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Unfolding the Water Framework Directive Implementation at the River Basin District Scale: An Italian Case Study on Irrigation Measures

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Abstract: Despite that the European Water Framework Directive has attracted scholars' attention worldwide, research is sparse on how its implementation is carried out for the whole River Basin District (RBD). This paper aims to fill this research gap by studying the implementation of this directive in the Italian Eastern Alps RBD. Based on 21 semi-structured interviews with both public authorities and the stakeholders engaged with implementation, along with a document analysis, we traced the overall implementation process, from planning to implementation, of measures to increase irrigation efficiency. Our interest was on how coordination mechanisms for the entire RBD were established during the main steps of the implementation process. Moreover, we looked at the effects of the Water Framework Directive at the local level, both in terms of changes in irrigation management practices and in terms of stakeholders' engagement in decision-making processes. We found that, establishing decision-making processes based on a stronger coordination among all the authorities involved was fundamental both in terms of the production of shared decisions and of the participants' satisfaction with the processes. Moreover, if true participation of stakeholders has to be achieved in the decision-making processes, then the RBD could not be the only scale where participation takes place. Actually, interactions among stakeholders and public authorities, in order to consider local interests in the decision-making processes, could be more effective at the sub-RBD level. Ultimately, while cross-administrative coordination can be achieved for the whole RBD through specific coordination mechanisms, public participation should find more appropriate spaces at the sub-RBD level.

Keywords: policy implementation; water governance; river basin planning; coordination; public participation; irrigation management

1. Introduction

The Water Framework Directive (2000/60/CE, WFD hereafter, a list of abbreviations is provided in the Annex B) is a milestone in European water policy, establishing a common legislative framework for water protection in Europe. Its overall objective is to achieve a good water status for all water bodies in Europe and, where this is not possible, it requires Member States to not further deteriorate their waters. The study of the WFD and its implications on EU countries has attracted the attention of several social scholars [1]. This is because, more than the other EU environmental directives, in the WFD, the achievement of the good status objective is linked to a significant change in national governance systems. Some authors actually argue that the WFD will be effectively implemented only when a substantial paradigm shift occurs in the water management practices across Europe [2,3]. At the base of this paradigm shift is the requirement to set up a new unit for the management and protection of river

basins, i.e., the River Basin District (RBD). According to the WFD, RBD “means the area of land and sea, made up of one or more neighboring river basins together with their associated groundwaters and coastal waters, which is identified (. . .) as the main unit for management of river basins” (Article 2). Moreover, large-scale river basin planning and management is required for the whole RBD through the elaboration of specific River Basin Management Plans (RBMPs). For the development of these plans, competent authorities should accomplish four key-tasks [4] that we have summarized in the following steps.

- **RBD analysis:** Competent authorities should carry out a comprehensive analysis of all the pressures on water bodies that might hinder the achievement of the good status and not deterioration objectives. The European Commission encourages the use of the Driver, Pressure, State, Impact, Response (DPSIR) analytical framework for the elaboration of RBMPs. DPSIR is a widely applied tool because it provides a ‘systematic examination of the causality flow between human activities and nature’ [5].
- **Setting objectives:** Based on the pressure analysis, for each water body, a specific environmental objective should be established. If achieving the good status objective is not possible due to technical, economic or natural reasons, then extensions in the deadline to achieve environmental objectives, along with less stringent objectives (called exceptions), can be applied.
- **Identification of measures:** To achieve the objectives, appropriate measures should be identified. The measures are contained in a specific document of the RBMPs, which is the Program of Measures (PoMs). Measures should be linked to the pressures identified to guarantee an actual improvement in the state of water bodies and should also be selected through a cost-effectiveness analysis. Moreover, Article 3 of the WFD requires PoMs to be coordinated for the whole of the RBD.
- **Implementation of measures:** The implementation of PoMs should not be considered as the end of the process, but should be linked with a continuous process of evaluation [4].

Public participation, at least in the form of information supply to the public and stakeholders’ consultation, should be ensured during the accomplishment of the four key tasks. This means that before the approval and publication of the plans, the documents should be made available to the public for comments and their observations should be considered in the final RBMPs [6].

Although the WFD recognizes some flexibility in the scale at which this planning process can be conducted, the unit of implementation of the WFD should be, regardless, the RBD [4]. This requirement has significant implications for the national decision-making procedures because it implies that coordinated and inclusive river basin planning should be promoted within RBD boundaries.

Given that, the goals of this study are to understand: (i) How coordination among the different administrative levels of the RBD is achieved during the planning phase, (ii) the effects of WFD on the local level, which means both how PoMs are translated into concrete actions at the local level, and how stakeholders’ interests are considered in the development of plans.

To achieve both research objectives, we focused on how the overall process, from the elaboration of the RBMP (2015–2021) to the implementation of measures, is carried out for the whole RBD. As Boeuf and Fritsch [1] argued, the scale at which WFD implementation is studied is itself a methodological choice that should be made explicit. Despite the relevance that WFD attributes to the RBD, most of the studies on the topic are located either at the national or sub-RBD-level, with the result that the picture we obtain from research is incomplete [1,7]. Studying WFD at the RBD level, instead, would provide relevant information on how the institutional arrangements for water protection and management develop to promote multi-level actors involvement and coordination in large river basins where often complex and competing interests are in place.

For this purpose, we focused on the process of implementation of the WFD in a single case study, namely the Italian Eastern Alps RBD. Since the district is already a large unit of analysis, we decided to focus on the development and implementation of a specific type of measures, i.e., measures to

improve irrigation efficiency. In Italy, as in all Mediterranean countries, most of the water withdrawals are employed for irrigation, and climate change is expected to exacerbate the pressure on water resources [8,9]. Moreover, despite its primary focus on water quality, the WFD explicitly addresses water quantity issues through water demand instruments, e.g., water pricing (Article 9 WFD), and the requirement of establishing ‘measures to promote an efficient and sustainable water use in order to avoid compromising the achievement of the objectives’ (Article 11, WFD).

Given our research objectives, four specific research questions (RQs) were formulated for each key-task described above. Figure 1 depicts how research questions were linked to the four key-tasks identified. RQ1 to RQ3 are related to our first research objective, which is understanding administrative coordination during the planning phase, while RQ4 concerns the effects of WFD on the local level. Due to the lack of detailed information on the topic, research questions were purely exploratory.

