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Towards a Good Ecological Status? The Prospects for the Third Implementation Cycle of the EU Water Framework Directive in The Netherlands

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Abstract: The aim of the EU Water Framework Directive (WFD) is to achieve a "good" chemical and ecological status for all waters by 2027. Currently, the Netherlands and other EU Member States are finalizing their plans for the third iteration of the WFD management cycle. In this paper, we conducted an ex ante evaluation of these plans by assessing the perceptions of regional water authorities on goal attainment and the factors that account for it. In order to gain these insights, we first reviewed literature and developed a framework of factors that stimulate or hamper the implementation of the WFD. More detailed insights into the relevance and characteristics of these factors were found by applying the framework in two in-depth case studies. A more generalizable pattern was found by translating the case study results into a survey among the regional water authorities. We found that the majority of the participating water authorities expect that 50% (or more) of their WFD objectives will be achieved in 2027. However, hampering factors such as a lack of political will or the impossibility to address key causes of the problems that were identified during earlier management cycles are still present. Since it is doubtful whether they can be addressed by regional water authorities, we conclude that it will be unlikely that ecological ambitions will be met by 2027.

Keywords: Water Framework Directive; implementation; Netherlands; goal attainment; water quality assessment; ecology

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1. Introduction

The EU Water Framework Directive (WFD) came into force in 2000. The aim of the WFD is to improve the chemical and ecological quality of European surface waters and to promote a transition towards a more Integrated Water Resources Management (IWRM) and a sustainable use of water resources [1]. More specifically, all European waters should have achieved a good status or potential by 2015, and at the latest by 2027. In order to achieve this, Member States (MSs) have to take several steps to develop and revise Programs of Measures (PoMs) (see Figure 1).

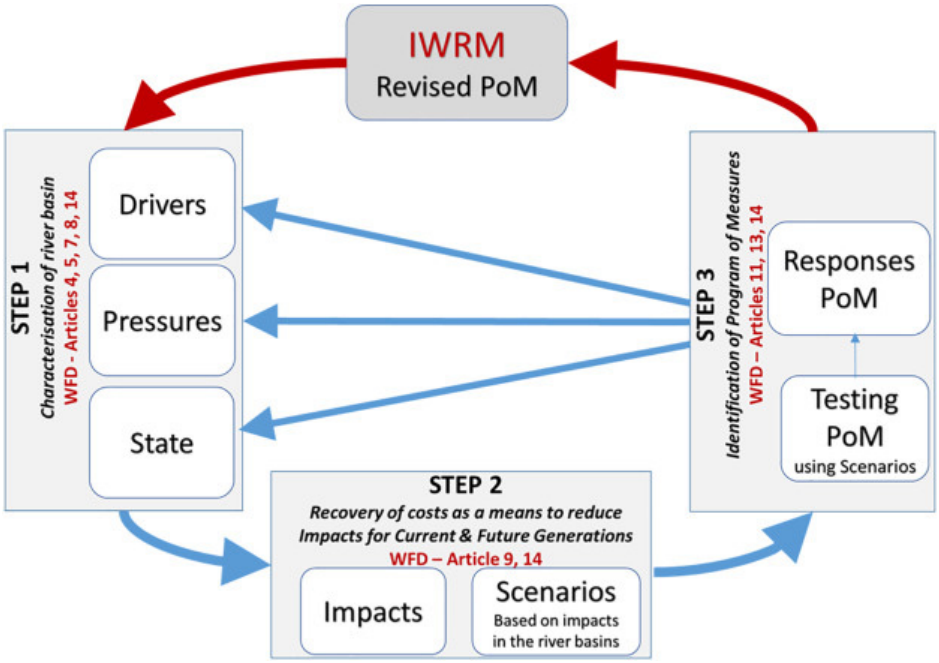

Figure 1. The management cycle of the Water Framework Directive [2].

Since the WFD follows a river basin approach, Member States (MSs) had to identify river basin districts (RBD) and make (economic) analyses of their characteristics, water use, and impacts caused by human activity. Moreover, MSs had to ensure that appropriate and competent authorities were installed that could facilitate the implementation of the WFD within each RBD. Furthermore, MSs had to classify each surface water body. Water bodies can be classified in the categories of rivers, lakes, transitional waters, and coastal waters—or as artificial (AWB) or heavily modified surface water bodies (HMWB). The ecological status/potential of a water body is assessed by monitoring biological, hydro morphological, and physico-chemical quality elements (QEs). The final classification of a water body is determined by the "one out, all out" principle, i.e., the status of the worst (chemical) quality element dictates the status (or potential) of the water body. When the classification of a water body is not considered to be in/does not meet a "good" ecological status/potential (GES/GEP), MSs are required to develop and implement necessary measures to achieve this status [3,4]. Three management cycles (2009–2015, 2016–2021, and 2021–2027) were identified for implementing measures and reporting (intermediate) results.

The third cycle (2021–2027) is currently set as the final implementation phase and will be the last chance for MSs to achieve the environmental targets as set by the WFD. Concerns have been raised as to whether the Netherlands will be able to obtain the goals of the WFD by 2027 e.g., [5–7]. The attainment of good ecological status will depend on the current status of the Dutch water bodies, as well as on the effectiveness of the programs of measures proposed for the third implementation phase. Hampering or stimulating factors may affect the establishment and outcomes of these programs of measures. An ex ante evaluation prior to the third WFD implementation cycle can provide valuable insights into the current status, possible drivers and pressures, and rationale behind the decisions that were made earlier in the Netherlands. The presence of new draft versions of Dutch (regional) water management plans for the third implementation phase allows for a more topical review on the current progress and on the possible attainment of goals by 2027. Furthermore, an ex ante evaluation might offer the possibility to inform or steer the course of the implementation of the WFD [8]. The aim of this paper, therefore, was to conduct an ex-ante evaluation of the third implementation cycle of the WFD. In the paper, we questioned the extent to which the 21 Dutch regional water authorities will be able to achieve the goals specified in the WFD by 2027. So far, this topic has not been

addressed in the scientific literature. Regional water authorities are public bodies charged with water management for a specific area and are key actors in implementing the Water Framework Directive in the Netherlands. In order to answer this question, we took several steps. First, following an extensive literature review, we developed a framework of factors that stimulate or hamper the implementation of the WFD (Section 2). The framework was applied in two in-depth case studies in the river basin districts of two regional water authorities, which revealed more detailed insights into the presence and characteristics of the hampering and stimulating factors. Next, we attempted to generalize our case study findings in a survey among the regional water authorities. In Section 3, we give an overview of the methods we used in the empirical part of the research. An overview of the results follows in Sections 4 and 5. The results are discussed in Section 6, followed by some concluding remarks in Section 7.

