

Article

# Integrated Water Quality Governance and Sectoral Responsibility: The EU Water Framework Directive's Impact on Agricultural Sector Policies in Norway

Sissel Hovik

Oslo Business School, Oslo Metropolitan University, 0166 Oslo, Norway; sissel.hovik@oslomet.no;  
Tel.: +47-67238236

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**Abstract:** In accordance with the EU Water Framework Directive (WFD), Norway has made the river basin the basis for coordination of sectoral policies. New units of River Basin Districts and Sub-Districts have been introduced. In each district, the joint water management plan and program of measures is formulated by cross-sector and multi-level networks. This network structure is added to and clearly subordinated to the primary structure following the sectoral principle and hierarchical steering. Therefore, the WFD objectives of good environmental status of all waters must be integrated into the goal structure and policy priorities of different sector authorities and levels of government. This paper examines whether and, if so, how the activities within the secondary structure of water governance influence the policies and practices of the agricultural sector regarding diffuse water pollution mitigation. The analyses of sector policy documents and water management plans reveal that even though the WFD's aim of good ecological status of water is integrated into the objectives of the agricultural environmental program, only minor changes have been made in instrument targets and settings. Economic incentives and voluntary measures still dominate. This leads to the conclusion that the corporatist governance mode of the agriculture sector dominates the sector's choice of policy objectives and instruments.

**Keywords:** water framework directive; Norway; agriculture; diffuse pollution; policy instruments; water governance

## 1. Introduction

The Water Framework Directive (WFD) aims to achieve good environmental status in all waters by 2021 [1]. The WFD takes a holistic, multi-level, and cross-sectoral catchment area approach to water management, through the requirement of river-basin-based management. The WFD leans on eco-system-based management and the integration of efforts in various policy sectors. Institutional fragmentation across vertical administrative levels and horizontal policy domains represent a huge challenge to this ambition [2]. The WFD's success is highly dependent on the integration, or mainstreaming, of the WFD's aims into various policy sectors [3]. There is a prevailing need for such water-mainstreaming into the agricultural sector policy.

The institutional adaptation to this challenge differs among EU member states [4]. Norway has chosen to adhere to the ecosystem-based principle of management more closely than most other countries have [5]. Norway has introduced new units of 11 river basin districts (RBDs) in order to meet the WFD's requirement of an ecosystem-based management. In each RBD, broad multi-level and cross-sector networks, comprised of all relevant public authorities, are established in order to formulate a joint management plan.

Norway addresses the dilemma of institutional fragmentation and distribution of power by introducing this ecosystem-based network structure as a secondary structure, which is added to

the primary hierarchical structure based on the sectoral principle [6]. The decisions made by the water networks—that is, the RBD management plans and Programmes of Measures (PoMs)—are not legally binding for either central government sector agencies or municipalities, making the networks a secondary structure. The sectoral principle retains primacy. This principle states that it is the responsibility of each policy sector and each county and municipality to ensure that it meets the environmental goals defined for its sector [7]. The secondary network structure is supposed to promote integration or mainstreaming of the environmental goals and objectives of the WFD into non-environmental sectors. Such integration refers to the extent to which the WFD objective of achieving good environmental status has become integrated into the goal structures and policy priorities in each individual policy area, and across governmental levels [8,9]. Thus, the WFD goals must influence the relevant sectoral policy objectives and instruments.

This paper examines the integration of the WFD goals into the agricultural policy sector in Norway, by asking the following question: Whether and, if so, how do the activities within the secondary structure of water governance influence the policies and practices of the agriculture sector?

The Norwegian water governance reform is an example of institutional layering, where the new network-based structure is added to the existing structure, rather than replacing it [10,11]. Founded on eco-system-based network coordination and sector-based hierarchical steering, respectively, different and potentially conflicting governance modes and policy regime logics dominate the new water governance structure and the agricultural policy sector. This paper applies a framework understanding policy design and change as embedded in the dominant governance modes and policy regime logics [12]. I examined how the agricultural sector's choice of policy objectives and instruments is influenced by the different and potentially conflicting governance modes and policy regime logics of the agricultural sector and the water governance. I did this by examining public documents and statistics presenting and evaluating the agricultural sector's environmental policy, and the RBD management plans and programs of measure in two river basin districts of Norway where such diffuse pollution is a significant problem.

I analyzed instruments and measures attacking discharges of nutrients, nitrogen, and phosphorus from agriculture land. Run-off of nutrients causes eutrophication, which is regarded as the most important pressure from the agriculture into the watercourses in Norway. The fragmented system of water management makes Norway an interesting case for the study of water policy integration [9].

This paper contributes with knowledge regarding the implementation of the WFD and integration of the environmental goals of the directive into national sectoral policies [2–4,9]. It also contributes to the knowledge on countries' choice of policy instruments to tackle diffuse pollution from the agricultural sector [13]. Knowledge on how different governance modes and policy regime logics of different layers influence policy integration and instrument choices also contributes to the literature on public policy and policy instrument choice [12,14,15].

