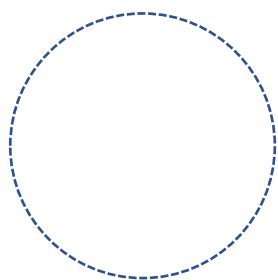




EUSALP EU STRATEGY FOR THE ALPINE REGION

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CROSS-CUTTING PRIORITY #3

The presented Input paper is the result of the work of the EUSALP Task Force *Promoting A Joint Water Management Transition*

MIND THE GAP IN WATER MANAGEMENT

A qualitative evaluation of gaps and needs in the implementation of the Water Framework and Floods Directives at project scale in the Alpine macroregion

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ACTION GROUPS INVOLVED: AG1, AG2, AG5, AG6, AG7, AG8

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SUMMARY

Commonly referred to as Europe's "water tower", the Alps, together with the surrounding mountain massifs, provide fresh water to vast downstream areas and support essential services, such as drinking water supply, agriculture and energy production. However, Alpine waters are increasingly threatened by the impact of climate change, excessive use and poor management, requiring urgent action to safeguard their resilience and protect local communities and ecosystems.

The current analysis is drawn on the results of a quantitative survey of 23 ongoing projects funded by Interreg programmes across the Alpine macroregion dealing with water issues and investigates whether and how the projects address the main challenges raised by the *7th Implementation Report of the Water Framework Directive (WFD) and Floods Directive (FD)*.

The results reveal that projects generally contribute to implementing the recommendations emphasised by the report. However, while current projects largely support action for better governance and transboundary cooperation, efforts to tackle diffuse pollution, improve data sharing, and enhance ecological flows remain insufficient, due to short project timelines, inconsistent data standards, and fragmented institutional frameworks.

Although the WFD incorporates the key principles of integrated water resources management (IWRM), the analysis recalls the need for consistent governance at all institutional levels and stronger coordination between key national and regional actors to enable effective cooperation and overcome opposition from interest groups while gaining their support. Furthermore, the analysis highlights that effective cooperation is essential not only to coordinate decision-making processes, but also for improving data exchange mechanisms to support effective and evidence-based decision-making and action.

EUSALP, with its unique ability to connect metropolitan, peri-mountain and mountain areas, often linked by the same water basins, can play a crucial role in encouraging interregional collaboration and scaling up the results of successful projects, promoting not only a deeper sense of ownership of the implementation of the WFD and FD, but also acknowledging existing initiative at local, regional and national level with their respective challenges and achievements.

1. Introduction

The Alpine region represents a crucial natural asset for Europe, delivering essential ecosystem services that extend well beyond their geographical range. Commonly referred to as "*Europe's water tower*", the Alps, together with the surrounding mountain massifs, supply freshwater to vast downstream areas, contributing to the 40% of water supply in Europe¹. Alpine waters are essential for providing drinking water, household use, agriculture, hydropower generation, recreational activities, as well as maintaining biodiversity. However, this vital resource is increasingly threatened by the impact of climate change, which is jeopardising the loss of natural water storage due to the rapid retreat of snowpacks and glaciers and changes in precipitation regimes.

The *EU White Paper on Adaptation*² identifies mountain regions, particularly the Alps, as among the most vulnerable areas to the impacts of climate change in Europe. The projected changes in precipitation patterns are expected to increase the frequency and intensity of floods and landslides along with aggravating summer droughts. Although the severity of these impacts will vary by region, such events can have significant consequences for local communities and economies, causing degrading water quality and extensive damage to infrastructure.

Beyond climate pressures, overexploitation and mismanagement further exacerbate water availability in the Alpine region, leading to detrimental environmental, economic and social consequences. Variations in available water quantity will affect strategic sectors such as tourism, agriculture, and energy production, while decreasing quality impacts drinking supply, aquaculture or biodiversity conservation. In this context, sustainable water management becomes crucial for mitigating increased overpressure of hydrological changes and ensure long-term resilience.

