



Coherence in EU law and policy for the protection of drinking water resources

Authors: Froukje Maria Platjouw, Harriet Moore, Susanne Wuijts, Sandra Boekhold, Susanne Klages, Isobel Wright, Morten Graversgaard and Gerard Velthof

Norwegian Institute for Water Research (NIVA), Norway

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Authors	Froukje Maria Platjouw, Harriet Moore, Susanne Wuijts, Sandra Boekhold, Susanne Klages, Isobel Wright, Morten Graversgaard, Gerard Velthof
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EXECUTIVE SUMMARY

Safe drinking water is vital for human health and the economy. Throughout the EU, diffuse pollution by nitrogen and pesticides from agriculture is one of the main obstacles to meeting drinking quality targets. The **H2020 FAIRWAY** project aims to review approaches for the protection of drinking water resources from pollution by nitrogen and pesticides. The project also aims to identify and further develop cost-effective and innovative measures and governance approaches that will protect drinking water supplies while increasing agricultural sustainability.

1. AIMS OF THE REPORT

WP6 analyses governance arrangements and legal structures. WP6 aims to examine the coherence and consistency of EU directives, national policies, instruments and means and explores how these apply to farm water management from farm scale to national scale and how to overcome possible shortcomings. Coherence and consistency are key factors for a successful EU regulatory and policy regime that aims to prevent and to manage diffuse pollution of vulnerable drinking water resources due to agriculture. More specifically, WP6 examines the coherence and consistency of EU directives and policies (WP6.1); compares governance arrangements in a range of case studies (WP6.2); identifies lacks of coherence and possible spill-over effects from challenges at the EU level to national, regional and local levels (WP6.3); identifies cost-efficient and coherent management models (WP6.4); and develops legitimate governance arrangements (WP6.5). While task 6.1 primarily focuses on directives and policies at the EU level, task 6.2 provides an overview of the implementation of these EU directives and policies, and governance arrangements, within 13 case study areas across Europe. Both reports (D6.1 and D6.2) form the foundation for further research to be carried out later in WP6. Good governance requires a coherent, efficient and effective governance approach. *Effectiveness* can be measured through analysing the implementation of EU directives and policies at the national, regional and local level. This has been the primary focus of task 6.2 and the national level of the directives' implementation has been comprehensively assessed in the D6.2 deliverable. In task 6.1 we analyse primarily *the level of coherence* within the EU legal framework.

This report presents the research conducted in **task 6.1**. In task 6.1, we reviewed relevant EU directives and policies, identified legal requirements, and assessed *their degree of coherence* with the overarching objective of the FAIRWAY project, i.e. the protection of drinking water resources against pollution caused by pesticides and nitrates from agriculture practices (**'vertical coherence'**). In addition to assessing vertical coherence of the legal framework with the overarching aim of protecting drinking water resources, we also assessed the degree of **horizontal coherence** amongst the five core EU directives, to identify any potential negative interactions between directives. For example, we scored to what extent the requirements of the Drinking Water Directive (DWD) are coherent with the requirements of the Water Framework Directive (WFD), the Groundwater Directive (GWD), the Nitrates Directive (ND), and the Pesticides Directive (PD). Horizontal inconsistencies, gaps, overlaps and counterproductive regulations and legal requirements could potentially jeopardize the attainment of the overall purpose of protecting drinking water resources and carry the potential to undermine the effectiveness of the overall legal framework. For that reason, both vertical as well as horizontal coherence needs to be investigated. The distinction between vertical and horizontal coherence is demonstrated in Figure 0.1 with the example of vertical coherence between the WFD and the FAIRWAY objective, and horizontal coherence between the WFD and other directives.

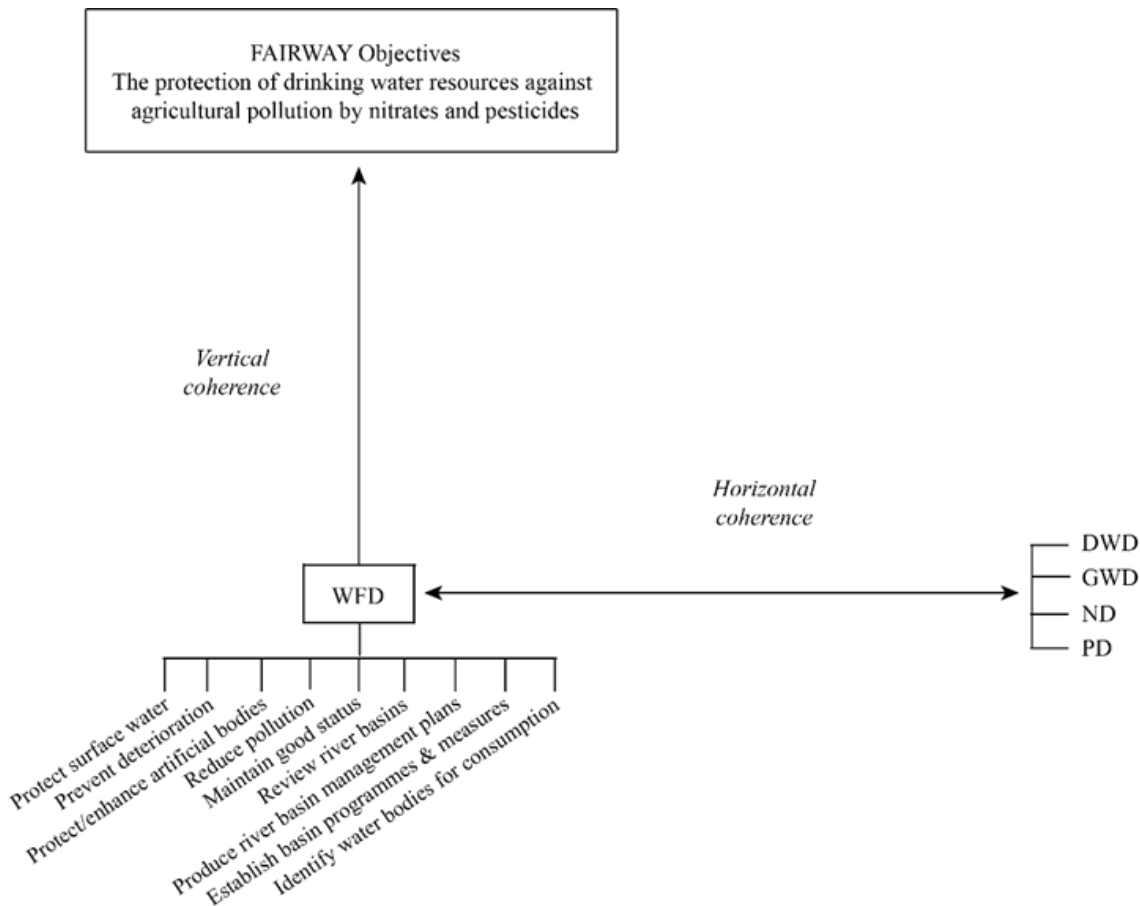


Figure 0. 1 Demonstration of vertical and horizontal coherence using the example of the WFD

