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COMMISSION STAFF WORKING DOCUMENT

Agriculture and Sustainable Water Management in the EU

1. The water – agriculture nexus

The sustainable management of water and other precious natural resources is one of the defining challenges of our time. Water is a vital resource in the EU, not only for agriculture but for human health, energy production, nature conservation, and transport, to name but a few policy areas. The multiple benefits that agriculture provides to society depend on the long term sustainable management of natural resources, including water. However a number of current pressures are affecting the quantity and quality of our water supply, affecting its current and future sustainability. Farming activities, which occupy more than half of the EU territory, are one of the causes of pressures on water bodies, impacting on the health of vital water ecosystems. Promoting certain sustainable agriculture and forest management practices is of paramount importance for water ecosystems. Addressing the pressures while maximising the beneficial effects of good agricultural land management will greatly enhance sustainable water management and sustainable agriculture in the EU.

Globally, agriculture and water play a substantial role in the 2030 Agenda for Sustainable Development. This is clearly reflected in the Sustainable Development Goals (SDGs). Sustainable water management (SDG6) and sustainable agriculture (SDG2) are both primary goals, and neither one can be achieved independently of the other.

Water, as recognized in the 2017 G20 Agriculture Ministers' Declaration, is an essential production resource for agriculture, critical for feeding the growing world population. Ministers reaffirmed their commitment to policies which boost agricultural productivity while ensuring that water and water-related ecosystems are protected, managed and used sustainably.¹

The delicate balance between agriculture and water-related objectives has been addressed at EU level by the evolving EU environmental and agricultural legislation.

First, the EU Water Framework Directive (WFD)², adopted by the European Parliament and Member States in 2000, set 2015 as the deadline to achieve good water status. Second, the Nitrates Directive has also had a measurable effect on the reduction of pollution from agricultural nitrogen.³ Nevertheless the Nitrates Directive alone will not lead to nutrient management at the scale necessary to secure the WFD environmental outcomes.⁴ Third, the Sustainable Use of Pesticides Directive⁵ is an important instrument to help achieve good water status. It reduced the risks and impacts of pesticides on human health; on the environment; and for promoting Integrated Pest Management.

¹ G20 Agriculture Ministers' Declaration 2017. Towards food and water security: Fostering sustainability, advancing innovation

http://www.bmel.de/SharedDocs/Downloads/EN/Agriculture/GlobalFoodSituation/G20_Declaration2017_EN.pdf?__blob=publicationFile

² Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy. OJ L327, 22.12.2000

³ Report from the Commission to the Council and the European Parliament on the Implementation of Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates. COM(2013)683

⁴ European Court of Auditors Special report 3/2016 of 12 April 2016. Combating eutrophication in the Baltic Sea: further and more effective action needed

⁵ Directive 2009/128/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides. OJ L 309, 24.11.2009

Fourth, the Drinking Water Directive⁶ mandates minimum health standards in water intended for human consumption, making linkages with other water-related policies.

Water and agriculture legislation must directly address these overlapping challenges to ensure the long term objective of making European agriculture sustainable – in other words, agricultural production must develop and grow while securing the good status of water bodies as defined by the Water Framework Directive.

The Common Agricultural Policy (CAP) 2014-2020 prioritises the 'sustainable management of natural resources and climate action' through a variety of complementary policy instruments: cross-compliance, the green direct payment, and rural development support measures. The CAP, recognising the adverse impact of some agricultural practices, establishes explicit links with the water policies. The recent EU circular economy package⁷ has also prioritized a number of agriculture-related initiatives with significant potential to improve water sustainability – including water reuse, the revised EU regulation on fertilisers, and food waste. Finally, EU climate policies address GHG emissions from land use,⁸ manure management and the use of fertilizers,⁹ which in turn incentivises action to support water sustainability such as improved soil management, and optimal nutrient and manure management.

With these policy instruments in place, some progress has been made in improving water chemical and ecological status. Nevertheless, results in terms of achieving good status have been slower than expected. The first cycle River Basin Management Plans (RBMP) estimated that 43% of surface waterbodies had achieved good ecological status, and predicted a 10% point improvement to 53% by the end of the first planning period in 2015.¹⁰ However the assessment of the first cycle reported that there were delays in implementing many of the improving measures.

Diffuse pollution significantly affects 90% of river basin districts and the agricultural sector is the primary source. In the river basins where over-abstraction is an issue, the analysis of the first Programme of Measures showed that measures to restore the long-term sustainability of abstraction were inadequate.

The fact that the first RBMP programmes are not on track¹¹ may put at risk the long term targets,¹² and may also limit the integration of water measures in the CAP architecture.

⁶ Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption. OJ L 330, 5.12.1998

⁷ http://ec.europa.eu/priorities/jobs-growth-and-investment/towards-circular-economy_en

⁸ Proposal for a Regulation of the European Parliament and of the Council on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry into the 2030 climate and energy framework (LULUCF Regulation for the period 2021-2030)

⁹ Decision No 406/2009/EC of the European Parliament and of the Council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020 (Effort Sharing Decision for the period 2013-2020)

Proposal for a Regulation of the European Parliament and of the Council on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 for a resilient Energy Union and to meet commitments under the Paris Agreement (proposal for an Effort Sharing Regulation for the period 2021-2030)

¹⁰ http://ec.europa.eu/environment/water/water-framework/pdf/3rd_report/CWD-2012-379_EN-Vol1.pdf

¹¹ Report on the progress in implementation of the Water Framework Directive Programmes of Measures. COM(2015) 120 final

¹² Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. The EU Environmental Implementation Review: Common challenges and how to combine efforts to deliver better results. COM (2017) 63 final

The Commission is supporting the WFD through bilateral meetings with Member States to discuss implementation, and through the Common Implementation Strategy process between Member States and stakeholders, under which a number of working groups have developed and adopted guidance documents and shared good practice on a range of issues, including agriculture.¹³ It is important to identify the barriers preventing adequate measures in the RBMPs.

Progress will be evaluated as part of the 2nd RBMP assessment.

2. Optimising the delivery of the EU water and agriculture policies

At this stage – following the adoption by several Member States of their 2nd RBMPs, and with the current CAP at its mid-point - the Commission has carried out an analysis of how the existing EU water and agriculture policy framework addresses the three main agricultural pressures affecting water (nutrients, pesticides and abstraction). This analysis reviews the main implementation challenges, as well as identifying cases of good practice at Member State level.¹⁴

The analysis indicates that existing EU policies contain possibilities for addressing water challenges in agriculture. However, it also points to a range of obstacles (structural, governance, economic, and behavioural) that prevent these possibilities from being fully and coherently implemented. To address these obstacles, the Commission is about to embark on an evaluation of several key pieces of water policy, such as the Water Framework Directive, Urban Waste Water Directive, and Floods Directive; as well as delivering a revision of the Drinking Water Directive and a process to modernise and simplify the CAP. The EU strategy for adapting to climate change, which aims to ensure that both water and agriculture policies play their part in climate action, is also being evaluated.

In the meantime, the Commission has identified several areas within the current legislative framework where increased cooperation could improve the sustainability of water management and agricultural production in Member States. These include better policy implementation; ensuring governance structures for water and agriculture that allow effective coordination; addressing investment needs for securing compliance with EU objectives and matching these with available funding sources; and making effective use of the existing knowledge base to innovate further towards water sustainability in the agricultural sector.

2.1. Improving policy implementation

The WFD Common Implementation Strategy (CIS) assists Member States in implementation; however it is clear from the first cycle of RBMPs that additional effort is needed to improve measures on the ground, including under the CAP.

The Commission has launched an Environmental Implementation Review (EIR) to improve the implementation of environmental policies, including on water. This offers an opportunity

¹³ <https://circabc.europa.eu/w/browse/7f9e3057-580f-4a04-bf69-e5802fb82262>; Workshop documents and conclusions available at <https://circabc.europa.eu/w/browse/37872168-8d23-4cdd-977a-f3277f4d7bc0>

¹⁴ This analysis is included as an annex to this Staff Working Document

to work with Member States on identifying and resolving the implementation and compliance gaps that exist on water policy, which are linked to agriculture pressures.¹⁵

Additionally the Commission has launched an initiative on Environmental Compliance Assurance¹⁶ to assist Member States by providing tools and guidance on compliance promotion, compliance monitoring, and enforcement. This should improve national compliance assurance systems for water legislation in relation to farming activities.