The introduction of the EU Water Framework Directive 2000/60/EC (WFD) established a unique framework for Member States for the protection and sustainable management of European water bodies, while the Floods Directive 2007/60/EC (FD) can be considered a complementary directive. In Switzerland, the EU WFD is reflected in the Swiss Water Protection Act (GSchG), which sets standards for water quality, ecological integrity and sustainable use, while in Liechtenstein, as a member of the European Economic Area (EEA), the EU WFD applies. Despite ambitious targets, the main objectives of achieving good water status and promoting sustainable water management have not been met. The challenges posed by unsustainable water use, poor management and conflicts over the resource have received increasing attention in the Alps over the past decade.

Within the framework of the European Strategy for the Alpine Region (EUSALP), the *Joint Declaration of Bad Ragaz*³ clearly established the need to strengthen action in the field of water management. Accordingly, a specific cross-cutting priority (CCP3 - Promoting a joint water management transition) and its dedicated task force were established, involving EUSALP Actions Groups 1, 2, 5, 6, 7 and 8.

The urge to foster sustainable water management is also endorsed in the *Declaration on integrated and sustainable water management in the Alps*⁴ of the XVI Alpine Conference, which consolidates the significance of

¹ European Environmental Agency, (2009), *Water resources across Europe - confronting water scarcity and drought*, <https://www.eea.europa.eu/en/analysis/publications/water-resources-across-europe>

² European Commission, (2009), *Adapting to Climate Change: Towards a European Framework for Action*. White Paper No. COM (2009) 147 final, <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A52009DC0147>

³ EUSALP Joint Declaration, (2023), *Joint Declaration on the EU Strategy for the Alpine Region* (EUSALP), Bad Ragaz https://www.alpine-region.eu/fileadmin/user_upload/EUSALP_Declaration_BadRagaz_.pdf

⁴ Alpine Conference, (2023), *Declaration of the XVI Alpine Conference on Integrated and Sustainable Water Management in the Alps*, (2023) www.alpconv.org/fileadmin/user_upload/Organisation/AC/XVI/ACXVI_WaterDeclaration_en.pdf

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protecting and restoring water systems, as well as climate change adaptation and integrated water management in the Alpine region.

In 2024, the European Commission has published the *7th Report on the Implementation of the Water Framework Directive (WFD) and the Floods Directive (FD)*⁵ emphasising the need for accelerating efforts for water protection and flood risks management to cope with “the triple planetary crisis of climate change, biodiversity loss and pollution”. The newly adopted *Water Resilience Strategy (WRS)* puts water resilience at the top of the political agenda, highlighting the urgency for restoring and protecting the water cycle from the source to the sea. The WRS builds on the principles of the WFD, the *Urban Wastewater Treatment Directive* and the *Bathing Water Directive* but shifts the focus towards resilience, ensuring Europe’s water systems remain robust, adaptive, and sustainable in the face of environmental and socio-economic pressures.

In this context, this input paper seeks to quantitatively analyse the needs and gaps of water management projects in the Alpine macroregion⁶. A gap analysis is a method used to assess the difference between current and desired performances, identifying areas needing improvement to achieve specific goals. Drawing on current projects from EU’s Interreg funding programmes in the Alpine region, the analysis examines whether and how existing initiatives address the main challenges raised by the *7th Report on the implementation of the WFD and FD* spotting the “gap” to help making informed decisions in the future.

2. Methodology

For the analysis a set of 38 projects from Interreg Programmes in the Alpine macroregion were contacted and provided with an online questionnaire. These projects were identified via the online platform keep.eu, looking for projects within the programming period 2021-2027 and within the seven “Alpine” cross-border Interreg programmes as well as the transnational Alpine Space Programme. Keywords used were *water management, water resources, drought, flood, water scarcity, water blue infrastructure, water quality, water pollution, groundwater, drinking water, water connectivity, extreme weather* and *watershed*. This led to a list of 48 projects which was reduced to 38 projects after an initial assessment of the project’s objectives in relation to *water management*. Finally, 23 projects answered the questionnaire (Annex I).

The survey was prepared against the background of the recommendations of the *7th Report on the implementation of the WFD and FD* by the European Commission (p. 36-40). These recommendations were grouped and adapted into measures, and the projects were asked whether they contribute to these measures.

