from local to macro-regional scale. Many of these challenges concern areas and regions throughout the entire Alpine space, and solutions are best sought through international coordination and cooperation, e.g. within the framework of the Alpine Convention or the Alpine macro-region. Therefore, this policy brief addresses especially the water-related bodies of the Alpine Convention and EUSALP, including national and regional authorities.

Drivers of future water availability and water demand in the Alpine region

A **changing climate**, manifested in higher temperatures, changing precipitation patterns, higher evaporation rates and novel atmospheric patterns, will alter water availability and regional water balances, particularly in the second half of this century. In the Alps, the increase in temperature is expected to exceed the global average considerably. It will significantly alter the role of snow and ice in the water balance: Less winter precipitation will be retained as snow and run off directly, reducing snow and snow cover in winter as well as spring and summer snowmelt and thus water availability in summer. Retreating glaciers will further decrease summer runoff. Precipitation is expected to increase during winter and decrease during summer. As a consequence, reduced summer runoff and a higher likelihood of drought periods in summertime are expected.

Natural hazard regimes will also change. Melting permafrost, together with the predicted rise of extreme precipitation events, will destabilise slopes and lead to increased accumulation of debris. This will increase the likelihood of debris flows and flood events. An adaption of risk management to these new challenges is urgently needed.

Alpine rivers and landscapes will change markedly as a result of climate change. In summer, white perennially snow-covered mountains will change to pebble-grey. Floodplains and new lakes will emerge where glaciers dominate today.

Socio-economic change will generally increase the pressure on water systems through greater demand for water (hydropower, public supply, irrigation, heating/cooling, snow making) and for riverine space (settlements, infrastructures, flood protection). Demand will also rise in adjacent downstream regions (water supply, irrigation, cooling water), underlining the transregional importance of the Alpine region and its change. Water demand is in part seasonal or time-specific (e.g. irrigation during summer, cooling during heat waves, water for artificial snow or electricity in

winter) and often not in tune with natural availability. To accommodate seasonally fluctuating water demand, artificial water storages could be extended (e.g. enlarging existing or building new reservoirs or artificial lakes). Further socio-economic pressures on water resources come from water pollution and the impacts on hydro-morphology of dams, embankments etc.

In view of these trends, **competition for the use and management of water resources** in the Alpine region is likely to intensify, and additional situations of competition and even conflict are likely to arise. To prevent an increase of conflict over water use, water quality, and riverine space, new cooperative approaches are required in water policy and management. It is time to act now to prevent conflicts as the following ones in the future.

Current and emerging competition and conflict over the use and management of water

Given the expected changes in water availability and demand, conflict over water use and management in the Alpine region will emerge or intensify in four dimensions: amount of water, water quality, spatial demands and landscape.

(1) Conflicts over the amount of water: Potential conflicts regarding the available amount of water will increase in future: With water becoming more scarce in the summer season, competition will increase between consumers such as agriculture/forestry (irrigation), hydropower, industry and tourism (golf, water sports, etc.). Intensive irrigation agriculture will be affected first.

In winter, competing demands between tourism, water supply and hydropower occur mainly locally in areas with high water consumption by tourism (technical snow making, drinking water, water supply, wellness).

With energy policies focusing on renewable CO₂-free sources, hydropower production will remain an important option for producing electricity. Conflicts that have existed for decades in the transitional area between ecology and economy will continue to exist and could even intensify.

(2) Conflicts over water quality. Water quality remains an important element of management despite enormous improvements in reducing nutrient pollution in the past 60 years. Various sources will continue to affect water quality and restrict the use of water and fishery : a) *persistent pollutants from industry and households*, which are not satisfactorily removed by wastewater treatment, a situation exacerbated in rivers during low flow or cold periods and in sediment traps; b) *agricultural input of pesticides and nutrients* into groundwater, rivers, and lakes; c) the *thermal use of water for heating and cooling* as a new and growing issue; d) *pollutants from contaminated constructions or sites (i.e. PCB)*. Such conflicts will concentrate in urbanised and intensively cultivated valleys.

(3) Conflicts over spatial demands arise where *sprawling urbanisation, industrial development and transport infrastructures* are expected to expand further, mainly on valley floors and in areas attractive for tourism. An increase in intensively used or even sealed surfaces will conflict with space required for the regeneration and protection of groundwater as well as for rainwater and flood retention. No new construction should occur in areas threatened by floods and debris flow.

(4) Conflicts over hydro-morphology and landscape. Areas with little or no human impact have become rare in the Alps. But the *natural integrity and ecological connectivity of aquatic ecosystems and habitats* (rivers, springs, wetlands, floodplains, lakes) is essential to the long-term vitality of the entire Alpine water system, as well as for aquatic biodiversity and attractive landscapes. Any relenting to further socio-economic demands that change the natural water regime is likely to increase pressure on the remaining and even on protected near-natural aquatic ecosystems, wetlands, and water resources.

Hotspots of current and future conflict over the use and management of water in the Alpine region have been identified mainly in these (partly overlapping) areas:

- **Urbanised and intensively used valley plains** (e.g. Inn valley) (Conflicts 1, 2, 3)
- **Tourism areas** (e.g. Crans Montana) (Conflicts 1, 2, 3, 4)
- **Areas periodically suffering from water scarcity or drought** (e.g. Trento) (Conflicts 1, 3)
- **Alpine rivers & river basins** (e.g. Isar or Isère catchment) (Conflicts 1, 2, 3, 4)
- **Aquatic habitats of high ecological integrity** (e.g. wetlands, moors) (Conflicts 1, 2, 3, 4)
- **Areas with destabilisation** (e.g. slopes in permafrost areas, bedload) (Conflicts 3, 4)

Hotspots of conflicting use and management of water share these **common characteristics**:

- Conflicts are often cross-border and multi-level (local to regional to national to international)
- Conflicts are trans-sectoral, i.e. different stakeholders, public service sectors and scientific disciplines are involved and in need of cooperation
- Usually numerous (natural and/or social) drivers and interests are involved.

