



## D2.2. Multi-assessment of impacts, trade-offs and framework conditions

# Regulatory Framework Section



## List of Acronyms

<b>ABPR</b>	Animal By-Products Regulation
<b>AECC</b>	Agri-environment-climate commitment
<b>CAP</b>	Common Agricultural Policy
<b>CBW</b>	Composted bio-waste
<b>CEN</b>	European Committee for Standardization
<b>CMC</b>	Component material category
<b>CRCF</b>	Carbon Removals and Carbon Farming
<b>CSP</b>	CAP Strategic Plans
<b>EAFRD</b>	European Agriculture Fund for Rural Development
<b>EAGF</b>	European Agriculture Guarantee Fund
<b>EEA</b>	European Environment Agency
<b>ETS</b>	Emissions Trading System
<b>EU</b>	European Union
<b>FAO</b>	Food and Agriculture Organization
<b>FM</b>	Feather meal
<b>FPR</b>	Fertilising Products Regulation
<b>G7</b>	Group of Seven
<b>GAEC</b>	Good Agricultural and Environmental Conditions
<b>GAFS</b>	Global Alliance for Food Security
<b>INMAP</b>	Integrated Nutrient Management Action Plan
<b>IWW</b>	Industrial waste water
<b>IWW</b>	Struvite from industrial waste water
<b>NVZ</b>	Nitrate Vulnerable Zones
<b>OFR</b>	Organic Farming Regulation
<b>p.e.</b>	Population equivalent
<b>PFC</b>	Product function category
<b>SDG</b>	Sustainable Development Goals
<b>SFD</b>	Solid Fraction of Digestate

<b>SML</b>	Soil Monitoring Law
<b>SMR</b>	Statutory Management Requirement
<b>SMS</b>	Spent Mushroom Substrate
<b>SS</b>	Stabilised sludge
<b>SSD</b>	Sewage Sludge Directive
<b>UN</b>	United Nations
<b>UWW</b>	Urban waste water
<b>UWWTD</b>	Urban Waste water Treatment Directive
<b>UWWTP</b>	Urban Waste Water Treatment Plant
<b>WFD</b>	Waste Framework Directive

## Disclaimer

This document reflects the views of the author(s) and does not necessarily reflect the views or policy of the European Commission. Whilst efforts have been made to ensure the accuracy and completeness of this document, the European Commission is not responsible for any use that may be made of the information it contains nor for any errors or omissions, however caused. This document is produced under [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/).

## Contents

List of Acronyms .....	1
Disclaimer .....	2
<b>Executive summary .....</b>	<b>5</b>
<b>1. Regulatory Framework Methodology .....</b>	<b>6</b>
1.1. Scope and objective .....	6
1.2. Methodology .....	6
<b>2. Analysis of the regulatory framework .....</b>	<b>7</b>
2.1. International level .....	7
2.1.1. UN's Sustainable Development Goals .....	7
2.1.2. FAO's International Code of Conduct for the Sustainable Use and Management of Fertilisers .....	8
2.1.3. G7's Global Alliance on Food Security .....	9
2.1.4. US-led Global Fertiliser Challenge .....	10
2.2. European level .....	10
2.2.1. The EU Green Deal strategies .....	12
2.2.2. The Waste Framework Directive .....	13
2.2.3. The Animal By-products Regulation .....	17
2.2.4. The Nitrates Directive .....	18
2.2.5. The Sewage Sludge Directive .....	20
2.2.6. The Fertilising Products Regulation .....	22
2.2.7. The Organic Farming Regulation .....	27
2.2.8. The Common Agricultural Policy .....	31
2.2.9. The Carbon Removals and Carbon Farming Certification Framework .....	35
2.2.10. The Soil Monitoring Law .....	38

2.2.11. The Urban Waste Water Treatment Directive .....	39
2.2.12. The European Taxonomy.....	40
2.3. National level .....	43
2.3.1. Implementation of the Waste Framework Directive: the lack of harmonisation of the end-of-waste criteria.....	43
2.3.2. Implementation of the Waste Framework Directive: Member States delay to reach the EU recycling and bio-waste separate collection targets .....	45
2.3.3. Implementation of the Nitrates Directive: the issue of nitrogen efficiency for circular fertilisers.....	49
2.3.4. Implementation of the Sewage Sludge Directive: a lack of harmonisation due to a low EU standard .....	49
2.3.5. The unnecessary alignment of the national legislation with the EU Fertilising Products Regulation.....	52
2.3.6. Implementation of the Common Agricultural Policy: potential for further voluntary measures to support circular fertilisers.....	53
2.4. Conclusions .....	54
2.5. Recommendations .....	55
2.5.1. Tackling regulatory barriers at European and national level .....	55
2.5.2. Introducing new regulatory drivers at European level .....	58
2.6. References.....	60