The focus in task 6.1 is on **legal requirements**. The directives and policies that have been reviewed contain a range of different types of requirements, including monitoring requirements; reporting requirements; requirements related to coordination between sectors, authorities and countries; requirements related to instrument choice (such as voluntary or economic instruments, in addition to legal rules), and requirements related to the enforcement and implementation of these requirements. All these categories of requirements have been identified and compiled in Appendix I. The main focus of this report though is on two types of requirements in particular:

1. **Requirements to protect/improve** natural resources that contribute to water quality, including:
 - a. general requirements, such as those to generally protect, enhance, or improve quality status or conditions, and;
 - b. specific requirements, such as setting fixed thresholds levels
2. **Requirements to establish the institutional frameworks** for achieving improvements in water quality
 - a. requirements related to establishing criteria, frameworks, catchment management plans and so forth.

These requirements have been identified, screened, scored and analyzed in terms of their vertical coherence with the overarching FAIRWAY objective of protecting drinking water resources against pollution by pesticides and nitrates from agricultural practices, and horizontal coherence with each other.

2. SCOPE OF THE REPORT

The report presents a comprehensive review of ten different directives and policies that are relevant for the protection of drinking water resources against agricultural pollution. The directives and policies that were part of the assessment as shown in table 0.1.

<i>The following directives have been subject to review in task 6.1:</i>	
The Water Framework Directive (WFD)	[Council Directive 2000/60/EC of 23 October 2000 establishing a framework for the Community action in the field of water policy]
The Drinking Water Directive (DWD)	[Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption]
The Nitrates Directive (ND)	[Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources]
The Groundwater Directive (GWD)	[Council Directive 2006/118/EC of 12 December 2006 on the protection of groundwater against pollution and deterioration]
The Sustainable Use of Pesticides Directive (PD)	[Council Directive 2009/128/EC of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides]
The Habitats Directive (HD)	[Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora]
The EIA Directive (EIA)	[Council Directive 2014/52/EU of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment]
The Industrial Emissions Directive (IED)	[Council Directive 2010/75/EU of 24 November 2010 on industrial emissions (integrated pollution prevention and control)]
Rural Development Regulation (RDR)	[Regulation (EU) No 1305/2013 of the European Parliament and of the Council of 17 December 2013 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) and repealing Council Regulation (EC) No 1698/2005]
EU Common Agricultural Policy (CAP)	[Common Agricultural Policy (CAP) 2014]

Table 0. 1 Overview of legal directives and policies reviewed

Currently, there are several interesting ongoing developments. Firstly, an evaluation of the CAP reform is due soon. Secondly, nutrient and pesticides-related EU regulations for fertilizers will soon enter into force and replace the EU fertilizer regulation 2003/2003 for mineral fertilizers. Adjustments will be made to product-related EU regulations for pesticides. These regulations are directly applicable to member states without the need for transposition into national law. The regulations are relevant for the protection of drinking water resources against pollution since they regulate the entering into markets of products that can affect water quality. They also set quality standards. In this report, these regulations will not be further discussed. However, later in WP6, we aim at incorporating relevant reflections upon these instruments.

3. METHODOLOGY

We explored a variety of possible methodologies to assess the level of vertical and horizontal coherence, including the use of external expertise. The task, however, requires a high level of understanding of EU legal directives and policies, a breadth of knowledge and perspectives, and a variety of views from respondents in different roles and positions. The Fairway partners judged the chosen method to be the most appropriate for the task as it ensures the representation of a wide number of perspectives across sectors and scales, from different geographical areas in Europe, and wide variety in roles and positions. The Fairway partners represent 13 different European countries. Using in-house expertise, rather than involving external consultancy expertise, also entailed an advantage in terms of understanding the purpose of the research and task and the existence of prior knowledge on the various directives. This enabled a cost-effective and sound methodology to complete the task.

For the assessment of vertical and horizontal coherence, we applied a **four-step procedure**. In a first step, we **identified** the key requirements and objectives of the various directives and policies. The purpose of the inventory step was to get a comprehensive overview of the requirements and objectives of all directives and policies. In the second step, we created a **screening matrix** that displayed all the different requirements and objectives in Excel spreadsheets. We created different matrices; the first matrix displayed all requirements and objectives from the directives in relation to the overarching FAIRWAY objective to enable a vertical coherence assessment. A further five matrices were developed to display the requirements of five individual directives on the vertical axis against the requirements and objectives of other directives on the horizontal axis for the purpose of a horizontal coherence assessment. In the third step, we **evaluated and scored** the vertical coherence of 10 directives and policies with the overarching FAIRWAY objective, and the horizontal coherence between 5 directives by using online **surveys**. Based on the results from the vertical coherence assessment, five directives were identified as highly relevant for the attainment of the Fairway objective. For that reason, the horizontal coherence assessment analyses these five directives thoroughly. The delimitation to these five directives, enabled a more thorough and in-depth horizontal coherence assessment than what would be possible if all directives had been included in this final analysis.

Survey One investigated opinions of ten FAIRWAY partners about the contribution of directives to the protection of drinking water resources. Survey's Two-Six were based on the five specific matrices developed in Step 2, each addressing horizontal coherence amongst the legal requirements of the most central directives. These surveys were completed by five partners, each of them completing one survey for a specific directive. The scores were generated based on an internal elicitation within the partner institutions. In most cases at least two contributors discussed a given interaction and provided their assessment of what the score 'should be'. Some partners also called on additional expertise of those working in the industry. When relevant, the partners provided explanations and examples for the given scores. In a fourth step, we **analysed the data**, including quantitative and qualitative analysis.