The results were evaluated by topics: (1) Reduction of environmental challenges, (2) Restoration and conservation, (3) Tackling water scarcity and drought, (4) Promoting transboundary cooperation and inclusive governance, (5) Monitoring, assessment, data management and reporting, (6) Flood risk management and climate resilience. This evaluation builds upon the guiding questions [1] *Which measures are addressed the most?* and [2] *Which measures are addressed the least?*

⁵ European Commission (2025), *Report from the Commission to the Council and the European Parliament on the implementation of the Water Framework Directive (2000/60/EC) and the Floods Directive (2007/60/EC): Third river basin management plans – Second flood risk management plans*. COM(2025) 2 final, EUR-Lex. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2025%3A2%3AFIN>

⁶ The term *Alpine macroregion* is used here in line with the territorial scope of the EU Strategy for the Alpine Region (EUSALP), encompassing 7 countries and 48 regions, and which goes beyond the core Alpine area defined by the Alpine Convention. Instead, it reflects a broader region that includes both mountainous areas and adjacent lowland urban centres.

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It is worth noting that the results only provide a partial overview of the measures most frequently lacking in the Alpine macroregion, due to limitations in the size of the data sample and theoretical and methodological constraints. Specifically, the analysis is based on projects funded by Interreg in the Alpine macroregion, while other relevant funding instruments, such as LIFE, Horizon, and national funding programs, were not included in the study. Thus, the scope of the analysis is limited, and findings may not be fully generalised.

Moreover, the question of whether a project contributes directly or indirectly to a specific measure does not indicate the extent to which it contributes to that measure. Finally, the reliance on self-reported data may introduce bias and subjectivity.

3. Survey results and discussion

This section showcases the results of the survey grouped by topic as outlined above. Figure 1 highlights the overall results of the survey with numbers of projects that (directly and indirectly) contributed to a certain measure as outlined in the recommendations of the 7th Report in the implementation of the WFD and FD.