2. Hampering and Stimulating Factors: An Analytical Framework

Following a Scopus search in March/April 2021, we found nine papers published after 2009 that address factors that hamper or stimulate the implementation of the Water Framework Directive. We inductively labeled these factors and clustered them into seven categories: "*legal aspects*", "*knowledge and monitoring*", "*political willingness*", "*intersectoral collaboration and public participation*", "*financial resources*", "*the relationship between pressures and measures*", and "*coherence of EU legislation*". An overview of the varying factors affecting the WFD implementation is shown in Appendix A.

The first category, "legal aspects WFD", includes complications and incentives related to the responsibilities under the WFD's regulations. There is a general consensus that the WFD legislation is flexible and leaves room for policy discretion, which at the same time also makes it ambiguous and open for interpretation. The obligations and objectives of the WFD are primarily described as ambitious and stringent e.g., [9–11]. In particular, the "one out, all out" principle was considered as an "overly strict" measure, which hampers the possibility to communicate the improvements in single quality elements (QEs), leading to an underestimation of the overall improvement of a water body e.g., [12,13]. The fact that the environmental objectives and the mandatory basic measures are legally binding and could result in infringement procedures at the Court of Justice in the case of non-compliance also has consequences. For some MSs, such as France, fear of infringement procedures was an incentive to raise its ecological ambitions, as it was expected that the Commission would not accept lower ones [14], while for the Netherlands, it resulted in a rather cautious approach. For some MSs, it also resulted in a rather pessimistic classification of water bodies from the start. Bodies of which the quality was uncertain were classified as heavily modified [15]. Other MSs only opted for the more low-hanging fruit measures, such as upgrades of waste water treatment facilities, or used the option to ask for exemptions and extensions [3]. The latter is also due to the "one out, all out" principle used in progress reporting [11]. Furthermore, the relatively short time frame available to attain the ecological objectives is considered to be a complicating factor [11–13]. The latter can be questioned, however, since obligations to reduce pollution by heavy metals, pesticides, and nitrates have existed since the 1970s [16].

Several of the reviewed papers focus on the role of factors related to "knowledge and monitoring". The availability of enough reliable data on water quality is described as a crucial factor for a successful implementation of the WFD [10]. The WFD has led to a better development of monitoring programs and assessment schemes for water bodies e.g., [9,13]. In addition to increased knowledge of the (current) status of the EU's water bodies, the implementation of the WFD has also led to better tracing and quantification of pollution levels [13,17]. The introduction of an intercalibration process, aimed at standardizing and harmonizing assessment methods and increasing the comparability of monitoring data, was received positively [11,18]. Furthermore, improved monitoring may result in better priority setting and the development of more cost-effective measures [19]. Nonetheless, a lack of ecosystem knowledge was also described as one of the main complications of WFD

implementation e.g., [14,18]. Examples of knowledge- and monitoring-related hampering factors include uncertainties concerning the assessment of the ecological status, the effects of measures (and complication factors such as climate change) on the ecological water quality, and the high ongoing costs associated with monitoring e.g., [9,12,14].

We found several factors that relate to the "political willingness" to implement ambitious measures to improve the ecological status of water bodies. Despite moderate criticism, the WFD is also described as being inspirational, ambitious, and able to raise ecological awareness [11,18]. Additionally, Wiering et al., [10] described the obligations of the WFD (and other directives, such as the Nitrates Directive) as "key drivers of change in water policies in all Member States". However, a lack of political will is described as a common issue in the implementation of the WFD in several MSs e.g., [14,20]. Several reasons led to the determination of less ambitious and low-hanging fruit types of measure. They include a fear of (financial/economic) trade-offs, the avoidance of political decisions with low societal support, uncertainties about the cost effectiveness of measures, and interests that are ultimately conflicting [11–14,20]. Political resistance to the implementation of the WFD is often linked to the agricultural sector, which not only has a high water demand/causes high water abstraction, but also has a significant influence on the water quality through agricultural runoff of fertilizers and pesticides for example, [20,21].

The fourth category of factors considered refers to "intersectoral collaboration and public participation". The introduction of the "river basin approach" requires efficient collaboration between different (transboundary) governments, stakeholders, and sectors [13,22]. Simultaneously, this shift towards a more holistic, integrated water resource management implies that the functioning of both physical and socio-economic systems must be addressed as well [12]. In order to attain goals on time, regional cooperation must lead to a management approach that is locally more "fit for purpose", taking regional needs and issues into account [10]. This collaboration aims to/should result in a better utilization of local knowledge, creating more awareness and understanding of water quality issues, and increasing public support and improved decision making e.g., [18,21]. For effective WFD implementation, international coordination is crucial as well, since the ambitions of upstream (or downstream when fish migration is involved) states (or their lack of ambitions) may affect the results of downstream states [22]. Several publications, however, report complications with respect to intersectoral collaboration and public participation. Conflicting interests among different stakeholders, such as between farmers and nature conservation organizations, or the search for a balance between ecology and economy, are frequently mentioned as issues, affecting the political will to implement unpopular or stringent measures e.g., [14,20]. The lack of collaboration and communication between different governmental departments was also described as a barrier to the implementation of the WFD. The consequences of these issues relating to intersectoral collaboration range from problems with the acquisition of land to implement measures to indecisiveness amongst public actors [14,20]. Furthermore, several MSs experience problems relating to public participation, stating that stakeholders are not sufficiently integrated throughout the implementation process, that there is insufficient time and resources to enable efficient participation and collaboration, or that the WFD content was too technically complex for non-expert participants [13,14,21]. Additionally, participants stated they had little to no major impact on decision making e.g., [11]. Moreover, a lack of authority and (mutual) dependencies on other governmental actors were identified as factors that limit the steering possibilities of Dutch regional water authorities [10,14,18]. The use of (economic) incentives and stimulating regulations (carrots and sticks), however, turned out to contribute to more successful cooperation between different stakeholders in several MSs [10].