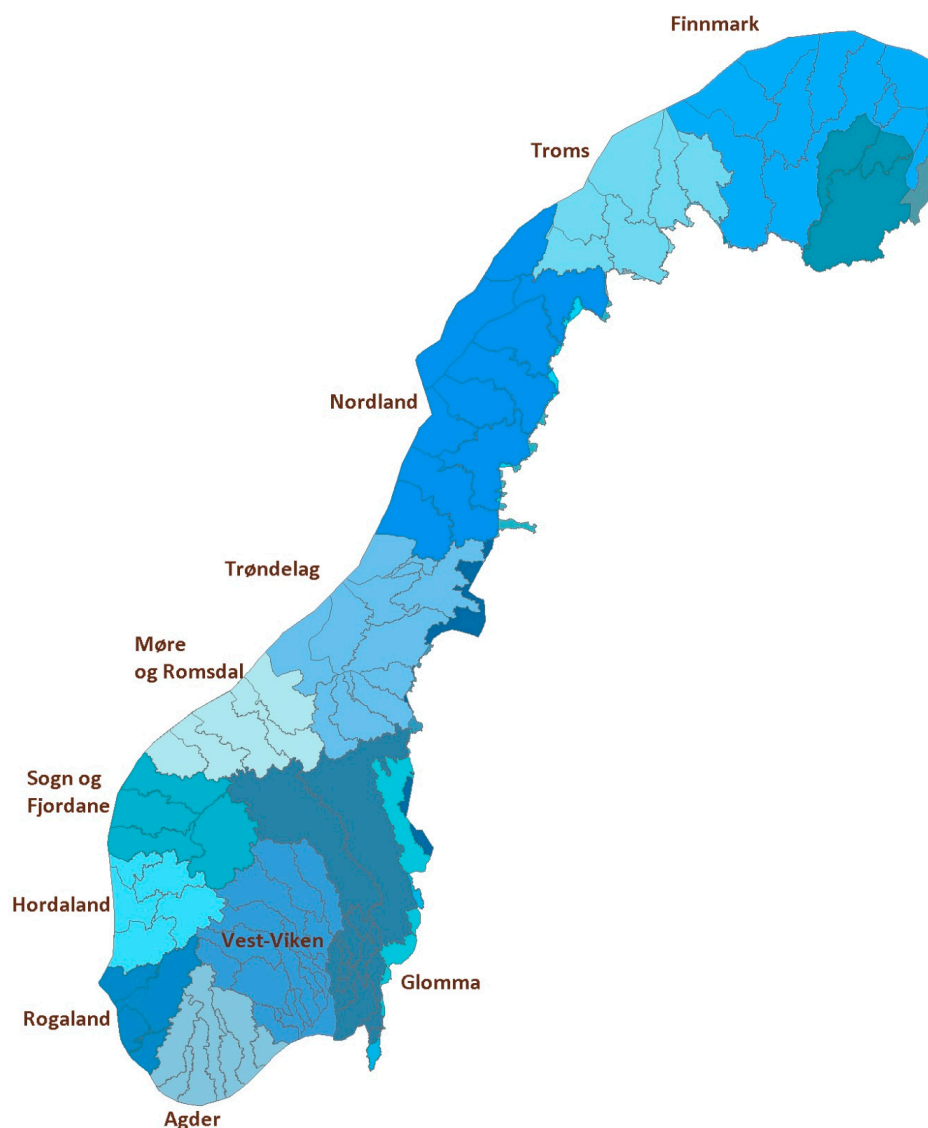
## 2. Norway's Implementation of the Water Framework Directive

### 2.1. The Norwegian Water Reform

The EU Water Framework Directive (WFD) was incorporated in the Agreement on the European Economic Area (EEA) in 2009, making Norway obliged to implement the directive. The EU's agricultural policy is not included in the EEA agreement. The WFD's goal of good environmental status in all waters is affected by many activities, including the production of hydropower; other physical interventions along the watercourses and riverbanks; pollution from agriculture, industry, fish farming, and households; and climate change. In Norway, the responsibility for regulating and guiding these activities is divided between the different levels of government; state, counties, and municipalities; and between different ministries and directorates at the national level. This implies a highly fragmented water governance system. In the early 2000s, five different ministries and seven national directorates

had competences regarding activities that either influenced or were influenced by the environmental status of water [16].

Norway implemented the WFD through the Water Regulation [17]. In order to meet the WFD's requirements of a holistic, river-basin-based management, Norway has established new governance units. The country is divided into 11 river basin districts (RBDs) (plus six districts shared with either Finland or Sweden) (see Figure 1). These 11 districts are divided into 105 subdistricts (SDs) as far as possible, the borders follow those of the catchment areas. Thus, the RBDs and SDs cut across the borders of municipalities, counties, and countries.



**Figure 1.** The Norwegian River Basin Districts. Source: <http://www.vannportalen.no/organisering/vannregioner/>.

In accordance with the WFD, the Norwegian Water Regulation makes the river basin the basis for coordinating sector policies. The Water Regulation introduces cross-sector and cross-level networks at the national, regional, and local levels. Table 1 below summarizes the water governance and agricultural governance structures. At the national level, there is one network among all relevant ministries, another for all relevant directorates. At the regional (river basin district) level, water boards guide the work. Subdistrict boards guide the work at the local (subdistrict) level. These RBD boards and SD boards comprise all affected municipalities, counties, and national authorities. The national

authorities are first and foremost the county governor (the state prefect, who has competences as regional agricultural and environmental agency), the Directorate for Fisheries, the Norwegian Water Resource and Energy Directorate, the Norwegian Food Security Authority, and the Norwegian Road Administration. Private actors are included in stakeholder groups and given a consultative role.

**Table 1.** The water governance structure and agricultural governance structure in Norway.

	<b>Water Governance</b>	<b>Agricultural Governance</b>
<b>Governance mode</b>	Network governance mode	Hierarchical governance mode
<b>Spatial division:</b>	Catchment based borders, RBDs and SDs cutting across administrative borders	Administrative borders
<b>National level</b>	Inter-ministerial network Inter-agency network	Ministry of Agriculture and Food The Norwegian Agriculture Agency
<b>Regional level</b>	River Basin Districts RBD-boards comprised by all affected national authorities, counties and municipalities	County governor Representing the state
<b>Local level</b>	Sub-Districts SD-boards comprised by all affected national authorities, counties and municipalities	Municipalities

These regional RBD boards formulate the joint water management plan for each RBD. This mandatory plan shall identify all environmental threats and risks to the ecological status of water within the catchment area, formulate a plan for goal achievement, and present relevant measures. The plan process follows the EU's six-year planning schedule. Apart from 30 pilot watercourses, the first generation of RBD management plans was approved in 2015. The RBD board members are expected to agree upon this joint management plan and the program of measures. The plan has the formal status of a regional plan made in accordance with the Planning and Building Act. The councils of each affected county approve this management plan, which is later accepted by the Ministry of Climate and Environment. This also implies that the management plan is not legally binding for either the municipalities or the state sector agencies. They must consider this plan when formulating their own policies and measures. However, they are not obliged to follow the plan or implement the measured listed in the program of measures.