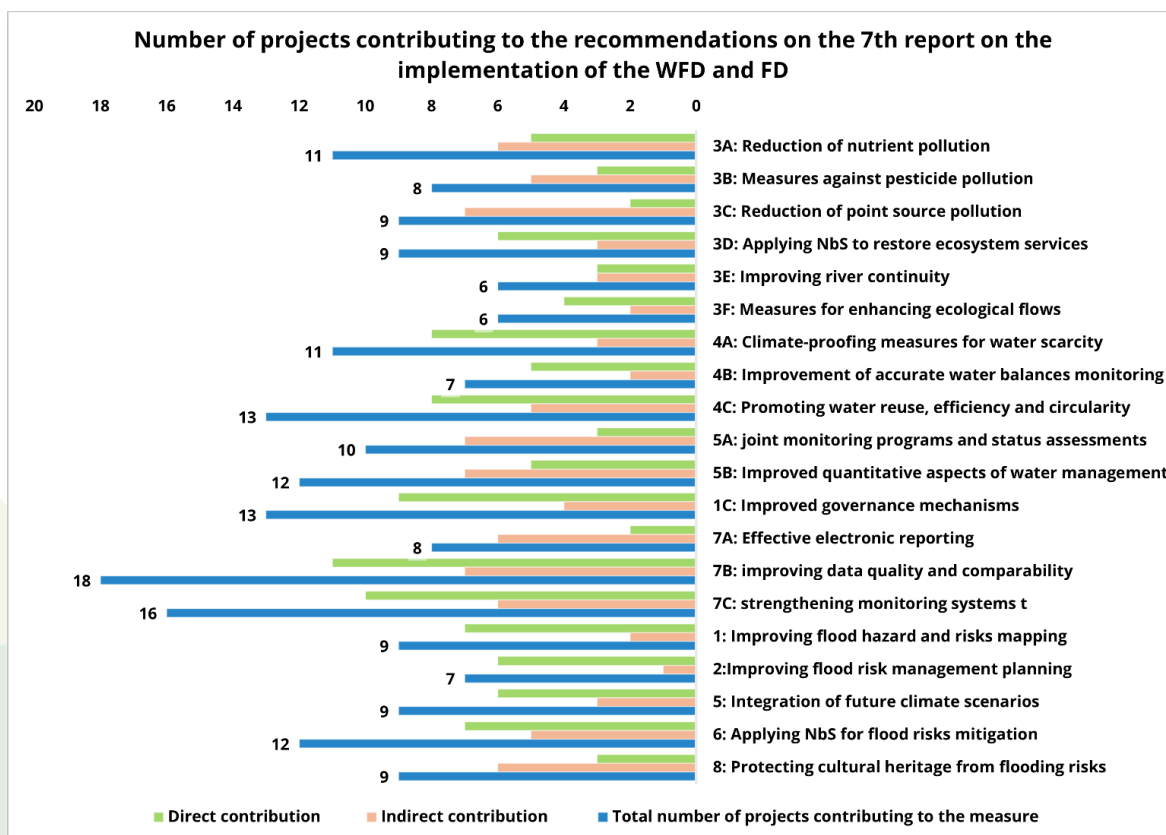


Figure1: Numbers of projects implementing measures addressed by the 7th Report on the implementation of the WFD and FD

3.1. Reduction of environmental challenges

A significant portion of EU citizens participating in the latest Eurobarometer survey on the environment identify pollution as one of the principal threats to water quality, expressing strong support for additional EU measures to handle water-related challenges. Despite some progress in addressing point source pollution, the EU remains far from achieving the “good quality” objectives set by the WFD. According to the 7th Report on

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the implementation of the WFD and FD, this shortfall is primarily associated with measures insufficiently based on the analysis of pressures and their reliance on easy technological fix for point source pollution, while diffuse pollution sources are inadequately addressed. According to several studies, the Alps also risk suffering increasing degradation in water quality and even high mountain lakes and streams are already vulnerable to chemical pollution.

Out of 23 projects surveyed, 14 declare to have contributed, either directly or indirectly, to one or more of the relevant WFD measures (see Fig. 1):

- **3A:** *Reduction of nutrient pollution*
- **3B:** *Strengthening of measures against pesticide pollution*
- **3C:** *Reduction of point source pollution*

More than half of the project surveyed contributed to at least one of the measures for reducing pollution, with 5 projects directly addressing the topic and 9 projects suggesting indirect contributions. If considering 'YES' and 'indirectly' responses, 11 measures have been adopted relating to 3A, with 5 direct contributions, 8 measures relating to 3B, with 3 direct contributions, and 9 measures relating to 3C, with a total of 2 direct implementation. Overall, the measure addressed the least is 3B.

Nonetheless, reduction of pollutants resulting from agricultural activities remains unclear and, in general, the answers do not clarify whether the projects contribute to analysing and monitoring the chemical status of the pilot water body. In addition, there is no clear evidence of actions specifically aimed at containing pollution from other sectors, such as urban settlements and industry, and at assessing their impact on the aquatic environment and human health. This is likely because the projects focus more on climate change adaptation and water availability rather than tackling water pollution directly.

While these findings highlight the need for more targeted actions to achieve WFD's pollution reduction targets in the Alpine macroregion, the complexity of the issue and the widespread misconception that pollution, particularly direct pollution, should be addressed by public institutions may hinder the fulfilment on a project scale.

However, projects can play a key role in promoting new collaboration and coordination mechanism between key institutions and actors, such as stakeholders from the agricultural sector, who are often reluctant to accept top-down regulatory interventions. If correctly involved, interest groups are more likely to engage constructively in decision-making and compromise in favour of long-term benefits and sustainability. Successful project outputs could provide lesson-learned for complex issues related to governance and favour action on domains such as reduction of pesticide pollution, which are currently challenging in the Alpine macroregion.

3.2. Restoration and conservation

According to the *7th Report on the implementation of the WFD and the FD*, physical and hydrological alterations caused by human activities pose significant pressures on water bodies. The newly adopted Nature Restoration Law sets the ambitious target of restoring 25,000 km of free-flowing rivers across the EU by 2030 and the WRS set restoration and protection of water cycles as one of its key objectives. Despite efforts to mitigate hydro-morphological impacts, challenges such as river fragmentation and the degradation of protected EU aquatic habitats persist. Alpine rivers with near-natural morphology and dynamics have become increasingly rare and are particularly vulnerable to degradation. Agriculture and hydropower, both central to the Alpine economy, are among the main sectors contributing to these pressures. In this context, efforts are needed to improve flow regimes, restore river continuity, and ensure ecological flows, while mitigating conflicts that could emerge with economic sectors at stake.