All surveys included two types of items; quantitative Likert-scale items and qualitative open-ended items. The quantitative items asked respondents to give a numeric score representing their perception about the interaction of a directive with either the overarching aim of FAIRWAY (Survey One), or with other Directives (Survey's Two-Six). The scale was based on the **typology and seven-point scale** presented by Nilsson et al (2016) to assess the degree of coherence.¹ Pursuant to the seven-point scale, interactions may be scored as either positive ('indivisible' (+3), 'reinforcing' (+2) or 'enabling' (+1)) or negative ('cancelling' (-3), 'counteracting' (-2) or 'constraining' (-1)); or the

¹ Måns Nilsson, Dave Griggs and Martin Visbeck, 'Map the interactions between Sustainable Development Goals' (2016) 534 *Nature* 320-322.

respective legal requirements may be entirely ‘neutral’ (0) with each other, incurring no significant positive or negative interactions whatsoever, perhaps no interaction at all.² Each survey also contained open-ended survey items to help interpret the quantitative data. These items asked respondents to give their opinion about the scorings and to describe potential positive or negative interactions. This approach allowed us to highlight certain interactions or uncertainties that are worthy of further investigation in successive tasks of WP6.

Seven-point scale of scoring coherence		
+3	Indivisible	The strongest form of positive interaction in which one of the requirements or objectives is <u>inextricably linked</u> to the achievement of the other
+2	Reinforcing	One objective or requirement directly <u>creates conditions</u> that lead to the achievement of another
+1	Enabling	The pursuit of one objective or requirement <u>enables</u> the achievement of another objective
0	Neutral	A <u>neutral relationship</u> where one objective or requirement does not significantly interact with another or where interactions are deemed to be neither positive nor negative
- 1	Constraining	A mild form of negative interaction when the pursuit of one objective or requirement sets a condition or <u>constraint</u> on the achievement of another
- 2	Counteracting	The pursuit of one objective <u>counteracts</u> another objective
- 3	Cancelling	The most negative interaction is where fulfilment of one requirement or objective makes it <u>impossible</u> to reach another requirement/objective

Table 0. 2 Seven-point scale scoring of Nilsson et al (2016)

It needs to be underlined that the coherence assessments between the directives and the overarching FAIRWAY objective (Survey One), and between individual directives (Survey Two-Six) outlined in this report are based upon **respondents’ perceptions and opinions**. As such, some bias in the scorings and explanations is unavoidable. The vertical coherence assessment (Survey One) was carried out by ten WP6 partners. The five horizontal coherence assessments (Survey Two-Six) were divided among the partners to task 6.1 specifically. Given that each survey (for the WFD, GWD, DWD, ND and PD) has been carried out by one partner, this might affect the scoring rates. To increase accuracy of scoring rates, the surveys have been distributed in accordance with the partners’ main fields of expertise.

4. FINDINGS RELATED TO VERTICAL COHERENCE

The overarching FAIRWAY objective is to find solutions to the protection drinking water resources against pollution by pesticides and nitrates from agricultural practices. The legal framework is both very comprehensive and fragmented. Many directives apply directly and/or indirectly to the FAIRWAY objective and many of these directives impose different types of legal requirements upon EU member states to comply with. Attainment of the overarching objective depends on the strength, coherence and effectiveness of the applicable legal framework.

Based on the scorings of the ten project partners, none of the directives is considered to have a negative average score. Five directives are perceived to be highly important and contributive very

² Ibid. See also David McCollum et al, ‘Connecting the sustainable development goals by their energy inter-linkages’ (2018) 13 *Environmental Research Letters*.

positively to the attainment of the FAIRWAY objective. These are the Water Framework Directive, the Groundwater Directive, the Drinking Water Directive, the Nitrates Directive, and the Sustainable Use of Pesticides Directive. As evident from figure 0.2, average scores for these directives varied from 2 to 2.6 suggesting that respondents considered these directives to be reinforcing (+2) or even indivisible (+3) to the protection of drinking water resources. For all the remaining directives, all average scores are significantly lower yet still positive. Respondents consider the Habitats Directive, the EIA Directive, the IED, and the RDR to be neutral (0) to or enabling (+1) the FAIRWAY objective. Average scores varied from 0.4 to 0.8, suggesting these directives have a slightly positive effect on the protection of drinking water resources. The lowest average score is given to the Habitats Directive (0.4). The CAP is given an average score of 1.7 and is considered to enable or reinforce the overall objective.

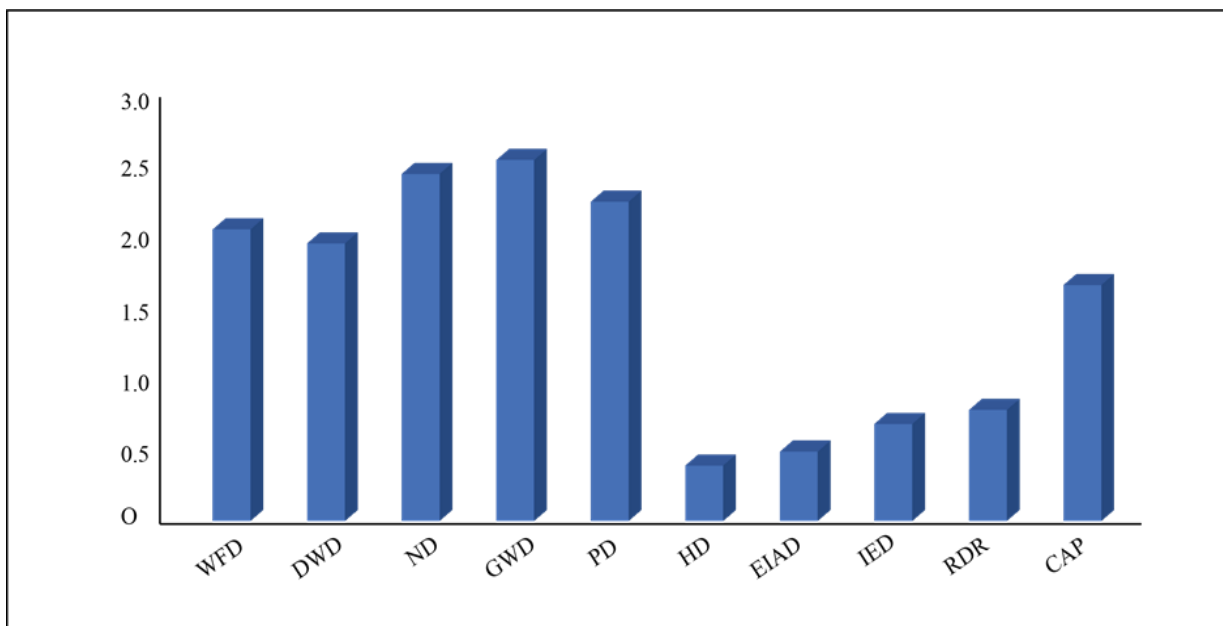


Figure 0. 3 Comparison of average contribution scores per directive. Requirements and objectives of each directive are scored by ten respondents as positive ('+3 indivisible', '+2 reinforcing' or '+1 enabling'), neutral (0), or negative ('-1 constraining', '-2 counteracting' or '-3 cancelling')