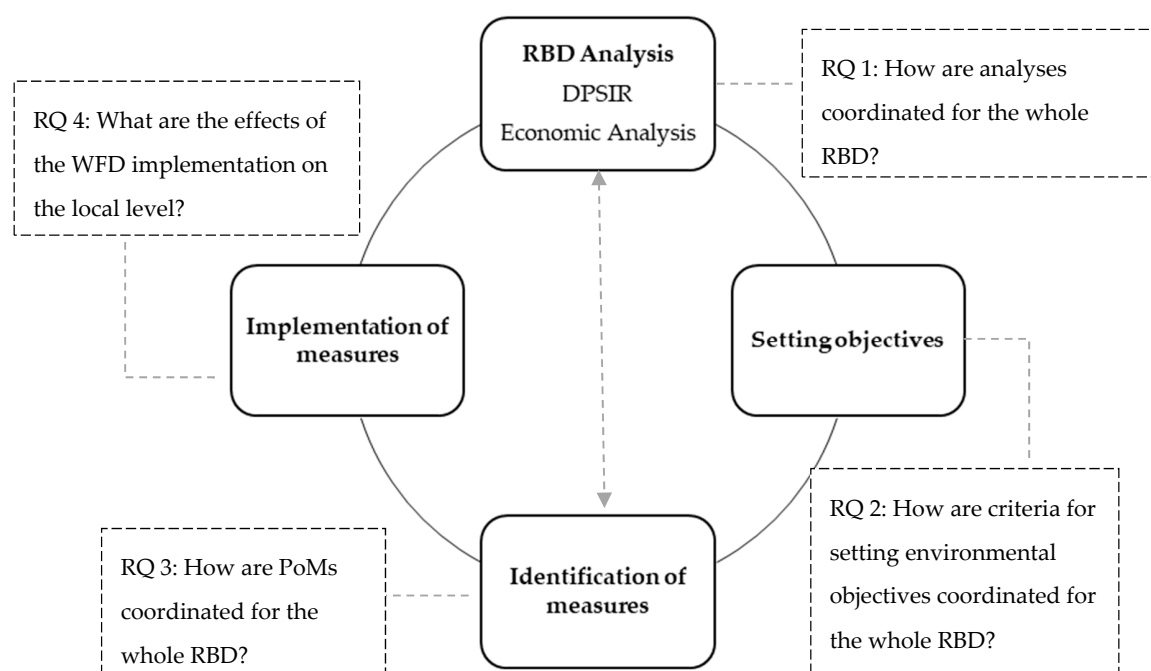


Figure 1. Four key-tasks for the Water Framework Directive (WFD) implementation and related research questions. Source: Authors’ own elaboration.

2. River Basin Approach in Italy: Between Institutional Reforms and Conflicts

This section describes and discusses the main steps that have been conducted in the institutionalization of river basin governance in Italy.

During the first decades of the last century, the Italian water policy was mainly focused on building large water infrastructure for hydropower and land reclamation, and on regulating the use and concession of public waters. In this phase, the state was the only government level holding legislative and regulatory functions, while a multitude of local actors were responsible for managing local infrastructure and water supply. Since the 1970s, with the institution of regional administrations, a process of devolution to the new government levels started. The institutional system in Italy foresees that regional administrations can exercise significant administrative and regulatory functions within the legislative framework provided by the central government. In the field of water policy, the transfer of competences to the regions, however, occurred without clear coordination mechanisms between the two levels [10]. Moreover, when the increasing awareness on environmental problems brought to the first law establishing emission limit values (Law 319/1976), water protection and management were subject to separate regulations [11].

Indeed, the first legislation concerning river basin management, the Law 183/1989, was issued in an attempt to improve the coordination among the government levels, and to create an integrated system for the protection and management of land and water resources.

Following this law, the national territory was split into national, interregional and regional river basins and for national river basins, specific river basin authorities were established. River basin authorities were composed of representatives from the main state ministries and from regional administrations and were coordinated by the General Secretary holding overall responsibility for river basin authorities' activities. These mixed State-Regions bodies had to develop basin plans that were overarching planning instruments to set up an integrated management of water and soil at the river basin level [12]. However, the regions went against the creation of river basin authorities and the related basin plans because they perceived these reforms to be an interference of the central government in their competences on water and soil management to the point that some regions brought an action against the Law 183/1989 to the Constitutional Court [13]. Despite the court rejecting their instances, these conflicts weakened the role of the river basin authorities, and the tensions between regions and state further increased [10].

A second step was made with the Law 36/1994 that was issued to create an integrated water service system for the whole of water services, from water capture to sewerage and depuration systems. According to the law, this system was organized and managed at 'optimal territorial units', for which intermunicipal agencies were defined by the regions. The rationale behind the Law 36/1994 was, on one hand, to create optimal units for an integrated management of the water system, overcoming municipal fragmentation, on the other, the law aimed at building an industrial model for water services' provision more independent from public finance [14]. However, in 2008, Massarutto [14] reported that the identification of the optimal territorial units and their relative authorities was still not completed. This partial implementation generated a piecemeal attribution of competences with high variability from one region to another [15].

Another important step is represented by the Legislative Decree 152/1999, which transposed the EU directives on wastewater treatment (91/271/CEE) and nitrates pollution caused by agricultural sources (91/676/CEE). This decree concerned both qualitative and quantitative aspects with the aim of achieving the 'good water status' of water resources, anticipating some basic concepts of the WFD. The decree introduced the regional water plans as part of the basin plans, with the aim to coordinate actions and measures for water protection across the river basins established by the Law 183/1989 [10]. Despite this purpose, the regional water plans were almost exclusively defined by the regions and the function of river basin authorities was limited to a final approval [13].

In 2006, the Legislative Decree 152/2006 (better known as the Environmental Code) abolished all the previous water legislation and transposed the WFD, creating a single, overarching, legislative framework for water protection and use. The Environmental Code divided the national territory into eight RBDs, abolishing the territorial organization established by the Law 183/1989. Moreover, the river basin authorities were replaced by the River Basin District Authorities (RBDAs). Similar to the preceding river basin authorities, the RBDAs are State-Regions boards composed of three main bodies: The Institutional Committee, which is the decisional body, the General Secretary, holding overall responsibility for the work done by the Institutional Committee, and the Technical Committee, which provides technical support to the Institutional Committee for the development of RBMPs. The Institutional Committee is composed of the General Secretary, the presidents of all regional administrations of the RBD, representatives of the main ministries concerned, and some representatives from the agricultural sector, only with an advisory function. The Technical Committee is made of representatives from all the regional administrations of the RBD and is chaired by the General Secretary.

Following the WFD, the RBDAs, the regions and the Ministry of Environment, were designed as competent authorities for implementation. More in details, while regions are responsible to provide most of the information and analyses needed for RBMPs, the RBDAs ensure that decision-making at the regional level complies with the overall objectives of the WFD and are also responsible for the elaboration of RBMPs.

Despite the aim of the Environmental Code to reorganize the overall water legislation characterized by overlapping norms and planning instruments, the code generated even further confusion and increased the conflicts among administrations [12,13]. Here, we report the most controversial aspects that affected the WFD implementation:

- The Environmental Code introduced the RBMPs that should have been developed based on regional water plans. Nevertheless, the RBMPs were thought to be very similar to the regional water plans to the point that some scholars have questioned the relevance of RBMPs [12].
- The abolishment of river basin authorities was contested by regional administrations and environmental NGOs because the territorial division into RBDs and the RBDAs were deemed not able to reflect local specificities [12].
- Within the Institutional Committee, the ministerial representation was larger than the regional representation, causing strong regional opposition [10].