Several forthcoming policy evaluations will further clarify the strengths and weaknesses of the current policy framework in terms of potential for delivering results and innovation impacts. These include an assessment of how Member States have complied with the ex-ante conditionality¹⁷ for European Structural and Investment Funds (ESIF) on having in place water pricing systems (Article 9 of the WFD), relevant where investments in irrigation were programmed in the 2014-2020 Rural Development Programmes; an evaluation of the overall impact of the CAP on water (to take place in 2018); and an evaluation of the second RBMPs (to be completed early 2018) which will assess implementation gaps and progress in overcoming them. Additional valuable contributions in this respect are expected in the context of the Innovation Deals (ID) mechanism.¹⁸

2.2. Enhancing governance

Overcoming strictly-sectorial approaches is fundamental to ensure that resources deliver value for money in meeting the Union's sustainability targets for agriculture and water management.

The Commission encourages better governance of water and agriculture through dialogue with Member States and stakeholders. This includes Water Directors meetings, the European Rural Development Network, the Expert Group on Cross Compliance and Greening, the Rural Development Committee, and the Water Framework Directive Common Implementation Strategy. The Commission is leading by example, reinforcing existing cooperation and coordination mechanisms and creating forums for dialogue and exchange of good practices.¹⁹

From the analysis outlined above, some examples of good inter-linkages between sectorial policies have been identified. These linkages are fundamental to ensuring coherence on the ground. For water and agriculture policy implementation to be working in synergy, a clear identification of water-related targets (consistent with good water status) is needed, as well as alignment and convergence of environmental and agricultural strategies to meet these targets.

While some good practices have been identified (included in the annex), there is a clear need for further dissemination and uptake by Member States' water and agriculture authorities.

¹⁵ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. The EU Environmental Implementation Review: Common challenges and how to combine efforts to deliver better results. COM (2017) 63 final

¹⁶ Commission Communication COM (2016), 710 final; and Commission Work Programme 2017 "Delivering a Europe that protects, empowers and defends" includes an initiative on environmental compliance assurance under Priority 10, A Union of Democratic Change

¹⁷ Article 19 and Annex 11 of Regulation (EU) No 1303/2013 of the European Parliament and of the Council of 17 December 2013 laying down common provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund, the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund and laying down general provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund and the European Maritime and Fisheries Fund

¹⁸ <https://ec.europa.eu/research/innovation-deals/index.cfm?pg=home>

¹⁹ European Court of Auditors (2014). Integration of EU water policy objectives with the CAP: a partial success

Cross-sectorial cooperation will be important to ensure innovative win-win actions are identified and promoted at all levels of governance.

2.3. EU Investments in water and agriculture

The most common obstacle reported by Member States to the implementation of the programmes of measures (PoMs) under RBMPs is insufficient financing.²⁰ Rural Development Programmes were identified by Member States as a major funding source for agriculture-related water measures. However, financial support to farmers for implementing water and nutrient management measures is often perceived as insufficient.²¹

In the Blueprint Communication following the assessment of the 1st RBMPs, possibilities to improve the up-take of EU funds to finance measures contained in RBMPs were set out.²² Since then, some useful actions have been taken.

The reasons for under-funding could include delays in adopting adequate RBMPs which make it difficult to match objectives with funding opportunities; administrative capacity and governance issues; as well as strong competition from other priorities at Member State level.

The Commission together with the European Investment Bank is reviewing possibilities for supporting investments to help achieve good water status; and to support the circular economy and resource efficiency. In addition to ESIF funding, the European Fund for Strategic Investments²³ can be an opportunity in this respect. Improving the knowledge on identifying investment needs and project preparation and fine-tuning the type of financial support to the characteristics of the projects and of the beneficiaries are in this context prerequisites for mobilising and prioritising investments towards innovative solutions for a more sustainable use of water in agriculture.

New investment projects in agriculture and water could target systems for smart irrigation, water reuse and smart land management measures. Existing CAP measures could be supported by additional investment, such as greening, agri-environment schemes, climate action, or advisory systems.)

Investment could support nutrient management at river basin level (such as the storage and use of manure surplus), as well as precision farming and resource efficiency. Information technology is crucial in many such projects. There is also a need to further invest in demonstration projects to bridge the gap between the lab and the farmyard.

2.4. Knowledge and innovation support for the water and agricultural policies

Research and innovation is vital for enhancing sustainable water management in the agriculture sector. However, this will only happen if adequate knowledge and information support systems are in place. Knowledge and information need to be accessible and useful to both public administrators and farmers. A proper information infrastructure should allow the seamless sharing of data among public sector organisations, facilitating public access and

²⁰ Report on the progress in implementation of the Water Framework Directive Programmes of Measures. SWD(2015)50 final

²¹ European Court of Auditors (2014). Integration of EU water policy objectives with the CAP: a partial success

²² A blueprint to Safeguard Europe's Water resources. COM (2012) 673 final

²³ Regulation (EU) 2015/1017 of the European Parliament and of the Council of 25 June 2015 on the European Fund for Strategic Investments, the European Investment Advisory Hub and the European Investment Project Portal

policy-making across boundaries. Moreover, user-friendly and effective decision-support tools must provide agriculture and water stakeholders with simple, readable and feasible roadmaps for reaching their sustainability objectives. The identification and dissemination of good practices is also important.

European research and innovation programmes have been an important driver for sustainable water and agricultural policies. Past and ongoing EU funded projects provide basic research, as well as innovative solutions for improving water management in agriculture and for assessing the trade-offs and interplay between water, agriculture and other policies, such as climate, food and energy.

In addition, significant added value in this respect could be provided by the European Innovation Partnership (EIP) network and EIP operational groups; through coordinated action between relevant EIP Water and EIP-AGRI Groups; and through the European Environment Agency (EEA) and its WISE²⁴ tool, bringing together Commission activity on water and agriculture and the European Rural Development Network.

The effectiveness of management and control systems in tackling pollution, over-abstraction and illegal abstraction relies on their capacity to utilise all relevant monitoring data. Setting clear objectives for achieving good water status for farmers relies on the availability of accurate data, the proper targeting of measures, as well as an accurate assessment on the minimum participation level needed to ensure that the water measures provide the expected environmental effects.

With regard to how CAP water-related measures integrate with the wider water management landscape, audits need to be more effectively channelled into appropriate decision-making at all levels of governance. Mechanisms for knowledge-gathering and transfer would benefit from better integration at EU level.

A focused assessment of overlaps, unaddressed difficulties, miscommunication, and interoperability issues might inform and improve action at EU, Member State and local level. The pooling of knowledge and modelling capacities at EU level could help to overcome implementation, funding and governance issues.

3. Conclusion

Current EU agricultural and water legislation provides a wide variety of policy tools which could substantially help to achieve good water status. Moreover, several other Commission initiatives such as the Investment Plan for Europe, the Circular Economy Action Plan and climate policies also provide a valuable contribution to this goal.

For a meaningful and immediate response to the challenges for agriculture and water sustainability, the abovementioned opportunities for improved implementation, better governance, targeted investments, and a reinforced knowledge base should be used to the fullest. The Commission's leadership in achieving the sustainable development goals will be reflected in all these areas.

In this context, a wider reflection and discussion exercise with the different stakeholders to identify possible ways forward will be important.

²⁴ <http://water.europa.eu/>

ANNEX
to the
Staff Working Document
Agriculture and Sustainable Water Management in the EU

1. The need for sustainable water management in the EU

Adequate water management is a primary component of sustainable development, as it provides the crucial link between the society, the environment and the economic system. It is also a goal in line with the Commission's priorities on developing a circular economy based on resource efficiency. Moreover, it is a key lever for the EU agenda on growth, jobs and investment, not only because the water sector directly includes 9000 SMEs and almost 500.000 jobs,²⁵ but also because all economic sectors need water to maintain their activities and contribution to growth. Addressing quantity and quality challenges will play a fundamental role in moving to a low-carbon, resource efficient and climate resilient economy by 2050, as defined in the Europe 2020 agenda, and will demand further developing and spreading water management technologies, addressing knowledge gaps, capacity building, or investments in water supply, infrastructure and innovation that reduces risk of water scarcity and disasters such as droughts and floods.²⁶ Water is a crucial resource for life, human health and wellbeing.

In Europe, the main users of water are the energy (44%), agriculture (24%), public water supply (21%), and the industrial and service sectors (11%). A significant proportion of freshwater resources abstracted is lost through leakages in the distribution system, which can amount to up to 40% in some countries.²⁷ Water demand from all sectors is projected to increase by up to 16% by 2030, and climate change will add to this demand and will affect water supply. This will need to be balanced with the need to maintain river flows and water bodies in good status. All water users in the EU need to perform better to save it and reduce its pollution and consequently the additional costs linked to ensuring healthy waters for the ecosystems and the next generations.