In general, it could be argued that the overall legal framework is likely to be fit for purpose. Yet to what extent this purpose will be realized depends to a large degree on implementation.³ Concerns include how consistently requirements are implemented by member states, and the ambiguity of key terminology. These factors could have both positive and negative impacts on the vertical coherence of the directives with the FAIRWAY objective. Several directives, including the Habitats Directive and the Environmental Impact Assessment Directive, were perceived to have contributive potential, probably more than indicated by the average scoring rate alone. If this potential is realised fully under implementation, the degree of vertical coherence increases.

To illustrate, conservation measures under the Habitat Directive can include both site-specific measures (i.e. management actions and/or management restrictions), and general measures that apply to many Natura 2000 sites over a larger area, for instance, measures to reduce nitrates pollution. The Habitats Directive could also require restoration measures to achieve favourable conservation status for key Natura 2000 habitats that have been damaged by pressures from intensive agriculture. Restoration actions may involve reversing soil enrichment and re-introducing vegetation, reseeding to restore plant species diversity, controlling scrub, controlling invasive weeds and alien species and restoring hydrological management (e.g. by reversing drainage, restoring

³ Implementation of the directives and governance arrangements throughout case study sites is subject to review in task 6.2 and deliverable D6.2.

groundwater levels and regimes, and flooding and river regulation).⁴ This might contribute positively to the protection of drinking water resources, if these Natura 2000 sites and drinking water resources coincide.

Summary of the specific contribution of each directive to the Fairway objective	
WFD	<p>Numeric responses indicate that participants feel that all articles of the WFD are enabling, reinforcing, or indivisible from the FAIRWAY objectives.</p> <p>Qualitative data suggests that the requirements of the WFD are reinforced by institutional frameworks at the state level, although the plans, programs and measures in place are not necessarily sufficient.</p> <p>Respondents identified important cross-over or interdependencies between the WFD and other directives, such as the Nitrates Directive; while this interdependency is intuitive (the ND must be upheld to achieve the objectives of the WFD), the interaction is informal. A potential action could be to formalise the interaction institutionally by requiring cross-referencing with regards to monitoring and enforcement.</p>
GWD	<p>Numeric responses indicate that participants feel that articles of the GWD related to threshold values and preventative measures are enabling, reinforcing, or indivisible from the FAIRWAY objectives.</p> <p>Qualitative data indicates some division between respondent perspectives. Most suggested the GWD positively reinforces the FAIRWAY objectives, while some suggested threshold requirements are not necessarily sufficient.</p> <p>There are clear interdependencies between the WFD and the GWD; formalising interactions between surface and ground water with cross-referencing may reinforce institutional frameworks to support these interdependencies.</p>
DWD	<p>Numeric responses indicate that participants feel that the articles of the DWD related to protection and controlling harmful substances are mostly indivisible with the FAIRWAY objectives. Articles related to new infrastructure were viewed neutrally.</p> <p>Qualitative data emphasizes interdependencies between the DWD and other Directives, such as the ND. Respondents expressed some uncertainty about how requirements related to pollutants under the DWD and requirements under the ND interact. This suggests that cross-referencing is required to ensure that the requirements of each Directive support each other.</p>
ND	<p>Numeric responses indicate that participants feel the articles of the ND are mostly indivisible, reinforcing or enabling of FAIRWAY objectives. One exception relates to livestock manure limits for land application for which opinions were divided. Most participants agreed limits contribute positively to FAIRWAY objectives while one suggested that limits are constraining.</p> <p>Reasons for this variation are suggested in the qualitative data. Respondents felt that catchment scale limits and targets may be more appropriate than farm scale limits; the cumulative effect may be more important than the individual application of manure. Similarly, the impact on water quality varies geographically.</p>

⁴ European Commission, 'Farming for Natura 2000' (Guidance on how to support Natura 2000 farming systems to achieve conservation objectives, based on Member States good practice experiences) 2014, p. v.

	Interactions between the ND and other Directives may be influenced by these geographical dynamics, highlighting the need for cross-referencing.
PD	<p>Overall, respondents considered that all requirements of the PD interact positively with the FAIRWAY objectives. Articles related to protection and requirements to establish a framework and national action plans were mostly viewed to be indivisible or reinforcing. Articles related to infrastructure were viewed to be indivisible, reinforcing, enabling, or neutral.</p> <p>Qualitative responses again emphasized the geographical dynamics of limits and targets, suggesting that set requirements may be more or less sufficient depending on wider context.</p>
EIA	<p>Quantitative scores reflecting perceptions of interactions between the requirements of the EIA and FAIRWAY objectives varied considerably. Most considered requirements related to adopting effective measures and identifying and assessing impacts to be neutral or enabling, however, others considered these requirements to be constraining, counteracting or indivisible.</p> <p>Qualitative data indicated that some respondents felt that the requirements of the EIA lack the necessary specificity to support other related Directives, such as the ND.</p> <p>These issues could be addressed by formalising some interactions between requirements across Directives.</p>
IED	<p>Most respondents indicated that the requirements of the IED are enabling, however, there was some variation, with minority views including that requirements are cancelling, constraining, neutral or indivisible.</p> <p>Respondents highlighted the interdependence of the IED and the ND in relation to large intensive livestock farms. Some comments indicated that respondents feel the IED is most relevant to industry practices rather than the full range of practices that contribute to the FAIRWAY objectives, which may explain the variance in scores and views.</p>
HD	<p>Scores suggest that respondents generally believe that the HD contributes only minimally to the FAIRWAY objectives. All responses suggest the requirements of the HD are either enabling or neutral.</p> <p>Some comments suggest that conservation areas are of relevance to the DWD and GWD because these spaces are less likely to involve use of fertilizers and pesticides. These positive interactions are not formalised and could equally benefit from cross-referencing as would more negative interactions. Comments also indicated the importance of effective implementation.</p>
CAP	<p>Most respondents suggested that the requirements of the CAP enable or reinforce the FAIRWAY objectives, however there was some variability regarding views of farm requirements and compliance, with some suggesting these requirements are indivisible, enabling or reinforcing and a minority suggesting they are counteracting.</p> <p>Qualitative data indicated that some CAP requirements interact with requirements of the ND, including those related to buffer zones for reducing concentrations of pollutants. Further, there are strong institutional incentives for compliance; funding is contingent on compliance. One issue of cross compliance identified was that farmers are incentivised to use pesticides to maintain certain vegetation to be eligible for the BPS, thus increasing pesticide run-off and impacting water quality. Another example of cross compliance identified was that farmers in the Netherlands may plough their land after 5 years to avoid being considered permanent grasslands in CAP, thus increasing nitrate leaching. Overall, while the funding mechanism offers incentives for compliance in some regards, there are multiple cross compliance issues</p>