One of the counties in each district is appointed as the RBD competent authority. These counties are responsible for coordinating and facilitating the planning process. They chair the RBD boards. In each district, a full-time coordinator is designated for this work. Thus, the counties have responsibility for process coordination, and for coordinating different state authorities and several municipalities. However, the counties have no binding authority over either state agencies or municipalities. Furthermore, they have only weak responsibilities regarding the content of water governance. Thus, their role as water authority is linked to their responsibility for regional planning in accordance with the Planning and Building Act, and their crucial role in regional development. Besides the counties' responsibility as process coordinators, the county governors are responsible for coordinating the professional actors and the knowledge gathering. They hold both environmental and sector policy competence due to their dual roles as regional environment agency and regional agriculture agency.

Even if the networks are given the authority to formulate management plans, they are clearly subordinated to the hierarchical structures of different sector authorities [6]. According to the principle of sector responsibility, it is the responsibility of the individual sector government, county, and municipality to ensure that they meet the environmental goals defined for their sector [7]. Norway adopted this principle through its implementation of the Word Commission for Environment and Development (the Brundtland Commission) in 1989. This principle is applied for the implementation

of the WFD; every sector government, county, and municipality must integrate the directive's goal of good ecological status. However, it is the responsibility of the individual ministries, counties, and municipalities to decide how to implement the management plan and program of measures.

The primary structure based on the sectoral principle and hierarchical steering is supplemented by a secondary structure based on eco-system management and network coordination. The water governance is an example of mandated collaboration networks [18], where autonomous actors reach agreement on a management plan through negotiation and where implementation of the plan depends on each actors' commitment [19]. Active participation in the planning process is expected to create ownership to the WFD environmental aim of good ecological status, and commitment to the River Basin Management Plan and the Programme of Measures.

## 2.2. The Agricultural Policy Sector

Agriculture is the third most important pressure on the ecological status of water in Norway, after river regulations due to hydroelectric power plants, and long-distance transported pollution [9] (p.3). The importance of agriculture varies a lot among RBDs and SDs. Discharges of nutrients and particles from agricultural land have been identified as the main problem caused by agriculture production [9].

Unlike water governance, responsibility for agriculture policy has been defined. The political-administrative structure forms a traditional vertical silo (see Table 1 above). Below the Ministry of Agriculture and Food, the Norwegian Agriculture Agency is responsible for providing expert advice to the Ministry and for implementing the government policy. The regional branch of this agency is placed within the office of the county governor. The County Governor, the representative of the state in each county, is a multi-purpose agency, responsible for environmental policy and some welfare services, in addition to agriculture. At the local level, the municipalities have responsibilities for individual case handling, as well as developing strategies for local industry development.

The agriculture policy subsystem was in the 1970s interpreted as a typical example of a segmented sector or iron triangle [20]. It was described as a close policy subsystem, composed by bureaucrats from the Ministry of Agriculture, members of parliament seated in the agricultural committee, and the farmers' organizations, supplemented by scientists from the Agricultural University. This changed during the late 1980s and early 1990s in response to macro-political changes. A combination of a weakened agriculture industry and the green wave led the sector to search for legitimacy through the industry's contribution to environmental values, such as biodiversity and landscape qualities, and to build alliances with the environmental sector [21,22].

However, the main policy frames for the agriculture industry are still defined through annual negotiations between the Ministry of Agriculture and Food and the farmers' organizations. This negotiation deals with the total amount of public subsidy and the distribution of this money among various sorts of productions and purposes. These negotiations are also important inputs to the Parliament and government when they define the goals and directions of the agricultural sector policy. A corporatist mode of governance is still dominant.

## 2.3. Governance Modes and Policy Instrument Choices

The Norwegian water management reform implies that the new network structure is added to the old hierarchical and sector-based structure. Hanssen and colleagues [6] interpreted the reform as an example of institutional change through layering [10]. The new structure is added to the existing structure, not changing it. A consequence of increasingly complex institutional layering is hybrid public organizations [23]. The Norwegian water governance is such a complex hybrid structure, combining different governance modes. The result might be incoherence and inconsistency: "Layering is a process whereby new goals and instruments are simply added to an existing regime without abandoning previous ones, typically leading to both incoherence amongst the goals and inconsistency with respect to instruments used" [24] (p. 137).

The policy aims and objectives of the WFD and the national Water Regulation create a need to redesign agricultural policy, changing its policy objectives and instruments. The present paper examined how the WFD objectives influence the policy objectives and instruments targeting diffuse pollution from agriculture. The research question in this study is: Whether and, if so, how do the activities within the secondary water network structure influence the policies and practices within the primary agricultural policy sector?

The way that institutional reforms work out depends on the interactions among the different institutional arrangements the system builds on. One implication is that reforms will work out differently in different institutional contexts [25,26]. Thus, the interaction between the new water governance arrangements and the agriculture policy sector will depend on (among other things) the institutional characteristics of agricultural sector.

According to Howlett [12] (p. 79), policy instrument choices result from a nested or embedded relationship within a larger framework of established governance modes and policy regime logics. The agricultural sector's choices of measures and policy instruments will be influenced not only by the policy aims and objectives of the water governance, but also by the existing corporatist governance mode of the agricultural sector, with preferences for given policy instruments and implementation style. Governments tend to repeatedly choose from a limited set of instruments, because the established governance mode guide governments' preference for particular types of governing resources [27]. These preferences influence their choice of policy instruments or tools, since different policy instruments employ different resources: Nodality (information), authority, treasure, or organization [14,28].

This reasoning leads to an assumption of path dependency [11]. Characteristics of the primary structure will influence how the agricultural authorities operate in the secondary structure, and how they integrate the results in the primary structure. In other words, institutional path dependencies are important constraints to policy change [29]. This line of argument leads to an expectation of little or no changes in the agricultural policy objectives and instruments, following their participation in the water governance networks.

However, some policy subsystems can be open for new actors, knowledge, and ideas [30]. The reorientation of the agricultural sector policy that we have witnessed since the late 1980s includes building alliances with actors from other policy sectors [22]. This reorientation has resulted in the sector's tendency to seek a cooperation strategy towards the environmental sector [7,31]. With this in mind, the agricultural sector could be expected to integrate the water governance policy into its sector and revise its policy objective and instruments in response to the network activities of water governance.

