



Adige Water

Fair 2025

Research and shared solutions to address future water management challenges in the Adige River basin

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1

Introduction

The Adige River, the second longest in Italy, is a complex system in which mountain landscapes, agricultural activities, urban contexts and natural environments intertwine. Water, a fundamental resource for life and development in the area, is used in many interconnected and interdependent sectors. Agriculture is critically dependent on water for irrigation; the energy sector uses it for hydroelectric power generation, and both create potential impacts on availability for other uses. In addition, human activities can significantly affect water quality, with repercussions for ecosystems and public health.

However, the different uses of water are often considered as separate, generating tensions and conflicts in water resource management, particularly during emergency conditions such as floods or periods of water scarcity. In such situations, there is a strong need for multi-sectoral and coordinated management that takes into account the upstream and downstream impacts along the entire course of the river and its tributaries.

Even scientific research, despite its breadth and quality, often tends to develop in a fragmented manner, through individual projects and sectoral approaches, with the risk of not fully grasping the complexity of the system and missing opportunities for synergy.

Within this context, the first edition of the Adige Water Fair was born – an inter-project and inter-institutional initiative – with the goal of uniting stakeholders and researchers involved in both basic and applied research across the Adige River basin, from its sources to its mouth, to share knowledge, discuss common problems and identify concrete actions and solutions of a technological, managerial and scientific nature.

This report documents the content that emerged during the event and is structured according to event sessions. The document presents the main points discussed and identifies the most significant challenges and priorities for action. The report aims to provide a basis for a shared path towards more integrated and resilient water management throughout the Adige basin.

2

Event overview

The Adige Water Fair was held on 19 and 20 May 2025 at Eurac Research in Bolzano. This event was organized by Eurac Research in collaboration with the Venice office of the Euro-Mediterranean Centre on Climate Change (CMCC) and Ca' Foscari University of Venice. The event was also sponsored by the Eastern Alps District Basin Authority.

The Adige Water Fair was organized in the context of the following research projects:

- [Nexogenesis](#)
- [Impetus](#)
- [EO4Multihazards](#)
- [InterTwin](#)
- [Return](#)
- [A-DROP](#)
- [BeyondSnow](#)
- [iNest](#)
- [NextWater_ST](#)
- [PlasticFree](#)
- [SnowTinel](#)

During the event, we aimed at identifying synergies and divergent interests among the various institutions within the Adige River basin, and at addressing each of these aspects in order to collaborate more effectively. Furthermore, as this was the first event to bring together stakeholders and actors involved in basic and applied research in the Adige River basin, a sense of collaboration and community was actively created, supporting constructive dialogue through collective exercises on envisioning a desirable, achievable and shared future.

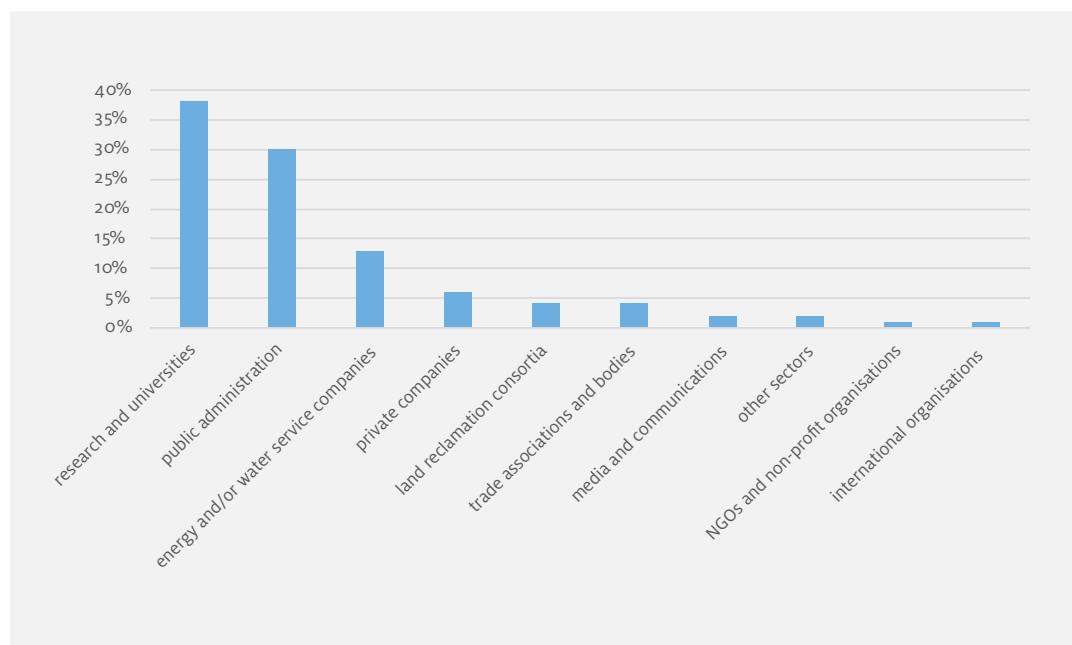


Figure 1: Breakdown of participants by sector of origin

To achieve this goal, we adopted a hybrid format combining a scientific conference setting and a trade fair for companies in order to encourage interaction and dialogue through various opportunities for engagement. Specifically, the Adige Water Fair featured a mix of:

- plenary sessions with round tables and presentations by experts,
- parallel sessions on specific topics with short 'pitch talk' style presentations,
- poster sessions,
- photography exhibition,
- concluding walk along the banks of the Talvera River with an explanation of the renaturalisation interventions.

The event was attended by 132 people from various public and private institutions, research centers and universities, public agencies, private companies and museums. In particular, the distribution of participants by sector is shown in Figure 1.

Furthermore, the geographical distribution of participants saw a majority from the province of Bolzano (52%), followed by the Veneto region (26%), the province of Trento (17%) and finally a small number from outside the Adige basin (5%).

3

Round table **with experts**

The round table was attended by Marina Colaizzi from the Eastern Alps District Basin Authority, Sandro Rigotti from the Provincial Agency for Water Resources and Energy of the Autonomous Province of Trento, Flavio Ruffini from the Provincial Agency for the Environment and Climate Protection of the Autonomous Province of Bolzano, and Fabio Strazzabosco from the Agency for Environmental Protection and Prevention of the Veneto Region. The round table was introduced by Stefano Terzi from Eurac Research and moderated by Luca Carra from Scienza in Rete. The meeting opened with a reflection on the role of the Adige as a complex and strategic river, subject to conflicting uses arising from agriculture, hydroelectric power, drinking water and ecosystem services. The notable need of understanding how the basin works and of enhancing opportunities through dialogue between local stakeholders emerged as a result. The Eastern Alps District Basin Authority illustrated its evolution and the role of the Water Resources Observatory which was created to address crises such as the water shortages of 2017 and 2022. This tool has promoted shared solutions among consortia, operators and institutions at the interregional level and has also strengthened relations and cooperation between entities. In the future, the Observatory will need to be strengthened in order to continue to find shared solutions in critical situations, while respecting the constitutional rights of ordinary and special statute regions, such as the autonomous provinces of Trento and Bolzano.





Representatives from the provinces and agencies highlighted how the Adige is perceived differently along its course, despite facing common challenges: from water quality and quantity to the management of salt wedge intrusion and water security for coastal populations.

The connection between water and energy is highly complex to manage, as it also has to take into account energy market dynamics. The example of the blackout in Spain and Portugal on 28 April 2025 highlights this complex condition and it should make us reflect on the laws on the priority of water uses. In this sense, mountain reservoirs play a very important role since, besides producing hydropower, they also have to ensure enough water quantity and quality downstream, even during water scarcity conditions.

With regard to water uses, there is a lack of a validated and standardized database that can support the review of historical concessions, the modulation of priority uses based on current and future conditions, and the planning of more effective irrigation methods and techniques.

The discussion also touched on the topic of awareness and education, with concrete examples of changes in people's daily behaviours and mindsets as a result of specific emergencies: in 2017, when dams were opened without clear planning to cope with the water crisis that hit the Veneto region. Moreover, the discussion highlighted the importance of integrating humanities to build social awareness on the value of water, including in the field of environmental education in primary schools for example.

Finally, scientific research was called upon to contribute in an applied manner, supporting decisions with accessible and validated results. The discussion highlighted the need for databases shared among different administrations, advanced hydrological models, and more reliable medium-term climate forecasts to support proactive management.