Water status in the EU

While water resources on average are relatively abundant, their availability differs across the EU. Some river basin districts have ample resources (e.g. Scandinavia), but others (e.g. Mediterranean) have frequent scarcity episodes and groundwater depletion. There is not, however, a straightforward North-South divide on water availability, as Northern European agriculture is becoming increasingly affected by prolonged periods of drought on account of more extreme weather events. Human pressures including pollution, abstractions, construction of dams and modifications of river morphology, are affecting water quantity and quality, compromising its sustainable management, now and in the future. These pressures can cause risks to human health, the ecosystems, and generate considerable costs to society and the economic system, and demand new efforts to adapt our water systems to the new challenges. (Figures 1 and 2 at the end of this document)

²⁵ The Water Framework Directive and the Floods Directive: Actions towards the 'good status' of EU water and to reduce flood risks. (COM (2015) 120 final).

²⁶ http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/SC/images/WWDR2015Facts_Figures_ENG_web.pdf

²⁷ EEA Report No 2/2009, Water resources across Europe — confronting water scarcity and drought, <http://www.eea.europa.eu/publications/water-resources-across-europe>

Water pollution from nutrient discharge is caused by several human activities, including household, industry, agriculture or fish farming, causing eutrophication and acidification of fresh and coastal waters. Eutrophication affects 22% of river and 37% of lake monitoring stations in the EU, mainly in Western, Northern and some Eastern countries. Pesticides from different sources contribute to poor status of water bodies in 16 Member States, affecting 20% of groundwater and 16% of the rivers and transitional water bodies classified as being in poor chemical status.²⁸ In addition, compounds of emerging concern (CECs) and novel emerging risks such as anti-microbial resistance being propagated by veterinary drugs appear to be relevant also for agriculture.²⁹

The role of agriculture

Agriculture, like other economic sectors, has a high dependence on available water supplies of good quality. More than half of the EU territory is occupied by agricultural land uses, and water bodies are, in turn, potentially affected by farming. As a result, in 2012, more than 90% of the River Basin Management Plans (RBMPs) assessed indicated that agriculture is a significant pressure.³⁰ A significant proportion of EU water abstraction is for agriculture, particularly in Member States where seasonal scarcity caused by climatic conditions generates competition with other uses. On the other hand, farming practices utilize or produce substances (e.g. fertilisers, pesticides, veterinary drugs, animal excreta) that, in excess, can cause pollution to water bodies: the use of fertilizers in agriculture is a significant source of nitrogen (over 50% of total discharge into surface waters) and phosphorus loading, and pesticides used in agriculture are also present in many water bodies. Moreover, irrigation, land drainage and land use changes associated with certain agricultural practices can cause erosion or hydro-morphological changes.

Conversely, EU agricultural and forest landscapes can provide advantages compared to alternative land uses (e.g. urbanisation), including the maintenance of soils, land cover and landscape elements with high water retention and filtering capacity. Maximizing this positive contribution while addressing the pressures mentioned above can greatly contribute to sustainable water management in the EU, while at the same time furthering other objectives such as biodiversity conservation, mitigation of climate change and improving climate resilience.

2. The Policy Framework. EU water and agriculture policies

EU water policy has evolved from addressing individual substances (pesticides in 1970s, nitrates in 1990s) to a more holistic approach with the Water Framework Directive (WFD) adopted in 2000, which defined two objectives – no deterioration, and the achievement of good status for all surface and groundwater bodies by 2015, by defining quality and quantity goals.

To meet the objective of good status, the WFD introduced an integrated management regime requiring an assessment of all the pressures in a river basin, and the development of Programmes of Measures (PoMs) to tackle them. The PoMs must consist of *basic measures*, incorporating the pre-existing EU *acquis* (e.g. the Nitrates Directive), plus some new

²⁸ EEA Report No 8/2012. European waters - assessment of status and pressures.

²⁹ OECD 2012. New and Emerging Water Pollutants arising from Agriculture, <https://www.oecd.org/tad/sustainable-agriculture/49848768.pdf>; FAO 2016. The FAO Action Plan on Antimicrobial Resistance 2016-2020, <http://www.fao.org/3/a-i5996e.pdf>

³⁰ Implementation of the Water Framework Directive (2000/60/EC) River Basin Management Plans. (COM/2012/0670 final).

obligations (control on diffuse sources of pollution and abstraction, protection of drinking water, promotion of efficient and sustainable water use and a water pricing policy). *Supplementary measures* can be applied in addition to the basic measures, as deemed necessary, to achieve the good status objectives (including e.g. training and advice, investments and agri-environment-climate operations in Rural Development Programmes).

The Common Agricultural Policy (CAP) 2014-2020, recognising the pressures on water sustainability of some agricultural practices, establishes explicit links with water policies. It relies on the complementary effects of various instruments: cross-compliance, the green direct payment, and rural development support measures.

CAP's Pillar I cross-compliance requirements represent the compulsory environmental obligations to be met by farmers to receive full funding. Several requirements refer to water directly (SMR 1 on Nitrates Directive, GAEC 1, 2 & 3 on buffer strips to protect surface water, groundwater pollution and irrigation), or indirectly (GAEC5 on limiting erosion, GAEC 7 on landscape features providing ecological services, or SMR 10 on pesticides).³¹ The new Green Direct Payment is expected to improve the environmental performance of the CAP, including water.³²

Pillar II of CAP (Rural Development) promotes activities aiming at three objectives, including sustainable management of natural resources, and contains two water-specific focus areas to meet some of its priorities: improving water management - including fertiliser and pesticide (priority 4, to restore and preserve ecosystems related to agriculture), and increasing efficiency in water use by agriculture (priority 5, on promoting resource efficiency).³³

Many rural development measures are relevant for the good status of water: some are explicit on water policies³⁴, while others can finance water quantity objectives at the landscape or river basin level, or practices in support of quality objectives.³⁵ Additional measures can be used to complement them.³⁶ Furthermore, the rural development policy provides financial support to investments for the improvement of water management in rural areas non-related to agriculture, such as provision of drinking water and waste water services, or in support of flood prevention, through structural and non-structural "green" measures. The strategic programming approach of rural development allows for the design, by the national authorities, of rural development programmes according to regional and local needs and specificities, including water-related needs where relevant. The quantified targets of the 2014-2020 Rural Development Programmes (RDPs) indicate that 15% of agricultural and 4.3% of forestry land in EU should be under contracts to improve water management.

Thanks to the policy instruments in place and the implementation effort by Member States (MS), progress has been made in terms of improving water chemical and ecological status.

³¹ SMR: Statutory Management Requirement; GAEC: standard of good agricultural and environmental condition of land

³² Payment for agricultural practices beneficial for the climate and the environment - Article 43 of Regulation (EU) No 1307/2013. These practices, expected to improve the environmental performance of the CAP, can have a direct and indirect beneficial effect on water quality through the introduction of ecological focus areas, maintenance of permanent grassland and crop diversification.

³³ Article 5 of Regulation (EU) No 1305/2013.

³⁴ Natura 2000 and Water Framework Directive payments (art. 30); investments in irrigation linked to RBMPs and water saving targets (art. 46); investments in physical assets linked to supply and saving of water (art. 17); investments on advisory services, farm management and farm relief services related to implementing the water framework directive (art. 15), or cooperation in joint approaches to environmental projects that include efficient water management (art. 36).

³⁵ Afforestation and creation of woodland (art. 22), restoring forest ecosystem services (art. 25) and other forest-related measures, the Agri-environment-climate (art. 28), or organic farming (art. 29, Regulation (EU) No 1305/2013.

³⁶ Training, support from the Farm Advisory System, the Innovation Partnership and applied research.

However, the results achieved implementing the WFD are not fully satisfactory: the planned measures in the first Programmes of Measures (PoMs), which were predicted by MS to increase from 43 to 53% the number of water bodies in 'good status' in 2009-2015³⁷, have not been fully implemented (Figure 3). Coherence in implementing the EU water and agriculture policy can be enhanced in MS, so that they allow for meeting the objectives of both. In practice, while some MS are taking steps towards this joint sense of purpose and are successfully tackling certain pressures on water bodies, others are making limited progress.

This document analyses briefly the inter-relation between agriculture and water and identifies some of the main pressures of agriculture on water - nutrients, pesticides, and abstraction; the available EU legislation to address them, and the challenges for their effective implementation. It identifies good practices in using the opportunities provided by the EU policies to address the pressures.³⁸

3. Nutrients (Nitrogen and Phosphorus) and water

Water pollution by nitrogen (N) and phosphorous (P) contribute to eutrophication and acidification of fresh and coastal waters, with many effects ranging from biodiversity and fish stocks loss, to deterioration of drinking and bathing water quality. High nitrate concentrations in drinking water are dangerous for human health, with potential carcinogenic effects. Nitrogen leaching from agricultural soils impairs groundwater quality and affects the long-term quality of the resource.

In the EU eutrophication – affecting 22% of river and 37% of lake monitoring stations, as well as coastal areas – is observed mainly in Western, Northern and some Eastern European countries, as well as in the Mediterranean. Several human activities cause nutrient discharge into water, including households, industry, agriculture or fish farming. The use of fertilizers in agriculture is reported to be the main source of nitrogen loading (over 50% of total discharge into surface waters), and a significant source of phosphorus loading.