## Executive summary

Regarding the **regulatory framework**, several “**soft law**” instruments were identified at the **international level**, which although providing guidance, have no binding power (e.g., UN’s Sustainable Development Goals, FAO’s International Code of Conduct for the Sustainable Use and Management of Fertilisers, etc.).

At the **European level**, three types of regulation have been identified: (1) **hindering regulations**, such as the Waste Framework Directive, and the Fertilising Products regulation, which puts in place significant barriers to circular fertilisers adoption, (2) **regulatory instruments with opportunities for improvement** and that could be refined to better support circular fertilisers uptake such as the Nitrates Directive, the Sewage Sludge Directive, and the Organic Farming Regulation, and (3) **enabling regulations**, such as the Carbon Removal and Carbon Farming Certification Framework, and the Soil Monitoring Law, which are supportive of circular fertilisers use.

At the **national level**, on the other hand, several **implementation challenges have been identified**, due to inconsistencies, delays, excessive strictness, and even lack of ambition.

It is much needed then to **harmonise European regulations** such as the Waste Framework Directive and the Fertilising Products Regulation), **improve the national implementation**, and **increase the policy ambition**.

Therefore, the recommendations emerging from the analysis propose to **tackle regulatory barriers** at European and national levels. At European level, it is necessary to **introduce new regulatory drivers** including:

- Revitalising the Integrated Nutrient Management Action Plan
- Establishing a European Nutrients Recycling Target
- Implementing fiscal tools for sustainable nutrient management
- Considering the integration of agriculture into the Emissions Trading System
- Enhancing Research and Innovation in sustainable nutrient management

# 1. Regulatory Framework Methodology

## 1.1. Scope and objective

The goal of this the regulatory framework analysis is to assess and summarise the **regulatory conditions influencing the production and deployment of circular fertilisers**. It covers **policies and legislations** impacting on the production, application, marketing or promotion/financing of circular fertilisers. Today, circular fertilisers encounter several regulatory obstacles that hinder their adoption by end-users. This report aims at identifying these barriers and proposing solutions to overcome them. Additionally, the report seeks to **introduce new regulatory drivers that can further stimulate the market of circular fertilisers**. The analysis is both looking at adopted legislation and legislation that is currently in the process of being adopted.

The analysis is conducted at **international, European and national level**. The national level comprises ten European Union (EU) countries: **Austria, Belgium, Denmark, France, Germany, Greece, Italy, the Netherlands, Spain and Sweden**.

## 1.2. Methodology

The approach followed for the analysis of the regulatory framework was threefold:

1. **Identification of policy experts:** From December 2023 to January 2024, the FER-PLAY consortium collaborated to identify policy experts for each type of circular fertiliser covered and at each level of governance. The 46 policy experts identified were included in a table.
2. **Interview process:** From February to May 2024, several partners (EBA, CIC, COLDIRETTI, Naturland) scheduled and ran interviews with the experts identified. A survey was designed and sent to the experts before each of the interviews to gather information and serve as a basis for the interview. A total of 24 interviews were completed and 20 responses to the online survey were received.
3. **Analysis of interviews and survey responses, supplemented by co-creation tasks and literature review:** From May to June 2024, the results of these interviews were analysed and completed with an extensive literature review. This review was based on results from previous European projects as well as scientific articles. Additionally, the results from the co-creation process with end-users (T3.1) and fertilisers producers (T3.2) significantly contributed to the analysis.

## 2. Analysis of the regulatory framework

### 2.1. International level

Fertilisers are undeniably vital in modern agriculture, supporting the production of food on a scale necessary to sustain our global population. Currently, around 50% of the world's food production relies on agricultural systems that heavily utilise synthetic fertilisers. These fertilisers, typically containing essential nutrients like nitrogen, phosphorus, and potassium, are instrumental in boosting crop yields and ensuring food security. However, the widespread use of synthetic fertilisers also brings significant challenges and risks linked to environmental pollution, soil degradation and health risks. Finally, the energy-intensive manufacturing process of these fertilisers further increases their carbon footprint.