4

Thematic sessions

The parallel thematic sessions were repeated on both days of the event, allowing each participant to take part in multiple sessions. Between 21 and 30 people participated in each session, during which the discussion focused on one of the following five specific topics:

- 1.** Data and models for estimating water availability and demand;
- 2.** Multi-risk assessments and management at the basin scale;
- 3.** Decision support platforms;
- 4.** Governance and climate adaptation in the Adige Basin;
- 5.** Water quality, biodiversity and river ecosystems health.

In each thematic session, the moderators posed questions to participants to stimulate dialogue. The main topics discussed are summarized below, with an effort to give space to the various sectors represented in order to bring out different points of view.



4.1 Data and models for estimating water availability and demand

1. Disparities in data access and availability among sectors

There is a disparity among sectors in terms of availability and data sharing: hydroelectric power provides data in some cases even in real time to public agencies, while for irrigation the availability of measured data is limited and more fragmented.

Irrigation concession data is normally available in relation to the concession granted and its related parameters, although it is not always easily accessible; data on actual withdrawals is not available due to the lack of a widespread monitoring system. Incentives are already in place for “agile” collections of irrigation data, such as rewarding mechanisms (normally up to 10%) on concession fees when meters are installed. Data on the location of intake points for public aqueducts are not published for public safety reasons.

In general, although water use data is collected, it is available with different limitations and methods depending on region or autonomous province. This affects the possibility of analyzing and using it to validate and improve models.

2. Requirements for data standardization, accessibility and governance

During the session, a clear need emerged regarding homogeneous spatio-temporal data, with well-documented metadata (used instrument, location, aggregation) and in a standard format, applicable to both irrigation and hydroelectric data.

The current fragmentation of data collection, sharing and use in the public administration (PA), often linked to sectoral purposes, is an obstacle that needs to be overcome through legislation and coordinated planning at national and European level. In this regard, it would be useful to establish

a specific PA service, for example a permanent committee supported by research, which promotes shared standards and facilitates the use of data for different purposes, including through the aggregation of data based on the purpose and scale of interest.

As an operational proposal, the participants suggested the development of a protocol for data exchange, which includes a centralized data collection by the PA which makes the data publicly available according to clear rules. The successful experience of sharing meteorological data can serve as a useful case, even though data on withdrawals are not environmental data per se and are therefore not always available or disclosable, except in aggregate form and in ways that should be defined in advance. However, it is necessary to question the PA's ability to manage the amount of data that such a system would entail in terms of human resources and IT skills.

3. Support tools and integrated modelling

A single platform at the basin level could facilitate standardization, monitoring and data sharing. The Eastern Alps District Basin Authority is already working in this direction, seeking to standardize existing information and define sharing levels for different types of data. Despite ongoing efforts, it remains essential to activate projects and investments to enhance data collection, integrate existing models, improve understanding of phenomena and provide accurate basin-scale water balances, which are fundamental for anticipating and supporting the management of crisis situations.

In order to make the various models already used by agencies and universities more effective, it would be useful to adopt an ensemble modelling approach. The Basin Authority already has an ecosystem (Delft-FEWS) that allows anyone to contribute with models, to potentially reduce uncertainty.

Issues such as irrigation and groundwater management are excellent examples of where dialogue can improve. From this perspective, it is appropriate to adopt a modular approach to modelling, with interoperable component models.

4. New data sources and opportunities

Citizen science activities show interesting potential, offering new and numerous data to supplement official data. Greater integration of these alternative data into official systems would be attractive, albeit with the necessity of a careful reliability assessment. Furthermore, there is scope for the use of unconventional data in emergency management, such as civil protection, but the question of what to include and what to exclude, i.e. the validation of data collected by citizens, remains open.

5. Open issues: ownership, security and access

The protection of intellectual and property rights is an important issue that must be guaranteed. A typical example is that of studies already conducted that cannot be shared without the owners authorization. In some cases, restrictions on access to data are justified on security grounds, as in the case of location data for drinking water supply sources.



4.2 Multi-risk assessment and management at basin level

1. Risk communication, behaviour and education

Risk communication is still largely overlooked and fragmented: although essential, it is often treated as a marginal issue, without adequate resources and tools.

Furthermore, the lack of widespread behavioral rules in the event of an emergency (floods) was highlighted. For example, many people continue to try to save objects or cars even in dangerous conditions. This situation is further complicated in the case of people passing through the area, such as tourists, who need adequate information on the procedures to follow in the event of an emergency. Some participants in the session introduced the concept of a “risk community”, which goes beyond the local community and would require greater shared awareness and an active citizen role.

The participants emphasized that cultural change is a slow process, while the adaptation required by climate change is extremely rapid, creating a dangerous misalignment. Furthermore, cultural change must involve all people at different levels: administrators, technicians, citizens, tourists and the research community.

2. Fragmented governance and the need for systemic coordination

Water resource management in the basin is currently characterized by institutional fragmentation, with hydraulic models developed separately in Trentino-Alto Adige, Veneto and by the Basin Authority, without fully shared integration. There is no organic and coherent governance system among all involved. Views are often partial and there is a lack of coordinated long-term action. There is no accurate, instantaneous and coordinated knowledge of the needs of the sectors of agriculture, hydroe-

lectric power, drinking water use during an emergency. This means that water management cannot as yet, be coordinated (e.g. release of water from hydroelectric reservoirs). It is therefore urgent to set up a basin-wide control room involving research, administrations, companies and local communities, with the aim of promoting joint projects and overcoming sectoral approaches.

With regard to joint projects, participants from the public administration expressed their interest in being included as active partners, rather than merely passive recipients of ready-made project proposals. Furthermore, although there is a wealth of technical and scientific knowledge available, there is often a lack of dialogue between different areas. There is no integrated platform or coordination capable of mediating between the various areas of expertise. To this end, it has been proposed that working groups at the basin level should be set up and that regular meetings to promote a shared and continuous vision over time should be organized.

3. Water management, infrastructure and tourist pressure

The tourism sector is putting increasing pressure on the water system, particularly in mountain areas, where facilities are designed for residents and cannot cope with seasonal influxes. Treatment plants are overloaded and the costs of running them are borne by local populations. The shift from mountain to luxury tourism has significantly increased daily water consumption per tourist. This exacerbates issues related to water availability and quality. Furthermore, there are tensions between the intensive use of water by tourism and the perception of residents, who often see the resource exploited and returned in a degraded state.

Technologies for more efficient irrigation (variable flow pivots) are also being developed in the agricultural sector, but their adoption remains limited to farms with investment capacity, increasing territorial inequality.

The collective perception of water remains problematic: it is seen as an unlimited resource, distributed to homes rather than to people, and rarely as a common good to be managed responsibly. There is therefore growing concern that surface waters will become increasingly polluted, partly due to factors that are still little discussed, such as the presence of pharmaceuticals. In the case of impacts on ecosystems, there is therefore concern that these are not sufficiently discussed or represented in legal proceedings.

4. Role of research and operational transfer

Climate change poses new challenges: traditional indicators, based on the assumption of an unchanging situation, are losing their significance. It is therefore necessary to develop updated tools (. new models that take climate change into account when assessing return periods). In particular, vulnerability is evolving rapidly and is often not given sufficient consideration. It has been observed that studies tend to focus more on hazard, because it is more predictable, while vulnerability is linked to faster and more complex dynamics.

Administrations struggle to recognize research as a strategic investment, often only looking five years ahead rather than at the medium to long term, which is incompatible with the speed of climate change. This may be a result of difficulties relating to:

1. knowledge transfer being hindered by language differences between researchers, technicians, and administrators
2. the need for research activities to include questions relevant to local administrations and agencies and which also enhance operational and local dimensions,
3. the need to evaluate research not only on the basis of scientific publications but also on transformative innovation and the practical impact generated (guidelines, operational tools, local projects).

Some institutions are attempting to fill this gap: the Province of Bolzano has established structured partnerships with research institutions (. Eurac Research) to entrust externally strategic activities that administrations are unable to pursue with internal resources alone. The need for shared tools was emphasized and included a list of priorities among research institutions, the identification of pilot areas for experimentation, and the use of successful and replicable case studies.

5. Human resources, organizational capacity and operational priorities

Public and private organizations do not always have adequate human resources to deal with emerging challenges. Despite the need to manage short-term emergencies, climate change also requires a medium- to long-term vision, as such, the adoption of tools for prioritizing activities, based on appropriate time scales and return time analyses was proposed.