Trends and pressures

Water quality in the EU has improved in the last 25 years, largely due to better control of point source pollution, with some progress in agricultural nitrogen balances.³⁹ Nitrates concentration in surface and groundwater shows some improvements in recent times in EU27⁴⁰ (2008–2011), with slightly decreasing percentages of stations exceeding the Nitrates Directive's thresholds for water pollution, although trends may not be clearly identifiable due to changes in the monitoring stations from which the data are available. While surface waters have a relatively fast turnover, the comparatively long residence time of groundwater may cause delays in the order of years to decades between the application of nutrient control measures and improvements in water quality.

Trends for phosphorus are better than for nitrogen. Average concentrations of phosphorus in European rivers more than halved over 1992-2012, mostly due to urban waste water treatment

³⁷ A blueprint to safeguard Europe's water resources, COM(2012) 673 final.

³⁸ The problems and good practices presented in this paper are not exhaustive. They build on existing reports and recent evidence from communication between the Commission and MS. Reports from MS and Commission's own evaluation activities will provide a better picture of the situation, which will be used to further analyse challenges and options to address them.

³⁹ EEA 2015, The European Environment - State and Outlook 2015, Synthesis Report, <http://www.eea.europa.eu/soer>

⁴⁰ <http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52013DC0683&from=EN>

and the switch to phosphate-free detergents.⁴¹ In lakes, phosphorus concentration also shows a gradual, though not as steep, reduction. Moreover, phosphorus stored in sediment can keep lake concentrations high and prevent improvement of water quality despite a reduction in inputs.

Nutrients and agriculture

Nitrogen and phosphorus are nutrients needed for plant growth. Adding them in the form of fertilisers (mineral, organic as manure) can increase crop yield significantly. Over-fertilisation is often the main reason for excess nutrient load in waters, which generates eutrophication and cause negative effects on human health and ecosystems; livestock manures and inorganic fertilisers also give rise to emissions of nitrous oxide, a powerful greenhouse gas, which exacerbates global warming and its negative impact on water systems.

The pressure from agriculture is decreasing, although not uniformly, in terms of numbers of animals and consumption of chemical fertilizers, continuing a long-term trend.⁴² However, diffuse pollution from agriculture still affects many water bodies and transitional waters, particularly in some areas (central and north-western Europe). Hotspots, where improvements in water quality are not yet forthcoming, remain a challenge, and some of them relate to intensive livestock rearing or horticultural production.

There is generally a high correlation between nitrogen application to soil and the level of nitrate in rivers. Agricultural measures have already resulted in a moderate reduction in total agricultural nitrogen inputs for the EU-27 of 15% since the 1980s, but, agriculture still has a cost-effective emission reduction potential.⁴³ The soils with the highest phosphorus indices in Europe coincide with the most intensive livestock production, and diffuse runoff from agricultural land continues to be an important source in lakes.

The type of agriculture and farming practices and the wide variety in N application rates and nitrogen use efficiency indicate that there is scope to improve resource efficiency and reduce the loss of nutrients and its environmental effects, without significant impacts on yields. Available tools comprise precision farming, or nutrient management planning. Likewise, the recovery of nutrients from the wastewater treatment processes and from manure management (e.g. biogasification) has been identified as an important opportunity for nutrient management in a circular economy.⁴⁴ In this context, the challenge is to ensure that these new sources of nutrients are used in a safe manner in order to avoid additional pressures on water.

EU Policy Instruments (Legislation & Incentives)

- *Water policy*
 - Nitrates Directive (Directive 91/676/EEC). MS are required to monitor water quality (nitrates and eutrophication), identify the waters polluted by nitrates and the eutrophic waters and the areas draining into them (nitrates vulnerable zones or NVZ), develop Nitrates Action Programmes for NVZ with measures to reduce water pollution caused by nitrates from agricultural sources, and prevent further pollution. Full

⁴¹ <http://www.eea.europa.eu/data-and-maps/indicators/nutrients-in-freshwater/nutrients-in-freshwater-assessment-published-6>

⁴² Report on the implementation of Council Directive 91/676/EEC for the period 2008–2011. (COM(2013) 683 final)

⁴³ Sutton, Mark A., et al., eds. The European nitrogen assessment: sources, effects and policy perspectives. Cambridge University Press, 2011.

⁴⁴ <https://ec.europa.eu/eip/agriculture/en/content/nutrient-recycling>

implementation should deliver waters that do not exceed 50 mg/l of nitrates and are not eutrophic as a result of agricultural nutrient losses;

- WFD. Nutrient conditions consistent with good status (no eutrophication) are to be defined by MS⁴⁵, but it may require additional measures in some water bodies (e.g. in transitional and coastal waters) to achieve good status that can be more stringent than the Nitrates Directive criteria;
- WFD Art. 11.3.h. Requires control of diffuse sources of pollution, including nitrogen and phosphorus, where these contribute to water body to be in less than good status;
- WFD Art. 7. Requires protecting raw drinking water to reduce the need for end of pipe treatment.
- *Common Agricultural Policy*
 - CAP Pillar I. Cross-compliance raises farmer's awareness on nutrients reduction objectives through: SMR 1 on Nitrates Directive; GAEC 1, on establishing buffer strips around the water courses within and outside vulnerable zones. The green direct payment supports environmental aims, too;
 - CAP Pillar II. Rural development measures contributing to water nutrient management are: Investments (art.17), agri-environment-climate operations (art. 28), organic farming (art. 29), Water Framework Directive payments (art. 30), advisory services (art. 15), knowledge transfer and information (art. 14), or cooperation actions (art. 35); LEADER local action groups (art. 42) can play a role in water sustainable management.
 - The Environmental framework under the Common Market Organization of Fruit & Vegetables allows Producers Organizations to propose environmental actions and production methods (organic farming), consistent with water objectives.

Implementation challenges

- The diffuse nature of agricultural nutrients pollution and the amount of actors involved (farmers, including many small farms) make this problem much more difficult to address than point source pollution. Addressing water quality issues in 'hotspots' with high nutrient loads as a result of farming is a key challenge;
- Effectiveness of Nitrates Action Programmes (Nitrates Directive) and Programmes of Measures (WFD) depend on better coordination of national/regional sectoral administrations (e.g. agriculture, water) to develop an approach to nutrients that can secure environmental objectives in a cost-effective manner, especially in nutrients 'hotspots' that originate from intensive agricultural production;
- MS would need a better picture on the nutrients balance needed to achieve good status in all waterbody types, in line with WFD objectives, and to decide in light of this which measures are to be taken to close the gap to good status. Up to now there has been

⁴⁵ Harmonisation of the nutrient conditions set by the MS corresponding to good status is being checked (by all MS and the Commission) for consistency under the WFD common implementation strategy working group ECOSTAT

reliance on the Nitrates Directive measures, which in many cases MS have stated will not allow for improvements in nutrient loads at the scale necessary to secure the WFD environmental outcomes;⁴⁶

- Balanced fertilizers application at farm level remains one of the most challenging measures to be implemented. Fertilisation planning would allow improving agriculture production while reducing costs to the farmer and minimising discharge to the environment. Appropriate fertilization practices require a change in the behaviour of farmers, in turn calling for appropriate conveyance of messages at the farm level (awareness raising about the effects of over-fertilization; sufficiently user-friendly and accessible decision support systems for precision farming). There is a significant potential for optimization of current practices, also thanks to the increased availability of satellite imagery (Copernicus programme), thus reducing nutrient losses without impact on yields.

Not all MS where phosphorus is an issue have planned or implemented measures to control phosphate application in their RBMPs.

Manure storage capacity is key for preventing inadequate management of manure and slurry (e.g. excessive application, timing to enhance benefits and minimise risks). Enhanced action would help the Nitrates Directive aims, including by improving information on available farms' storage capacities, or further analysing investment needs (currently RDPs support manure storage systems during 1st year after NVZ designation). Solutions to transform manure into fertilizers products with similar agronomic standards and environmental performance than mineral fertilisers may help both managing manure surplus, and reducing mineral fertilizers demand.

There is some evidence that the financial support to farmers to implement the required management measures may be in certain cases insufficient. While the cohesion policy (European Regional Development Fund and Cohesion Fund) and rural development policy (European Agricultural Fund for Rural Development) have significantly contributed to improving wastewater treatment and drinking water supply to millions of people,⁴⁷ EU structural and investment funds have been more sparsely used in funding WFD basic and supplementary measures. In some cases, delays in adopting RBMPs by MS may have made it difficult to match the objectives the management plans with the opportunities of rural development programmes, e.g. by defining clear nutrients objectives for priority areas.

There is also a need to enhance the skills base and awareness of farmer community, to catalyse behavioural change, including by linking the environmental (for the society) and economic (for the farmer) effects of over fertilisation. Adequately skilled advisers on nutrient planning can help make both the economic and environmental rationale clear to farmers.