To address the environmental and climate drawbacks linked to synthetic fertilisers, shifting towards circular alternatives emerges as a beneficial strategy for farmers. Yet, globally, farmers have a preference for synthetic fertilisers due to concerns regarding potential income reduction associated with the adoption of circular options. Consequently, policymakers must propose incentives to promote the widespread adoption of organic fertilisers among farming communities.

While there is no single regulatory framework for (circular) fertilisers at international level, efforts are underway to harmonise standards, share best practices, and facilitate cooperation among countries to promote the adoption of circular fertilisers worldwide. In the following section, four examples of policy initiatives at international level are presented: the Sustainable Development Goals of the United Nations, the International Code of Conduct for the Sustainable Use and Management of Fertilisers of the Food and Agriculture Organization, the Global Alliance on Food Security by the Group of Seven and the Global Fertiliser Challenge led by the United States.

#### 2.1.1. UN's Sustainable Development Goals

The 2030 Agenda for Sustainable Development, adopted by all United Nations (UN) Member States in 2015, lays out a collective roadmap for peace and prosperity for both people and the planet, now and into the future. Central to this agenda are the 17 Sustainable Development Goals (SDGs), which represent an urgent call to action for every nation, whether developed or developing, to engage in a global partnership in order to achieve these goals.





**Figure 1.** List of the 17 Sustainable Development Goals of the United Nations.

SDG 2 aims to end hunger, achieve food security and improved nutrition and promote sustainable agriculture. Effort should be put urgently on increasing sustainable agricultural production, improving the global supply chain, decreasing food losses and waste, and ensuring that all who are suffering from hunger and malnutrition have access to nutritious food. Among the many actions that must be taken to achieve this goal, the UN puts a specific emphasis on “the more extensive use of organic fertilisers” (United Nations, n.d.).

### 2.1.2. FAO’s International Code of Conduct for the Sustainable Use and Management of Fertilisers

As part of its commitment to achieving the goals outlined in the 2030 Agenda for Sustainable Development and addressing challenges such as land degradation, the Food and Agriculture Organization (FAO) has established the Global Soil Partnership in December 2012. This initiative aims to promote sustainable soil management practices to ensure food security, enhance nutrition, and safeguard the environment.

One of the key outputs of the Global Soil Partnership is the development of Voluntary Guidelines for Sustainable Soil Management. These guidelines serve as a framework for making informed decisions regarding soil management practices at various levels, tailored to specific contexts. They address critical global threats, such as nutrient imbalances and soil pollution, by providing strategic guidance.

To support the implementation of these guidelines, the International Code of Conduct for the Sustainable Use and Management of Fertilisers (Food and Agriculture Organization, 2019) plays a crucial role. This code emphasises the importance of addressing issues related to nutrient imbalances and soil pollution through sustainable fertiliser practices. It encourages actions such as nutrient recycling and improved agronomic and land management techniques to enhance soil health. The International Code of Conduct was endorsed during the 41st session of the FAO Conference in June 2019.

In the International Code of Conduct, an organic fertiliser is defined as a “carbon-rich fertiliser derived from organic materials, including treated or untreated livestock manures, compost, vermicompost, sewage sludge and other organic materials or mixed materials used to supply nutrients to soils”. Article 3.4 highlights the importance of viewing various sources of plant nutrients as complementary rather than exclusive, emphasising the benefits of using multiple nutrient sources through the combination of organic and inorganic fertilisers.

Article 5 of the International Code of Conduct promotes the use of circular fertilisers by proposing that governments collaborate with scientific analysis, global cooperation, and industry stakeholders to:

- Promote nutrient reuse and recycling through advocacy, policy, and financial mechanisms, fostering innovation and knowledge sharing across sectors like agriculture, water, energy, and health.
- Develop policies supporting safe reuse of locally available nutrient sources, such as animal manures and crop residues, which enhance soil quality and contribute to plant nutrition.
- Establish guidelines and regulations to ensure safe use of recycled nutrients, mitigating risks to human, animal, and soil health, and the environment.
- Invest in research and development focused on decontamination of sewage sludge and other recycled nutrient sources.