The establishment of shared objectives among different stakeholders is a fundamental step in ensuring that the proposed solutions are acceptable, effective and sustainable.

Training, planning and decision-making must be integrated rather than separated, building more cohesive decision-making chains. All stakeholders, whether public or private, technical or academic, must be willing to step outside their comfort zone in order to collaborate more effectively.



4.3 Decision support platforms

1. Tools, current platforms and types of available data

Currently, there are two main categories of digital platforms: 1) those dedicated to data provision and 2) those for decision support. The former are currently more numerous and widely used than the latter. Many of these platforms, despite being initially valid and promising, have been gradually abandoned over time due to a lack of maintenance and the absence of a long-term strategy to ensure their updating and operational sustainability. Local authorities use tools and data mainly for short-term forecasts (weather, alerts, flood management). On the contrary, long-term climate projections are still poorly integrated into decision-making processes. Existing support platforms generally use internal algorithms that process available data and estimate climate impact, communicated through “risk traffic light” systems. However, there is no single, structured and interoperable decision-making system capable of integrating data from different sources. The fragmentation of formats, reference systems and databases is a further obstacle to accessing and effectively using information.

2. Purpose of decision support

Decision support is provided on two main levels:

- Informative level: raising awareness of climate trends and scenarios, while avoiding catastrophic narratives that lead to paralysis.
- Analytical level: providing validated data and credible projections to enable planning and research.

A crucial challenge is to manage uncertainty in climate data (sea level rise) while avoiding rigid communication that fuels resignation.

3. Obstacles and involvement of local actors

One of the main obstacles to the development and adoption of decision support platforms concerns the involvement of local actors and the building of mutual trust between different sectors. In particular, the agricultural sector shows some resistance to digitalization and data sharing, often for fear of examination or losing water use concessions. This is despite the fact that effective tools, such as smart meters and precision farming practices are already available and could promote more efficient use of water resources. To overcome these barriers, it is essential to promote the active involvement of multiple stakeholders, including not only farmers but also entities such as Alperia, irrigation consortia, civil protection agencies and basin authorities, in permanent technical committees dedicated to integrated water resource management. These forums for discussion would help to build trust, promote data transparency and support shared decisions based on verified information.

One successful example cited during the discussion was that of the weather forecasting for extreme events carried out by functional centres. These systems monitor the evolution of the event in real time and provide useful operational information to deal with or prevent emergency situations. The same logic of collaboration, data collection and decision-making anticipation could be extended to slower and more complex processes, such as drought management, moving from emergency management to proactive management based on seasonal forecasts and probabilistic scenarios.

A further limitation concerns institutional and informational fragmentation: data is often distributed among different entities (irrigation consortia, provinces, municipalities, environmental agencies, hydroelectric operators) and produced using heterogeneous methodologies, making it difficult to integrate into a common framework. Public administrations also struggle to capitalize on research activities due to the profound differences in 'reaction time' between public bodies and the world of research. While research advances rapidly, public bodies encounter difficulties in absorbing and implementing the tools developed. It is therefore necessary to maintain lasting connections between research and institutions to prevent project results from remaining confined to the experimental stages.

Finally, insurance companies can play a key role as providers of knowledge and experience in risk management. They often have advanced data, models and tools to assess uncertainty and define probability scenarios and can contribute to the development of more robust decision-making systems. However, as emerged from the discussion, it is necessary to ensure unique, validated and transparent data sources that can prevent the proliferation of divergent estimates and reduce the risk of alarmist messages that can generate catastrophism or resignation among the public.

4. Future vision for an ideal platform

A common problem is that much of the fundamental data (water concessions, actual consumption) is not digitized, up to date or easily accessible. An ideal platform should therefore be based on a common database of standardized data, including both historical and current information, ensuring quality, transparency and interoperability. With regard to future scenarios, it is essential that authoritative and shared sources are used in order to ensure consistency and comparability between different applications and analyses. This could, by example, be presented as a coordinated choice of reference climate scenario (such as *Representative Concentration Pathways* - RCPs) and the inclusion of the results within the platforms, making explicit the uncertainty associated with each scenario.

Political and regulatory coordination is also needed to standardize data and improve interoperability and information exchange between provinces and regions. A case in point is drought risk management, which also requires seasonal-scale data and forecasts for effective planning.

Finally, an ideal platform should integrate interactive and dynamic maps with input and output modules that allow users to choose the models to apply, modify scenarios, simulate decisions and visualise the final impacts, thus promoting a truly participatory and evidence-based approach.



4.4 Governance and climate adaptation in the Adige basin

1. Governance and the role of policy makers

Decision-making is stalled, even when solutions are shared, due to concerns about upsetting specific interests. In addition to this condition, there is a lack of coordination between sectoral plans: the absence of a shared master plan hinders the effectiveness of planning tools. SEA (Strategic Environmental Assessment) and other planning tools can promote dialogue between categories and the integration of environmental and social visions, but they must be systematized in order to address future challenges and be truly effective. Furthermore, the complexity of these tools must be translated into understandable language that serves to promote awareness and citizen participation.

2. Multidisciplinarity and integration of skills

Addressing contemporary challenges requires a humanistic and systemic approach: technology alone is not enough, but must be integrated with social, cultural and environmental skills. However, the various actors involved (such as technical officials, local community leaders and policy makers) communicate little with each other, highlighting the need for a new governance interface between the different categories.

The complexity of the issues requires adequate training and effective communication tools capable of simplifying without losing information. Research suffers from ideological polarization between infrastructure-based and *nature-based solutions*, leaving little room for hybrid and contextual approaches. In this context, European projects should be exploited to create lasting networks, overcoming the logic of projects as an end in themselves.

In some areas, the implementation of an integrated water system (IWS) is still lacking or inefficient.

However, publicly owned companies involved in water management, such as Alperia and Dolomiti Energia, have demonstrated, in complex situations such as that of summer 2022, that it is possible to combine economic objectives with environmental and social ones. In this scenario, it is becoming urgent to involve the agricultural sector more closely, promoting the use of consortia and reviewing irrigation concessions that are not very functional in order to better manage irrigation.

3. Water resource management and use

The management of hydroelectric concessions and reservoirs requires compensation and shared planning tools that are capable of taking into account multiple uses and economic and environmental impacts. As demonstrated during extreme events (Storm Vaia), dams play a strategic role in risk mitigation, but they must be redesigned to be adaptive and sustainable.

Knowledge of water resources is still fragmented: there is a lack of up-to-date data on water balance and groundwater, making effective management difficult. It is necessary to recognize the value of water not only as an economic resource, but as a multifunctional common good, promoting cultural change.

Reservoirs can serve a variety of purposes, from energy production to flood control and tourism, and must be managed in a flexible, integrated and sustainable manner. Water purification and reuse also offer concrete opportunities for adaptation, but it is essential to take action in normal times, not just in emergencies.

Finally, there is an urgent need to develop a groundwater monitoring network and governance based on shared predictive data to ensure informed and resilient water resource management.

4. Adaptation, prevention and resilience

Acting "in peacetime" is essential: prevention requires advance planning, collaboration between sectors and experimentation with innovative solutions, such as wastewater reuse and leak reduction. At the same time, it is essential to optimize consumption, particularly in the agricultural and industrial sectors (smart irrigation, green hydrogen) as well as reducing waste and promoting consortium models.

The lack of shared archives on past water events limits the ability to learn from the past, while the disappearance of glaciers requires the development of new adaptation scenarios. Existing technical strategies must be integrated, funded and monitored more effectively to ensure a coherent and lasting response to future water challenges.

5. Environmental vision and the relationship between humans and nature

Overcoming anthropocentrism is essential to rethinking the relationship between humans and nature, restoring greater freedom to rivers and enhancing resilient ecosystems. Water has a direct impact on public health, and, strengthening the link between environmental and health policies can help raise awareness among citizens and decision-makers.

Water management is often unbalanced: quantity is prioritized over quality, despite the fact that the latter has a direct impact on the environment and human well-being. A rebalancing of research and policies is needed. In addition, it is necessary to promote environmental justice that guarantees equitable access to water, compensation systems and shared responsibility, directing the use of the resource towards the common good.



4.5 Water quality, biodiversity and the health of river ecosystems

1. Priority pressures on river ecosystems belonging to the Adige river basin

Climate change and the associated effects such as rising temperatures, melting glaciers and more frequent extreme events are profoundly altering the hydrological regimes of the Adige river. Floods and droughts exacerbate existing pressures and interventions such as rectifications, embankments and canalization have made the watercourse increasingly artificial, reducing its connection with surrounding ecosystems, impoverishing the species habitat and hindering the free movement of sediments and species.