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Out of these 23 projects, 11 have addressed at least one of the key recommendations highlighted by the report on the implementation of the WFD and FD (see Fig. 1), namely:

- **3D:** *Applying Nature-based Solutions (NbS) to restore and enhance ecosystem services, such as re-naturalisation and ecosystem restoration to reduce hydro-morphological pressures*
- **3E:** *Improving river continuity*
- **3F:** *Establishing ecological flows (the water levels needed for ecosystems to function properly) and promoting their consideration in water management decisions*

Within the project sample, the measure addressed the most by surveyed projects is 3D, with 6 projects working directly on the related impacts. The measures addressed the least are 3F and 3E, suggesting that these areas might need more attention in future initiatives.

While the projects surveyed do not provide details on the implementation of ecological flow measures, the report on the *Implementation of ecological flows in the EU (2023)* draws attention on specific factors hindering progress in this field. These include institutional and governance constraints, jurisprudence and operational challenges, and difficulties in enforcing suitable methods and approaches⁷. In addition, *the 7th Report on the implementation of the WFD and FD* emphasises the lack of consistency in how ecological flows are defined. On top of this, ecological flow and river continuity measures are often complex and may require specialised expertise and dedicated resources, making them more difficult to implement and therefore less prioritised compared to other measures, such as applying NbS. A further constraint is the difficulty of finding a methodology to monetise the ecosystem services associated with these measures, due to their complexity, variability and the lack of short-term results.

With rising water demands for irrigation, exacerbated by climate change, and increased energy production through hydropower, as well as escalating loss biodiversity due to raising temperatures, hydro morphological pressures in the Alpine macroregion are likely to intensify. Failing to promote and incorporate measures for establishing ecological flows and promote river continuity disregards the benefits for the wider community and the entire Alpine ecosystem. Therefore, there is a clear need to steer more projects toward this critical aspect of water management.

3.3. Tackling water scarcity and drought

Droughts (periods of low level of precipitation) and water scarcity (a more systemic unbalance between available water and demand) have historically sparred the Alpine region, but climate change is already having a substantial impact on the occurrence and severity of these events, and an increase droughts related to reduced snow-melt in the Alps is affecting downstream water flow patterns at a scale much larger than the Alps. Droughts are projected to intensify, last longer, and slightly increase in spatial extent, with the magnitude of change increasing with the warming level.⁸

The objectives of the WFD and the FD can only be achieved by taking into full consideration the impacts of climate change.

Out of the 23 surveyed projects, 14 indicated that they contribute to tackling water scarcity and drought. The three relevant measures from the report on the implementation of the WFD and FD (see Fig. 1) are:

- **4A:** *Improving climate-proofing measures for water scarcity*

⁷ Ecologic Institute, (2023), Fresh Thoughts Consulting GmbH, Milieu Consulting, <https://www.ecologic.eu/sites/default/files/publication/2024/70603-implementation-of-ecological-flows-in-the-eu.pdf>

⁸ Brunner, M. I., & Gilleland, E., (2024), *Future changes in floods, droughts, and their extents in the Alps: A sensitivity analysis with a non-stationary stochastic streamflow generator*. Earth's Future, 12, e2023EF004238. <https://doi.org/10.1029/2023EF004238>

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- **4B:** *Improving updating and monitoring accurate water balances for river basins*
- **4C:** *Promoting water reuse, efficiency and circularity*

The measures addressed most often by surveyed projects are measures 4C, with respectively 8 projects addressing on it directly and 5 indirectly and 4A, with 8 projects addressing it directly and 2 indirectly. Measure 4B, “improving updating and monitoring accurate water balances for river basins”, is only being addressed by 5 projects working on it directly and 3 indirectly.

Since all measures are addressed by several projects and more than half of the surveyed projects indicate tackling water scarcity and drought, the measures seem relevant. However, some measures can be considered as easier to contribute to than others. For instance, “promoting water reuse, efficiency and circularity” is less specific and requires less resources as opposed to “improving, updating and monitoring accurate water balance for river basins”. Moreover, the heterogeneity and the lack of standards in hydrological and meteorological data in the Alpine region limits monitoring and modelling efforts, making it more difficult to achieve measure 4B.