Thus, it is not surprising that the implementation of the large-scale river basin approach required by the WFD was not smooth in Italy [10]. In particular, the RBDAs, although formally envisaged by the Environmental Code, did not acquire full competences until 2016. Meanwhile, the first and second cycles of RBMPs were approved by the pre-existing river basin authorities that, in some cases, did not even cover the entire territory of the RBD [16]. Due to the unclear governance for WFD implementation, after the first implementation cycle, the European Commission sent the EU Pilot 7304/15/ENVI to Italy. The EU Pilot is an informal dialogue between the European Commission and the Member State concerned, on issues related to potential non-compliance with EU law, prior to launching a formal infringement procedure. The EU Pilot 7304/15/ENVI addressed many aspects of Italian implementation that were considered to be barriers for the achievement of WFD objectives. Among them, Italy was required to establish adequate coordination mechanisms to ensure that the objectives of the WFD were fulfilled for the whole RBD. Moreover, Italy was required to provide clear signals of progress regarding the internalization of environmental and resource costs within the agricultural sector.

Consequently, in the second implementation cycle, many activities to improve the coordination for the whole RBD were undertaken [17]. One above all was the attribution of full competences to the RBDAs to coordinate and supervise the WFD implementation process. Despite these changes, crucial issues, such as the overlap between RBMPs and regional water plans, were not changed.

As shown by this overview, the Italian water governance system is characterized, on one hand, by a repeated gap of policy implementation, and on the other, a continuous change of legal dispositions often generating a system of overlapping norms and unclear competence attribution [12,18].

3. Study Area

Recently, with the Law 221/2015, the division of the Italian territory has been modified from eight to seven RBDs: Po Basin, Eastern Alps, Northern Apennines, Central Apennines, South Apennines, Sicily and Sardinia (Figure 2a). The Eastern Alps RBD (Figure 2b) covers an area of approximately 37,600 km² and it is composed of four regional administrations (EU-NUTS 2 classification): Veneto, Friuli Venezia Giulia, Trento and Bolzano. The district is composed of twelve river basins, the Venice lagoon and the Marano and Grado lagoon. Three river basins are transboundary, falling between Italy and Slovenia, and between Italy and Switzerland.

Over the last 40 years, the population living in the Eastern Alps RBD has constantly grown, reaching almost seven million inhabitants. The regions of the Eastern Alps RBD represent one of the most developed areas of the country, especially, regarding the manufacturing industry [19]. The agricultural sector is particularly developed in the southern part of the RBD, and in particular in the Veneto region [19]. The RBD is supplied by approximately 402 irrigation schemes, 209 of which are located in Veneto region [20]. The technical characteristics of the irrigation systems are very different across the RBD: Surface irrigation prevails in Veneto (47%), in Friuli Venezia Giulia there is a mix of sprinkling irrigation (63%) and surface irrigation (36%), while in Trento and Bolzano sprinkling

irrigation (57%) and drip irrigation (30%) are predominant [21]. The most irrigated crops in the RBD are corn, followed by permanent crops (orchards and vineyards) and meadows [21].

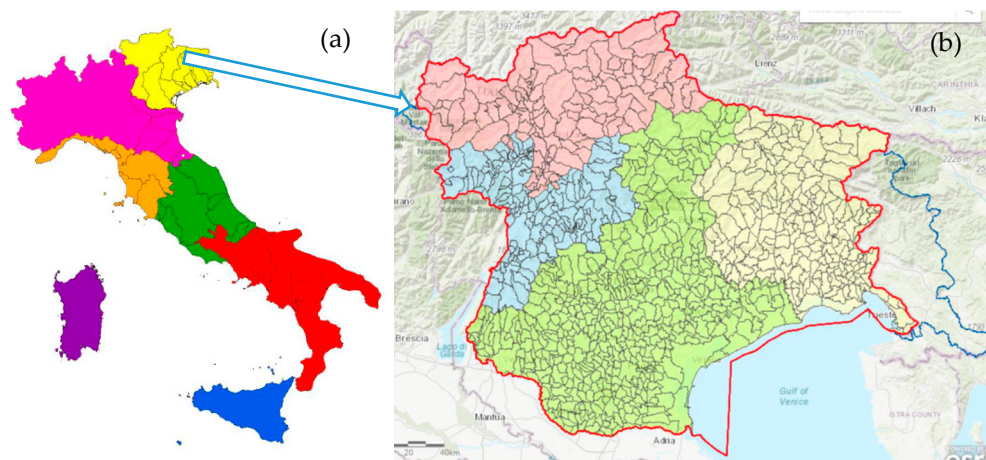


Figure 2. (a) Italian river basin districts (RBDs); and (b) Eastern Alps RBD: The red line is the border of the RBD, the blue line is the international border of the RBD, the different colors represent the four regional administrations. Source: (a) ISPRA; (b) www.alpiorientali.it.

Regarding the measures to improve irrigation efficiency, the following actors are involved in the implementation of the WFD: The official competent authorities, the regional irrigation management departments, the irrigation boards and the associations for irrigation boards. These categories are briefly discussed below, and Figure 3 schematically represents the main actors involved, their relations and competences.