Knowledge and innovation transfer, as well as support towards the use of new techniques can increase efficiency (e.g. use of precision farming for fertilisers and irrigation; user-friendly

⁴⁶ European Court of Auditors, Special Report No 3/2016 – “Combating eutrophication in the Baltic Sea: further and more effective action needed”, http://www.eca.europa.eu/Lists/ECADocuments/SR16_03/SR_BALTIC_EN.pdf

⁴⁷ In the 2014-2020 period, Member States expect to connect 17 million additional people to new or upgraded wastewater treatment facilities (on top of 7 million people between 2007 and 2013, and even more between 2000 and 2006) and more than 12 million people will be served by improved water supply (on top of 6 million between 2007 and 2013).

decision support systems, improved animal diets; processing of manure into biological fertilisers etc.)

Reinforcing monitoring and inspection systems (e.g. statistics on farmer knowledge, compliance with codes of practice) is desirable to measure trends, and address specific needs.

Optimising the use of existing tools (examples of good practices)

- *Improve information on pressures and load reduction needs*
 - RBMPs that clearly define the target reduction in agricultural nutrient pollution in order to reach good ecological status (in coastal waters) and set the territorial target for the measures (detailing the agricultural area needed for results to be obtained) (DK);
 - A new nitrogen strategy based on integrated assessment of reactive nitrogen from all sectors to demonstrate how addressing this would realise benefits for water, air, biodiversity (DE).
- *Improve monitoring and delimitation of measures*
 - Monitoring networks which serve the purposes of different directives in some MS. Others (DE, LU) are aligning their networks for nitrates directive and WFD;
 - A whole territory approach on nitrates (same rules for all farmers), to avoid a limited approach to vulnerable zones that would demand additional controls for WFD (IE).
- *Improve use of CAP to finance RBMP measures*
 - Using combinations of EU funds to finance basic (WFD Art. 11.3.b to i) or supplementary measures as in the case of PT, EE, HU;
 - Using rural development programmes to finance supplementary measures in the Programmes of Measures (PoMs): PL (22% of such measures financed from Rural Development Fund), RO (14%), FR (11%) or FI (10%), in 2007-2013.⁴⁸ Other MS are barely using this measure or not using it at all;
 - Using rural development funds to finance basic measures (WFD Art. 11.3.b to i) such as HU (18% of such measures financed from Rural Development Fund);
 - Under CAP Pillar I, some MS have used ecological focus area (EFA) to ban the use of fertilizers for catch crops or green cover (BE, DE), and for nitrogen fixing crops (BE). As regards short rotation coppice, using fertilizers is banned in a majority of MS.
- *Limitation of fertilizers application*
 - The project “Focus on nutrients”, involving fertilisation planning, led to reduction of 4.2 kg N/ha on arable farms, 9.4 kg N/ha on dairy farms and 13.8 kg N/ha on pig farms (SE);
 - Some MS have opted for defining limits of total applicable nitrogen for all crops, as a simple and clear way to inform farmers about their obligation, and to facilitate

⁴⁸ Progress in implementation of the WFD Programmes of measures, SWD (2015) 50 final.

controls (NL, IE, UK, BE);

- Online fertilizer accounts including information on: area and type of crops; number and type of livestock; N from livestock production; N quota for the farm; use of fertilizers; exchange of chemical fertilizer or manure; manure and fertilizer stock; fertilizer plans (DK);
 - Incorporating phosphorus limits within the Nitrates Action Programmes (UK, IE, BE, NL). Some MS have introduced new P controls under the WFD (IE);
 - Routine sampling of nutrients in soil to inform the level of additional nutrients that should be applied (IE).
- *Better manure management*
 - Mandatory injection of slurry and mandatory processing of manure surplus (NL);
 - Agri-environment-climate scheme aiming at reducing nutrients leaching into water courses, including: protection of watercourses from bovines; riparian margins (linear buffer zones); arable grass margins; low emission slurry spreading (IE);
 - A proposal on manure surplus tax discussed in the context of a nutrients strategy (DE).
 - Strict manure movement control regimes through the use of GPS (NL, BE);
 - Some control procedures of SMR 1 include key requirements of Nitrates Action Programmes, including the Manure Storage Capacity.
 - *Apply cost the recovery and polluter pays principle of WFD Article 9*
 - A tax per kg of P added, accompanied by lowering the general land tax (DK).
 - *Engaging the farming sector*
 - Compliance assurance strategy agreed and promoted with Agriculture Farming Union in Scotland (UK), including: a new regulation fully;
 - Implementing WFD article 11.3, walkovers to assess on the ground compliance, one-to-one advice to farmers, signposting of investment, repeated visits, culminating in fine if action not taken.

4. Chemicals and water

Among other chemicals from different sectors, pesticides in water cause negative environmental impacts on water quality, terrestrial and aquatic biodiversity, and human health. Their presence in water also has an economic impact, increasing treatment costs to MS (e.g. 20 million € per year to Belgian water utilities; 78.5 million € in CZ for upgrades to 2 treatment plants,⁴⁹ cost of additional treatment in drinking water 260 - 360 million €/year in France).⁵⁰

⁴⁹ Compiled by EUREAU - information provided by national water authorities

⁵⁰ <http://www.developpement-durable.gouv.fr/IMG/pdf/ED136.pdf>

Pesticides from different sources contribute to poor status of water bodies in 16 Member States. They are the predominant cause of poor chemical status in rivers in Luxembourg, affecting a substantial number of water bodies in FR, BE, NL, CZ, HU, RO, DE, ES, IT, and UK. They cause poor chemical status of 20 % of groundwater and 16% of those rivers and transitional water bodies classified as being in poor chemical status.⁵¹

- *Trends across the EU*

There is limited information available on trends in pesticide usage, as harmonised statistical data are not yet available on a European scale, and on pesticide contamination, particularly of groundwater, with data not fully reliable or comparable. According to existing data, about 7 % of the groundwater and 5% of the river monitoring stations contain excessive pesticides. Declines have been observed in some pesticides, as a result of restrictions on their use, but some are persistent and will stay in waters for decades.⁵²

- *Pesticides and agriculture*

The use of chemical products is an important tool for the farming sector to reduce crop pests and weeds. Their use, particularly if it does not follow the authorised conditions written on the label and relevant guidance, can damage water resources. The risks of pesticide use vary considerably, depending on the active ingredients, the use patterns (volume, period, method), and the crop and soil type.

Agriculture is considered as a key contributor to pesticides in European waters, and groundwater at risk appears to be mostly located in areas used intensively for agriculture. However, the share of agriculture contributing to the problem is not clear, given the absence of reliable statistical data.

Problematic pesticides include the herbicides alachlor and isoproturon, which together contribute to poor status in 11 Member States, despite their presence seldom exceeding quality standards. Atrazine and its metabolites are the most frequently found above quality standard in EU groundwater, despite it being forbidden more than 20 years ago. In rivers, pesticides found in excess affecting significant river monitoring stations are also banned substances (cyclodiene-group and endosulfan).

EU Policy Instruments (Legislation & Incentives)

- *Pesticides legislation*

- Directive 2009/128/EC establishing a framework for Community action to achieve the sustainable use of pesticides (SUD) aims at reducing the risks and impacts of pesticide use and promoting the use of integrated pest management and alternative approaches or techniques. The directive includes several measures which can directly or indirectly improve water protection. Its Article 4 requires National Action Plans (SUD-NAP) identifying objectives, targets, measures and timetables to reduce risks and impacts, and to encourage integrated pest management (IPM) and alternative approaches. Articles 5 to 6 set training and sale requirements including training subjects on "special care in protected areas set under WFD". Article 8 mandates inspection of

⁵¹ EEA Report No 8/2012. European waters - assessment of status and pressures.