Lenschow et al. [29] (pp. 802–803) distinguished between three dimensions of policy change, based on Hall's [32] three basic dimensions of policy content: Overarching goals that guide policy, the instruments by which policy goals are attained, and the calibration or precise setting of the instruments. An underlying assumption is that it is harder to change policy instruments than to change their calibration, and harder to change the overarching goals than to change the policy instruments. Following this line of argument, one might assume that the activities within the water governance will influence the policy targets and instrument settings, but will not influence the policy objectives and instruments of the agricultural sector.

The catchment approach of the WFD requires institutional solutions that acknowledge the differences among catchments and allow a tailored approach to their management [2]. The Norwegian water reform supports such tailored management practices through the establishment of collaborative networks for each catchment area. In order to be effective, this system requires that the regional-level sector authorities (the county governors in the present case) are given some discretion to negotiate solutions with the other actors, and that the negotiated solutions are properly anchored at the central level [33] (p. 1293) [6]. The logic of network governance is that the central level defines the direction or course of action, not that it gives instructions [19]. In addition to looking at changes in policy objectives and instruments that directly target farmers' practices, I looked at changes in the county governors'

competences and discretion: Are they given the instruments and freedom to tailor the sectors measures in accordance with the situation of each catchment?

### 3. Materials and Methods

The main data source used in this paper is document sources. The national environmental program for the agriculture sector contains information about the environmental policy for the sector, including the policy that is addressing run-off of nitrogen and phosphor to rivers and lakes. Information about the sector's policy objectives and instrument was gained from four generations of the program, from its start in 2004 until 2018 [34–37], supplemented with information from a report from a multi-party (corporatist) working group in 2015 [38], the current instruction for regional environmental programs [39], and reports by the Statistics of Norway that present information regarding the implementation and effects of these policy instruments. I used information from the 2014, 2016, and 2019 versions [40–42].

The River Basin District Management Plans and Programmes of Measures in the two RBDs of southeast Norway, Glomma [43,44] and Vest-Viken [45,46], provided information about how water governance perceives the threats and pressures the agricultural sector exert on the environmental status of water, and which measures they consider necessary. These two RBDs were chosen due to the importance of agriculture, and due to the average ecological status of the water in these districts. Approximately 76 percent of all water bodies in Norway are characterized as having good or very good ecological status [42] (p. 117). This varies among RBDs and SDs. In the two RBDs of Glomma and Vest-Viken, 61 percent of the water bodies have good or very good ecological status [43,45]. As mentioned above, agriculture is identified as the third most important pressure on water environment in Norway. Its importance varies a lot. Agriculture is a particularly significant pressure in the RBDs of Glomma and Vest Viken, together with the RBDs of Rogaland (in southwest Norway) and Trøndelag (in central Norway) [42]. Together with Agder, these four RBDs have the least good ecological status.

Discharges of nutrients from agricultural land (grain fields and vegetable fields) were identified as the main problem with agriculture production in these two RBDs. Some water bodies also had problems with point-source pollution from manure storages, silos, and green houses, while areas with dense farm animal production had problems related to the use of manure. Pesticides were not perceived as putting significant pressure on water quality in Norway; this issue is hardly mentioned, if at all, in the RBD management plans and PoMs of Glomma and Vest Viken. Therefore, I focused on measures and instruments targeting run-off of nutrients (nitrogen and phosphor) and soil from agriculture land.

Data from the document studies was supplemented with information gathered through a research project studying the implementation of the WFD in Norway [47]. This information was obtained from surveys sent to all members of all the 11 RBD boards in 2013 and 2015. In 2013 the response rate was 41 percent, but in 2015 only 30 percent. All different regions and all different authorities were represented in both years. Furthermore, information was obtained from interviews with key informants representing different levels and sectors of government and three different RBDs. This material is presented in order to give some contextual information about the participants' general assessment of the Norwegian water reform and their assessment of the position of the agriculture sector compared to other policy areas.

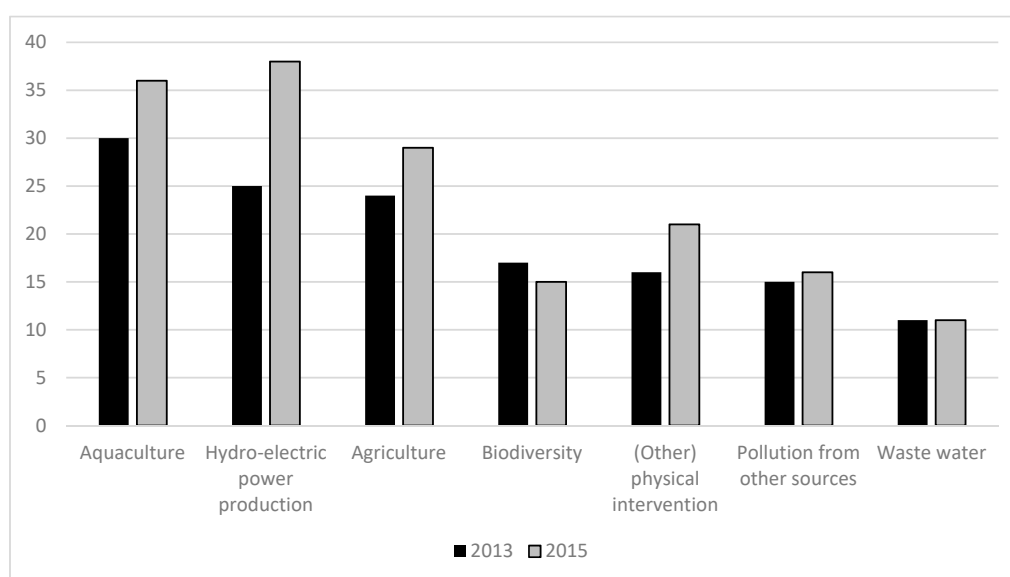
I focused on program-level instruments and on-the-ground measures and looked for the policy instruments and instrument calibrations listed in these documents. I also looked for changes in policy objectives and targets as these are formulated in the policy documents. I distinguished among policy instruments following the NATO scheme [14,28], which is based on the type of government resource applied: Government information (nodality), legal authority (authority), financial resources (treasure), and government staff and organization (organization). According to Belemans-Videc et al. [15], information attempts to influence people through the transfer of knowledge, the communication of

reasoned argument, and persuasion. Legal regulations aim to influence people by means of formulated rules and directives, which mandates receivers to act in accordance with what is ordered in these rules and directives. Economic instruments involve handing out or taking away material resources, such as money (for example, subsidies and grants). Organization is the direct provision of services by the state or its staff [28], which might include the creation of new infrastructure influencing the behavior option of the target group. Calibration of instruments and instrument settings depend on the type of instrument. Examples are levels of emissions standards, grants or fees, the requirements in order to receive a grant, and the area covered by the regulation or a grant scheme.