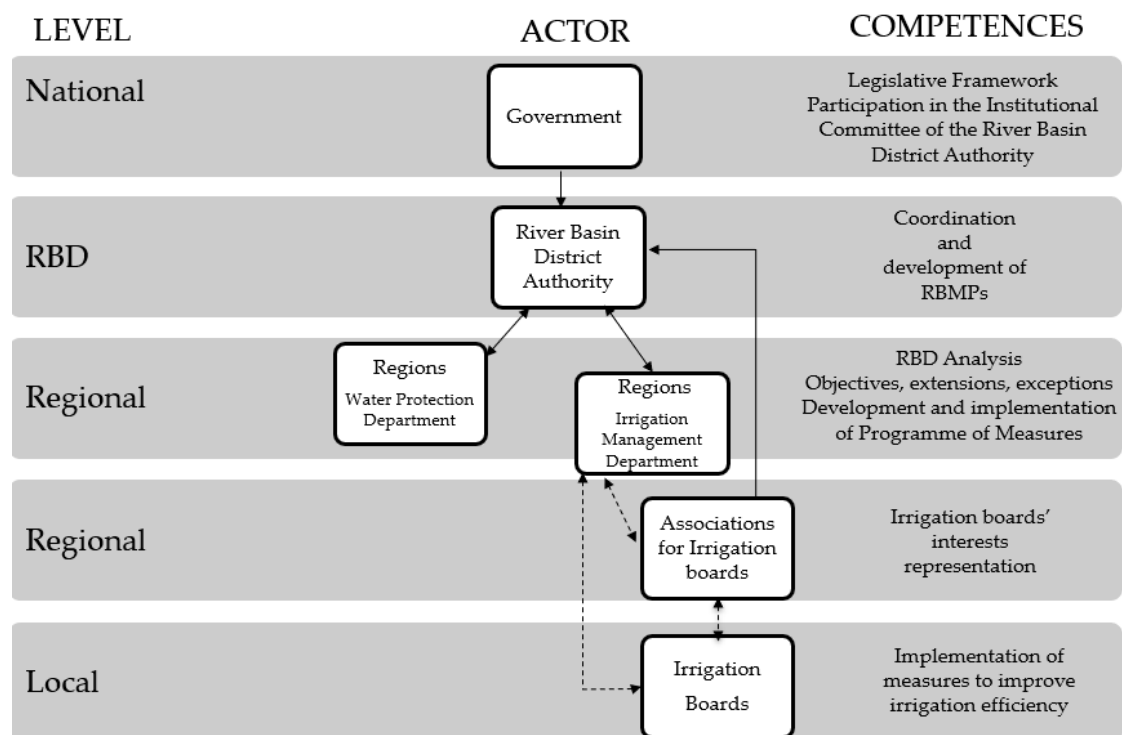


Figure 3. Main actors, relations and competences for the implementation of measures to improve irrigation efficiency under the WFD in the Eastern Alps RBD. Arrow means formal relations defined by the Legislative Decree 152/2006; dashed arrow means informal relations. Source: Authors' own elaboration.

3.1. Official Competent Authorities (OCAs)

Official competent authorities (OCAs) have remit on the overall implementation process and are officially designed as competent authorities for WFD implementation in the Eastern Alps RBD. These are the RBDA, which coordinates and supervises the process of implementation for the whole RBD, and the regional water protection departments (WPDs), which coordinate the process at the regional level. The WPDs work in close collaboration with the regional environmental protection agencies, which carry out monitoring, data collection and analysis of water resources.

3.2. Regional Irrigation Management Departments (IMDs)

Irrigation management departments (IMDs) are the regional offices that define the rules for irrigation water uses. For instance, IMDs provide regulation on water metering, water tariffs and on the use of European funding sources, such as rural development programs. Moreover, IMDs are the reference for the irrigation boards for on-the-ground implementation of technical measures. Despite some small differences, IMDs have the same competences for WFD in all the regions of the district.

3.3. Irrigation Boards (IBs) and Association for Irrigation Boards (AIBs)

IBs are responsible for the implementation of technical measures related to irrigation and are the recipients of regional regulations on irrigation water uses. IBs were established in 1922 in Italy with a double function: On one side, they are public entities entitled to use water resources for irrigation and to manage public water infrastructure for wetland reclamation, water security and irrigation; on the other hand, they are consortia of private landowners who elect their own representatives and pay water fees to IBs for the irrigation services that they receive. IBs approve their own financial plans, *Piani di classifica* in Italian, which establish the tariff that farmers have to pay for the irrigation services received. Water services are paid either through flat tariffs, that are not based on the actual irrigation services received, or binomial tariffs, that are composed of a fixed part (e.g., the costs of maintenance for the irrigation systems) and a variable part that can be based on different parameters, e.g., the volume of water used, the type of irrigation systems, the type of crops produces, etc. The most diffused tariff system in the RBD is the flat tariff usually based on the irrigated acreages [21]; however, binomial tariffs have recently been introduced in some of the regions of the RBD (see Section 5.4.2). The structure and organizations of IBs vary among the regions of the district: Ranging from one of the largest IB in the Veneto region with approximately 190,000 ha, to a very small IB (approximately 6 ha) in Bolzano; moreover, some IBs are not public entities but act only as private consortia. Most of the IBs of each region are associated and represented by an association for irrigation boards (AIBs). These associations are consulted during the decision-making processes related to WFD implementation and act as intermediaries for IBs' interests. The AIBs' structure, functions and level of engagement in WFD implementation vary across the regions of the district since some AIBs are similar to a labor union, some provide practical support to IBs for their daily tasks and others are more active at the institutional level to lobby for IBs interests in the decision-making processes. Overall, three regions have a AIB even though not all are active in the same way in the WFD implementation, while one region does not have any AIB.

4. Materials and Methods

4.1. Data Collection

This study was based on 21 semi-structured interviews, a set of closed-ended questions on a 5-point Likert scale [22], and analysis of some of the documents of the RBMP (2015–2021) [19,21,23–27]. The different methods were used to answer the four RQs presented in Figure 1.

Data collection was carried out in two steps:

- Interviews with eleven institutional actors involved in the planning phase. We interviewed one civil servant from RBDA, five from WPDs and five from IMDs.

- Interviews with ten stakeholders involved in the implementation and their representatives: Seven representatives of the IBs of the district together with three representatives of the AIBs. The sample of IBs and AIBs was selected to cover all the regions of the RBD, but the differences discussed in the previous section were considered in the selection of the interviewees. In particular, we selected the larger and more active IBs of the district and we considered only the IBs that had both public and private functions.

Starting from the general RQs presented in Figure 1, more specific questions were asked during the interviews. Due to the heterogeneity of the actors interviewed, questions were tailored on their level of engagement in the planning and implementation processes. For instance, the questions addressed to the OCAs and IMDs aimed to understand: First, what coordination mechanisms (if any) were in place in the different steps of the implementation process, i.e., if implementation was conducted following a RBD perspective or was conducted within administrative boundaries. The questions asked to IBs and AIBs, instead, aimed to understand two aspects of the implications of WFD on the local level: First, how plans are translated into concrete measures for irrigation management at local level (Section 5.5.1), and second, the inclusion of local interest in the development of plans (Section 5.5.2). Moreover, some cross-cutting questions were asked to all interviewees to understand: (i) Their role and competences in the implementation process, and (ii) changes and consequences derived from the WFD implementation. Last, the set of closed-ended questions on a 5-point Likert scale was asked to the interviewees to understand their perception of the effectiveness of coordination and participatory mechanisms in place for the WFD implementation.

Interviews lasted 40 min–2 h each and interviewees were given an assurance of confidentiality. The text of interviews was analyzed using the framework approach as guidance [28] and a coding scheme was created based on the research questions presented in Figure 1.

4.2. Selection of Measures

This study focuses on the measures to improve irrigation efficiency that are included in the PoMs of the RBMP (2015–2021). Due to the large size of the RBD and to the large number of measures included in the PoMs, we decided to focus only on measures for which more coordination across the administrations of the district has occurred. We conducted a preliminary analysis of the RBMP [25] and we found that a common strategy was established for the whole RBD to recover environmental and resource costs in the agricultural sector. More coordination regarding the recovery of environmental and resource costs was triggered by two constraints established by the European Commission. The first was the EU Pilot 7304/15/ENVI that, as explained earlier, required more coordination specifically regarding the internalization of environmental and resource costs within the agricultural sector. The second was related to EU Regulations 1303/2015 and 1305/2015, which established the common regulatory framework for the use of the European funding sources, linking the access and use of European funds to the fulfillment of some prerequisites (called ex-ante conditionality). Among them, the existence of incentivizing pricing policies, the installation of water metering devices in agriculture, and more stringent conditions on the investments for irrigation in the case where the state of water bodies is less than good. Hence, the risk of an infringement procedure, and the need to satisfy the ex-ante conditionality established by the EU Regulations, required a more coordinated strategy among all the administrations of the RBD.