Future projects should focus more on this last measure to work towards providing an initial overview of water inflows and outflows within a catchment area, with regular updates. This would enable decision-makers to make informed decisions based on the state of the resource at a given time. This initial state could also serve as a basis for future research programmes. It would be interesting to have management tools applicable from municipal to transnational levels and more communication between scientists and policy makers.

3.4. Promoting transboundary cooperation and inclusive governance

Transboundary water governance entails a complex mechanism of coordination and requires cooperation of stakeholders across different sectors and geographical scales. For river basins crossing national borders, the WFD requires Member States to coordinate among each other and make reasonable efforts with non-EU countries where relevant. In the Alpine region, most water bodies are transboundary and there is a strong dependence on ecosystem services provided by inner Alpine waters to downstream areas. With global climate change altering the water patterns in this region, the relevance of a structured cooperation in transboundary water bodies represents an urgent priority.

Out of the 23 projects surveyed, 16 contributed to transboundary cooperation and inclusive governance, with 7 projects explicitly working on transboundary waterbodies (see Fig. 1). The measures assessed are the following:

- **5A:** *joint or coordinated monitoring programs and status assessment methodologies,*
- **5B:** *quantitative aspects of water management,*
- **1C:** *strengthening governance by improving public consultations and coordination between the different administrative levels and authorities.*

Among these 16 projects, 9 explicitly stated that they contributed to the adoption of at least one of the measures promoting transboundary cooperation and inclusive governance. Despite the limited number of total responses, the projects demonstrate a strong commitment to promoting transnational cooperation. The results show that the measure addressed the most is 1C, while the measure addressed the least is 5A, revealing less action in developing joint monitoring programmes.

While river basin management plans (RBMPs) provide a framework for cooperation on joint monitoring with common indicators and threshold values, the 7th Report on the implementation of WFD and FD highlights that this is not fully achieved. Direct participation of relevant agencies is often in place, but there are still gaps in the integration of harmonised monitoring procedures into planning.

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Rising water pressures in the Alps emphasise the need for a cooperative framework that aligns scientific and non-scientific knowledge for shaping coordinated monitoring programmes. In addition, the lack of coordination between national, regional, and local governance, along with the unique characteristics of water catchments, highlight the need for better communication across management plans at all levels. Efforts should also focus on expanding water governance to include stakeholders from upstream and downstream regions, where cross-border projects can make a significant contribution.

3.5. Monitoring, assessment, data management and reporting

Data management, monitoring, and reporting are critical for effective water management. Incomplete or deficient monitoring and reporting can lead to wrong or incomplete assessments. The *7th Report on the implementation of the WFD and FD* indicates that EU water body knowledge and monitoring have generally improved over time. However, although the WFD outlines common monitoring elements, Member States differ widely in practices, frequency, and parameters monitored. This is particularly evident for the monitoring of the ecological quality, especially of small and high-altitude catchments. Additionally, issues persist in delivering water data in electronically readable formats across Europe. In the Alps, multiple projects have enriched water monitoring datasets, but the lack of a common regulatory standard hampers consistent monitoring, creating operational challenges and complicating decision-making.

Out of the 23 projects surveyed, 18 have contributed to the following measures (see also Fig. 1):

- **7a:** *ensuring timely and more complete electronic reporting*
- **7b:** *improving data quality and comparability*
- **7c:** *strengthening monitoring systems to increase confidence in the status assessments*

Among these projects, 12 explicitly stated that they contributed to the adoption of at least one of the measures contributing to data monitoring, assessment, management and reporting; others stated to deal with the topics indirectly. The measure addressed the most is 7B, while the one addresses the least is 7A.

In general, considerable progress has been made in improving water data and the capacity to exploit its use while seizing the opportunities offered by digitisation and Earth observation, thereby reducing administrative burdens and improving accuracy. In the sample considered, no reference is made to the use of artificial intelligence in data management, which could lead to better identification of inadequate measures. Noteworthy is the effort that seems to have been made to harmonise the elements present in modelling and data collection methods for river basin districts in terms of monitoring, assessments, projections, etc., and in making data available not only to decision makers but also to the public. Although there has been a general improvement, greater attention needs to be paid to improving the sharing and communication of data in electronic format. Aspects that should be explored further include the need for a common real-time platform, a shared data format and more information on where to find data of interest.