## 4. Results

### 4.1. The Participants' Assessment of the Water Governance Arrangements

The Norwegian Water Regulation introduced cross-sector and multi-level networks at the RBD and SD level. Their main task is to formulate and agree upon RBD Management Plans and Programmes of Measures. Since the management plan is not legally binding for either state sector authorities or municipalities, compliance is supposed to be ensured through participation in the entire process of formulating the plan (from identifying and characterizing water bodies, through identifying crucial matters and defining environmental goals, to the formulation of the plan and program) and through agreement on the content of the plan and program. Surveys to the members of the RBD boards revealed strong support for this system of water governance among all groups of actors [47]. The RBD board members were optimistic regarding the system's ability to improve the ecological status of water and its ability to protect and safeguard the water environment. Furthermore, they appreciated the fact that actors representing different policy sectors meet at the RBD and SD boards, and that the River Basin Districts are the units for cross-sector coordination. However, they recognized several shortcomings and challenges. A crucial problem was the ability to balance different national sector policy goals and solve conflicts of interests among such goals. The planning process makes the different actors' interests and objectives visible but does not resolve conflicts of interest among the actors [47] (p. 87). Agriculture is one of the sectors that quite a few of the RBD board members found hard to reach agreement on, together with fish farming and hydroelectric power production (see Figure 2 below).



**Figure 2.** Percentage of river basin district (RBD) board members indicating that it is very difficult or difficult to reach agreement on issues related to the seven policy sectors (marked value 4 or 5 on a five-point Likert scale). (N = 301; 231) [47] (p. 84).



Interestingly, more RBD members reported problems reaching agreements in 2015, the year for finalizing the management plan and program of measures, than in 2013. This indicates that the network cooperation process had not managed to solve conflicts of interest. These conflicts became more apparent when the time came to agree on measures. Informants representing the farmers' organizations claimed that it was impossible to combine the national goal of increased food production with the ambition of no discharges to water from farming. An informant representing the regional agricultural authority (the county governor's office) claimed that there were limits to the environmental demands they can impose on the farmers and still expect increased food production [6] (p. 170).

As mentioned above, agriculture has been identified as one of the three main pressures on Norwegian waters. In the two RBDs of Vest-Viken and Glomma, discharge of nutrient from agriculture land (particularly grain fields and vegetable fields) causing eutrophication was the main problem related to agriculture. In these districts, measures targeting agriculture were the most numerous [44,46]. The main body of measures aim to target diffuse sources of nutrient loss. The listed measures were efforts to optimize fertilization, to avoid plowing in the autumn, to lay out vegetation belts along rivers and streams, and to construct hydro-technical installations and coffer dams. There were also some measures targeting point source discharges of nutrients, such as manure storages, silos, and green houses.

#### *4.2. The Agriculture Sector Policy Objectives and Instruments*

Norway introduced legal policy instruments that aimed to regulate pollution from agriculture in the 1970s. Initially, the regulations mainly aimed to target point source pollution. Later, the focus turned towards diffuse sources of nutrient discharges, partly because of Norway's responsibilities in accordance with the North Sea Declaration. For example, regulation of manure storages was introduced in 1977. A major revision of this policy came in 1989. The main changes aimed to regulate the amount and time of manure spreading [31]. These regulations were accompanied by grants supporting and motivating farmers' investments in manure storages and silos, and regulations demanding fertilization programs at each farm. Additional measures and efforts were introduced in heavily polluted lakes and rivers, combined in task programs. These were voluntary measures, backed up by economic incentives [48]. The policy regime logic determining the agriculture sector's policy objectives and instruments was built on a preference for voluntary measures backed by public-supported consultancy and economic incentives.

During the 2003 agricultural negotiation, the Ministry of Agriculture and Food and the farmers' organizations agreed to introduce a National Environmental Program in 2004. This program gathers the policy sector's environmental efforts and has been revised regularly since its inception. The program lists the national goals and identifies the measures and instruments targeting the industry's pressures upon the natural environment. It is formulated by the Norwegian Agriculture Agency, and approved by the Ministry of Agriculture and Food, after consulting the farmers' organizations. The amount of money allocated to this program is settled through the annual negotiations between the ministry and the farmers' organizations.

One chapter of this environmental program addresses discharges of nutrients from agricultural land. According to the 2008 version of the Program, the policy objective for this effort was "to reduce erosion and loss of nutrients to water" [35] (p. 23). This chapter encompasses "particularly exposed (vulnerable) watercourses and other areas of priority". The 2008 version refers to the WFD and the national Water Regulation, and the authors expect demand for new measures and increased effort to reduce diffuse discharges, following the implementation of WFD. Since 2012, the policy objectives have been operationalized with strong reference to the WFD: "No water bodies in agriculture-dominated areas shall have an ecological status classification lower than in 2009/2015", and "the most exposed water bodies shall improve their status by 2015/2021" [36] (p. 11). The 2012 version mentions that the first generation of regional water management plans (in 30 pilot watercourses) did reveal a need

for stronger measures and instruments, as well as stronger efforts to reduce water pollution from the sector.

At the most abstract policy level, one of four broad policy aims for the sector, formulated by the Norwegian Parliament in 2017, is to promote “sustainable agriculture production and reduce discharges of climate gasses”. The other three are to promote food supply and emergency preparedness, to promote agriculture production (farming) in the whole country, and to enhance the industry’s value creation. Thus, one of the general policy aims is to reduce the pressure the sector puts on the natural environment, while reduced agriculture water pollution is listed as one of the sub-aims [37] (pp. 8–9).