Consequently, the questions addressed to the authorities involved in this decision-making process aimed to understand how this coordination was reached, if it was deemed effective, and what outcomes were produced.

5. Results

In this section, results were reported in the view of the four RQs presented in Figure 1 to understand what coordination and participation mechanisms were established for the development of RBMP (2015–2021). Moreover, we commented on the perception of the interviewees regarding

the effectiveness of these mechanisms that had been acquired through the closed-ended questions. Moreover, Table A1 in the Appendix A reports the summary of the descriptive statistics. In addition to the four RQs, the following Section 5.1 provided information on the OCAs' opinions regarding how the competences for WFD implementation were allocated within the RBD. Finally, Table 1 shows the different approaches adopted by the regions for the selection of irrigation water efficiency measures, while Tables 2 and 3 at the end of this section summarizes the answers to the four RQs.

5.1. Competences for WFD Implementation

Given the role that OCAs have in coordinating and supervising the implementation both at the RBD and regional level, one question concerned the extent to which the allocation of competences and responsibilities for WFD implementation was clearly defined. Respondents had different opinions on the issue mostly due to intra-regional implementation structures. However, all of them mentioned that the coexistence of RBMPs and regional water protection plans generates overlaps for competences attribution, reduces accountability and hinders the adoption of a large-scale river basin approach. According to interviewees, these plans had very similar contents to the point that one interviewee questioned the significance of the RBMP: "the information for the RBMP are usually taken from other regional plans but then the RBMP should provide some obligations for the lower governance level to generate a virtuous circle. However, very often the result is a vicious circle in which the limitations of regional plans are transferred in the RBMP".

5.2. RQ1: How Are Analyses Coordinated for the Whole RBD?

The analysis of the RBMP [24] and the interviews revealed that specific working groups were established by the RBDA to set up common criteria and methods for the identification of significant pressures on water bodies. These working groups were composed of civil servants from regional administrations and environmental protection agencies that held the responsibility for the update of all the analyses related to the WFD implementation, while the RBDA was responsible for coordinating the process [24]. Coordination through the working groups was on average appreciated (Mean: 3.8) by all the actors involved that agreed on the effectiveness of this coordination mechanism to provide a common criterion for pressure analysis. As the output of these working groups, the institutional actors found an agreement on the thresholds that distinguish what is a significant pressure from what is not [24].

Some interviewees, however, highlighted that, despite the enhancement of coordination in the decision-making process, administrations were not always aligned in their analyses because the RBDA was not always able to steer the process. According to one interviewee, instead, the limitation in the coordination capacity was not due to the RBDA but rather to the unclear legislative framework as expressed by these words:

"The law allocates to the regions competences on these subjects, consequently each administration went on its own. We did not start to collaborate from the beginning, but we had to put all together at a later time. It was not always easy to find a common strategy because we worked separately. In addition, the Ministry of Environment should have provided us with clear guidelines from the beginning, but this did not happen". Indeed, only with the Law 221/2015, it has been established that the analyses performed by the regions have to be fed into the RBMPs. Before that law, in fact, regions were required to collect the data and conduct analyses only to update their own regional water protection plans.

5.3. RQ2: How Are Criteria for Setting Environmental Objectives Coordinated for the Whole RBD?

We found that coordination to set up a common strategy for the definition of objectives, extensions and exceptions was more controversial among the OCAs interviewed. The perceived effectiveness of coordination in this step is on average low (Mean: 2.8), and the interviewees expressed very different opinions on this issue.

Indeed, no true coordination mechanism was in place to set up common criteria for setting environmental objectives but coordination was limited to the guidelines provided by the RBDA on the basis of European Commission recommendations and of other European experiences such as the UK Technical Advisory Group on the Water Framework Directive [23]. The RBDA also reported that coordination in this step should be improved because the criteria for setting objectives, extensions and exceptions are not objectively defined. Hence, while some administrations deemed the guidelines provided by the RBDA to be an effective strategy to ensure coordination among the regions, others found them inadequate to avoid an unbalance of commitments among the administrations of the district to achieve the WFD's objectives.

Moreover, the interviews revealed that the limited information provided by the central government on this topic affected the possibility to establish common criteria to set up objectives, extensions and exceptions. This argument was raised regarding the application of extensions and exceptions due to the disproportionate costs of the measures, as established by article 4 of the WFD. The first guidelines provided by the Ministry of Environment on the topic arrived quite late, with the Legislative decree 39/2015, which established the legislative framework for the economic evaluation of water uses and services. Moreover, many of the interviewees considered such legislation too theoretical and not providing any operative instructions on how to implement a sound economic evaluation.

5.4. RQ3: How are the Programme of Measures Coordinated for the Whole RBD?

5.4.1. RBD Coordination for the Selection of Measures

We found that, with the exception of the measures related to the internalization of environmental and resource costs, which are discussed below, coordination for the definition of measures is not provided for the whole RBD. The way through which the RBDA ensures that the administrations adopt the same strategy for the selection of measures is by encouraging them to adopt the DPSIR analytical tool to link measures to the pressures identified. This means that "once the pressures on water bodies have been identified, the regional administrations should search for the measures that can mitigate the pressures in the available regional and local planning instruments" (RBDA). The opinions on the effectiveness of coordination in this step of implementation were very different and a medium result (Mean: 3) was attributed to the effectiveness of coordination mechanisms. Some respondents found that the guidelines provided by the RBDA were effective to improve coordination, while others deemed the guidelines not sufficient to establish a common strategy. Similarly, the approaches adopted for the selection of measures were very different: Some were more aligned with a DPSIR approach, while in other the link pressures-measures was less evident. One region, for instance, reported that the selected measures were never site-specific or identified starting from the pressures, but rather were generic measures identified to deal with macro-problems. Another interviewee reported that the process for the selection of measures started from the measures already available in the regional and local plans with a limited consideration of the state of water bodies. Other administrations, instead, reported being able to follow the DPSIR approach: The WPDs decided to focus only on water bodies classified with a bad state and for those water bodies, specific measures were identified by the WPDs to cope with the pressures. These heterogeneous approaches are also reflected in this statement of the RBDA: "improvements must be performed to make the link pressure-measure more robust (. . .) nevertheless it is difficult to improve this aspect because this would mean to adopt analytical tools that, in many circumstances, are not available".

It is noteworthy that the Environmental Code foresees that the PoMs are part of the regional water protection plans and not of the RBMPs. Coordination should be guaranteed by the final approval of PoMs by the RBDA, which should control that the measures are sufficient to achieve the environmental objectives.