	related to the interdependence of other Directives. There are opportunities with the CAP to formalize interactions with the ND and establish cross-referencing.
RDR (CAP Pillar II)	<p>Overall, respondents suggested that the requirements of the RDR enable the FAIRWAY objectives. Most respondents agreed that requirements to protect and enhance ecosystems are reinforcing or indivisible while the requirement to promote resource efficiency is enabling. Views on requirements to implement measurements and to enhance farm varied considerably, from reinforcing and enabling to neutral and constraining.</p> <p>Qualitative data indicates that on the one hand, market engagement has driven innovation and sustainability. On the other hand, increasing competition is likely to increase pressures on water resources which may have negative outcomes. Market competition may incentivise less sustainable environmental practices, which may counter the benefits of innovation. Thus, there are competing incentives within the RDR framework.</p>

Table 0.3 Summary of contribution of each instrument to the Fairway objective

Based on the scorings and comments provided by project partners, we identified **four reoccurring themes** that emerged from respondents' scores and comments about the coherence of the directives with the objectives of FAIRWAY. These are:

- Divided opinions between respondents about the effectiveness of fixed threshold values. Some respondents suggested fixed thresholds are effective, while others raised the concern that effectiveness may vary depending on scale and geographic location;
- Some directives are more supported by wider institutional frameworks compared to others;
- Respondent scores may be dependent on knowledge and understanding of biophysical processes, and the impact of EU policies on biophysical processes;
- In many cases, participants assigned more positive scores to interactions between requirements with more direct links to the FAIRWAY objectives, and less positive (and occasionally negative) scores to interactions with indirect links to FAIRWAY objectives.

These themes are expounded below.

The effectiveness of fixed thresholds for achieving the FAIRWAY objectives

There appear to be divided opinions between respondents about the effectiveness of fixed threshold values. Some respondents suggested fixed thresholds are effective, while others raised the concern that effectiveness may vary depending on scale and geographic location. To illustrate, it has been argued that threshold levels of nitrates (50 mg/L) and pesticides (0.1 µg/L) are not necessarily sufficient for controlling pollution. In the case of pesticides, fixed thresholds could limit the leakage of less harmful pesticides to the environment, while not being stringent enough for other more harmful types of pesticides. Despite overall positive scores, respondents were also divided about the effectiveness of the explicit limit to the amount of livestock manures applied on land (170kg/ha each year). Thus, it was suggested that differentiated threshold levels could be more appropriate, providing a leeway to take into consideration scale and geographic variation when setting threshold levels. The respondents' comments underscored the limitations of 'blanket' approaches to setting limits, thresholds, regulations across diverse geographical landscapes.

Some directives are more supported by wider institutional frameworks compared to others

Legal requirements that are supported by wider institutional frameworks are often scored more positively than those that are not. To illustrate, respondents emphasized the difficulty of ensuring the non-deterioration of large groundwater bodies with variations in quality. And respondents believed there may be disconnect between the large time scales between impacts and effects on groundwater quality, and the timescales over which measures are taken to assess groundwater quality. Thus, in practice it may be difficult to prevent deterioration if measures do not reflect ongoing causes and

rates of deterioration. These concerns warrant further investigation into the effectiveness of institutional requirements of environmental directives, such as requirements to establish frameworks (Art. 1 WFD) and national action plans (Art. 4.1 PD)

In many cases, participants assigned more positive scores to interactions between requirements with more direct links to the FAIRWAY objective and less positive (and occasionally negative) scores to interactions with indirect links to the objective to protect drinking water resources.

Scores suggest that project partners viewed direct interactions between the requirements of directives and the protection of drinking water resources more positively than indirect interactions. To illustrate, the requirement related to remedial action (Art. 8 DWD) targets a different temporal scale of management compared to the FAIRWAY objective. Remedial action includes restoration of degraded resources, while the FAIRWAY objective is perhaps more focused on long term prevention of pollution. Thus, respondents may perceive a less direct relationship between the long-term goals of FAIRWAY, and the more immediate reactive purpose of restoration.

Moreover, the requirement to ensure that water used for human consumption should be free from any micro-organisms, parasites and substances which, in numbers or concentrations, constitute a potential danger to human health (Art.2, annex 1 DWD) might be unclear in terms of their relevance for pollution by pesticides and nitrates. Several respondents were uncertain about the applicability of this requirement to the protection of drinking water resources against agricultural pollution.

Also requirements from apparently less relevant directives, such as the Habitats Directive, scored generally lower. This could suggest that there is some uncertainty with regard to the relationship between habitats and the protection of drinking water resources against nitrates and pesticides pollution. However, these scorings and comments may also be related to knowledge about biophysical processes. For example, restoring habitats often involves revegetation, which can create a buffer for pollutants and prevent agricultural runoff from entering waterways and decreasing water quality. However, this interaction is much less direct and transparent than more positively scored requirements related to other directives. The distinction between direct and indirect interactions between requirements of EU Directives and the objectives of FAIRWAY is an important finding that may speak to more institutional barriers between conceptualization of water quality policy, and on ground practice. These findings should be addressed further in successive tasks in WP6.

5. FINDINGS RELATED TO HORIZONTAL COHERENCE

For the assessment of horizontal coherence, project partners scored the coherence between the legal requirements of the Water Framework Directive, Groundwater Directive, Drinking Water Directive, Nitrates Directive and Pesticides Directive. The purpose was to identify interactions between legal requirements and objectives that could hinder the attainment of the overall goal related to safe drinking water quality or reduce the contributive effect of any one directive or requirement towards achieving the overall goal.