⁵² http://ec.europa.eu/eurostat/statistics-explained/index.php/Agri-environmental_indicator_-_pesticide_pollution_of_water

pesticides application equipment and Article 9 prohibits aerial spraying; derogations may be allowed under certain controlled conditions. Article 11 addresses ensuring appropriate measures to protect the aquatic environment and drinking water, while article 12 stipulates that the use of pesticides should be minimised or prohibited in specific areas such as protected areas as defined in WFD. Article 14 required the general principles of IPM to be implemented by 1 January 2014;

- Further legislation on plant protection products (PPP): the completion of the evaluation programme under Directive 91/414/EC (evaluation and potential, approval of active substances at EU-level and authorisations of PPPs at national level) and the full applicability of new Regulation (EC) No 1107/2009 on the placing of plant protection products on the market resulted in the removal of many of the more hazardous active substances from the EU market and in the introduction of specific criteria for approval of active substance and new data requirements thereby reducing risks for users, consumers and the environment.
- *Water policy*
 - WFD Article 11.3.h. Basic measures to prevent or control the input of pollutants for diffuse sources liable to cause pollution.
 - WFD Article 11.3.d. Basic measures to meet the requirements of Article 7, including safeguarding water quality to reduce the level of purification treatment required for the production of drinking water.
 - WFD Article 11.4. Supplementary measures (such as advice and agri-environment schemes (e.g. organic).
- *Common Agricultural Policy*
 - CAP Pillar I. SMR 10 on plant protection products. Compliance with Article 55 of Regulation (EC) No 1107/2009.⁵³ GAEC 1 (Obligation for Member States to establish buffer strips around the water courses) and GAEC 3 (groundwater protection, preventing direct discharge and indirect pollution of water) also contribute to the goal. The green direct payment can contribute, through the implementation of e.g. the ecological focus areas and permanent grassland.
 - Pillar II – Priority and Focus area 4b aims at improving water management, including fertiliser and pesticide management. Several rural development measures can contribute to address the pesticides challenge: agri-environment-climate (art. 28); Organic Farming (art. 29); WFD payments (art. 30); Advisory services (art. 15); Knowledge transfer and information (art. 14). RDPs can indicate needs regarding pesticide management, and identify measures to address the problem.

Implementation challenges

⁵³ Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC. Article 55. Use of plant protection products. 1) Plant protection products shall be used properly. 2) Proper use shall include the application of the principles of good plant protection practice and compliance with the conditions established in accordance with Article 31 and specified on the labelling. It shall also comply with the provisions of Directive 2009/128/EC and, in particular, with general principles of integrated pest management, as referred to in Article 14 of and Annex III to that Directive, which shall apply at the latest by 1 January 2014.

- MS submitted their first SUD-NAP by 26 November 2012 (last one submitted in 2014). A preliminary analysis of SUD-NAPs⁵⁴ identifies the following main shortcomings:
 - Targets, timetables and geographical location of measures to protect the aquatic environment are not always explicitly linked to the environmental objectives of WFD;
 - Absence of quantified targets, in terms of load reduction or water quality standards;
 - Limited information on IPM objectives and actions;
 - Most SUD-NAPs contain reference to possible derogations for aerial spraying not giving detail on the conditions necessary for such derogations.
- In 2017 DG SANTE will report to the European Parliament and the Council on overall progress on the implementation in the Member States of the Directive, based on the results of a survey already sent to all MS and on the results of a series of fact-finding missions to six Member States, scheduled to take place between March and June 2017. This report will also cover SUD-National Action Plans and the implementation of national targets.
- The implementation of the Directive has been the subject of discussion and exchange of best practices within a dedicated Member States expert group run by DG SANTE which has met on average three times per year from 2011.
- Moreover, during the period 2012 to June 2016, individual aspects of the SUD were covered in two series of audits on controls of plant protection products in the Member States carried out by DG SANTE. These audits have shown that Member States had made good progress on the implementation of SUD.

An Overview Report⁵⁵ was produced which gives a summary of findings and also identified common weaknesses and good practices. Furthermore, individual aspects of the SUD were also covered in the subsequent audit series, (January 2015- June 2016) to assess official controls on the marketing and use of plant protection products. An overview report is currently being prepared for publication.

Optimising the use of existing tools to help reach water objectives (examples of good practices)

- *Using reduction targets and timelines*
 - DK set an overall target of 40 % reduction in pesticide load by 2015, using a pesticide load indicator (PLI) to calculate a tax on pesticides, making the highest load pesticides to be the most expensive, encouraging compliance with IPM;
 - FR required an overall use reduction in 53 particular active substances in 2008-2010. The 2015 Ecophyto plan established a pesticide reduction target of 50% by 2025;
 - UK has a target in the SUD-NAP of full compliance with the WFD;
 - SE set a goal of almost zero pesticides in surface water and groundwater by 2020. It has also an overall target of 20 % of all land farmed organically.
- *Programming ambitious measures in NAPs*
 - Not allow for any aerial spraying derogation (EE, SI);
 - The use of pesticides is minimised or prohibited in land draining to WFD protected

⁵⁴ DG SANTE Directorate F (former FVO) presentation given to WFD agriculture working group meeting, October 2014.

⁵⁵ http://ec.europa.eu/food/audits-analysis/overview_reports/details.cfm?rep_id=79

- areas (drinking, bathing, economically important fishery);
- DE set a target to increase the use of drift reduction equipment of 50% by 2023;
 - Direct employees of authorisation holders cannot act as advisors (IT);
 - Specific measures to deal with pesticides in water in "hotspots." (CZ, DE);
 - Crop Protection Surveys, including data on changes in cultural practices, IPM etc. (IE).
- *Fostering IPM - Encouraging professional users to implement guidelines for IPM*
 - IPM guidelines in place for 100% crops/non-agricultural areas/allotment crops by 2018, and a list of IPM guidelines recognised as relevant, appropriate and up to date (DE);
 - A target of IPM guidelines in place for 80 % of agricultural land (ES);
 - Seventy-one crop-specific manuals to be publicly available on the competent authority's website (PT).⁵⁶
 - *Using CAP funds to contribute to pesticide use reduction*
 - Under Pillar I, a limited number of MS has banned, under their EFA, the use of PPP for catch crops or green cover (BE, FI, DE, NL), and some limitation of use for nitrogen fixing crop (BE). As regards short rotation coppice, there is a ban of use pesticides in a majority of MS;
 - Agri-environment measures have been used in 2007-13 to protect or improve water quality from pesticide pollution, including pesticide reduction in all farming practices (e.g. limits in pesticide use) (AT, BE, DE, DK, ES, EL, EE, FI, IE IT-BZ, NL, LU, MT, SE, FR), or restriction of pesticide use for specific crops (AT, CY, DE, IT, MT);
 - Prohibition of use of pesticides in RDP 2014-20, allowing only targeted fertilisation in fruit and citrus trees, olive orchards and vineyards (CY);
 - Buffer zones to limit the use of pesticides and fertilizers next to the water courses (AT, DE, DK, IE, UK, PO). Combining this objective with other aims such as biodiversity conservation (DE, IE, UK);
 - Almost all MS have programmed the organic farming measure. The total organic area in the EU is 5.9 % of the utilised agricultural area, and is steadily increasing.⁵⁷
 - *Providing financial stimuli*
 - A private yield insurance scheme (a mutual fund) for farmers, in which the required

⁵⁶ http://ec.europa.eu/food/fvo/overview_reports/details.cfm?rep_id=79

⁵⁷ http://ec.europa.eu/eurostat/statistics-explained/index.php/Organic_farming_statistics

insurance premium is usually lower than insecticide costs (IT).⁵⁸

- *Better focusing the problem*

- Making farmer records accessible to the water company so they can refine monitoring focusing on the pesticides used in the catchment area (Article 67 of Regulation (EU) No 1107/2009) (SE);
- Range of pesticides analysed in water extended to cover all river basin specific and priority hazardous substances included in products registered in the MS;
- Review of Maximum Residue Level breach data to focus on problem areas and formulate preventative measures (DE).

5. Water quantity

All economic sectors need water for their activities: agriculture (36%), public water supply (32 %) and the service sector (11%) lead on total consumptive water use on an annual scale (2002-2012 figures). Seasonally, the share agriculture in abstraction increases further in spring (44%) and summer (60%, up to 75% in the Mediterranean).⁵⁹

In Europe, water is relatively abundant; only 5% of renewable freshwater resources are abstracted each year. However, high pressure over freshwater occurs in several areas of Europe, particularly in summer.⁶⁰ The most vulnerable areas are the Mediterranean region, due to low availability and high demand, and some populated basins in the Atlantic region, due to high demand. Around 20 river basin districts face water stress during the summer, primarily in the Mediterranean. The highest pressure for water happens in four countries (IT, ES, CY, MT) where most of the water abstracted is for consumptive uses, especially irrigation. Five other EU countries experience water-stress (DE, UK, BE, PT, BG).⁶¹

The environment needs water to sustain aquatic ecosystems and ecosystem services. Excess water abstraction affects surface and groundwater, altering the hydrological regime and degrading ecosystems, leading to severe ecological impacts that affect biodiversity and habitats, but also the quality of water and soils (e.g. affecting temperature in water, reducing the dilution capacity for pollutants, or salt-water intrusions in coastal areas).⁶²

- *Trends and pressures*

Pressure on water availability has improved, and significant water savings have been achieved in the EU, where abstraction decreased by more than 20% over the last 15 years; abstraction remains stable or moderately increased in some countries (GR, PT). Over-abstraction affects 10% of surface and 20% of groundwater bodies, and quantitative problems affect many river basin districts across the EU (CY, ES, IT, PT, GR, but also UK).⁶³ Prevention to avoid

⁵⁸ Furlan *et al.* 2014. Difesa integrata del mais: come applicarla in campo. L'Informatore Agrar. 2014; 9 (Supplemento Difesa delle Colture):11–14.