The RBD coordination for the selection of measures to internalize environmental and resource costs in the agricultural sector, instead, followed a different path. As explained in Section 4.2, the EU Pilot 7304/15/ENVI and EU regulations on the use of EU funds, boosted coordination for the decisions

regarding the recovery of environmental and resource costs in the agricultural sector. Interviewees reported that specific working groups were established by the RBDA to define a set of common actions for the internalization of the environmental and resource costs for the whole RBD. These working groups were composed of all the IMDs of the district, along with some representatives of AIBs with an advisory function. The interviewees agreed on the effectiveness of the working groups (Mean: 3.75) because the meetings allowed the administrations to become acquainted with the other regional contexts and coordinate their activities. Four common objectives to improve irrigation efficiency were established for the whole RBD: (1) To increase the knowledge regarding the volumes of water employed in agriculture; (2) to improve water use efficiency through the adoption of more efficient irrigation systems and through initiatives that increase awareness and knowledge regarding irrigation efficiency; (3) to internalize environmental and resources costs within concession fees and (4) to implement incentivizing water pricing policies. Since the regions are very different in terms of irrigation infrastructures, crops production, regulatory framework and on-going initiatives, the specific measures to achieve these objectives had to be defined at the regional level [25].

5.4.2. Selection of Measures at the Regional Level

Despite the common strategy established at the RBD level through the working groups, we found that common outcomes for all administrations of the RBD were achieved only regarding the first objective. Based on the guidelines provided by the Ministry of Agriculture and on the work performed through the working groups, in 2016, all the regional administrations of the Eastern Alps RBD adopted specific regulations that introduced the obligation to install water metering for large water withdrawals and of water estimates for minor withdrawals. The IMDs found the coordination through working groups effective (Mean: 4) and appreciated the role of the RBDA that acted as an intermediary between the Ministry of Agriculture and the regions.

For the other objectives, instead, the outcomes of coordination were limited. Assessing the outcomes related to the second objective was not possible because of the high quantity of activities carried out in each region to improve irrigation efficiency. Moreover, the measures to fulfill the second objective depend on several local aspects, such as the climate, crop production, soil conditions and water availability; thus, a comparison throughout the district would be meaningless. Regarding the measures to recover the environmental and resource costs in concession fees or volumetric pricing, only two regions deliberated on the topic. Furthermore, one introduced a system of volumetric pricing for the water provided for irrigation, while the other established that concession fees must be differentiated on the base of the efficiency of the irrigation systems.

We also analyzed the PoMs [27] to understand what type of measures the regional administrations included to promote a more efficient use of water in agriculture and, therefore, to achieve the four objectives established at the RBD level. We found a great heterogeneity in the way the measures were selected by the four administrations of the RBD. Two main types of measures were identified in the PoMs: (1) Technical measures for which IBs are typically responsible, e.g., the shift to more efficient irrigation systems, and (2) non-technical measures, for which regional administrations are responsible. Non-technical measures can be divided in mandatory regional rules issued, for instance, to enact the four objectives established at RBD level, and financial incentives for agriculture. The latter are usually linked to the rural development program that is a system of financial incentives granted by the EU that each region implements to support the competitiveness of the local agricultural sector and to stimulate farmers to adopt more sustainable farming practices.

Given these two types of measures, we identified two different approaches adopted by the four administrations for the selection of measures: In the first, technical measures greatly exceed non-technical measures; in contrast, in the second approach, only non-technical measures are included (Table 1). Regarding the authorities responsible for implementation, in the first approach, responsibilities are distributed among regional administrations (52.7%), IBs (38%) and a few other authorities (9.3%),

while in the second approach, only regional administrations (100%) are accountable for implementation (Figure 4).

The IMDs belonging to the first approach reported that the measures contained in the PoMs were simply taken from regional plans (e.g., rural development program) and that the PoMs ends up being a collection of measures established elsewhere.

In the second approach, instead, the measures included are fewer and are all specifically related to the objectives established at the RBD level. Moreover, one interviewee from OCAs reported that the choice of not fragmenting responsibilities for implementation among several actors was made to enhance effectiveness and accountability.

In both cases, however, the measures contained in the PoMs (2015–2021) were not selected on the base of the pressures identified in water bodies. Nevertheless, the interviews revealed that some improvements might be achieved in the next planning cycle (2021–2027). The ex-ante conditionality established by the EU regulations 1305/2015 is actually strengthening the link-pressure measure in all administrations of the district. This is indicated by the actuality that in all the regions of the district, initiatives of coordination among WPDs and IMDs were set up to identify the most appropriate irrigation efficiency measures, starting from the assessment of the state of water bodies. In one region, the coordination went even further with the creation of the Technical Committee for Water (Tavolo tecnico Acque in Italian) to ensure the coordination of all regional departments for the implementation of the WFD and the Flood Directive (2000/70/CE) and also to ensure collaboration with the RBDA.

Table 1. Different approaches adopted by the regions for the selection of irrigation water efficiency measures.

Approach Based on:	Overall Measures (n°)	Technical Measures (%)	Non-Technical Measures (%)	
			Mandatory Rules	Incentive-Based
Mostly technical measures	115	73	23.5	3.5
Exclusively non-technical measures	20	0	70	30

Source: Authors' own elaboration based on Distretto Idrografico Alpi Orientali [27].

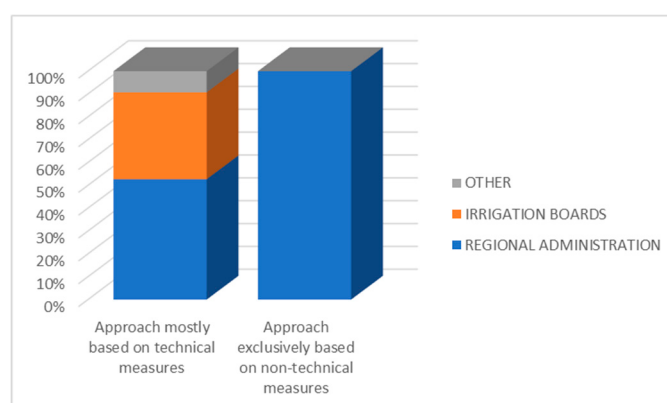


Figure 4. Authorities responsible for measures implementation by approaches (%). Source: Authors' own elaboration based on Distretto Idrografico Alpi Orientali [27].

5.5. RQ4: What are the Effects of the WFD Implementation on the Local Level?

5.5.1. The Translation of PoMs into Concrete Measures at the Local Level

Concerning the technical measures contained in the PoMs, these are usually taken from the local plans of IBs and, so, they are already concrete measures. Each IB, in fact, has its own programming tool to define what actions are required for irrigation, land reclamation and flood management. Consequently, the measures contained in the PoMs are derived from these plans but how these are related to the objectives established at RBD level was not always evident. For instance, one IB reported

that technical measures were included in the PoMs that were in no way related to the improvements in the state of water bodies because the IB was not adequately informed on the meaning and importance of the PoMs.