The environmental program is divided between a national and regional program. The 2012 version of the environmental program represents a change in policy targets for the regional program. In 2008, the regional environmental program should contribute to “a significant reduction of ordinary (normal) autumn ploughing by 2020” [35] (p. 22). The ambition was a further reduction in grain fields plowed in the autumn from the 2008 level of 60 percent. Since 2012 and on, the specific policy targets concern vulnerable watercourses and water bodies, not farmers’ practices. Since 2012, the National Environmental Program has distinguished between “areas of priority” and “other areas”. The county governor has been asked to give priority to the most vulnerable and exposed water bodies, where there is a need to reduce discharges from agriculture in order to reach the WFD goal of good ecological status [36]. In these areas of priority, farmers receive higher grants than in “other areas” [39]. Thus, the incentives for farmers to implement environmental measures are higher in these areas.

The National Environmental Program contains two groups of nationwide policy instruments targeting nutrient leakages. The first are economic incentives: To obtain the area-based part of the general production grant that any farmer can apply for, farmers are required to establish a vegetation zone along rivers and streams [49]. This grant will be reduced if the farmers do not follow the requirements of a fertilizing program and pesticide logbook. Through a revision in 2014, the demand for an environmental program for each farm was dropped. An evaluation showed that both farmers and authorities had difficulty knowing what such a program should look like. Farmers considered it to be a demand for paperwork rather than an environmental measure [38] (p. 89).

The second group of instruments is legal regulations, where two national regulations are important. Firstly, regulation of organic fertilizers [50] regulate the processing, storage, and use of such fertilizers. For example, the regulation forbids fertilizer storages located in areas with a risk of flooding or close to rivers and streams, demands enough capacity for manure storing and sufficient area for spreading, and forbids manure spreading in wintertime and on frozen fields. Secondly, the regulation of fertilizing program [51] demands such program at each farm for each season and covering all land. The aim is to achieve optimal (or correct) fertilizing and to avoid nutrient leakages to water and air. This regulation also demands regular soil samples in order to monitor the level of phosphor and other relevant substances in the soil.

According to the national government, the regional environmental program is the most important tool for the sector’s implementation of the national water regulation, and thereby the WFD [36]. This program consists mainly of grants that aim to motivate farmers to take environmentally friendly action. Any farmer can apply for these grants, and anyone that meets the requirements is awarded a grant.

The annual budget limit and each county’s share of the grant is decided through the annual national negotiations between the ministry and the farmers’ organizations. The national Agriculture Agency defines areas and activities for the regional programs; loss of nutrients and soil from agricultural area has been one such theme since the start in 2005 and is one of seven themes in the most recent program from 2018. The county governor decides which of the national defined areas is included in the regional program, depending on what the county governor perceives as the most important problems in the county. Thus, within the national framework, the county governor prioritizes among areas (one of which is water pollution) and measures. The county governor formulates a regional environmental program, after consulting the farmers’ organizations. The Agriculture Agency approves the final

program. The municipalities handle the applications for grants in accordance with the national and regional programs.

There were initially four groups of measures attacking nutrient losses: Avoiding autumn plowing (it is particularly important to keep the stubble field until the spring at fields exposed to flooding or erosion), the use of catch crops, establishing vegetation zones along rivers and streams, and coffer dam maintenance. The 2012 program added a fifth group: Voluntary agreements. The regional program also has a chapter targeting discharges to air and climate change mitigation. Grants promoting environmentally friendly use of organic fertilizers fall under this chapter. Such measures often have effects on nutrient leakages to water. Table 2 lists the different measures and instruments identified in the National Environmental Program for the agriculture sector, at the different levels of government.

**Table 2.** List of policy instruments addressing diffuse water pollution from agricultural fields, categorized after type of instrument and level of government.

Type of Policy Instruments	National Level	Regional (County) Level	Local (Municipal) Level
<b>Legal instruments</b>	Regulation of organic fertilizing (major revision in 2003) Regulation of fertilizing program (1999)	Regional regulations forbidding autumn plowing	-
<b>Economic instruments</b>	Environmental requirements linked to production grants. The national climate and environmental program (since 2012)	Avoid autumn plowing. Use of catch crops. Establish vegetation zones. Coffer dam maintenance. Voluntary agreements (since 2012). Environmentally friendly spreading of manure (since 2012). OR: Manure spreading restricted to springtime or growing season (since 2019).	Investments in coffer dams and wetland. Investments in hydro-technical infrastructure
<b>Information</b>	Environmental program at each farm (until 2012)	-	-
<b>Organization</b>	-	-	-

As Table 2 shows, the policy includes local grants, allocated to the farmers by the municipalities. This grant scheme was introduced in 1994 and aims to support environmental investments. This program includes investment targeting diffuse water pollution and nutrient leakages; that is, to establish coffer dams and wetlands and build hydro-technical infrastructure.

Furthermore, there are legal instruments at the regional level: The county governor can make regional regulations forbidding autumn plowing and other forms of soil tillage in areas of high risk of erosion and flooding, which are draining to particularly vulnerable watercourses. Two county governors (Østfold and Akershus) introduced such regional regulations in 2015, applied to some vulnerable catchment areas. However, there was some confusion regarding the county governors' room for discretion. The Ministry of Agriculture and Food meant that the county governor of Østfold departed from his area of competence when he introduced extended constraints on autumn plowing, as a part of a negotiated deal with other authorities. In 2013 the Ministry of Agriculture and Food ordered the county governor to withdraw this regulation. This is an example of ambiguity regarding both the ambitions on behalf of the agricultural sector and the room of discretion delegated to the regional level [6,47].

Since 2012, the national environmental program has contained grants supporting projects that aim to increase knowledge production, dissemination, and consultation, the so-called Climate and Environment Program [37] (p. 24). Parts of these grants are allocated to projects targeting nutrient leakages.

The environmental program does not identify any informative policy instruments targeting nutrient losses. Fertilizing programs and environmental program at each farm are initiatives that include monitoring measures and education, and as such are informative instruments. However, these measures are advanced by legal and financial instruments.

The program does not list any organizational instrument either. Both the industry's own consultancy services and the municipal-employed civil servants might promote and advise farmers regarding measures preventing nutrient losses, but these are not linked to the environmental program.