The prevention of conflicts over the use and management of water will require new approaches in cooperation and coordination that involve all aspects mentioned and all interests at stake.

Action needed to prevent conflict over the use and management of water

Five fields of action have been identified as most urgent for the Alpine region:

1. Balance water availability and water use. Demand and availability of water can be balanced either by demand control, by efficiency measures or by an improvement in water supply systems. A balanced water management also ensures sufficient residual water in Alpine rivers.

Demand side: Numerous options are available to **reduce water consumption** or to make it more efficient, particularly in agriculture (e.g. drip irrigation), industry (e.g. reuse wastewater), energy production (e.g. more efficient turbination), and tourism (e.g. concentration of snow making at higher altitudes).

Action is needed to improve the efficiency of water use in Alpine regions.

Supply side: A concerted large-scale assessment of future water demands and storage options can lead the way to adequate water availability at times of seasonal or drought-induced water scarcity. Storage options need to consider both multifunctional management of conventional dams (mainly at high altitude) and decentralised interlinked smaller units (e.g. ponds, underground storage, artificial groundwater recharge). Ideally, future water storages will be multifunctional, supplying water for energy production, irrigation, snow-making and wastewater dilution, sustain ecological flow and sediment transport in rivers, and retain floodwaters. Where appropriate, they ought to be combined with existing storage units. Compared to traditional storage, adapted or new multifunctional storage systems need to fulfil highest landscape and environmental standards and contribute to the attractiveness of Alpine areas.

Action is needed for (cross-border /macro-regional) planning of storage networks and their operation, integrating all stakeholders and parties concerned.

It is also necessary – where applicable from a cross-border perspective – to develop operative priorities in times of water scarcity and emergency plans to deal with droughts.

2. Reduce water pollution. The concentration of micro-pollutants in many rivers, lakes and groundwater bodies is still on the increase and jeopardises aquatic ecology as well as the supply of clean drinking water. While pollutant discharge from wastewater treatment plants can be reduced by further treatment steps, inputs from non-point sources, such as agriculture, urban areas and atmospheric deposition, pollutants from older constructions (e.g. PCB in dams, military buildings), mining, shooting ranges and waste deposition require legal action.

Action is needed to optimise agricultural and industrial technologies and production systems in order to reduce micro-pollutants at source.

Further action should be taken and to improve wastewater treatment as periods of low flow and hence low effluent dilution are becoming more frequent. Restoration of polluted sites or contaminated constructions (especially PCB in dams) remains an important focus.

3. Prevent conflict along rivers and in riverine plains. Rivers and their plains are essential landscape elements of Alpine valleys and attract a wide range of interests. Promising methods for balancing interests have been developed in several countries (e.g. river dialogue in Austria, Network of River Contracts in Italy, River Watch by WWF, space reserved for water (Gewässerraum) in the Swiss federal law for water protection). They are being further elaborated in projects like SPARE. River dialogues have to take in the entire river basin, including tributaries, lakes, groundwater and riverine zones. This includes setting aside areas needed for risk prevention: zones potentially exposed to high risks of extreme events, such as flooding, debris flow or avalanches, need to be kept free of settlements and valuable assets. Also, ever more frequent periods of low flow in rivers and springs need to be taken into account.

Action is needed to implement insights of existing approaches in local and cross-border dialogue efforts along river basins and to further develop and strengthen them.

Special attention must be paid to encourage natural water retention measures and to develop environmentally sound low-flow management practices for residual water sections, in low-flow sections with treated wastewater, and in case of water scarcity.

4. Preserve remaining near-natural aquatic ecosystems and landscapes. Growing societal demands for water, water storage and land will add pressure on the remaining natural lakes, ponds, rivers, springs and wetlands. In an increasingly overused landscape, these aquatic elements and their surroundings are pivotal reservoirs of biodiversity and deserve the highest degree of protection. Not to forget their role as important assets for tourism, wellbeing and recreation.

Action is needed to fully enforce existing conservation legislation on aquatic ecosystems and to ensure their ecological connectivity and biodiversity.

Protection must be improved for endangered pristine springs, based on an action plan and monitoring across the entire Alps.

In protected areas in particular, full care of pristine aquatic ecosystems needs to be safeguarded.

5. Provide useful data and develop appropriate procedures. Presently, there is a general lack of water consumption data in all sectors. Such data are a prerequisite for any water management and holistic planning.

Similar to the above-mentioned river dialogues, new dialogue models should be developed for regional and cross-border water management. Such dialogues will help to balance public and private ownership, as well as upstream and downstream interests, prioritise water use in times of scarcity and coordinate cooperation.

Action is needed, first, to monitor water use by individual actors, specified by time of demand. This should be compared to and balanced with actually available water resources.

Second, short and mid-term forecast systems for soil humidity, river run-off and groundwater levels need to be established to help predict availability and demand, ensure adequate water allocation and avoid overexploitation of resources, particularly in times of drought and scarcity.

Third, novel approaches should be established to ensure cooperation and coordination in complex water management issues.

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