Technical measures to improve irrigation efficiency are mostly related to the adoption of more efficient irrigation systems. These measures imply considerable costs for IBs that are financially supported either through regional funds or through the national rural development program to whom boards have access through public announcements. However, the availability of regional funds is very different among the regions of the district, so that in some regions, half of the financial resources for IBs comes from regional funds, while in the others, regional funds are almost non-existent. Moreover, not all the IBs have been selected to have access to the national rural development program, with the result that, in some cases, the implementation of measures to improve irrigation efficiency can be prevented by the lack of financial availability.

The translation of non-technical measures into local actions usually means the installation of water metering devices and, for those regions that approved specific regulations, the adoption of pricing policies. In both regions that approved a regulation on water pricing, the implementation is very recent or is not started yet, so it was not possible to understand what the implications for irrigation management are. However, the interviewee with one AIB revealed that the effect of the introduction of water pricing will not be dramatic for the farmers because the largest share of the tariff is related to the fixed costs (construction and modernization) that are not related to the actual water consumption. Water metering and estimates, instead, is requiring a great effort from many IBs for the implementation: Before 2016, in fact, only large water withdrawals were subject to metering, while now this requirement has been extended also to medium withdrawals and for small withdrawals an estimate is required. Most of the IBs and AIBs interviewed reported that the implementation is challenging and, as for the adoption of more efficient irrigation systems, the installation of metering devices is strictly related to the availability of funding sources. However, some interviewees from IBs and AIBs agreed that the knowledge and awareness regarding qualitative and quantitative aspects of water resources is rising and, despite the difficulties of implementation in this initial phase, the irrigation management will benefit from these improvements.

Overall, all IBs and AIBs stated that the implementation of the WFD has accelerated a process of improvement of irrigation efficiency that, however, was underway regardless of the WFD. Finally, it is noteworthy that in all the regions, the interviewees revealed that the PoMs was not considered as the reference plan for irrigation management by the administrations and IBs involved. Indeed, the interviewees referred that the PoMs (2015–2021) did not have real operational implications for irrigation management compared to the other regional and local plans.

5.5.2. The Inclusion of Local Interest in the Development of Plans

The interviews revealed a great heterogeneity in the way IBs and AIBs participate in the activities carried out at the RBD level. We found that only two AIBs participated in the meetings organized by the RBDA to inform stakeholders about the implementation of the WFD and the AIBs found them very useful to acquire relevant information. The other AIB, instead, deemed that the information provided by the regional IMD was adequate and there was no need to participate at the meetings organized by the RBDA. Out of seven IBs, six participated at the meetings organized by the RBDA and five of them were satisfied with the information provided (Mean 3.67). Nevertheless, one IB was very critical regarding the work done by the RBDA because, in his opinion, the information provided to stakeholders was partial and there was no interest in listening to their comments and observations.

In addition to these meetings, AIBs have the right to represent IBs during the decision-making processes occurring at the RBD level. Moreover, in this case, only two AIBs participated and their evaluations were positive (Mean 4.5). The different level of engagement of AIBs in the processes carried out at the RBD level can be explained because some of them have traditionally had a closer relationship with the former river basin authorities and so are more used to interacting with the RBDA even informally, while, in the other case, the AIBs prefer to interact with the regional IMDs.

IBs do not formally have the right to participate in the decision-making processes held at the RBD level. Nevertheless, we found that two IBs participated in some of the working groups to decide on water metering. Those who participated found the working groups effective for what concerns planning but not effective regarding the consideration of their interests in decisions that will dramatically impact their irrigation practices (Mean: 2). We also found that the IB's dissatisfaction was not only related to the RBDA. The IBs that were more critical towards the decisions taken by the RBDA were also very disappointed with the way the regional administration was dealing with implementation.

Table 2. Summary of the results related to the research questions 1, 2 and 3 presented in Figure 1.

RQ	Coordination Mechanism	Effectiveness (Perception)	Outcome	Barrier to Coordination
RQ1: How are analyses coordinated for the whole RBD?	Working group	Effective	Common thresholds for significant pressures	Until the Law 221/2015 coordination for the analysis was not required by the national law
RQ2: How are criteria for setting environmental objectives coordinated for the whole RBD?	Guidelines provided by the RBDA	Low effectiveness	No common outcome	The national legislative framework for the application of extension and exceptions arrived late
RQ3: How is PoMs Coordinated for the Whole RBD?	For all the measures: Guidelines provided by the RBDA and approval of PoMs by the RBDA	Medium effectiveness	No common outcome	Different availability of analytical tools among regional administrations
	For water metering: Working group	Effective	Common regulation for water measuring and estimates.	

Table 3. Summary of the Results Related to the Research Question 4 Presented in Figure 1.

RQ	The Translation of Poms into Concrete Measures	Barrier to Implementation	The Inclusion of Local Interests in the Rbmps	Barrier to Participation
RQ4: What are the effects of the WFD implementation on the local level?	Technical measures are taken from local plans so there is not the need for 'translation'. Non-technical measures are regional rules, so implementation is mandatory	Lack of financial availability; low acceptance towards decisions taken at a higher level	Limited stakeholder consultation	The large scale of the RBD; regional commitment to engage with stakeholders

Source: Authors' own elaboration.

6. Discussion

Studying the implementation of WFD at the RBD scale in Italy is compelling because, compared to other countries, Italy adopted a large-scale river basin approach for the directive's implementation. Moss [29] highlights that the task of institutionalizing river basin management can be accomplished in two different ways: Either, with 'institutionally hard solution', meaning the creation of river basin authorities 'equipped with extensive executive powers, budgets', or with 'a cooperative institutionally soft solution' that are based on a set of procedures to reach agreement among the various authorities concerned.

Apparently, the Italian water governance for the implementation of WFD adopted an 'institutionally hard solution' with the creation of new overarching authorities, suggesting high substantive ambitions [30] for implementing the requirement of river basin approach. Nevertheless, the RBDAs in Italy are neither equipped with executive powers, nor with budgets; on the opposite, regional administrations are fully equipped with administrative and regulatory powers for water protection

and management. As Rainaldi [12] observed, the gap between, the ideology that inspires the legal disposition (the theory) and the context in which the law has to be implemented (the practice), generates a context-oriented evolution of the law that needs to be constantly adapted to the reality. In the Eastern Alps RBD, the context-oriented evolution of water governance brought to the creation, by the RBDA, of working groups to reach consensus among administrations on relevant decisions for WFD implementation. This ‘cooperative institutionally soft solution’ produced positive results both in terms of the participants’ satisfaction and of reaching shared decisions, such as the definition of common thresholds to identify significant pressures, and the regulation on water metering in agriculture. Nevertheless, the co-existence and similarity of regional water protection plans and the RBMPs, together with the actuality that many competences are still exclusively attributed to the regions, e.g., the development of PoMs, make these cooperative soft solutions temporary. In both of the cases where more coordination was achieved, in fact, this was driven by the EU Pilot and the need to comply with the EU regulation. Once the risk of infringement procedure is overcome, and the EU regulation satisfied, there is not necessarily the need to keep on working together because the overlaps that characterize the Italian water governance system are still in place.