The management of hydroelectric power plants contributes to peaks in turbidity, deoxygenation and alterations in flow rates. Added to this is the growing presence of emerging pollutants, such as microplastics, heavy metals (nickel) and chemicals of agricultural origin, such as pesticides and fertilizers, or those of urban origin, which partly escape traditional purification methods and compromise water quality. Finally, the spread of alien species competing with native species and altering the dynamics of river ecosystems is also altering the river's ecological balance.

2. Governance and planning: critical issues and opportunities

Although planning tools such as river management plans and river contracts exist, their implementation is often hampered by bureaucratic delays, lack of funds and poor operational coordination, with significant disparities within the same basin. Management decisions still tend to favor economic exploitation, for example in relation to agriculture and hydroelectric power, to the detriment of an integrated and sustainable vision of the river as an ecosystem and hydroelectric

power, to the detriment of an integrated and sustainable vision of the river as an ecosystem. Administrative fragmentation, with numerous agencies and decision-making levels, makes coordinated management difficult, increasing the risk of inefficiencies and decisions that lack synergy. Despite the availability of a large amount of environmental data, this data is often difficult to access or understand and is not always comparable for stakeholders and the public, limiting participation and collective awareness.

Truly effective management must take place at the basin level, considering ecological connections and water flows from source to mouth. In this context, it is essential to strengthen the bottom-up approach, supported by political strategies and environmental education programmes based on shared values, in order to improve dialogue with citizens and the effectiveness of decisions.

3. Monitoring and environmental assessment tools

The bodies responsible for environmental monitoring already collect a large amount of data, but this is often used in a disjointed manner and is poorly integrated into long-term planning. Official biological indices, such as STAR_ICMi which are required by current regulations, do not always capture the functional complexity of river ecosystems.

The creation of a network of river basins, including in cross-border contexts, would facilitate the sharing of tools, methodologies and best practices, promoting sustainable and coordinated water resource management. There is also an urgent need to develop updated protocols for the systematic monitoring of emerging contaminants, such as microplastics, new-generation pesticides and heavy metals, and to assess their effects on ecosystems.

Finally, long-term monitoring is needed to understand the cumulative effect of restoration and redevelopment interventions, and to plan them more effectively and consistently.

4. Future development points

In order to implement the plans that have already been approved, it is necessary to overcome administrative obstacles and allocate adequate resources to ecological interventions. Even specific actions on secondary tributaries or riparian areas can contribute significantly to improving the river system, provided that they are planned in an integrated manner at the basin level.

The fees for the “environmental fund” deriving from hydroelectric concessions and intended to support redevelopment and protection of the territory should have clearer spending rules designed to support ecological restoration projects exclusively. New concessions for large hydroelectric diversions represent an opportunity to introduce rules more geared towards protecting the overall functionality of rivers.

Educating and involving citizens, schools and local communities strengthens shared and sustainable management, raises awareness and sensitivity, and creates a direct link between river protection and quality of life. Integrated water resource management should focus on ecological functionality, overcoming fragmented and conflicting approaches, in order to build a collective vision capable of combining environmental protection, territorial development and social well-being in the long term.

5

Future prospects and priority actions

This section outlines the main future challenges and possible strategies for improving water management that emerged during the discussions at the Adige Water Fair, both during the plenary sessions and within the thematic sessions. The following figures summarize the outcome of these discussions. In fact, all discussions highlighted the need to increase and improve inter-institutional exchange in order to fully involve stakeholders in water management processes. Figure 2 shows actions to enhance exchanges, both between public administrations

(periodic workshops, formalization of public-private partnerships) and between researchers (through shared projects or informal specialist meetings) in order to link the needs of the territory even more closely to scientific activities. An increase in exchanges, together with greater awareness of water use by certain sectors (residents and tourists) could help to outline a shared vision of the community for achieving better management, especially during conditions of water scarcity.

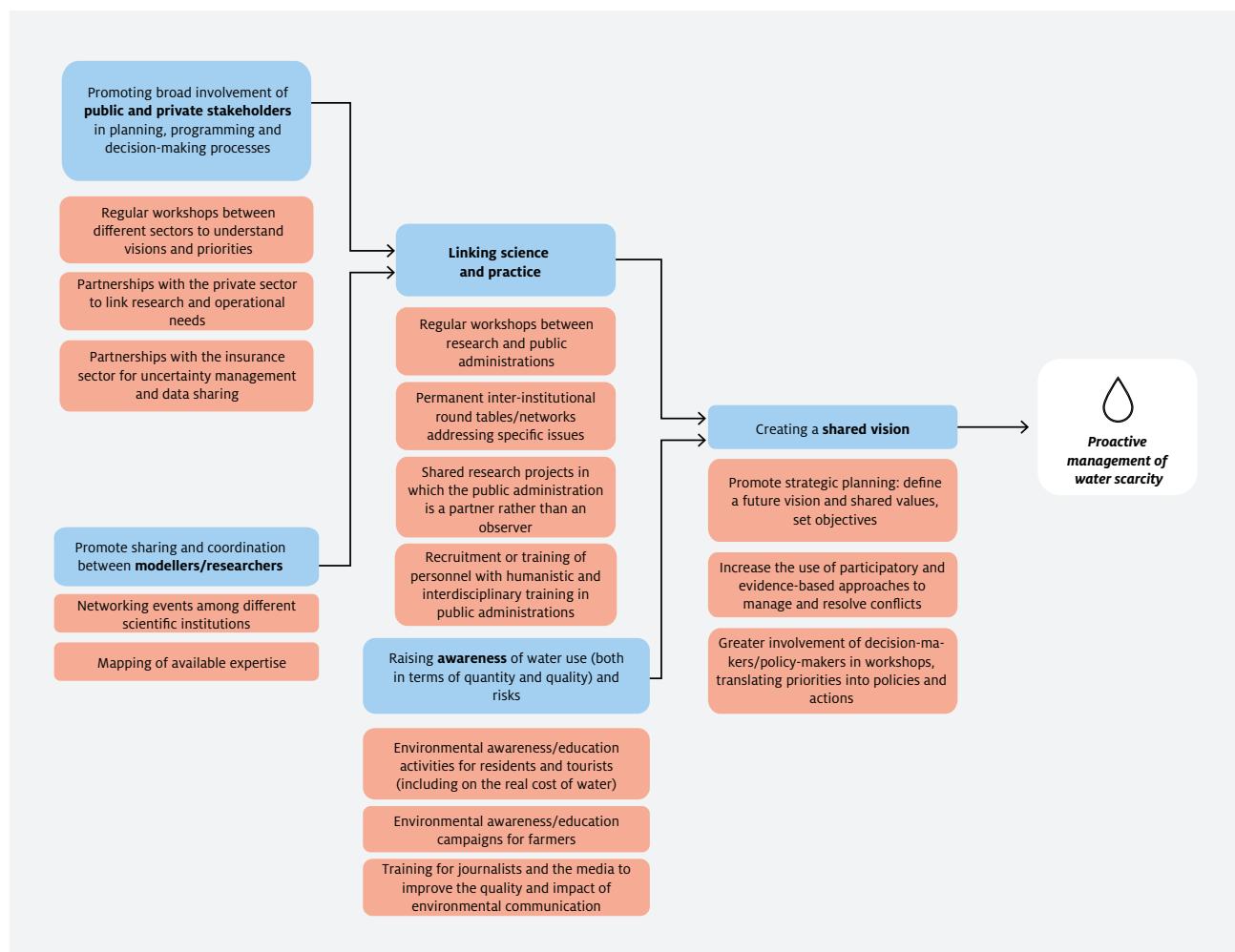


Figure 2: Challenges (blue boxes) and possible actions to be taken (red boxes) to promote better institutional coordination and interaction between stakeholders

Another recurring theme in all discussions was the difficulty of accessing or standardizing data and the need to better coordinate the application of existing models for analysing biophysical and socio-economic processes related to water availability and demand (Figure 3). Four main challenges were identified:

- Implementation of water quality and quantity monitoring systems
- sharing of data on water use by key institutions,
- improvement of multi-model hydrological analyses,
- modelling of climate and socio-economic changes.