The availability of sufficient funding is crucial for the implementation of most measures and monitoring programs, and ultimately for attaining the WFD objectives e.g., [10,13]. For financial resources, implementing agencies depend on national funding, since there is no funding budget from the EU for the WFD [13]. In multiple MSs, the lack of financial resources is mentioned as an important limiting factor for WFD implementation. Zingraff-

Hamed et al. [20] argued that three out of four main complications are (in)directly linked with insufficient funding (i.e., insufficient land reserves, insufficient availability of staff resources, and issues with financial mechanisms). Compared to other MSs, the implementation of the cost recovery for water services (Art. 9 WFD) was relatively less complicated in the Netherlands, as regional water authorities are able to levy their own taxes [23]. The availability of such tax funds not only implies that regional water authorities have a stable budget, but it also means that their investments in water quality improvements do not have to compete against other political portfolios, such as infrastructure or health care [23]. As a result, regional water authorities could propose measures for incorporation in the first draft river basin management plans (RBMPs) that were financially feasible [14] and within their own competences. However, more ambitious measures (e.g., measures requiring the acquisition of land) that would call for an increase in taxes were not found to be popular [14]. The prioritization of measures based on limited funding instead of implementing more idealistic measures is frequently mentioned as a hampering factor in obtaining the WFD objectives e.g., [13,18].

The sixth category, the "relationship between pressures and measures", refers to the identification of potential causes of deterioration and the development and assessment of suitable measures for addressing these causes. The WFD asks for a holistic approach and, more specifically, the development of RBMPs and a compilation of basic and supplementary measures in a Program of Measures (PoM). This implies that relevant pressures should be indicated, for which necessary measures can be determined [12]. However, this integration proved to be a challenge for several MSs. A poor linkage between pressures and measures was found to be a relevant complication e.g., [9,13]. This poor linkage between causes and measures results from a lack of knowledge of the current status of the water body and its reference conditions, and of the effects of measures on the desired status of the water body (or the time necessary to see the results of these measures) [14,24]. A lack of coordination and alignment also results from a lack of political will (e.g., the preference of cost-effective measures that show quick improvements and the focus on particular quality elements (QEs) and issues related to cooperation with other sectors (e.g., conflicting interests) [10,18,25]. This resulted in PoMs that focused on "treating symptoms" rather than addressing the pressures causing water deterioration, such as land use within the drainage basin [12,13]. By focusing on the improvement of single QEs, MS's governments opted for a more pragmatic approach to identifying and acting on existing issues [12,18]. They tend to act within their own competences and on issues where no cooperation with other governmental bodies is necessary.

Factors clustered in the last category, "coherence of EU legislation", refer to the relation between the WFD and other EU directives and policies. Although the WFD integrates several former EU directives, MSs still need to comply with obligations resulting from other EU legislation, such as the Bird and Habitat Directives, the Flood Directive e.g., [1,26], and the Nitrate Directive. The implementation of other directives may result in synergies for the implementation of the WFD, but may also lead to conflicts. EU directives, such as the Habitats, Birds, Nitrates, and Marine Strategy Framework Directives, were identified as potential synergistic directives, while others were expected to blend well with the WFD, such as the Floods Directive [11,20]. In practice, the Bird Directive and WFD may have conflicting environmental targets, with waterfowl thriving in more productive habitats and the WFD often penalizing this level of productivity. It thus seems rather challenging to implement and comply with all these EU environmental directives at the same time e.g., [18,20,27]. The Common Agricultural Policy (CAP) is often perceived as one of the main conflicting policies e.g., [11]. Apart from this, the WFD asks MSs to focus on the basin level, while other directives (e.g., the Habitats Directive) may result in other geographical scales to focus on [14].

3. Methods

In order to assess the prospects for achieving the WFD goals by 2027, we have used our analytical framework of hampering and stimulating factors for an identification of the perceptions of the Dutch regional water authorities. First, we identified what measures are taken or proposed and which hampering and stimulating factors are present in two in-depth case studies at, respectively, the regional water authority De Dommel (WDD) and Hoogheemraadschap De Stichtse Rijnlanden. (HDSR) (see Figure 2).