On average, the respondents scored the interaction between the directives positively. However, the scoring for individual requirements indicates that some potentially negative interactions were identified. While these assessments are subjective, and likely to reflect varying degrees of knowledge, the negative scorings may indicate interactions that may impede the effectiveness of some components of EU legal frameworks. While some fragmentation between legal frameworks is likely to be inevitable, and in many cases unproblematic, in some instances fragmentation may become problematic, such as cases of significant inconsistencies between directives. Further, in some cases, it is possible to identify gaps where two directives could support the objectives of each more cohesively. Inconsistencies, and gaps that point to unfulfilled opportunities for greater

coherence, could jeopardize the overall aim to protect drinking water resources, and potentially undermine the effectiveness of the wider legal framework.

The following figure displays the results of the horizontal coherence assessment. The figure presents a synthesis of findings from analysis of horizontal coherence between the five directives.

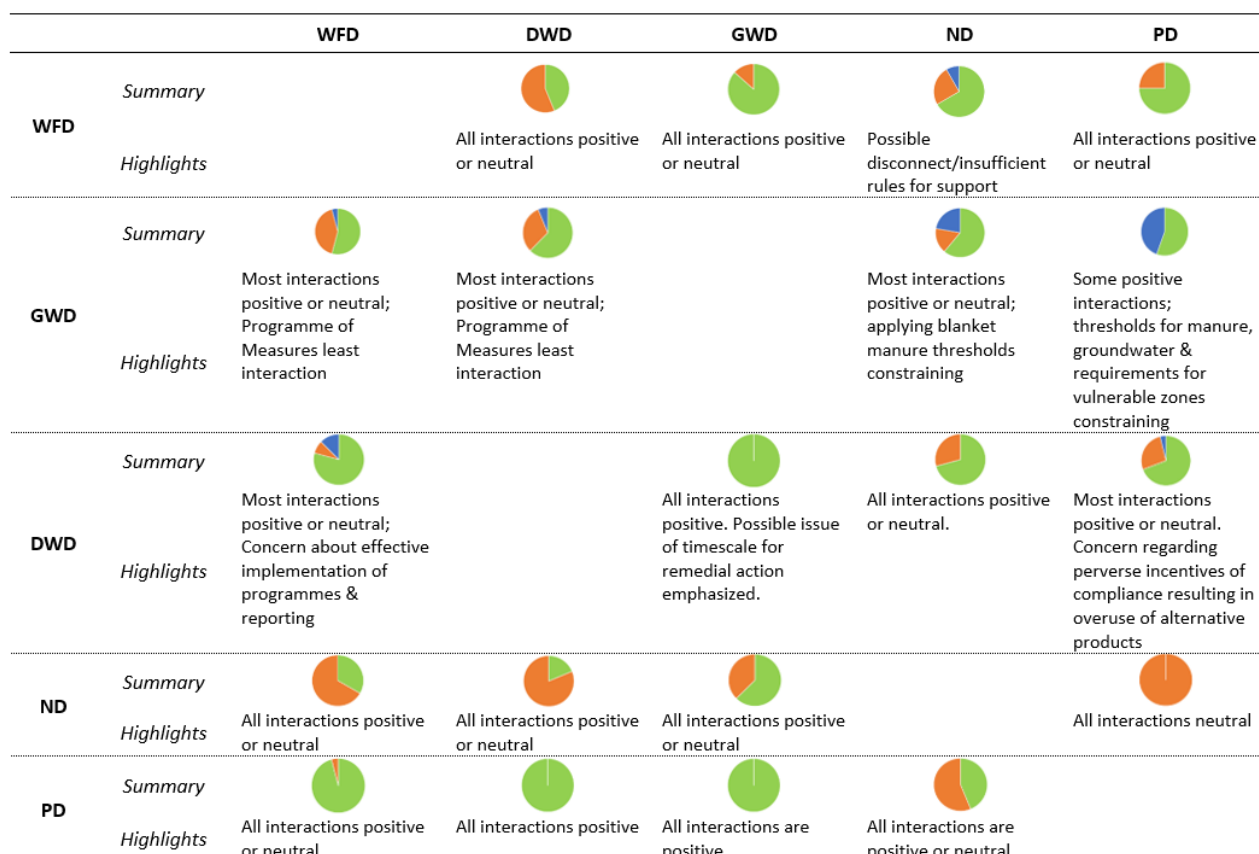


Figure 0.3 A synthesis of findings from analysis of horizontal coherence between the WFD, DWD, GWD, ND, and PD, including a visual summary of interactions between each Directive and highlights. Visual summaries (pie charts) demonstrate the proportion of interactions between the requirements of each Directive that respondents judged to be positive (green), neutral (orange) and negative (blue).

Emphasized highlights	
WFD	Potential disconnect between ND and WFD; in practice drinking water requirements rarely extend to the wider catchment, spatial disconnect. Nitrate requirements should target drinking water quality directly, as well as water quality in the wider catchment because the two are clearly connected. These ideas warrant further investigation in successive tasks of WP6.
GWD	Article 4.1 of the ND related to reducing pollution could offer an opportunity to formalise cross-referencing between the GWD and the ND. While the interaction is viewed to be positive, there is currently no requirement for cross-referencing.
DWD	There may be unintentional negative outcomes of setting restrictions on pesticides without considering the alternative products used by farmers. National action plans may not be sufficient

	<p>for addressing the spatial dynamics of the entire aquifer. These concerns could be followed up in successive tasks of WP6.</p> <p>Perceptions of interactions between the DWD and other Directives appear to reflect a range of beliefs, including those about cohesion between requirements, as well as wider confidence, or lack of confidence in process and implementation. How these concerns might be addressed, and the appropriate scale of governance to address these concerns could be considered in successive tasks of WP6.</p>
ND	<p>Overall, the requirements of the ND are viewed to interact positively neutrally with other directives' requirements. However, there is room for improvement. According to the respondents, only a restriction of breeding intensity or a restriction on the number of animals per hectare could support the 170kg/ha limit positively. It should be stressed here that there appear to be diverging interpretations of the requirement related to livestock manure limits; is this requirement about the amount of manure contribute from cattle or about the amount of manure that farmers can use on crops and apply themselves like a fertilizer. As there are diverging views on the scope of this requirement, this is worthy of further investigation later in WP6. There appears to be a need for increased specificity in the directives to avoid unclarities.</p>
PD	<p>Overall, many positive interactions have been identified. The WFD, DWD and GWD are generally considered to contribute positively to the achievement of the PD directive.</p>