To address these challenges, several actions have been identified, including the adoption of new indicators to better describe the ecological and functional conditions of ecosystems, the systematic collection of data on the impact of drought, the standardization and sharing of data on water use in different sectors, the mapping of all hydrological models applied to the entire Adige basin, and the integration of socio-economic projections, especially for the analysis of future vulnerabilities.

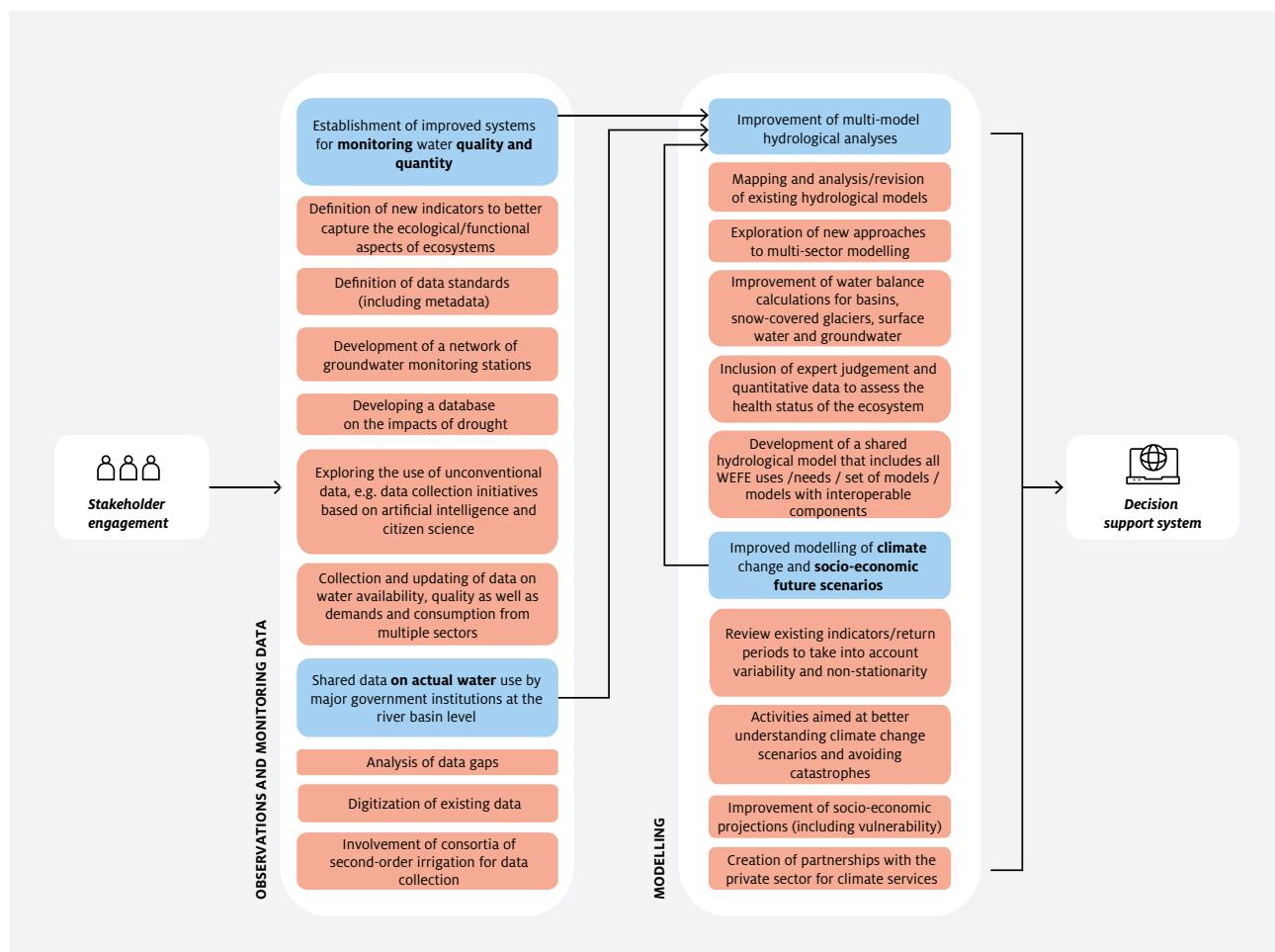


Figure 3: Challenges (blue boxes) and possible actions to be taken (red boxes) to improve existing shortcomings in terms of data and process modelling

The various discussions highlighted the need for greater active involvement of stakeholders, including for the purpose of developing decision support systems (Figure 4). The need to work on creating a shared, multifunctional platform that integrates data from field measurements, the results of various hydrological and hydraulic models, and future climate and socio-economic scenarios was also emphasized.

To achieve this, it is important to promote data sharing between institutions at a basin level at the political level as well as overcoming privacy issues through the management of the platform by a public authority. The ultimate goal is proactive management, for example in the case of drought, based on reliable data, shared decision-making tools and inter-institutional cooperation.

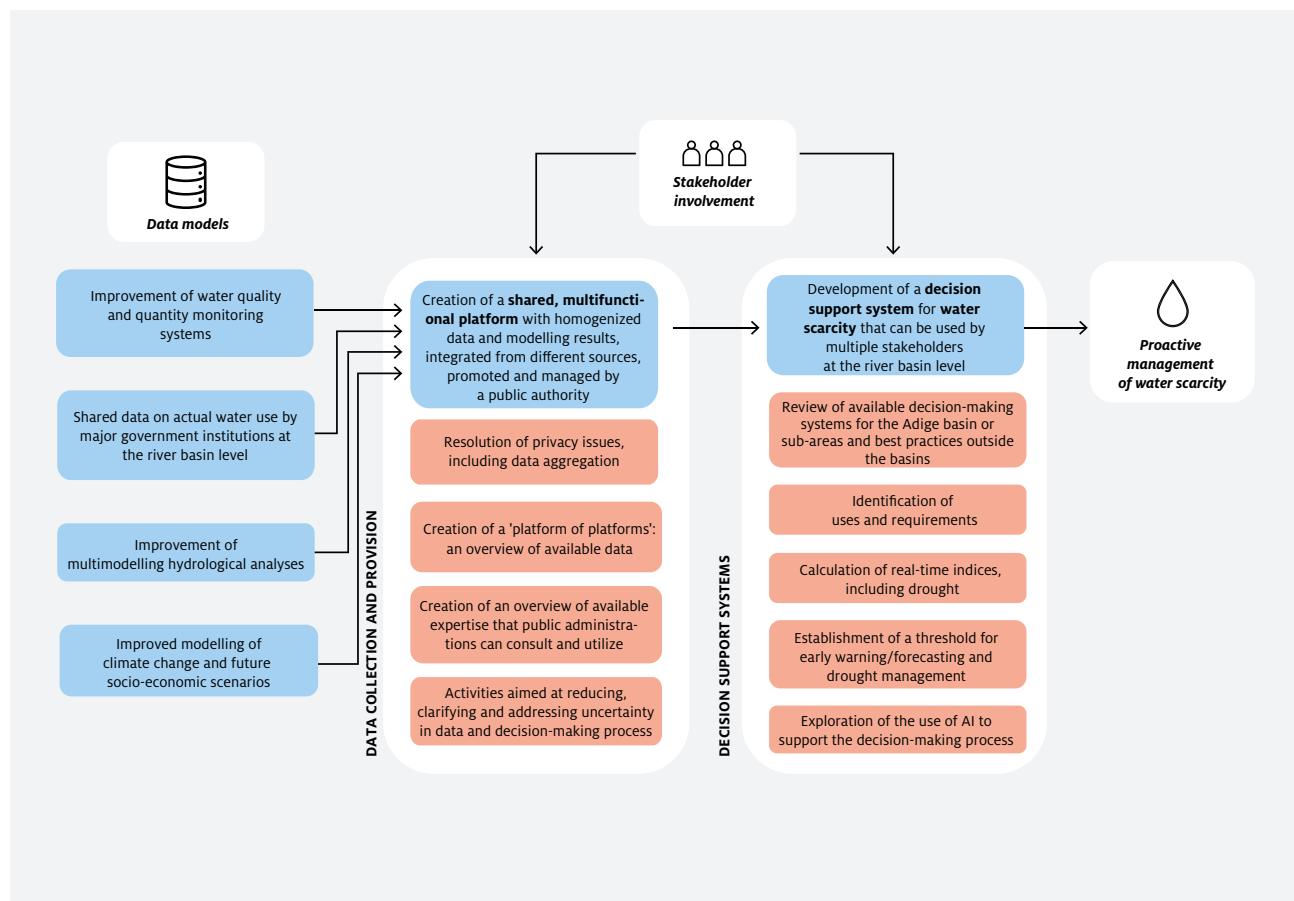


Figure 4: Challenges (blue boxes) and possible actions (red boxes) to improve the use and sharing of common data and models through a single platform

On the topic of water scarcity risk management (Figure 5), the discussion highlighted stakeholder involvement, the adaptation of public policies and the integration of data and models. The importance of understanding decision-making mechanisms through the mapping of existing policies in the water-energy-food-and-ecosystems sectors was also emphasized.