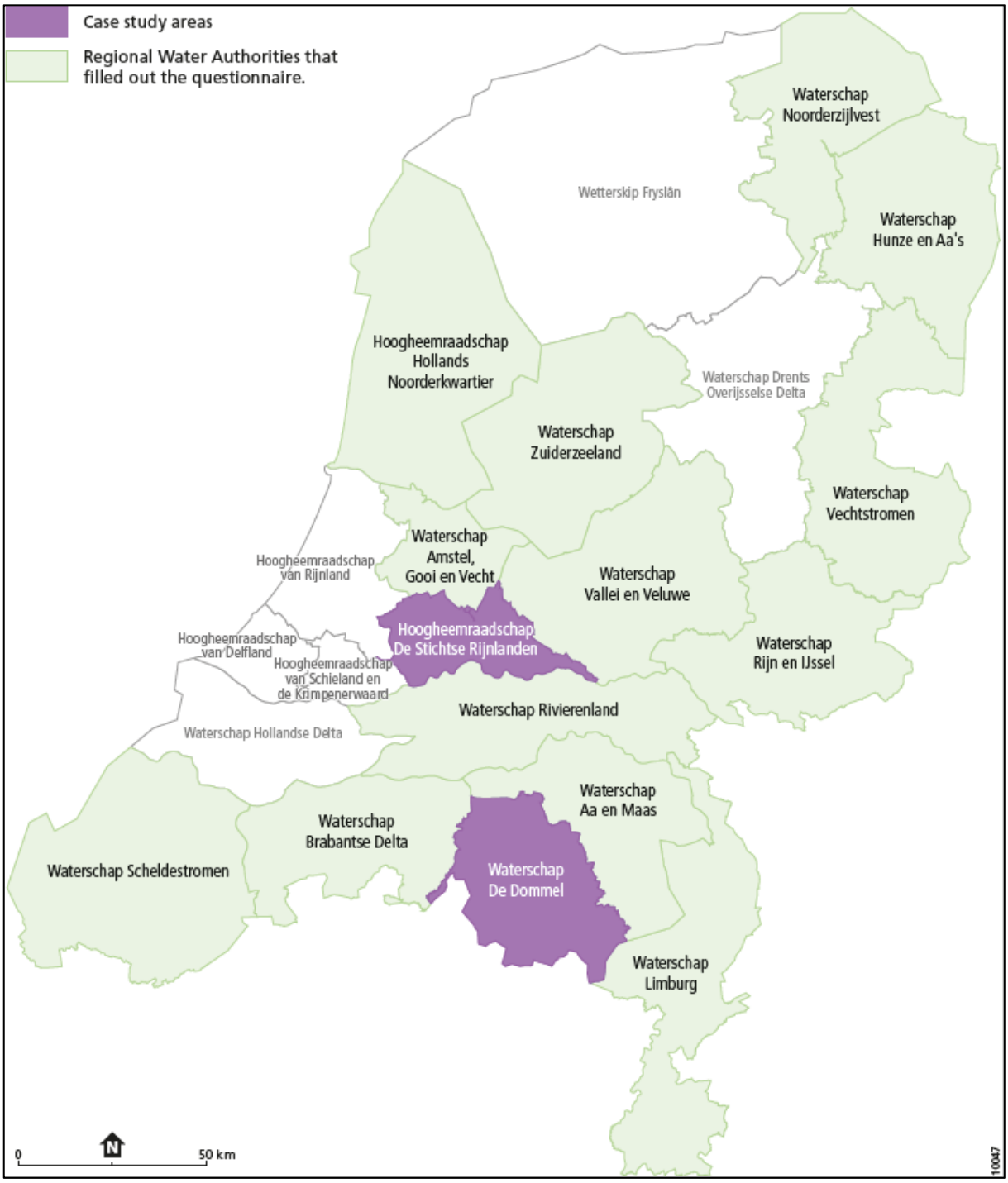

Figure 2. Map of the Dutch regional water authorities.

WDD, located in the Meuse river basin district and named after the Dommel River, represents the higher, sandy grounds in the Netherlands. Land in the Dommel catchment is mainly used for agriculture but also as residential and nature areas [28]. In 2021, a total of 26 surface water bodies were identified in WDD, one of which was designated as "natural", 16 as "heavily modified", and 9 as "artificial". HDSR is located in the Rhine (West) river basin district. The region of HDSR is diverse, consisting of residential areas, river areas, low-lying peatland areas in the west, and more elevated sandy soils in the *Heuvelrug* region in the east [29]. HDSR's region includes 30 surface water bodies, of which 5 are designated as "heavily modified" and 25 as "artificial" [30,31]. In both case studies, the analytical framework was used in content analyses of the water management plans of the regional water authorities and as input for the development of semi-structured interview questions. Interviews were conducted with civil servants involved in the development and execution of the programs of measures.

Subsequently, the findings from our case studies were transcribed and translated into statements which were used in an online survey among the remaining Dutch regional water authorities (see Figure 2). In this way, we tried to extrapolate our more case-specific findings and to obtain more generalized insights into the presence and characteristics of the varying factors affecting the implementation of the WFD in the Netherlands. Civil servants were asked to indicate to what extent they agreed with the statements on a five-point Likert scale ("Strongly disagree", "Disagree", "Neutral", "Agree", and "Strongly agree"). As well as this, they were asked to explain their answers in a separate comment section. In addition, respondents were asked to reveal their expectations on the attainment of planned measures and WFD goals (five options were given: 0%, 25%, 50%, 75%, and 100%). The questionnaire was filled out by 16 civil servants representing 15 regional water authorities. Furthermore, we compared our findings with recent evaluation reports from the Netherlands Environmental Assessment Agency (PBL) [6,32–34]. Finally, additional semi-structured interviews were carried out with experts from the Netherlands Environmental Assessment Agency (PBL) and the National Institute for Public Health and the Environment (RIVM) on the possibilities for the attainment of the WFD goals in the Netherlands.

4. The Prospects for Goal Attainment by the Regional Water Authorities De Dommel and Stichtse Rijnlanden

In this section, we firstly identify what hampering and stimulating factors were relevant for both regional water authorities. Next, we focus on what both authorities have done and plan to do to meet the goals, and what the expectations for goal attainment are.

4.1. Relevance of Hampering and Stimulating Factors

Tables 1 and 2 show that many, but not all, hampering and stimulating factors found in the literature were considered relevant in the two case study areas. Both regional water authorities perceive factors that hamper the achievement of a good chemical and ecological status by 2027. The "one out, all out" principle was considered to give a misleading, underestimated image of the progress made in both areas. Furthermore, a lack of perspectives for concrete actions was considered to be a hampering factor by both water authorities. Although the pressures on the water system are clear, there is not always a clear perspective for the water authorities to act on these pressures, because they do not have the competence to do so. According to one of the interviewees, the competence to act on specific pressures was lacking, especially for river-basin-specific pollutants and priority substances, and partly for nutrient emissions. Cross-border pollution from Belgium was mentioned as an additional barrier for the attainment of WDD's goals.

Table 1. Relevance of hampering factors affecting the implementation of the Water Framework Directive in the regional water authorities Dommel (WDD) and Stichtse Rijnlanden (HDSR).

Category	Hampering Factors	WDD	HDSR
Legal aspects WFD	• Stringent obligations and time frame (e.g., the "one out, all out" principle)	x	x
	• Legislation is considered to be ambiguous		
	• Fear of infringement procedures	x	
	• Focus on achieving goals, instead of improvement		
	• Methodological approach of the WFD was perceived as a burden		x
Knowledge and monitoring	• Lack of knowledge leads to uncertainties concerning the assessment of ecological status and (cost) effectiveness of measures		
	• High ongoing costs of monitoring		x
Political willingness	• Unpopular decisions may affect politicians' choices	x	
	• Fear of (financial) trade-offs/conflicting interests	x	
	• Uncertainties of cost effectiveness		
	• Implementing "easy" measures that lead to quick results, rather than more crucial measures		
	• Lack of perspective for concrete action	x	x
Intersectoral collaboration and public participation	• Conflicting interests	x	x
	• Dependency on other (area) partners	x	x
	• Impeded collaboration affects practical implementation of measures (e.g., acquisition of land)	x	
	• WFD is technically too complex for some non-experts, which hampers public participation	x	x
	• Little impact on decision making by public participants		
	• Communication of results and plans to stakeholders and public is challenging		x

Table 1. *Cont.*

Category	Hampering Factors	WDD	HDSR
Financial resources	• Limited financial resources hamper the implementation of more ambitious measures or the prioritization of measures		
	• A lack of personnel	x	
Relationship between pressures and measures	• A lack of data/knowledge results in uncertainties, which results in a poor linkage between pressures and measures	x	x
	• Addressing "symptoms" instead of the causes of water deterioration		
	• Developments such as climate change and new insights affect the outcome of implemented measures	x	x
Coherence of EU legislation	• Conflicting interests or priorities between EU policies	x	
	• Differences in geographical scales (RBD or local) or governance styles between EU policies		

Table 2. Relevance of stimulating factors affecting the implementation of the Water Framework Directive in the regional water authorities Dommel (WDD) and Stichtse Rijnlanden (HDSR).