Table 0. 4 Emphasised highlights of the horizontal coherence analysis

6. REFLECTIONS

Three important themes emerge from the analysis of scores and comments about interactions between the requirements of the WFD, DWD, GWD, PD and ND. Some of these themes reinforce the findings related to vertical coherence, while some are unique to the analysis of horizontal coherence. The key themes are:

- Emphasis on the fact that the effectiveness of fixed threshold values compared to more general terms about protecting resources, reducing pollution, and performing restoration is subject to diverging views and lower scores;
- The tendency for project partners to score direct interactions more positively, and indirect interactions less positively, or occasionally negatively, and the possibility that varying degrees of knowledge about biophysical processes may have influenced these judgements;
- That, with minor exceptions, the scores for requirements related to environmental outcomes, including protecting resources, reducing pollution, and remediation, tended to be more positive than scores for requirements related to the institutional arrangements for achieving environmental outcomes, such as requirements to establish frameworks.

These key narratives are expounded in the following.

The effectiveness of fixed threshold values

Chapter Two emphasized the perceived limitations of fixed thresholds for achieving the FAIRWAY objectives. The scores and comments given by project partners in Chapter Three reinforce these perceptions. This is not surprising given that the same work package partners were involved in both

stages of the research. However, the results of the five surveys conducted about interactions between the directives suggest that fixed threshold values may also impede EU laws from supporting each other.

Project contributors perceive more general requirements related to protecting water quality and preventing pollution more positively than requirements associated with fixed thresholds. This seems to be due to the risk that a fixed threshold may be appropriate in some contexts, and insufficient in others. Thus, one potential area for improving coherence may be including terms in requirements to necessitate more strict thresholds under certain environmental conditions. For example, it may be possible to identify biophysical conditions that pose a greater risk to groundwater quality than others, and thus, determine that stricter thresholds should be adopted.

There were two exceptions to the tendency for contributors to score general requirements about achieving environment outcomes more positively than requirements about specific fixed thresholds. Firstly, in the context of groundwater limits, project partners did not consider any negative interactions between fixed limits and the requirements of the WFD, GWD, DWD and PD. These results contrast with scores given to other requirements related to specific threshold values; in other instances, project partners presented conflicting perspectives suggesting that there are negative risks associated with adopting fixed thresholds. Overall, the scoring for groundwater limits suggests that project partners feel the fixed thresholds related to nitrates may be more appropriate than other fixed thresholds, such as limits to contaminants in groundwater. Secondly, fixed thresholds related to the ND were viewed positively, compared to other fixed thresholds examined in relation to other directives. This may reflect the varying opinions of multiple project partners. Alternatively, the fixed thresholds related to nitrate concentrations may not produce the same risks as those identified in relation to other directives, such as concentrations of contaminants in groundwater.

Another issue raised in relation to fixed thresholds was the potential disconnect between drinking water requirements and requirements that affect water quality in wider catchments. For example, in theory, the requirements of the ND related to the amount of livestock manures applied on land, to apply common criteria for water pollution, and to limit values of 50 mg/l nitrates should target both drinking water quality and wider ecological conditions that impact water quality in catchments. In practice, these linkages are seldom realised due to various complexities (see further WP3 FAIRWAY). Importantly, these perspectives are subjective and warrant further investigation.

Direct versus indirect interactions & the influence of knowledge

Scores suggest that project partners view direct interactions between the requirements of directives more positively than indirect interactions. However, these judgements may also reflect the varying knowledge of project partners about biophysical processes, and how specific management practices may influence those processes. Thus, the findings presented in this report should be considered in the context of scientific literature about the relevant processes. We recommend a robust literature review to complement these findings.

For example, in the context of the ND, numerous interactions were viewed to be 'neutral'. There are several explanations for this. In some instances, it is likely that these perspectives reflect a genuine lack of connectivity between ND objectives and other directives, particularly with regards to requirements under the PD. However, in some cases, these perspectives may reflect the more complex nature of interactions between nitrate levels and other environmental concerns. This is consistent with the conclusions of Chapter Two which suggested that *less direct* interactions may be more difficult to identify and score accurately.

Differences between requirements to achieve environmental outcomes & requirements related to institutional frameworks

Overall, the scoring suggests that requirements related to achieving environmental outcomes are viewed more positively than requirements related to the institutional frameworks that are used to implement environmental policy on the ground. For example, most requirements to protect resource, prevent pollution, and implement remediation are scored highly positively, such as those requirements under the DWD and GWD. By comparison requirements to establish a programme of measures, establish frameworks, and establish national action plans were viewed less favourably. For example, no positive interactions were identified between the requirement to establish a programme of measures and other directives. This may reflect disconnect between the environmental objectives of the directives, and the institutional processes required to ensure those objectives are achieved. Similarly, respondents suggested that national action plans may be ineffective as these are often not targeted at a specific source, but a whole aquifer. Thus, it may be necessary to introduce stricter measures in targeted areas.

Several respondents suggested that the disconnect between environmental objectives and the institutional frameworks employed to achieve those outcomes stems from time-lag between the causes of degradation, observable degradation, and the timescales over which condition monitoring and assessment is performed. One example given was related to groundwater contamination and the time required before measures of condition are likely to correctly identify concentrations of contaminants. However, there was also some variation in scores. For example, institutional requirements of the PD were viewed more favourably than the institutional requirements of other directives. This may reflect genuine differences in coherence between legal requirements related to environmental outcomes and requirements related to institutional arrangements under the PD compared to other directives. However, these judgements are subjective and may also reflect bias.

7. FURTHER RECOMMENDATIONS

This report (D6.1), together with the report produced in task 6.2 on governance arrangements in case study areas (D6.2), forms the basis for research to be carried out in successive tasks of WP6.

In general, we recommend further investigating the reoccurring themes that have been described above. In particular, the effectiveness of the legal framework to attain the objective of protecting drinking water resources against agricultural pollution, might be adversely affected by fixed threshold values and 'blanket' approaches to setting limits, thresholds, and regulations across diverse geographical landscapes. Furthermore, the distinction between direct and indirect interactions between requirements of EU Directives, and the objectives of FAIRWAY is an important finding that may speak to more institutional barriers between the goals and aims conceptualization of water quality policy, and on ground practice. These findings should be addressed further in successive tasks in WP6. For example, the goal to reduce agricultural pollutants is very clearly linked to FAIRWAY objectives. The fact that institutional requirements, such as establishing frameworks, are perceived as contributing less may indicate a disconnect between frameworks, implementation, and environmental outcomes.