The adoption of a multi-risk perspective emerged as a central element, with the transfer of existing good practices for flood risk management to water scarcity risk, experimenting with cross-sectoral solutions and assessing cascading impacts.

The need to improve decision-making in situations of water scarcity was emphasized, leveraging the Permanent

Observatory on Water Use and valuing ecosystem services in order to raise awareness of the importance of water as a common good and a vital element.

Furthermore, topics that emerged concerned the adaptation of public administrations to potential challenges, including interdisciplinary staff training, the revision of planning tools such as Strategic Environmental Assessment, and the adoption of preventive measures in spatial planning. Finally, the need to conduct shared post-emergency debriefing activities and to integrate environmental assessments focused on ecosystem functionality was also highlighted.

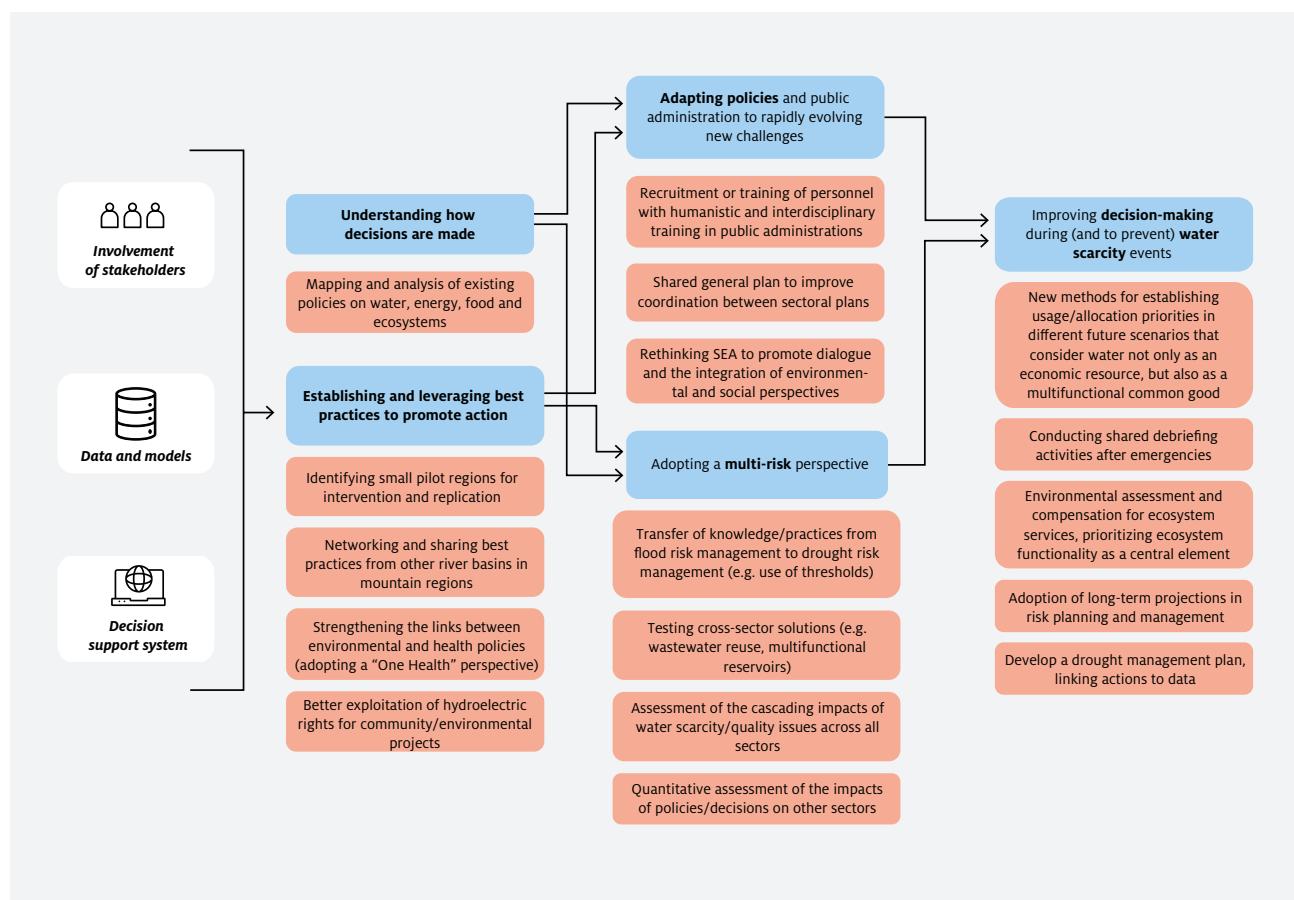


Figure 5: Challenges (blue boxes) and possible actions (red boxes) to improve drought risk management

6

Conclusions

The Adige Water Fair provided a new forum for discussion on existing critical issues and the actions needed for sustainable water management in the Adige river basin. On this occasion, for the first time, 132 people, including experts, researchers, industry professionals, representatives of institutions and trade associations from across the Adige river basin, came together in a multidisciplinary setting, helping to create a sense of community around shared water management. The various discussions that took place in plenary and thematic sessions highlighted many challenges. In particular, those related to the availability and quality of water data and the heterogeneity of the models used, which does not facilitate comparisons and interactions. The need to work with consistent spatial-temporal data, making it accessible to all relevant sectors, to promote shared and more efficient data governance it was also highlighted that existing digital platforms are often fragmented, poorly updated and not integrated into long-term decision-making processes. A shared platform, based on standardized and accessible data, capable of managing climate uncertainty and supporting operational scenarios would be needed. When creating these tools, the involvement of local actors would be essential to ensure trust, effectiveness and sustainability. The fragmentation of governance and lack of systemic coordination was also identified as an obstacle to effective and shared risk management. The urgent need to strengthen risk communication and environmental education was highlighted and a solution could be to involve citizens and tourists in a “risk community” approach in order to raise awareness. The role of research and local expertise should be enhanced by promoting operational tools, adaptive models and long-term planning capable of making shared strategic decisions. It would be advantageous to promote a multidisciplinary approach that values technical, social and environmental expertise and encourages dialogue between public and private actors. It was emphasized that the river ecosystems of the Adige basin are under increasing pressure, exacerbated by climate change, emerging pollutants and ecological fragmentation. Governance relating to water quality has also been found to be uneven and poorly coordinated, hindering effective planning and integrated management at the basin level. To address these challenges in the future,



participants pointed to the need for up-to-date monitoring tools, concrete actions and, above all, a shared vision in order to enhance the river as a common good.

At the end of the two-day event, the idea to make the Adige Water Fair a recurring event every 3 or 4 years was proposed. In this way, the event would consolidate the exchanges of the first edition, enriching them with feedback from new projects in progress without aggravating the logistical and organizational aspects of having to make the event too frequent.

Several institutions voiced their willingness to participate in the organization of a new edition of the event. These entities include the Regional Agency for Environmental Prevention and Protection of Veneto, the University of Bolzano and EcoResearch of Bolzano. This possibility will be discussed at the next meeting of the Adige Water Fair. This possibility will be discussed further in the coming months through bilateral meetings between Eurac Research and the institutions that have expressed interest. In addition, updates and news about the Adige Water Fair will be posted on the existing page currently hosted on the Eurac Research website (<https://www.eurac.edu/en/institutes-centers/cen-ter-for-climate-change-and-transformation/news-events/adige-water-fair>).

For further information or expressions of interest, please contact Stefano Terzi (stefano.terzi@eurac.edu) or Silvia Cocuccioni (silvia.cocuccioni@eurac.edu).