In 2017, approximately 158 million Norwegian kroner (NOK) was allocated to measures aiming to reduce nutrient leakages; this constituted approximately 36 percent of the total of regional environmental program grants [42]. In 2005, approximately 153 million NOK was used, which accounted for 47 percent of the total [34]. The annual amount of money allocated to these measures has been relatively stable over the whole period. A high point of 179 million NOK was reached in 2012. There are huge differences among the counties regarding grants allocated to diffuse discharges of nutrients. In 2017, the counties in the eastern part of Norway (comprising the main parts of the RBDs of Glomma and Vest-Viken) and in Trøndelag spent almost 97 percent of the total amount of these grants. Since 2012, most of the money has been used in areas of priority. Approximately 94 percent of the money was spent in areas of priority in 2015 and in 2017 [42]. However, grants promoting environmentally friendly use of organic fertilizers (placed under the heading of discharges to air and climate mitigation) are increasing, from 28 million NOK in 2013 to 46 million NOK in 2017. The three counties with the most animal production (Hedmark, Møre og Romsdal, and Rogaland) received more than 60 percent of these grants.

The most popular among the water pollution measures was to avoid autumn plowing. In 2013, 84.3 percent of all regional grants allocated to water measures were spent on measures reducing autumn plowing [38] (p. 73). The area with postponed plowing did increase from 37 percent of all grain-fields in 2001 to 57 percent in 2012. Since then, the area declined to 31 percent in 2017 [42] (p. 125). There is a similar trend regarding the use of catch crops. Since peaking in 2002 with grant applications covering 350,000 decares (approximately 90,000 acres), the area declined to only 23,900 decares (c. 8000 acres) in 2017. The number of farmers (farming companies) applying for grants supporting measures against diffuse nutrient discharges peaked in 2012 with 11,413 firms [40] (p. 113), but in 2017 the number dropped to 6894 firms [42] (p. 157).

The regional grants supporting environmentally friendly manure spreading, introduced in 2013, are increasingly popular among farmers in the 15 relevant counties. The total amount of money spent on such measures increased from 28 million NOK in 2014 [41] (p. 132) to 46 million NOK in 2017 [42] (p. 158). The number of firms applying for these grants rose from 3148 to 3443.

Regarding the local (municipal) investment grants, 58.4 million NOK was spent on water pollution measures in 2017. This fund has increased since 2005, when less than 11 million NOK was spent [34]. In 2017, most of the money (51.6 million NOK) was allocated to hydro-technical installations [42] (p. 129). Such installations reduce discharges of nutrients and erosion, particularly from grain fields. This arrangement has become increasingly popular since its introduction in 2001.

#### *4.3. Summing Up Pattern of Stability and Change in Policy Objectives and Instruments*

The agriculture government's environmental program applies different policy instruments in order to influence different farming activities and practices [13]. As Table 2 shows, voluntary market-based instruments are dominant. A combination of legal and economic instruments is used to promote optimal use of manure and other fertilizers, and to establish vegetation zones. To avoid autumn plowing is mainly promoted through economic incentives, leaving legal regulations an option in some areas. To use catch crops and to establish coffer dams and hydro-technical installations are promoted only through economic incentives.

The agricultural policy sector has adopted the WFD goal of good ecological status of water and operationalized its environmental program objectives in line with the WFD and the national water

regulations. Alongside this, the policy targets have moved away from specific farming activities and practices towards the areas that the water governance networks identify as the most vulnerable and exposed of diffuse agricultural pollution.

However, these changes in objectives and targets have not been accompanied by significant changes in policy instruments targeting diffuse agricultural pollution; voluntary and market-based instruments still dominate. There has neither been any increase in money allocated to the regional environmental programs efforts to reduce diffuse pollution, efforts that the agricultural policy sector defines as its most important tool when implementing the water regulation. Nor have there been any significant changes in the national regulations. Even though the sector acknowledges the need for increased efforts, it has not allocated more money to the purpose or introduced new policy instruments.

The measures listed in the RBD-PoM echo the regional environmental programs for the agriculture sector. This is no surprise since it is the agricultural sector's own responsibility to identify measures. However, the Management Plans of both Glomma and Vest-Viken emphasize the insufficiency of the existing measures and instruments attaching diffuse agricultural pollution. One example is the 'pilot' river of Numedalslaagen (Vest-Viken), where the aim of good ecological status within 2015 was not reached for 160 of 482 water bodies. Insufficient reduction of nutrient discharges was one of the main causes of this failure, partly because the current incentives were not strong enough to secure the necessary reduction in autumn plowing [45].

The RBD Management Plan for Vest-Viken 2015 points to the need for better coordination and integration with the agriculture sector environmental program. The plan addresses the level of incentives, the priority among locations, and the total amount of money spent. Furthermore, the plan proposes a stronger emphasis on voluntary agreements between government and groups of farmers, which should release public grants. The RBD Management Plan of Glomma [43] presents an even broader list: Increased public grants for environmental plans (for farms), for environmental advisors, for hydro-technical installations, and for measures to prevent erosion along streams. The plan also called for stronger legal instruments, making it possible for municipalities to demand installations or maintenance of hydro-technical installations and for the county governor to demand environmental efforts and postpone plowing along the most vulnerable water bodies and/or at individual farms. The plan also addresses the need to differentiate legal instruments.

The most noticeable change regards the calibration of the instruments. Most importantly, the regional environmental program put stronger emphases on targeting the activity towards the most vulnerable watercourses and the farmland with the greatest discharges of nutrients (highest risk of flooding or erosion). The regional environmental program changes from being a part of the general program of subsidies, focusing on distribution among farmers, towards targeting the most polluted watercourses, focusing on the situation for the recipient. Regarding legal instruments, the government has announced that it will give the county governors a new and extended warrant to define environmental demands in vulnerable areas. It will also urge the county governors to use this opportunity in water bodies and catchment areas where pollution from agriculture hinders achievement of the WFD aim of good ecological status with current activity and instruments [52].