3.6. Flood risk management and climate resilience

Regions with significant mountain ranges, like the heavily populated Alps, display flood risks due to the potential for topography and weather patterns to cause severe and abrupt flooding. Moreover, the Alps are undergoing rapid warming, which will likely contribute to an increase in intense rainfall occurrences.⁹

Out of the 23 surveyed projects, 15 indicated that they contribute to one or more of the 5 relevant measures related to the FD identified by the report on the implementation of the WFD and the FD (see Fig. 1):

- **1:** *Improving flood hazard and risks mapping*

⁹ Wilhelm, B., Rapuc, W., Amann, B. et al. (2022), *Impact of warmer climate periods on flood hazard in the European Alps*. Nat. Geosci. 15, 118–123 <https://doi.org/10.1038/s41561-021-00878-y>

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- **2:** *Improving flood risk management planning*
- **5:** *Considering future climate scenarios for flood management*
- **6:** *Applying Nature-based Solutions (NbS) to cope with flood risks*
- **8:** *Protecting cultural heritage from flooding risks*

The measure addressed by most projects was measure 6 “Applying Nature-based Solutions (NbS) to cope with flood risks”, with 7 projects targeting it directly and 5 indirectly. Measures 1, 5 and 8 were addressed by 9 projects, with measure 1, “improving flood hazards and risks mapping”, receiving the most direct mentions (7). The measure which was addressed the least was “improving flood risk management planning” with 6 direct mentions and one indirect one.

Most projects contribute to flood risk management and climate resilience by assessing hazard and vulnerability areas in urban environments in relation to flood and drought risks and by focusing on wetland restoration. They also address risk assessments related to storm surges and strong winds in coastal areas, evaluating the vulnerability of local water resources under changing climate conditions, and improving knowledge of the territories and developing respective future scenarios.

Of the 15 projects contributing to flood risk management and climate resilience, 7 projects follow a holistic approach, addressing all five key measures either fully or partially. This holistic and overarching approach of the research projects should be maintained and further enhanced to strengthen synergies not only within the water management sector, but also with other sectors, such as biodiversity or spatial planning. The topic of ‘flood risk management planning’, which promotes integrated planning and can serve this cross-cutting dimension, has only been addressed sparsely until now and needs to be addressed more often in future projects.

Consistently addressing water-related risks and planning respective flood management activities can overcome the potential lack of knowledge and awareness among practitioners, policymakers and key stakeholders, as well as existing structural and administrative barriers. Furthermore, pursuing a multi-level approach can close data gaps and address the discrepancy between instruments of different political levels which often results in an absence of dedicated and targeted political frameworks. Therefore, focusing on these aspects ultimately enables the (co)-design and implementation of tailored solutions to tackle flood risks and to monitor the activities. In addition, attention should be given to non-structural information and awareness action for risk management.

4. Conclusion

The analysis of the results shows the degree of implementation of the recommendations included in the 7th Report on the implementation of WFD and FD in 23 projects in the Alpine macroregion in the frame of cross-border Interreg Programmes as well as the transnational Interreg Alpine Space Programme for the period 2021-2027.

Looking at reducing pollution, the results show that while pollution in general has received considerable attention, diffuse pollution caused by pesticides has been addressed to a lesser extent. Along with technical and scientific knowledge, tackling diffuse pollution requires coordinating governance at multiple levels. Governance is crucial in facilitating or hindering the adoption of effective policies and in obtaining consensus from interest groups that are often reluctant to accept stringent regulatory interventions or radical changes. While projects have the capacity to introduce new practices and bottom-up knowledge with transformative potential, the impact is often insufficient for boosting structural change, also given the limited project time scope.

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Nonetheless, the analysis reveals that many projects in the Alpine macroregion emphasise the importance of well-functioning governance structures, with projects directly contributing to coordination among institutional actors, the scientific community, and relevant interest groups. This is particularly crucial given the hydrogeological and political complexities of Alpine water bodies, which are predominantly transboundary and subject to varying jurisdictions. However, insufficient attention remains in the promotion of joint monitoring programmes and standardised methodologies for assessing the status of water bodies. Notably, these findings align with a broader trend identified in the *7th Report for the implementation of WFD and FD*, which highlights inconsistent coordination among countries sharing the same basin, as well as a lack of alignment with the national measures outlined in each Member State's Integrated River Basin Management Plans (IRBMPs). These gaps affect the implementation of the WFD, as informed decision-making and effective negotiations between water users require frameworks built on agreed indicators and shared responsibilities.