7

Appendices

Event agenda

Day 1

19.05.2025

Eurac Research, Auditorium and seminar rooms

12.00–13.00	Registration and lunch
13.00–13.30	Conference opening
13.30–15.00	Round table with experts (Eastern Alps Basin Authority, Autonomous Provinces of Bolzano and Trento, and Veneto Region)
15.00–16.00	Coffee break and poster session
16.00–18.00	Parallel thematic sessions
18.15–19.00	Summary and conclusion of the first day
19.30	Dinner at Eurac Research

Day 2

20.05.2025

Eurac Research, Auditorium and seminar rooms

08.45–09.00	Introduction to the second day
09.00–09.30	Presentation by Maria Rusca (researcher at the University of Manchester)
09.30–10.30	Presentation by Massimo Bastiani (coordinator of the National River Contracts Committee)
10.00–10.30	Coffee break and poster session
10.30–12.30	Parallel thematic sessions
12.30–14.00	Lunch
14.00–15.30	Summary of thematic sessions and conclusion
15.30–16.30	Walk along the Talvera with explanation of renaturalization measures

Participants and affiliated organizations

#	First name	Surname	Affiliation
1	Andreoli	Andrea	Free University of Bolzano-Bozen
2	Areggi	Giulia	Veneto Region
3	Argentin	Anne-Laure	Free University of Bolzano-Bozen
4	Bartolini	Matteo	Alperia SpA
5	Bastiani	Massimo	National River Contracts Table
6	Battistel	Gian Antonio	Edmund Mach Foundation
7	Battisti	Giorgio	Alperia SpA
8	Bellin	Alberto	University of Trento
9	Bertoldi	Giacomo	Eurac Research
10	Bertuzzi	Ermanno	Autonomous Province of Trento - APRIE - Water and Energy Resource Management Service
11	Borga	Marco	University of Padua
12	Boscolo	Paolo	Veneto Regional Agency for Environmental Prevention and Protection (ARPAV)
13	Bottarin	Roberta	Eurac Research
14	Bozzoli	Michele	Eurac Research
15	Bracchetti	Monika	Ecocenter
16	Brambilla	Micol	Patscheider&partner
17	Brighenti	Stefano	Eco Research
18	Caceffo	Daniele	Generali Italia SpA
19	Campalani	Piero	Eurac Research
20	Carletti	Giacomo	Acquevenete SpA
21	Carnelli	Fabio	Eurac Research
22	Carra	Luca	Zadig
23	Casagrande	Samuele	Ca' Foscari University / CMCC
24	Castelli	Mariapina	Eurac Research
25	Cocuccioni	Silvia	Eurac Research
26	Colaizzi	Marina	Eastern Alps District Basin Authority

27	Colombarini	Ester	Hydrodata
28	Comiti	Francesco	University of Padua
29	Contrini	Antonella	Autonomous Province of Trento
30	Costantini	Sarah	Veneto Region
31	Cremonese	Silvia Maria	ARPA Veneto
32	Curtarello	Marina	Veneto Region
33	Dalla Libera	Nico	Eastern Alps District Basin Authority
34	Dall'Amico	Matteo	Waterjade
35	D'Alonzo	Valentina	Eurac Research
36	De Fanti	Barbara	Veneto Region
37	De Sabbata	Alessandro	VENETO REGION - Directorate for Territorial Offices for Hydrogeological Instability
38	Dinale	Roberto	Civil Protection Agency – Autonomous Province of Bolzano
39	Egarter Vigl	Lukas	Eurac Research
40	Egger	Florian	Provincial Federation of Land Reclamation, Irrigation and Land Improvement Consortia
41	Eisenstecken	Bruno	Ecocenter
42	Ferrari	Marika	Autonomous Province of Trento - APRIE - Research and Planning Department
43	Ferrario	Iacopo	Eurac Research
44	Ferrario	Marco	Marco Ferrario Photography
45	Festi	Alex	South Tyrol Fishing Association - South Tyrol Fishing Union
46	Festi	Nicola	Provincial Federation of Irrigation and Land Improvement Consortia
47	Franzinelli	Alessio	Dolomiti Energia Group
48	Formetta	Giuseppe	University of Trento
49	Furlanetto	Jacopo	CMCC
50	Galletti	Andrea	Eurac Research
51	Gallmetzer	Willigis	Civil Protection Agency – Autonomous Province of Bolzano
52	Garziera	Silvia	Viacqua SpA
53	Ghetta	Stefan	Civil Protection Agency – Autonomous Province of Bolzano
54	Hecher	Peter	Civil Protection Agency – Autonomous Province of Bolzano
55	Jacob	Alexander	Eurac Research
56	Kofler	Christian	Civil Protection Agency – Autonomous Province of Bolzano
57	Kuntz	Marianne	South Tyrolean Farmers' Union

58	Labella Fonseca	Heloisa	Ca' Foscari University / CMCC
59	Laghetto	Giacomo	Etifor Valuing Nature
60	Largaiolli	Gabriella	Office for Sustainable Water Resource Management - Autonomous Province of Bolzano
61	Larsen	Stefano	Edmund Mach Foundation
62	Lencioni	Valeria	Science Museum
63	Leonardelli	Irene	Global Network of Water Museums
64	Luchi	Rossella	Hydrodata
65	Lucianetti	Giorgia	ARPA Veneto
66	Macconi	Pierpaolo	Civil Protection Agency – Autonomous Province of Bolzano
67	Maestri	Andrea	Acquevenete SpA
68	Magna-guagno	Luigi	Dolomiti Energia Group
69	Maino	Federica	Eurac Research
70	Mair	Karl	Eco centre spa
71	Majone	Bruno	University of Trento
72	Mantovani	Diego	Civil Protection Agency – Autonomous Province of Bolzano
73	Marangoni	Nicola	Civil Protection Agency – Autonomous Province of Bolzano
74	Mareso	Chiara	Eco centre spa
75	Maron	Matteo	Veneto region
76	Marsoner	Thomas	Eurac Research
77	Masina	Marinella	Ca' Foscari University / CMCC
78	Melus	Ana	Eco centre spa
79	Micheletti	Stefano	ARPA Veneto
80	Moroni	Agnese	Eurac Research
81	Nave	Swanny	Passer-Eisackmündung Land Improvement Consortium
82	Negri	Paolo	Provincial Agency for Environmental Protection - APPA Trento
83	Nguyen	Diep	Ca' Foscari University / CMCC
84	Nicoli	Lorenzo	Freelancer - Head of General Experts Italy
85	Niedermair	Gottfried	Valle Venosta Land Reclamation Consortium
86	Notarnicola	Claudia	Eurac Research
87	Omizzolo	Andrea	Eurac Research
88	Osti	Giorgio	University of Padua

89	Pedoth	Lydia	Eurac Research
90	Persichetti	Antonio	Archetipo
91	Pescaroli	Gianluca	University College London
92	Pirazzini	Massimo	Generali Insurance
93	Pitscheider	Felix	Free University of Bolzano-Bozen
94	Pittore	Massimiliano	Eurac Research
95	Poli	Meris	Eco centre spa
96	Pomella	Alessandra	Eurac Research
97	Renner	Kathrin	Eurac Research
98	Righetti	Maurizio	Free University of Bozen-Bolzano
99	Rigotti	Sandro	Autonomous Province of Trento
100	Rizzi	Giuliano	Autonomous Province of Trento
101	Robbiati	Giorgia	Consortium of Municipalities B.I.M. Sarca Mincio Garda
102	Romanin	Elisa	Water Analysis and Chromatography Laboratory – Autonomous Province of Bolzano
103	Ruffini	Flavio	Provincial Agency for the Environment and Climate Protection – Autonomous Province of Bolzano
104	Rusca	Maria	University of Manchester
105	Saibanti	Serenella	Autonomous Province of Trento
106	Serra	Giorgio	Piave Services
107	Siligardi	Maurizio	Freelancer
108	Sparber	Karin	Water Protection Office – Autonomous Province of Bolzano
109	Sperotto	Anna	Ca' Foscari University / CMCC
110	Strazzabosco	Fabio	ARPA Veneto
111	Tamburini	Marco	Italian Alpine Club South Tyrol
112	Terzi	Stefano	Eurac Research
113	Tessarollo	Alessandra	Veneto Region - Civil Engineering Unit of Rovigo
114	Tocchella	Filippo	Generali Insurance
115	Turri	Francesco	Alperia Trading
116	Vallefouoco	Francesca	Eurac Research
117	Vidoni	Antonella	Autonomous Province of Bolzano
118	Vidoni	Barbara	Autonomous Province of Bolzano
119	Villgrattner	Armin	Federation of Consortia Bolzano
120	Vinciguerra	Domenico	Veneto Region