⁵⁹ <http://www.eea.europa.eu/data-and-maps/indicators/use-of-freshwater-resources-2/assessment-1>

⁶⁰ As measured by the water exploitation index plus (WEI+): % of total freshwater used compared to total renewable freshwater available.

⁶¹ <http://www.eea.europa.eu/themes/water/featured-articles/water-scarcity>

⁶² EEA Report No 2/2009, Water resources across Europe — confronting water scarcity and drought, <http://www.eea.europa.eu/publications/water-resources-across-europe>

⁶³ <http://www.eea.europa.eu/data-and-maps/indicators/use-of-freshwater-resources-2/assessment-1>

unsustainable levels of abstraction is therefore needed.

Demand from main users is projected to increase of up to 16% by 2030,⁶⁴ and it has to be matched with the need to maintain environmental flows.⁶⁵ Climate change will add additional burden to the projected increase in water demand, affecting water availability and the patterns of extreme events (drought, floods). Climate change will widen the existing differences in water availability between N and S Europe. S Europe and some N European areas (notably Northern FR, BE, UK), can be particularly affected by additional water scarcity. Significant declines in precipitation have been observed in recent decades in parts of Europe.⁶⁶

- *Water Use and agriculture*

Agriculture accounts for 36 % of total consumptive water annual use. In summer, this increases to about 60%.⁵⁹ The share of agriculture in EU water abstraction (24%) has wide variations: in Southern countries the share is 65% (up to 80%), mostly used for crop irrigation, and in Northern Countries it varies between almost zero and 30%, and use by livestock prevails. Local factors influence the use of irrigation, including water quality and the characteristics of the soil.

Overall in the EU water abstraction for irrigation is being reduced (by a 22% since the 1990s),⁶⁷ with very different patterns: a significant decline in Eastern and Western Europe, due to different reasons (decrease of irrigable area, more efficient water use, some decline of agricultural activities); a slight decrease (about 4%) has been recorded in Southern Europe.

Climate change will increase irrigation needs in Europe in a context of reduced water availability and potential constraints to irrigation caused by higher economic costs.⁶⁸

EU Policy Instruments (Legislation & Incentives)

- *Promote an efficient and sustainable water use*
 - WFD. Art. 11.3.c. Basic measures to promote an efficient and sustainable water use in order to avoid compromising the achievement of the objectives specified in Article 4; Art. 11.4. Supplementary measures (e.g. incentives for less water consumptive crops in Rural Development Programmes);
 - CAP Pillar 2. Many Rural development measures offer support for the efficient water management in agriculture, the achievement of water quantity and reduced abstraction. These measures comprehend: Knowledge transfer & information actions (art. 14); Advisory services (art. 15); Investments in physical assets (art. 17); Agri-environment-climate operations (art. 28); Organic farming (art. 29); Cooperation (art. 35);

⁶⁴ http://ec.europa.eu/environment/water/quantity/building_blocks_prev.htm

⁶⁵ "[...] A hydrological regime consistent with the achievement of the environmental objectives of the WFD in natural surface water bodies as mentioned in Article 4(1)." CIS guidance document n°31 - Ecological flows in the implementation of the Water Framework Directive,

http://ec.europa.eu/environment/water/water-framework/facts_figures/guidance_docs_en.htm

⁶⁶ De Luis et al. (2009) reported precipitation reduction in 90.1% of the surface area of the Mediterranean Iberian Peninsula in 50 years, with the greatest decreases in summer and spring (– 22.5% and – 19.3%, respectively).

⁶⁷ <http://www.eea.europa.eu/data-and-maps/indicators/use-of-freshwater-resources-2/assessment-1>

⁶⁸ Kovats et al. (2014). Europe. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability, 5AR IPCC.

- The Environmental framework under the Common Market Organization of Fruit & Vegetables, implemented at national level, provides options to farmers for improving water efficiency.
- *Water abstraction*
 - WFD Article 11.3.e. Basic measures consisting of controls over abstraction of surface and groundwater and impoundments to be established (including a register and prior authorisation). Member States can exempt from these controls, abstractions or impoundments which have no significant impact on water status;
 - CAP Pillar I: GAEC 2. Where use of water for irrigation is subject to authorisation, compliance with authorisation procedures. The authorization to extract water for irrigation is delivered by the competent national or regional authorities, where relevant;
 - CAP Pillar 2: investments in irrigation (art. 46). All investments in irrigation are subject to requirements such as consistence with the RBMP, the setting up of water metering, or conditioned to water savings or the absence of significant negative environmental impacts.
- *Water Pricing*
 - WFD Art. 9. Requires MS to take account of the principle of recovery of the costs of water services, including environmental and resource costs, in accordance with the polluter pays principle; to implement water-pricing policies the provide incentives to use water efficiently; and to ensure an adequate contribution of the different water uses, including agriculture, to recover the costs of water services;
 - WFD Art. 11.3. b. Basic measures deemed appropriate for the purposes of Article 9;
 - CAP Pillar 2. Investments involving water efficiency and irrigation should meet an ex ante conditionality consisting on the country having a water pricing consistent with Art. 9 of the WFD.

Implementation challenges

The current EU environmental and agriculture legal/policy frameworks, combined with measures in other sectors where relevant, can act synergistically to achieve the quantitative 'good status' objectives of the WFD and ensure sustainable agricultural production. Main shortfalls for the realisation of this objective are due to:

- Insufficient Member States' uptake of CAP pillar 2 options to improve water efficiency in RDPs. Development of the RBMP and RDP was not always duly coordinated in MS. As a result some RDPs set water saving percentages that fulfil Art. 46 of the RD Regulation, without reference to the needs defined in PoMs to achieve good status of waters;
- Over-abstraction. Despite the WFD requires MS to take measures to restore the sustainability of water abstraction, by ensuring review and updating of permits, inspection and enforcement of 'uncontrolled' or 'unauthorised' abstractions, i.e. without a permit or license or exceeding license conditions, in many MS this has not yet happened. In some countries, water abstraction permits (issued before the WFD) surpass the actual water

volume available;

- Each RBMP should define the conditions for potential investments in irrigation, ensuring they do not affect or are beneficial to the goals of achieving good status of waters. GAEC 2, on water use for agriculture, conditions the CAP payments to compliance with the national rules but does not request MS to develop specific requirements on authorisation procedures, as these should be designed to meet the specific needs at national and river basin levels;⁶⁹
- Water pricing policies that do not provide incentive for farmers to use water efficiently are still in place in several Member States, due mostly to lack of metering and volumetric pricing. Deficiencies in water pricing policy should be addressed in the 2nd RBMPs, and are the subject of an ex-ante conditionality to several priority investments for Rural Development funding that have to be addressed by December 2016; non-compliance can have funding implications for the relevant RDP;
- Another problem of water pricing is the absence of comprehensive estimations on the environmental or resource costs, as most work to date has focused on direct service costs;
- The first RBMPs showed that most Member States did not address the water needs of nature, which are required if the WFD environmental objectives are to be achieved.

Optimising the use of existing tools (examples of good practices)

Measures and practices can be taken for better water management, in the context of agricultural policy/rural development, as some examples and references show:

- *Adaptation of crops to climate:* Certain crops may locally provide higher income with less water requirements (e.g. grapes vs olives in Crete – GR);
- *Modernising irrigation systems.* In the EU, significant improvements in both conveyance and application efficiency have been achieved. In GR, improved efficiency networks led to an estimated 95% water efficiency gain.⁷⁰ In the EU, the potential water savings from irrigation have been estimated to up to 43% of the current volume abstracted for agriculture;⁷¹ using saved water to ensure environmental flows and ecosystems is a useful environmental measure.
 - Investments in irrigation at farm level using Rural Development measure 4 (investment in physical assets), for replacing old irrigation systems using the full savings potential indicated by Art. 46 of RD regulation: water saving set at 10% (CY), 20%-25% (various IT regions) and 25% (DE, SI, HR);
 - Investments to replace old and obsolete irrigation systems with new ones saving water consumption (ES, FR, CY) (Fruit & vegetables). Improving controls on water use: roll out of metering for all abstractions, addressing illegal abstraction through the use of remote sensing Malta (2nd RBMP).
- *Promoting efficient and sustainable water use.* The decoupling of direct payments from production has been a good driver of water efficiency improvement and reduced pressure on water. Adjusting the amount of water applied to the actual needs of the crop can also deliver good water savings.

⁶⁹ Report European Court of Auditors: Integration of EU Water Policy Objectives into the CAP: a partial success, S.R.4: 2014, and the subsequent Commission reply.