In addition to these reoccurring themes, we recommend investigating several potential inconsistencies or gaps more thoroughly. The three challenges that we consider most worthy of further investigation are the following:

- **The relationship between the Drinking Water Directive and the Water Framework Directive**

Respondents emphasised that there appears to be a potential gap between the risk-based approach to improve drinking water quality at the tap as adopted in the DWD and the wider goal to protect protection of drinking water resources under the WFD. One suggested reason for this disconnect may be related to the physical distance between urban areas and river catchments. Respondents

may be concerned about the fact that there are many sources of pollutants in river catchments that are not addressed at the tap. However, it is unclear whether these subjective perspectives reflect genuine risks to water quality. This gap also came forward in the evaluation of the Drinking Water Directive (98/83/EC) as an area for improvement.

Another example of this disconnect is related to groundwater bodies. Respondents highlighted that, the WFD only takes into consideration, the number of groundwater bodies used for drinking water purposes, without taking into account the water volume size of these bodies. Thus, a member state could use the size of a groundwater body to get a more favourable outcome. The member state could have a very small groundwater body with 'good status', while also having a very large groundwater body with 'poor status' requiring additional measures. By a mere focus on number, this would equal to 50% compliance while the actual quality status of all sources would be poorer.

The recent revision of the DWD (EU/2020/2184) introduces a risk-based approach from source to tap, including risk identification, risk assessment and risk management, following the methodology of 'Water Safety Plans' as was introduced by the WHO (WHO 2009). This risk based approach aims to strengthen the links between the DWD and the WFD and the GWD and connects to WFD-methodologies regarding characterization of water bodies and pressures, risk based monitoring, and the objectives of Article 7 (2000/60/EC). This enables authorities to concentrate on potential risks to water quality at the source and its catchment (Article 8, DWD) onto distribution, but also requires adequate programmes of measures to prevent and mitigate risks and monitoring programmes to identify effects of these measures. Timelines are being aligned to the WFD. Furthermore, monitoring should be risk based including possible emerging contaminants. The WFD is not yet so explicit in the monitoring of emerging contaminants. The revised DWD should be transposed by MS within 2 years from the introduction. As it seems, the gap identified seems to be resolved by the revision of the DWD. However, the first set of data for the DWD needs to be delivered at the formal end date of the WFD (2027). So, it remains somewhat open how these linkages will develop in practice.

- **The relationship of the Water Framework Directive and the Nitrates Directive**

Respondents suggest that there is a potential disconnect between drinking water requirements under the Nitrates Directive and requirements that affect water quality in wider catchments pursuant to the Water Framework directive. For example, in theory, the requirements of the ND related to the amount of livestock manures applied on land, to apply common criteria for water pollution, and to limit values of 50 mg/l nitrates should target both drinking water quality and wider ecological conditions that impact water quality in catchments. However, the objectives of the ND are primarily related to drinking water quality and only to ecology in the context of eutrophication. Some respondents therefore argue that existing requirements related to the use of fertilizers and manures are not comprehensive enough to support WFD ambitions. Respondents had different views on the nature of the relationship between the WFD and the ND though, and therefore we recommend this issue to be examined further later in WP6.

- **Potential negative effects of the funding mechanism under the Common Agricultural Policy**

Some respondents identified potential negative consequences of the CAPs funding mechanisms on the protection of drinking water resources. To illustrate, the Basic Payment Scheme (BPS) linked with CAP and cross compliance could mean that farmers are keeping land in production just to receive this payment. In certain areas, farmers are spraying pesticide to remove rushes, so that the land is eligible under the BPS. This is resulting in an increase in pesticide run-off to the river. In addition, the areas declared for the BPS are also used to calculate the farm's organic N loading for the Nitrates Directive. For that reason, a farmer can legitimately increase his/her stocking density up to 170kg/ha organic N, even though the land may not be able to support this agricultural intensity.

Furthermore, farmers may also plough their grasslands within 5 years, to avoid that their grasslands will be considered as permanent grasslands in CAP, with more strict regulation. Ploughing of grasslands can strongly increase nitrate leaching. Overall, the CAP is perceived to contribute positively to the protection of drinking water resources against nitrates and pesticides pollution from agricultural resources. However, the funding mechanism and its implementation might also have some drawbacks that could affect drinking water quality adversely. This needs to be explored further.

8. SPECIFIC SUGGESTIONS FOR CROSS REFERENCING AND FORMALISING INTERACTIONS IN THE EU LEGAL FRAMEWORK

- WFD, DWD, GWD were viewed to be interdependent on one another, however, the connectedness is not formalised in any way. There are opportunities here for cross referencing. One option would be to include these requirements as an additional component to existing requirements related to institutional frameworks, such as WFD Article 1, 'To establish a framework for achieving or maintaining good status of inland surface waters, coastal waters, transitional waters and groundwater, *with reference to, and in collaboration with parallel frameworks put in place with the DWD and GWD*'. Another example might be the WFD Article 13.1, 'To ensure that a river basin management plan is produced for each basin district lying entirely within their territory, *including actions and objectives for ensuring compliance with the thresholds and *requirements* of the DWD and the GWD*'. Similar adjustments could be made to articles referring to programmes of measures (e.g., WFD Article 11.1) to reflect the interdependence of Directives, such as ensuring that programmes of measures consider the thresholds and relevant requirements in the DWD and GWD.
- There is also interdependence between the EIA, IED and ND suggesting that the implementation of these Directives would benefit from cross referencing. There are opportunities to improve the outcomes of the ND by ensuring consistent specificity between the ND, EIA and IED towards achieving the FAIRWAY objectives.
- Views expressed on the CAP and RDR raise concerns about competing incentives for farming communities to simultaneously innovate towards sustainability and sacrifice sustainable practices to engage competitively in markets. Issues of cross-compliance, such as increasing pollutants to remain eligible for funding, suggest a need for cross referencing between the requirements of the CAP and RDR and other directives, such as the ND and the DWD. More specifically, market based instruments work most effectively when implemented within a framework that mitigates potential side-effects, such as 'perverse incentives' associated with increasing pesticide use to remain eligible for financial support. This, and other such 'perverse incentives' should be revisited and the introduction of guidelines or additional peripheral requirements for the CAP and RDR to uphold the underlying principles of other Directives, including the ND, such as Article 4.1 related to a code of conduct.