121	Vogt	Mathilda	Ca' Foscari University / CMCC
122	Volcan	Mohane	Sustainable Water Resources Management Office - Autonomous Province of Bolzano
123	Volponi	Chiara	Alpine Convention
124	Vorhauser	Samuel	Autonomous Province of Bolzano
125	Zambon	Filippo	Autonomous Province of Trento
126	Zanette	Piero	Acque Risorgive Land Reclamation Consortium
127	Zaramella	Mattia	Inside Climate Service
128	Zebisch	Marc	Eurac Research
129	Zennaro	Barbara	Eurac Research
130	Zoeggeler	Stephan	Alperia Trading Ltd.
131	Zolezzi	Guido	University of Trento
132	Zorzi	Nadia	Autonomous Province of Trento

Pitch talks

Name	Title	Presentation session
Anne-Laure Argentin	Modelling of background solid transport under climate change conditions	Data and models for estimating water availability and demand
Giuseppe Formetta	Natural Hazard and Risk Assessment in the Adige River Basin Using a Hydrological Digital Twin	
Matteo Dall'Amico	Digital Solutions for the optimisation of water abstraction	
Gianluca Pescaroli	Are satellite technologies (EO) really making a difference in risk management?	Multi-risk assessment and management at basin scale
Jacopo Furnaletto	Use of satellite data to improve multi-risk assessments in the agricultural sector due to drought and heat waves in the Adige Basin	
Piero Campalani	The X-RISK-CC WebGIS: An interactive platform for mapping current and future climate extremes in the Alps	
Marco Tamburini	Acqua Sorgente, a CAI Citizen Science project for monitoring water sources in mountain environments	Decision support platforms
Silvia Cocuccioni	NExus Policy Assessment Tool (NEPAT)	
Marika Ferrari	Main objectives and tools related to water: a historical overview	
Agnese Moroni	Beyond snow: winter tourism and water resources in the face of climate change	
Giorgio Osti	Water governance, between integration needs and subsidiary pressures	Governance and climate adaptation impacts in the Adige basin
Fabio Carnelli	A roadmap for water governance in the Adige basin	
Silvia Garziera	LIFE Blue Turnaround: voluntary credit system to promote water saving and conservation	
Giorgia Robbiati	Participatory and multi-stakeholder approaches for adaptive water resource management in a context of climate change	

Alex Festi	Fish biomass in the Adige River - An overlooked indicator!	Water quality, biodiversity and the health of river ecosystems
Giacomo Laghetto	Integrated water and biodiversity management in water services: a pilot project from the 'nearby' Medio Brenta	
Stefano Larsen	Stakeholder perspectives on riparian zones in Europe: shared views and regional contrasts	
Mathilda Vogt	Machine learning to support the analysis of climate change impacts on water resource quality	
Samuele Casagrande	Interaction between land use and surface water quality in Italian river basins	

Posters

#	Name	Title
P1	Giuseppe Formetta	Natural Hazard and Risk Assessment in the Adige River Basin Using a Hydrological Digital Twin
P2	Giorgio Serra	The Data Clime platform – Climate risk assessment
P3	Heloisa Labela Fonseca	Impact Chain Approach to Understand Hot and Dry Risks in the Adige Basin
P4	Marinella Masina	Droughts and heat waves in the Adige River basin and adjacent plains over the last few decades
P5	Michele Bozzoli	Evaluation of modelling and satellite products for snow estimation in the Val Venosta basin
P6	Andrea Galletti	Classification of hydrological drought in the South Tyrol river basin
P7	Rossella Luchi	AIFA LT - Advanced inflow forecast algorithm (long term module)
P8	Guido Zolezzi	Changes in the course of the Adige River (Eastern Italian Alps) over the last 1000 years and identification of the historical river corridor
P9	Giacomo Bertoldi	Snow assimilation for modelling the Noce River
P10	Alexander Jacob	Alpine Drought Observatory
P11	Alessandra Pomella	Progress on drought impact data collection for the Italian Alps through textual data collection and analysis
P12	Roberta Bottarin	Assessing the effects of external drivers on water quality, biodiversity and ecosystem functions in the Vinschgau Valley
P13	Diep Nguyen	Water Quality and Climate Change in Veneto: An AI Analysis in Support of the Water Framework Directive
P14	Francesca Vallefuoco	PlasticFree: Cross-sectional study for the identification and reduction of microplastics in freshwater ecosystems in South Tyrol
P15	Federica Maino	Laboratory of the future, Strategy for adaptation to climate change – South Tyrol
P16	Andrea Omizzolo	Communities and tourist destinations at medium-low altitudes: less and less snow and less and less water. Reflections from the Alpine Space project 'BeyondSnow'

Questionnaire results

During the last plenary session of the Adige Water Fair, a link to a live questionnaire was shared to gather feedback on the event. Fifty-five out of a total of 132 participants responded, many had already left prior to the last session.

The vast majority of participants answered in the affirmative to the question of whether they would recommend the Adige Water Fair to others: 50 answered with a yes, while 5 answered 'with an I don't know and none answered with a no. This indicates a very high level of satisfaction and a good overall perception of the event. Among the 55 participants who responded, the majority said they would be willing to participate in the Adige Water Fair again, with 41 positive responses, 12 uncertain and only 1 negative, confirming their interest and motivation to participate in future editions.

Most appreciated aspects

The comments highlight the most appreciated aspects of the Adige Water Fair: the discussion and exchange between multiple actors from different fields and disciplines and well as the opportunity for networking. Many emphasized the value of the thematic sessions and round tables which encouraged interaction in addition to the sharing of ideas and experiences, and listening to different perspectives. The organization, the high level of participation, the sense of community created and the transdisciplinary and collaborative approach within the Adige basin were also appreciated. These are aspects to be repeated and enhanced in future editions of the Adige Water Fair.

Suggestions for improvement

The suggestions for improvement for the Adige Water Fair mainly concern three aspects:

1. **Political and institutional involvement:** many participants would like to see greater involvement and active participation from politicians, public decision-makers, local administrators and representatives from key sectors such as agriculture, tourism and skiing.
2. **Structure and content of sessions:** discussions should be less generic and more focused on concrete cases, practical solutions and issues that will be relevant in the coming years; more parallel sessions and thematic breakout sessions should be offered, to allow participants to follow more topics and explore them in greater depth with facilitated subgroups.
3. **Networking and organization:** suggestions include encouraging even more interaction (posters near coffee breaks, small group work sessions, lists of participating organizations), enriching the event with international guests and specialist lectures, and taking care of practical aspects such as logistics and hospitality.

These are aspects to be taken into consideration and improved upon in future editions of the event.

Acknowledgements

The authors of this document would like to thank the experts who participated in the round table discussion for their availability and participation: Marina Colaizzi from the Eastern Alps Basin Authority, Sandro Rigotti from the Provincial Agency for Water Resources and Energy of the Autonomous Province of Trento, Flavio Ruffini from the Provincial Agency for the Environment and Climate Protection of the Autonomous Province of Bolzano, and Fabio Strazzabosco from the Agency for Environmental Protection and Prevention of the Veneto Region. We would also like to thank Luca Carra of Scienza in Rete for moderating the round table and participating in the event. In addition, thanks also go to Maria Rusca of the University of Manchester and Massimo Bastiani of the National River Contracts Table for their presentations on the second day of the Adige Water Fair.

Special thanks go to the various projects that funded the event and made it possible, including Eurac Research, the Euro-Mediterranean Centre on Climate Change and Ca' Foscari University of Venice. We would like to thank Manuela Bernardi and Alessio Tardivo from the Centre for Climate Change and Transformation at Eurac Research, all the moderators of the various thematic sessions, and the Meeting Management and Communication departments at Eurac Research, who provided administrative and logistical support. We would also like to thank Peter Hecher and Caterina Ghiraldo from the Provincial Functional Office of the Autonomous Province of Bolzano for accompanying the participants on the walk along the banks of the Talvera River and carefully explaining the renaturalisation measures despite the adverse weather conditions.

Thanks also go to Roland Psenner, President of Eurac Research, and Roberta Bottarin, Deputy Director, for their institutional greetings at the opening of the event, which helped to highlight its scientific and territorial value.

Finally, our heartfelt thanks go to all the participants and their respective organizations, whose active presence and contribution to the discussions made the Adige Water Fair an opportunity for genuine and constructive dialogue.

Co-organisers



Università
Ca'Foscari
Venezia

Projects that supported the event



A-DROP



BeyondSnow