Category	Stimulating Factors	WDD	HDSR
Legal aspects WFD	• Substantial freedom within the flexible approach of the WFD, which leaves policy discretion for the MS to choose the appropriate measures		
	• Incentive to improve the ecological status of water bodies	x	x
	• Possibility to use exemptions		x
Knowledge and monitoring	• Increased knowledge aids decision making and may prevent misjudgments	x	x
	• Increased monitoring and knowledge could be a cost-effective measure because effective measures that tackle causes can be chosen		
	• Intercalibration leads to a flexible approach for MSs to share data		

Table 2. *Cont.*

Category	Stimulating Factors	WDD	HDSR
Political willingness	• Implementation of WFD inspires and raises ecological awareness		
	• Obligations of the WFD may act as an incentive or "key driver" of (policy) change	x	x
	• Political momentum with respect to the environmental cause		
	• Political support for proposed/considered measures	x	x
Intersectoral collaboration and public participation	• Collaboration and public participation enable the possibility to utilize local knowledge and aid decision making	x	x
	• Increases awareness and understanding of water quality issues	x	x
	• Increases public support for the implementation of measures		
	• Use of stimulating policy tools (e.g., economic incentives)		x
	• WFD may act as an incentive to work more closely with regional partners	x	x
Financial resources	• Sufficient funding is available to enable more ambitious measures (e.g., use of financial incentives, hiring of staff, or acquisition of land)	x	x
	• An effective cost-recovery system	x	x
Relationship between pressures and measures	• Identification of pressures helps to select effective measures	x	x
	• Improvement of individual QEs enables a pragmatic approach to identify pressures and suitable measures		
Coherence of EU legislation	• Implementation of other directives may result in synergies for the implementation of the WFD		

Multiple interviewees stated that addressing these pressures (e.g., atmospheric deposition) would require a combined regional, national, and/or European approach. This relates partly to the shared view on the barriers related to "intersectoral collaboration and public participation". In both water authorities, dependency on other (regional) partners, including the national government, and conflicting interests were perceived as relevant hampering factors. Moreover, the (technical) complexity of the WFD itself was considered to be a hampering factor for public participation and the communication with the regional partners and the general public. Furthermore, the interviewees from both regional water authorities considered new challenges such as the nitrogen crisis in the Netherlands, the lack of affordable housing leading to the need to build hundreds of thousands of new houses, and the agricultural and energy transition as relevant factors (indirectly) affecting the development and implementation of measures and the attainment of the WFD objectives. In addition to this, the effects of climate change on the water system were reported to be uncertain, which "might have a more dominant effect than the effects of the WFD measures taken in the last 20 years".

Several hampering factors were considered to be more relevant in WDD as compared to HDSR. One factor was the fear of legal infringement procedures and of political consequences of the WFD. With the possibility of sanctions, it was sometimes perceived that the commitments made in the past restrain the possibility to reassess water management plans and to check whether planned measures were still the most effective to improve the water quality. Moreover, the acquisition of land from farmers for the purpose of redesigning waterways was considered to be a relevant barrier. If farmers refused to cooperate, the water authority was not willing to expropriate land from their owners. The *Dienst Landelijk Gebied (DLG)*, a former government agency that was charged with multiple tasks related to the management, development, and purchasing of land in rural areas, was mentioned as an important partner for the acquisition of land. The closure of this agency in 2015 was noted as one complicating factor to taking further steps. Furthermore, the lack of trained personnel was considered to be a limitation for the supervision of various projects. Lastly, a lack of synergy between the WFD and the Birds and Habitat Directives was perceived. In the case of specific contradicting objectives between different directives, pragmatic choices were made.

Simultaneously, some hampering factors were considered to be more relevant in HDSR as compared to WDD. In HDSR, a gap was perceived between the highly technical methodology of the WFD and what actually needs to be done to improve the water quality. In particular, the WFD methodology for the definition and monitoring of the ecological potential was seen as a complicating factor, as well as the relatively high ongoing costs of monitoring. As one of the interviewees stated: "A lot of time and money was spent on administrative work, perhaps time and money that could be spent more effectively and productively on the improvement of the water quality itself." Lastly, communication with the public and the regional actors involved was sometimes perceived as challenging.

Table 2 shows that in both areas, stimulating factors were perceived as being present as well as barriers. In WDD as well as HDSR, interviewees considered the WFD as an incentive to improve the ecological status of water bodies and to work more closely with regional partners. Hereby, the obligations of the WFD were perceived as an extra incentive to put this topic more prominently on the agenda. Moreover, both regional water authorities stated that in general, there was sufficient funding and political support for proposed measures at the regional level. It was argued that Dutch water authorities are able to raise their own taxes, so the foundations for an effective cost-recovery system were already in place. In addition, the introduction of the WFD resulted in the more extensive monitoring of the water quality in both areas, resulting in better insights into the existing pressures and aiding the implementation of suitable measures. Lastly, both water authorities were able to increase awareness and understanding of water quality issues among their regional partners. Most of the stimulating factors were found to be relevant for both water authorities. By linking "water quality" with other, related challenges, such as the effects of climate change and soil subsidence, HDSR aimed to develop more integrative measures. By creating "win-win" situations for other stakeholders, such as providing subsidies for implementing measures or explaining the (co-)benefits of improving the water quality, HDSR tried to gain support from their (agricultural) partners.