## 5. Discussion

Norway has responded to the WFD's request of an integrated and river-basin management approach by adding a secondary network-based water governance structure to a primary hierarchical and sector-based structure. The formal power and responsibility are still placed within each policy sector, and potentially sustaining a highly fragmented system of water governance. The predominance of the sectoral principle implies that integration must be achieved by mainstreaming water quality concerns into, in this case, the agricultural sectoral policies. The responsibility for combating eutrophication is still divided between different sectors and levels of government. It is the responsibility of the agricultural sector to choose policy instruments and measures targeting agricultural pollution. Agriculture is, however, an activity that is otherwise both legitimate and wanted. Both the environmental goals and

the sector policy goals must guide the choice of policy instruments and measures. This is one main argument behind the sectoral principle in Norway's environmental management. The potential conflicts of interests and goals are often put in the background, but such conflicts do mark the agricultural sector's policy against diffuse water pollution. It is difficult to combine measures restricting autumn plowing and national goals of increased food production. Such measures have a significant impact on production and income for farmers. The possibility to change production from grain and vegetables to grass in the most vulnerable areas clearly challenges the goal of using the whole country for agriculture production, according to one informant representing one of the farmers' organizations. This is because there are few or no alternatives to grass production in the less vulnerable areas (in western and northern Norway). The sector's integration of the WFD aims is clearly restricted by such agricultural policy goals.

Different environmental goals can also be difficult to combine. This is true regarding the most popular, and, initially, the strongest recommended measure to combat losses of nutrients from grain fields: To not plow the fields in autumn. However, autumn plowing reduces fungi growth and, consequently, the need to use pesticides [38] (p. 74). This is probably one reason why this measure has lost popularity among farmers in recent years and why the agricultural authorities are targeting this measure towards the most vulnerable and exposed watercourses.

As mentioned, voluntary and market-based policy instruments dominate the agricultural sector's tackling of diffuse pollution. The most important tool for the sector's implementation of the WFD, the regional environmental program, is an example of such. Legal regulations are mainly reserved for the use of organic fertilizers. Although the involved actors seemingly agree that the agriculture sector's efforts are too low, and the policy instruments are too weak, only minor changes have been made in the policy instruments. There have also been hardly any changes in the amount of money the sector spent on water pollution abatement measures over the last 15 years. The agricultural sector authorities have, however, integrated the Water Regulation into their policy objectives. By this, the agricultural sector recognizes the aim of the WFD and the Water Regulation and accepts to balance the sector's goals and interests against the goals and interests of the water governance. Thus, the agricultural sector government continues to follow its cooperation strategy towards the environmental policy sector [7,31]. However, the water policy integration is still strongly restricted by the dominant corporatist governance mode and policy regime logic of the agricultural sector. Its preference for voluntary measures promoted through economic incentives, and its reluctance towards introducing stronger legal regulations, illustrates this. So does the sector's reluctance towards increased spending on environmental measures. In a situation where the total level of public subsidies to the sector is set, the money allocated for water pollution competes with other purposes, such as securing farmers' income and income distribution within the sector.

However, changes have been made in the policy targets and the policy instrument settings. The agricultural sector concentrates its efforts on those water bodies and watercourses that the water governance networks define as the most vulnerable to and exposed to diffuse agricultural pollution. Thus, the present study supports the assumption that it is easier to change policy instrument calibration than to change policy instruments or goals [24]. When the regime logic of the agricultural sector prevents an increase in the money allocated and the introduction of harder instruments, the alternative is to concentrate the resources where action is most needed. Larger grants mean increased compensation for each farmer. Thus, stronger incentives for the farmers to change their practices have been introduced in these most vulnerable areas.

The observed targeting of the policy instruments is in accordance with the catchment approach of the WFD [2,53]. This targeting can also be interpreted as an adaptation to the network logic embedded in the water governance. The targeted use of the regional grants, as well as the announced changes in the use of regional regulations [52], will increase the county governors' discretion to collaborate with and negotiate solutions with the other participants in the water network [6,33] and increase their ability to adapt the agricultural policy instruments to the RBD management plan. It will also

enable them to contribute to a river-basin-based management, as it enables a tailored approach to the choice of measures [2]. In this case, the policy objectives and instruments on one hand, and the specific on-the-ground targets and settings on the other hand, were influenced by different governance modes and logics. The corporatist mode and sector-based logic influenced policy objectives and instruments, while a network mode and an eco-system logic influenced the targets and instrument settings. Even though the water governance structure was added as a secondary structure to the primary hierarchical sector structure, the reform led to some changes in the primary layer. The agricultural sector's participation in the cross-sector and multilevel arenas of water governance instigated some changes in the sector's policy.

This study has some obvious limitations. It focuses on Norway and the integration of water policy goals into the agricultural sector; only further studies can answer whether the situation is similar or different in other countries and for other policy sectors in Norway. Studies show that both other Nordic countries [53] and European countries [54] implement a similar mix of measures to mitigate diffuse agriculture pollution as Norway. Even though some countries rely on coercive instruments and mandatory measures [54], the tendency to prefer economic policy instruments has been observed in most other European countries [3]; so also, for a continuity in institutional and procedural arrangements [4]. European countries integrate water governance with other policy sectors, including agriculture, in different ways. A wide variety of domestic factors come into play [55]. The institutional characteristic of the multi-sector governance is one such domestic factor. Wiering et al. [54] observed a divergent picture regarding implementation of spatially differentiated measures. For example, Flanders in Belgium relies on coercive instruments and mandatory measures, while Denmark combines financial incentives and information in a voluntary strategy. The study presented in this paper shows how institutional aspects of the multi-sector governance in Norway, the primacy of the sectoral principle, constrain the agricultural policy sectors response to the WFD. The choice of policy instruments is strongly influenced by policy regime logic of the agricultural sector.

The fact that document studies constituted the main data material used in this study, is another limitation. Interviews with key policy actors could have contributed additional information and made it possible to trace the policy formulation processes and draw conclusions regarding causality. The modest changes in Norway's agricultural sector policy indicate that the water governance structure is still clearly subordinated to the primary structure. The agriculture sector's water policy integration is dominated by actors within the agriculture sector. Sector actors and institutions provide the most important premises for this integration. The objectives and instruments are defined by the sector authorities, within frames defined through negotiations between the sector ministry and the farmers' organizations. Consequently, Norwegian water management still suffers from institutional fragmentation across horizontal policy domains.

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