The findings of this case study are also consistent with those of other studies that evidenced that the PoMs are not used to guide local implementation of measures [31]. However, studies usually focus on whether and how measures established during the planning processes are translated into concrete actions at the local level. In the Eastern Alps case study, we observed a different trend: Most of the measures contained in the PoMs were derived from local plans and their implementation was either already under-going or waiting for the necessary funding sources. This approach for the selection of measures reveals that the PoMs has not been used as planning instruments to promote integration between local management practices and the qualitative and quantitative state of water bodies. These findings resonate with what a recent study has highlighted: The way in which measures are selected indicate a little consideration of the rationale that is at the base of the WFD, that is ‘the harmonized transposition of the integrated river basin management paradigm’ [32]. In this case study, the recent spread of initiatives of integration among the water protection departments and water management departments at the regional level, as described at the end of Section 5.4.2, can be interpreted as a good signal that goes in the direction of a more systematized selection of measures, but these improvements have not concerned the current planning cycle (2015–2021). These progresses in the integration among water protection and water management can only be partially related to the implementation of WFD. Our results are in line with the results of Schröder [33] highlighting that ‘The WFD was found not to be a driver for integration as a regulative framework but induced an increased number of integration attempts through setting goals which can rarely be achieved without integration’. We may add to this consideration that in the Eastern Alps RBD, at least for what concern measures to improve irrigation efficiency, the EU Pilot and EU regulations on the use of European funds were the most significant drivers for integration, more than the WFD.

Finally, scientific literature highlights the importance of considering the geographical scales at which public participation is conducted. Two arguments are usually raised by scholars. The first points out that lower scales for participation, e.g., at the local level, are usually linked to higher representativeness [7], and to the production of better informed and meaningful plans that are also deemed more legitimate because decision-making processes are closer to stakeholders’ interests [34]. On the other hand, research highlights the risk of co-optation of environmental groups by more powerful interests when participatory settings are organized at a very local level [34]. The case study analyzed in this paper describes how public participation is structured in a large river basin. In such a large RBD, participation cannot, by definition, exceed information supply and limited stakeholder consultation. The process that we observed in the Eastern Alps RBD, in fact, resembles that of the ‘expanded stakeholder consultation’ [35] where, despite the WFD’s requirement of public participation being formally complied with, active participation of stakeholders is very partial. One of the arguments to support the engagement of non-state actors in the development of plans is to enhance

the effectiveness of policy delivery [36]. The latter is running the risk of limited implementation if decisions are perceived as imposed by stakeholders and they do not see the possibility to negotiate their interests. For this reason, it is at the sub-RBD level that stakeholders should find the appropriate spaces for participation, and the regional administration plays a crucial role in that. Being IBs local actors, the effect of WFD, as well as their involvement in the implementation of WFD, are mediated by the activities carried out at the regional level. Not surprisingly, the region where the IBs were more critical towards the WFD was also the region in which the relationships among IBs and the regional administration were less structured.

7. Conclusions

This paper unfolds the process of WFD implementation at a scale usually less explored by research: The RBD. Studying WFD at RBD level contributes to widen our understanding of how the institutional arrangements for water protection and management evolve to comply with the WFD requirements of river basin planning and participation. In the Eastern Alps RBD we found that new institutional arrangements to promote coordinated decision-making have only occurred for two key-tasks of the implementation process: The analysis of significant pressures and the identification of a set of common objectives to recover environmental and resource costs. In either case, coordination proved effective both to reach common outcomes for the whole RBD, and for participants' satisfaction with the decision-making processes. Nevertheless, we also found many problems that affect the Italian water governance system: The co-existence and similarity of regional water protection plans and the RBMPs that generates significant competences' overlaps, the delays of the national legislative framework that affected the overall process of WFD implementation, a limited consideration of the actual state of water bodies in the selection of measures contained in the PoMs (2015–2021), a limited stakeholders' participation in the development of RBMPs. As the RBD is a unit of implementation too large to encourage stakeholders' participation, it is at the sub-RBD level where stakeholders should find the appropriate spaces for participation. Therefore, the quality and frequency of interactions among stakeholders and public authorities at the regional level plays a crucial role to enhance the acceptance of stakeholders towards decisions that will inevitably impact their irrigation management practices.

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Abbreviations

RBD	River Basin District
WFD	Water Framework Directive
RBMP	River Basin Management Plan
DPSIR	Driver, Pressure, State, Impact, Response
POMs	Program of Measures
RQ	Research Question
RBDA	River Basin District Authority
OCA	Official Competent Authority
WPD	Water Protection Department
IMD	Irrigation Management Department
IB	Irrigation Board
AIB	Association for Irrigation Board

Appendix A

Table A1. Descriptive statistics of closed-ended questions.

Official Competent Authorities				
Question (5: Completely Defined; 1: Not Defined)		N° Respondents	Mean	Standard Deviation
To what extent are competences and responsibilities for WFD implementation clearly defined?		5	3.4	1.14
Official Competent Authorities				
Question (5 Very Effective; 1 Not Effective)		N° Respondents	Mean	Standard Deviation
RQ1	What is the degree of effectiveness of the coordination mechanisms (if any) to make the criteria for the analyses homogeneous for the whole RBD?	5	3.8	0.45
Official Competent Authorities				
Question (5 Very Effective; 1 Not Effective)		N° Respondents	Mean	Standard Deviation
RQ2	What is the degree of effectiveness of the coordination mechanism (if any) to establish common criteria for objectives, extensions and exceptions for the whole RBD?	5	2.8	1.64
Official Competent Authorities				
Question (5 Very Effective; 1 Not Effective)		N° Respondents	Mean	Standard Deviation
RQ3	What is the degree of effectiveness of the coordination mechanism (if any) to coordinate the Program of Measures for the whole of the RBD?	5	3	1.87
	Irrigation Management Departments			
	To what extent were the working groups effective to produce coordinated decision-making for the whole RBD?	4	3.75	0.5
RQ4	To what extent were the working groups effective to produce coordinated decision-making for the measuring of water in agriculture?	4	4	0.82
	Irrigation Boards			
	To what extent were the public meetings organized at the RBD level useful to acquire relevant information on the planning process?	6	3.67	0.82
RQ4	What is the degree of effectiveness of the working groups organized at the RBD level (if participated in any) to coordinate the decision-making among administrations and stakeholders of the RBD?	2	4.5	0.5
	Association for Irrigation Boards			
	To what extent were the public meetings organized at the RBD level useful to acquire relevant information on the planning process?	2	5	0

Statistics based on a 5-point Likert scale questions. Given the limited number of respondents the statistics simply provide a description of the opinions of interviewees on the coordination and participatory mechanisms (mean) and the degree of consensus on the topic (standard deviation).

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