4.2. Measures Taken and Proposed by the Two Regional Water Authorities

Table 3 gives an overview of the measures both regional water authorities have taken in the first two management cycles and the ones they propose for the third cycle. Table 3 shows considerable similarities between the measures taken and proposed by both regional water authorities. Both focus on technological measures, such as improvements to existing sewage treatment plants and the construction of eco-friendly riverbanks—for which legal instruments also have to be used—as well as on "soft" measures, such as research and better cooperation with other partners and authorities. One reason might be that for many of the legal instruments necessary to operationalize the measures, regional water authorities do not have the competence. WDD, however, seems to focus more on the management

of surface and groundwater levels (so-called *GGOR* measures) to mitigate droughts (such as the conservation of water in "climate buffers") and problems related to water quantity. This includes the careful consideration of the balance between water availability and the needs of different user functions (e.g., industry and agriculture). Although the main "water goals" did not change significantly for the period 2021–2027 for WDD, the fifth Water Management Plan (WBP5) deviated from previous plans for the benefit of the water transition. This transition includes a gradual shift from the traditional Dutch view of water management, mainly focusing on flood control, towards a water system which is more "climate-robust" and "future-proof" [35,36]. The need for this different water management approach was emphasized by the droughts of 2018, 2019, and 2020, as well as the excessive precipitation events in June 2016 [35]. HDSR seems to focus on other (soft) measures, such as the introduction of subsidy programs to stimulate the reduction in emissions from the agricultural sector. While HDSR mainly focused on the measures for the designated WFD water bodies during the first cycle, the focus was broadened towards the smaller waterways in the second cycle [29]. In addition to the measures executed during the first cycle, HDSR introduced the aforementioned subsidy programs to stimulate the nature-friendly maintenance of these small waterways.

Table 3. Measures taken and proposed by the regional water authorities De Dommel (WDD) and Stichtse Rijnlanden (HDSR) for the three WFD management cycles.

	WDD			**HDSR**		
	1	**2**	**3**	**1**	**2**	**3**
Improvement of sewage treatment plants	x	x	x	x	x	x
Redesigning or widening of waterways	x	x	x	x	x	
Construction and optimization of fish passages	x	x	x	x	x	x
Construction of eco-friendly riverbanks	x	x		x	x	
Construction of wetlands		x		x		
Removal of polluted dredged material	x			x		
Reduction in pesticide use on own land	x					
Conclusion of a covenant with fruit growers for reducing pesticides emissions					x	
Intensification of cooperation with partners, authorities, and other sectors	x	x	x	x	x	x
Provision of subsidies					x	x
Research	x	x	x	x	x	x
Exploration of opportunities for eco-friendly maintenance (e.g., mowing, dredging, and control of exotic species)		x	x			x
Exploration of opportunities related to legal instruments (e.g., the new Environment and Planning Act)			x			x
Management of surface and groundwater levels (*GGOR* measures)	x	x	x			
Application of a sludge trap		x		x		

Sources: [29–31,35,37,38].

If we compare the measures proposed for the third implementation cycle, we see that some measures will be repeated, while others are no longer proposed. The improvement of sewage treatment plants and the construction and optimization of fish passages continue to be part of the portfolio of measures. New measures that are introduced for the third cycle include exploring the steering opportunities that may be offered by the new Environmental and Planning Act. The construction of eco-friendly riverbanks is no longer proposed. The creation of more extensive land–water transitions results in observed increases in terrestrial biodiversity, but has limited or no impacts on the attainment of a good ecological status of water bodies. Apart from this, they are relatively expensive and not always easy to

implement due to the multiple functions (e.g., navigation) water bodies may have and to the fact that widening rivers and brooks must be done mainly on private land, which needs the support of landowners.

4.3. Goal Attainment

Overall, both regional water authorities tend to be positive about the attainment of the WFD goals by 2027. The WDD acknowledges that it experiences difficulties in the (timely) achievement of all the WFD objectives [35]. One interviewee stated that "while the commitments made in 2005 were regarded as feasible, varying developments (e.g., the Dutch nitrogen crisis), the effects of climate change, and advancing insights made the attainment of the objectives more challenging". Although significant progress was made on several individual QEs during the first two planning cycles, the overall goals were not yet attained. While the (overall) biological and physico-chemical QEs improved over the last two periods, progress on the reduction in "river-basin-specific pollutants" remained stagnant. The lack of improvement of the "chemical" status could be accounted for partially by an increased accuracy of measuring standards e.g., [32]. Despite the difficulties and challenges ahead, it is expected that the majority of the planned measures will be completed in WDD by 2027, while the remainder will likely be realized after 2027. With respect to the attainment of the WFD objectives, the expectations are less certain, considering the various factors and developments mentioned earlier.

In HDSR, similarly to WDD, there has been significant improvement in the status/potential of multiple individual biological and physico-chemical QEs during the first two cycles. However, due to the "one out, all out" principle, none of the water bodies could be classified as having a Good Ecological Status/Potential (GES/GEP). Up to the third period, HDSR aimed at achieving a "standard" Ecological Quality Ratio (i.e., an EQR of 0.6) for all QEs in all waters. The Ecological Quality Ratio is a number between 0 (very bad) and 1 (very good) with which the quality of four ecological categories is indicated. The categories concern "macrophytes" (water and riparian plants), "macrofauna" (aquatic animals), "fish", and "phytoplankton" (algae).

For the third management cycle, HDSR updated the ecological targets for multiple WFD water bodies on the grounds of "technical feasibility" (Art. 4.4 of WFD). Achieving a standard EQR score of 0.6 for all water bodies was no longer considered to be realistic. Based on the latest insights, the maximum potential for one or more QEs of the water bodies in the Rhine (West) sub-basin was modified, which should provide more realistic (and attainable) EQR values [31]. Achieving a GEP of 0.6 is no longer the standard target for all water bodies. However, the aforementioned uncertainties concerning the effects of measures and the effects of climate change may interfere with the attainment of these goals. Additionally, the emergence of invasive species was mentioned as a possible significant impediment in attaining the (updated) ecological targets.

5. Perceptions of Other Regional Water Authorities

The main results from the online survey are shown in Figure 3. Overall, there is consensus among the water authorities on the majority of statements concerning barriers and opportunities for the implementation of the WFD.

Figure 3. Respondents' perceptions of factors that hamper or stimulate the implementation of the WFD (n = 16).