⁷⁰ <http://www.eea.europa.eu/articles/water-for-agriculture>

⁷¹ http://ec.europa.eu/environment/integration/research/newsalert/pdf/81na1_en.pdf

- Agri-environment measures used in some regions (IT, ES) to foster integrated production and conservation agriculture reducing the water used for irrigation;
- Agri-environment measures finance specific operations to reduce the water provision for irrigation, as in the case of water use reduction on rice fields (IT), or in CY, where citrus orchards are replaced with less water consuming trees (e.g. olive, carob and prickly pear);
- Cooperation measures finance joint projects and approaches to efficient water management, such as innovation projects to improve water use in agriculture (IT, FR);
- Precision irrigation is being used in horticultural crops (FR), despite training needs and costs;⁷²
- Use of farm-level decision support tools to promote precision agriculture including through advisory services (IT);⁷³
- *Water pricing* is an important factor for improving water use efficiency and for selecting adequate crops, stimulating crops suitable to the reality of the water available in a given area.
 - Countries (e.g. FR) that use more water for irrigated agriculture has a quite comprehensive pricing system for agricultural water use;⁷⁴
- *Water storage in landscape: natural water retention measures (NWRM)*. Good agriculture and forestry practices can enhance the natural water retention by forests, pastureland and farmland, increasing the amount of water stored in soils, reducing run-off, improving the seasonal supply of water, and enhancing resilience facing extreme events such as droughts and floods.
 - An EU project has identified abundant examples of natural water retention measures implemented in the agriculture sector, which can be further disseminated⁷⁵ promoted by MS through measures to the benefit of farmers and ecosystems;⁷⁶
 - RDPs represent a potential significant source of finance for NWRM, which can fit under several kinds of measures: investments in forest area development (art. 21), agri-environment-climate (art. 28), Natura 2000 and WFD payments (art. 30), forest environmental and climate services (art. 34).
- *Planning for extreme conditions*
 - Drought management plans to prevent and mitigate the impact of droughts on the environment, society and the economy, are in place in some MS (ES, PT, UK).
- *Water reuse* can contribute to reducing negative impacts associated with over-abstraction and ensure a more efficient use of the resources. Conditions for safe wastewater reuse need to be identified and communicated appropriately in order to avoid impacts on food

⁷² BIO 2012. Water saving potential in agriculture in Europe. Final report for DG ENV.

⁷³ http://www.irriframe.it/irriframe/home/Index_er?cookieCheck=true

⁷⁴ Assessment of cost recovery through water pricing. EEA Technical report No 16/2013

⁷⁵ <http://nwrn.eu/implementing-nwrn/practical-guide>

⁷⁶ <http://www.nwrn.eu/agriculture>

safety, quality and marketability.

- Reuse of water for irrigation is taking place in some EU countries and water reuse standards are in place in several countries (6 MS) (ES, IT, CY, etc.), where it is already a component of water management;
- Investments are ongoing in water reuse installations for irrigation of greenhouses (NL).
- *Alternative water sources.* Under the European Regional Development Fund (ERDF) and the European Fund for Rural Development (EAFRD), investments can help improve the water balance in MS.
 - Water reuse measures in the context of the circular economy are included in the operational programmes of several Member States in Southern Europe;
 - Water storage can contribute to improve water management allowing to reach a quantitative equilibrium of water bodies during summer months (FR). (Though needs to be cumulatively managed to ensure it does not negatively impact on habitat and ecological functioning of aquatic ecosystems);
 - Desalination plants can help the water balance in MT, GR, CY, as alternative complementary water sources when other, more cost-effective resources are insufficient;
 - Rainwater harvesting. The EAFRD can support investments for storing/using rainwater, replacing the use of water from other sources (IE);
 - Evaporative desalination or creation of seawater greenhouses enables the growth of crops in arid regions, using seawater and solar energy (being trialed in Canary Islands, ES).
- *Capacity building.* Some problems faced to rationalise water use relate to the need to build capacity and disseminate information on water resources and good water management practices.
 - Some MS have used the opportunities of funding knowledge transfer and innovation actions to give training to farmers for improving water use for irrigation (ES, FR);
 - Advisory and farm relief services have facilitated the provision of technical advice at farm level on water use (FR).

Supporting graphs and maps

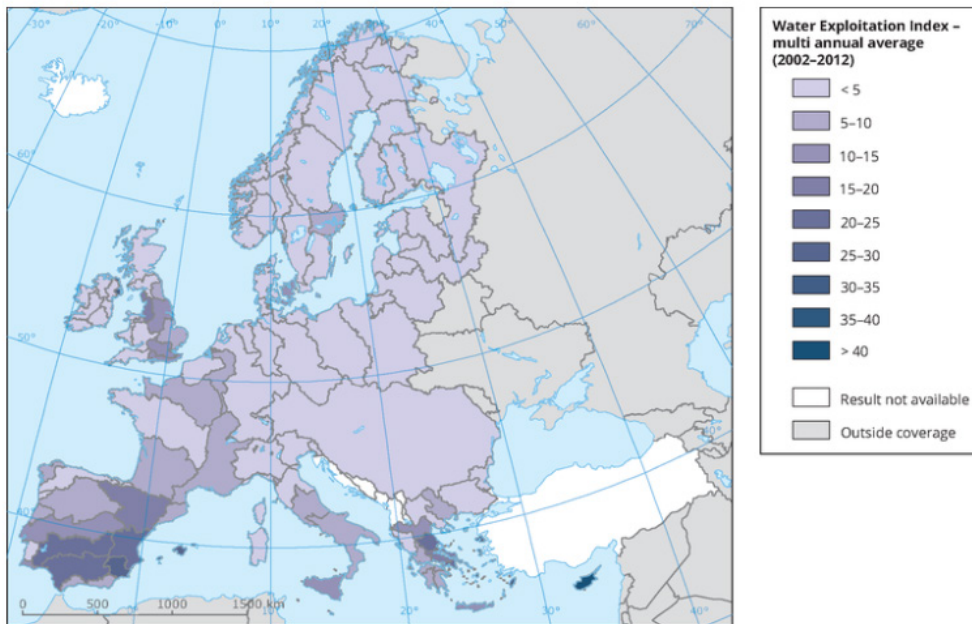


Figure 1 Average Water Exploitation Index 2002-2012, which measures the pressure over freshwater available resources. The map shows that high pressure occurs mostly in the Mediterranean area, but it also affects some North Western river basins.

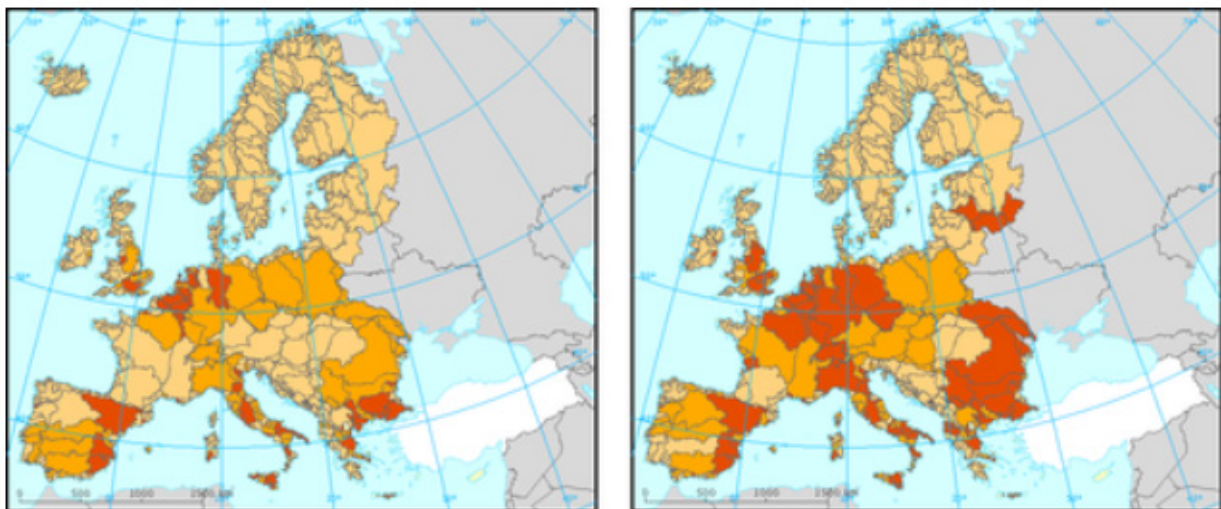


Figure 2 Water stress indicator WEI for annual average on river basin level for the a) baseline (2005), b) 2050 under the 'economy first' scenario (<http://climwatadapt.eu/scenarios>).



Figure 3 Status of implementation of the WFD in the Member States. **Green** - all second River Basin Management Plans adopted; **Yellow** - part of the second River Basin Management Plans adopted; **Red** - second River Basin Management Plans not yet adopted (updated 15/06/2016)