Furthermore, despite several projects address water scarcity and drought mitigation, action to tackle fragmented data in this field received less attention. Specifically, improving and updating water balance data remain among the least targeted measures. A major limitation is the heterogeneity and lack of standardisation in hydrological and meteorological data across the Alpine region, which complicates both monitoring and modelling efforts. Although the WFD has supported the progressive adoption of common approaches to monitoring, data comparability and information exchange, further action is needed to bring together water-related data and provide a coherent picture of the status of water bodies. In this regard, it is necessary to overcome silos in governance by simplifying and better defining institutional roles, as well as adapting standardised methods and languages.

For measures focused on flood risks management and climate resilience, the results showcase that flood risk management planning has only been addressed sparsely until now. Flood risk management is an integral part of integrated river basin management, but difficulties related to governance fragmentation may prevent projects from taking concrete action in this field. In the Alpine region, innovative measures are needed to foster effective implementation. This includes improving coordination between management plans across different vertical governance levels and enhancing communication between scientific communities and policy-makers. Strengthening the hydrological knowledge of local actors, and their capacity to understand the implications of decisions based on climate scenarios and combined environmental and socio-economic analyses, is essential.

Finally, the results emerging from projects dealing with restoration and conservation highlight a gap in the implementation of measures aimed at establishing ecological flows. This finding aligns with the *7th Report for the implementation of the WFD and FD*, which similarly points out the inconsistencies in the implementation of ecological flows across the EU Member States. Although barriers to implementation of such measures are context-specific, governance constraints, inconsistent funding, lack of expertise along with ineffective regulations on the trade-offs between human and environmental water needs, limit the implementation of measures of this kind. However, it is crucial that future efforts in the Alpine region to restore and protect the water cycle, which represent one of the key objectives of the WRS, better acknowledge the critical role of ecological flows in maintaining healthy ecosystems and slowing the decline of biodiversity.

The newly adopted WRS reflects the increasing attention to the water cycle as a foundation to our competitiveness and wellbeing. While projects can foster innovation and provide tailored solutions to various water management challenges in the Alpine region, the findings underscore the need for proactive intervention by national and regional governments in promoting coordination and ensuring the meaningful engagement of diverse stakeholders in shaping the future of sustainable water governance. Indeed, ensuring fair and inclusive access to the decision-making process helps building a shared sense of responsibility and ownership and in many cases, stakeholders are more driven by a perceived responsibility to act rather than by direct water-related business risks. Aiming at this, EUSALP can facilitate processes fostering collaboration at different

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governance levels (regional, national, EU) and together with international institutions (e.g. the Alpine Convention) as well as other cross-border initiatives (e.g. ARGE ALP and Alps-Adriatic Working Groups, European Grouping of Territorial Cooperation). It can also support the Alpine region to consolidate the approach launched by the Mission Ocean and Waters, shifting from national strategies to an Alpine strategy for protecting and restoring Alpine waters as well as promoting the role of the Alps in water supply and management at European level.

In addition, improving coordination around data-sharing practices can lay the foundation for harmonised information on the status of water resources across the Alpine region. This, in turn, can support the development of more effective and timely response measures, including in transboundary river basins. At the same time, greater emphasis should be placed on adopting new technologies and smart infrastructure, implementing NbS, and developing capacity-building programmes to more effectively manage water-related risks.

To support this process, EUSALP, with its unique capacity to connect metropolitan, peri-mountain, and mountain areas, often linked by the same water basins, can play a key role. By encouraging cross-regional collaboration and scaling up successful project results, EUSALP can foster a deeper sense of ownership over the implementation of WFD and FD, along with advancing sustainable water management across the Alps.

On the other hand, stakeholders involved in setting programme priorities for funding allocation in the Alpine region should better channel resources to prioritise water management, paying particular attention to gaps in the implementation of the WFD and FD in the Alpine macroregion.