5.1. Hampering and Stimulating Factors in The Netherlands

For the majority of the statements, a general agreement among the water authorities could be identified. One of the most prominent hampering factors included the "one out, all out" principle. All the water authorities (strongly) agreed that due to the "one out, all out" principle, the WFD reporting of the QEs creates a distorted picture of the water quality in their area. While progress was made on the individual biological and physico-chemical QE's, the "Environmental Quality Standards" are often exceeded by nutrients and specific pollutants, which are the responsibility of ministries at the national level, thus resulting in insufficient scores. Furthermore, the majority of the regional water authorities agreed that due to a lack of appropriate legal competencies (as they are laid down at the state level), the perspective of the water authorities to act on specific pressures is too limited to implement some of the desired measures for attaining the WFD goals. Similarly, a national (or European) approach is regarded as necessary to deal with (diffuse) pressures such as priority substances and river-basin-specific pollutants (RBSPs). Moreover, most of the water authorities stated that the acquisition of land for taking desired measures (e.g., redesigning waterways and constructing eco-friendly riverbanks) was a relevant hampering factor. Authorities seem to be unwilling to do this to obtain their WFD objectives. Furthermore, most of the participating water authorities agree that the effects of climate change (such as an increase in temperature and drying up of streams) on the water quality and/or the water system are insufficiently incorporated in the WFD. In addition, nearly half of the water authorities considered local political interests to have a hampering effect on decision making or the execution of measures. The factor is considered to be hampering in the Meuse and Scheldt RBD, in particular. In the Rhine (West) RBD, this is not the case. Some water authorities considered a lack of personnel an impediment for executing their WFD policy. Lastly, half of the water authorities made clear that several new (societal) developments, such as the nitrogen crisis and challenges related to energy or agricultural transition, have

significant effects on the attainment of the WFD goals. Addressing these challenges may result in synergies, for instance, by reducing diffuse emissions.

A general consensus could also be found on the relevance of several stimulating factors. Almost all regional water authorities perceive enough support from the administrative level to execute the desired measures. Moreover, the majority of them considered the availability of financial resources to be sufficient to take the measures that are within their own competence. The ability of the Dutch water authorities to levy their own taxes (and the absence of other competing political portfolios) seems to have resulted in steady budgets. Furthermore, cooperation with other sectors and regional partners was generally perceived positively by most regional water authorities. Lastly, most regional water authorities considered their knowledge of the existing pressures and suitable measures to be sufficient to attain the desired standards. Finally, factors relating to other EU directives were considered to be of minor relevance. It was argued that, when necessary, the authorities are able to make a pragmatic choice in dealing with the requirements resulting from different directives.

5.2. Expectations of the Dutch Water Authorities

Figure 4 shows that overall, the respondents expected that the measures proposed for the last management cycle will be executed and that in 2027, the majority of the goals will be attained.

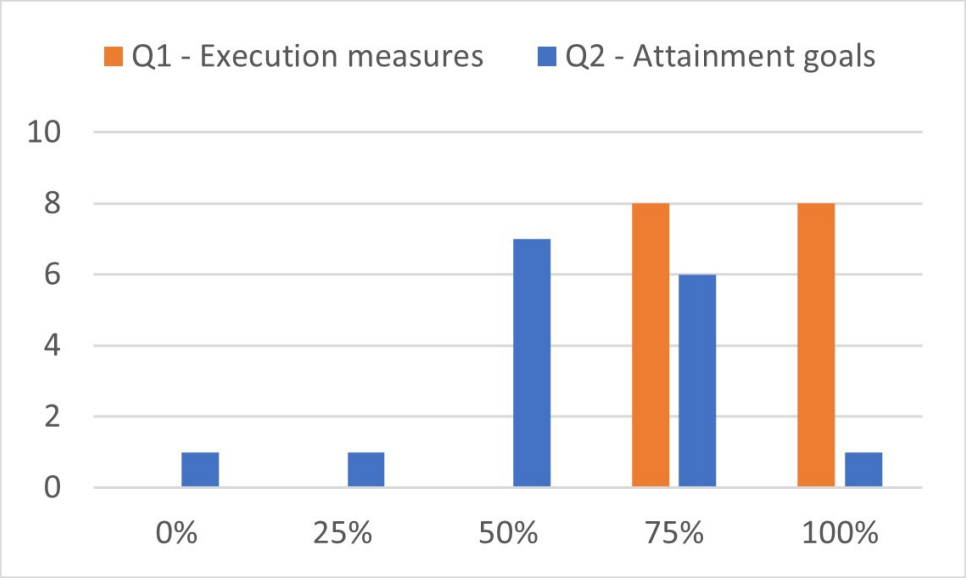

Figure 4. Interviewees' expectation of the actual execution of methods and the attainment of the 2027 goal (n = 16).

Interviewees were positive about the execution of the planned measures. Approximately half of the participants expected that 75% of the planned measures would be executed by 2027, while the other half expected that all planned measures would be executed by then. The respondents, however, were less positive about the attainment of the WFD goals in 2027. Of the participants, over one-third expected that half the WFD goals would be obtained, while a similar number of participants expected that 75% of the WFD goals would be obtained in 2027. The remaining participants expected an attainment of 0%, 25%, or 100%. By adding up the resulting percentages of the participants and dividing the total by the total number of participants, the average score on the expected goal attainment is 58%.

6. Discussion

Our interviewees were modest in their optimism about goal attainment by 2027. The presence of hampering factors account for this. The average score of expected goal attainment (58%) is in line with the estimation already made prior to the implementation

of the first cycle, when Ligtvoet et al., [6] estimated that only 40–60% of the Dutch water bodies would reach a GEP/GES. After the implementation of the first RBMPs, Van Gaalen et al. [32] were even less optimistic, as they estimated that a maximum of only 15% of the surface water bodies would attain a GES/GEP. Nearing the end of the second cycle, Van Gaalen et al. [33] and Knoben et al. [34] again concluded that not all Dutch water bodies would attain a GES/GEP, without, however, specifying numerical estimations.

The Netherlands is no exception, as most MSs have difficulties in realizing ecological improvements. The overall improvements in the quality of European water bodies vary, and are considered as moderately slow progress e.g., [39]. After the second RBMPs, several authors identified a "significant gap between aspirations and achievements" for several MSs e.g., [11,39], with approximately 44% of all European surface water bodies classified as "good" or higher [40]. A comparison between the Netherlands and other MSs is quite challenging. While the Netherlands focuses on multiple QEs for the biological quality assessment, several MSs only assess one QE [41]. The chance that a water system must be classified as insufficient is higher if more parameters are assessed, due to the "one out, all out" principle. Although the water quality is not clear in many quarry lakes and small ditches, which are not assigned as formal WFD water bodies, compared to other MSs, the Netherlands has few formal WFD bodies with an "unknown" ecological status [41]. This complicates comparisons, since an "unknown" status is not classified as insufficient, and therefore, following the "one out, all out" principle, the assessments may misrepresent the actual quality of a water system.

We collected interviewees' perceptions of the achievement of the GEP by 2027. However, it may be the case that the perception of what a good GEP entails may differ between the interviewees. The GEP concept is disputed. What is considered "good" depends greatly on one's point of reference. The way GEP and GES have been defined has changed. The first definitions were based on a theoretical optimal situation, from which non-feasible measures were distracted. Later on, a more pragmatic approach was chosen (the so-called Prague method developed by the EU water directors [42]), which was based on the actual ecological status of a water body. Next, the European Environment Agency's Drivers, Pressures, State, Impact, and Response framework was used to identify cause–effect chains and to discuss possible interventions with their ecological effects. Measures that were considered feasible were added to this in order to define the GEP and GES. However, detailed cost–benefit analyses for assessing the feasibility of measures are not always part of the portfolio of regional water authorities [43,44].

The main pressures on the water quality in the Netherlands include nutrient emissions from agriculture, priority substances, and (river-basin-) specific pollutants. Besides current intensive agricultural practices, sources of nutrient emissions vary: sewage treatment plants, atmospheric deposition, the release of pollutants from aquatic sediments, natural sources, seepage, and pollution/impacts from upstream countries [33,45]. This requires a more holistic approach [46]. Regional water authorities can address most of these sources only indirectly, as they lack the authority for addressing them directly. While some pressures can be treated by the water authorities individually (e.g., the improvement of sewage treatment plants), other pressures, such as aerial pollutants and nutrient emissions of agriculture, require contributions and/or cooperation from other sectors and parties such as industries, municipalities, provinces, and several ministries. With a wide variety of sources for different pressures, there is a large dependency on other (area) partners to cover these pressures effectively. To deal with some of these pressures, such as nutrient emissions, water authorities depend largely on measures that have to be taken at the central governmental level. The latter may include stricter national regulations on waste disposal licenses for industries, new and stricter legally binding requirements in addition to agreements with collective agricultural organizations concerning the use of manure on a voluntary basis, reaching agreements with other MSs on effluents, and reducing emissions from the production chain concerning consumable products [33]. For the attainment of the WFD objectives, inconvenient political choices on land-use change must be made at

national, regional, and local levels. Although doubts about the attainment of WFD goals were expressed in early ex ante evaluations, the political debate about this was postponed until the start of the *Delta-aanpak Waterkwaliteit* (DAW) in 2016. The possible limiting effects of the WFD on economic activities and the fear of conflicts with the agricultural sector could be considered as complications to the attainment of the ecological goals. Only recently, the Dutch Minister of Agriculture affirmed that there is a relationship between the responsibility to achieve the goals of the WFD, primarily laid down by the Minister of Water Affairs, and that of the Nitrates Directive, with a primary responsibility for the Minister of Agriculture. The Sixth Nitrates Action program recognizes this relationship and mutual dependency, while acknowledging that the proposed measures are insufficient to achieve both the goals of the Nitrates Directive and the WFD [47]. Following this, the new Dutch government has set up an agricultural transition fund of 25 billion Euros until 2035.

7. Conclusions

The aim of this paper was to conduct an ex ante evaluation of the third implementation cycle of the WFD in order to gain insight into the expected ecological status of Dutch waters in 2027. This was performed by interviewing Dutch water authorities on their expectations and their perceptions of the presence of hampering and stimulating factors. We found that the majority of the participating water authorities expect that 50% (or more) of the WFD objectives will be obtained in 2027. Considering the perceived presence of several hampering factors, the current ecological status of the Dutch water bodies, and the previous estimations in (ex ante) evaluation reports, this is quite optimistic. It is doubtful whether these ambitions and expectations can be realized.

Regional water authorities depend, for a significant part, on other actors (e.g., the state, provinces, municipalities, and the agricultural and industrial sector) to reach their ecological goals. Although the decentralized nature of Dutch water governance offers the water authorities opportunities to cooperate with regional partners, effective policy measures cannot be implemented when regional water authorities lack the legal authority to take the necessary measures. Ultimately, the attainment of WFD goals will thus be defined primarily by the ecological ambitions and the choices made at national and European levels.

Significant steps must be taken during the last implementation period to obtain a GES/GEP for all Dutch water bodies. While some pressures can be addressed by the water authorities individually (e.g., improvement of sewage treatment plants), for other pressures, such as aerial pollutants and emissions of agriculture, a national or European approach is needed. In addition, other factors, such as the effects of climate change and invasive species (e.g., American crayfish), complicate the attainment of WFD goals. We expect that these factors are also relevant in other EU countries, and therefore encourage other researchers to assess what role is played by hampering and stimulating factors in the achievement of a GES/GEP in other European countries. The framework we developed can be used for a systematic comparison between countries. In this way, we may gain better insight into the relative importance of the factors for progress towards a better ecological water quality.

Our research has made clear that ecological improvements ultimately require multi-sector, multi-actor, and multi-level governance. Inspiring and shared visions are needed to coordinate and to steer the activities of the different sectors, actors, and levels involved. Despite the effort made by the Dutch water authorities, it seems that attaining a "good ecological potential" for all Dutch water bodies in 2027 is a bridge too far. However, without hope, optimism, and ambitions, there is no future.

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Appendix A. An Overview of Hampering and Stimulating Factors Affecting the WFD Implementation

Categories	Hampering Factors	Stimulating Factors	References
Legal aspects	- Stringent obligations and time frame (e.g., the "one out, all out" principle) - Legislation is considered to be ambiguous - Fear of infringement procedures - Focus on achieving goals, instead of improvement - Methodological approach of the WFD was perceived as a burden	- Substantial freedom within the flexible/pragmatic approach of the WFD - Incentive to improve the ecological status of water bodies - Possibility to use exemptions	[9–14,18,23]
Knowledge and monitoring	- Stringent obligations and time frame (e.g., the "one out, all out" principle)	- Stringent obligations and time frame (e.g., the "one out, all out" principle)	[9–14,18,23]
Political willingness	- Legislation is considered to be ambiguous	- Legislation is considered to be ambiguous	[9–14,18,20,23]
Intersectoral collaboration and public participation	- Fear of infringement procedures	- Fear of infringement procedures	[9–12,14,18,20]
Financial resources	- Focus on achieving goals, instead of improvement	- Focus on achieving goals, instead of improvement	[10,13,14,18,20,23]
Relationship between pressures and measures	- Methodological approach of the WFD was perceived as a burden	- Methodological approach of the WFD was perceived as a burden	[9,10,12,13,18]
Coherence of EU legislation	- Stringent obligations and time frame (e.g., the "one out, all out" principle)	- Stringent obligations and time frame (e.g., the "one out, all out" principle)	[11,13,14,18,20]

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