By promoting responsible fertiliser use and management, the code contributes to the overarching goal of sustainable soil management and helps mitigate environmental degradation while supporting agricultural productivity and food security.

### 2.1.3. G7's Global Alliance on Food Security

The Global Alliance for Food Security (GAFS) was initiated during the Group of Seven (G7) Development Ministers Meeting in Berlin, Germany, on May 19, 2022. It was launched to address the emerging global food security and nutrition crisis. GAFS is a collaborative effort led by the

World Bank Group and the German G7 Presidency, with active involvement from humanitarian and development partners, regional organisations and governments.

The aim is to prompt a swift and coordinated reaction to the worldwide food and nutrition security challenges. Designed as an open joint forum, GAFS seeks to take action in a flexible manner. It serves as a temporary platform to maximise synergy and cooperation in addressing immediate crises and strengthening preparedness for future emergencies.

In the consolidated list of 15 priority actions that was published in November 2022 (World Bank, 2023), priority action 11 focuses on scaling and improving access to innovative approaches in farming, including by the following action “Optimise use and efficiency of fertilisers and invest in alternatives to synthetic fertilisers”.

#### 2.1.4. US-led Global Fertiliser Challenge

The Global Fertiliser Challenge (Foreign Agricultural Service, 2022) was introduced during the Major Economies Forum in June 2022 by the United States (US) President Joe Biden in response to the Ukraine invasion. Its aim is to strengthen global food security and reduce agriculture-related greenhouse gas emissions by addressing fertiliser supply shortages. This is to be achieved through improved nutrient management, enhanced fertiliser efficiency, adoption of alternative farming methods and exploring alternatives to mineral fertilisers. The initiative is currently identifying specific actions to fulfil its objectives. It aims to support nations with high fertiliser use and losses by promoting efficient nutrient management, alternative fertilisers, and sustainable cropping systems through research, demonstrations, and training. The Global Fertiliser Challenge is collaborating with the Agriculture Innovation Mission for Climate, a joint initiative by the United States and the United Arab Emirates which has over 200 partners.

To support this initiative, the US launched a \$500 million program and encouraged other countries to contribute towards a \$100 million funding target by the 2022 UN Climate Change Conference (COP 27). In November 2022, the European Commission announced its participation in the initiative during the COP27, though it did not specify a dedicated budget for it.

## 2.2. European level

As the European institutions begin their new mandate for 2024-2029, the European Council has reaffirmed its commitment to “promote a competitive, sustainable and resilient agricultural sector that continues to ensure food security” and to “develop a more circular and resource-efficient economy, [...] reaping the full benefits of the bioeconomy” (Council of the European Union, 2024).

However, the recent rise of the far-right in the European Parliament presents a significant risk to the climate and environmental ambitions of the Green Deal. These parties often prioritise national sovereignty and economic considerations over environmental policies and could potentially obstruct the implementation of new measures or even attempt to roll back existing commitments and policies. However, the extent of this risk will depend on various factors, including the ability of other political groups to form effective coalitions and the overall public support for environmental initiatives.

In this context, the future of circular economy and circular fertilisers remains uncertain. With the last Circular Economy Action Plan dating back to 2020, many EU stakeholders are calling for a new holistic strategy (ACR+, 2024; FEAD, 2024). According to the European Environment Agency's report "Accelerating the circular economy in Europe" from 2023, while the circular economy concept has gained political momentum, additional measures are necessary to drive changes in consumption and production patterns. The report emphasises that "Near-term actions to accelerate the circular transition include setting clear targets, supporting emerging secondary raw material markets and further developing circularity monitoring."

At the forefront of the European legislative framework for circular fertilisers are the overarching strategies and action plans designed by the EU Commission, such as the Circular Economy and Zero Pollution Action Plans and the Farm-to-Fork, EU Biodiversity and EU Soil Strategies.

Then, several legislations regulate the production, application and marketing of circular fertilisers in the European Union. Other legislations are (financially) supporting the application of circular fertilisers. The regulatory framework often depends on the input used in the manufacturing process. These policies include:

- The Waste Framework Directive and the Animal By-Products Regulation which directly regulate the production of these fertilisers depending on the input material – waste or animal by-product.
- The Nitrates Directive and the Sewage Sludge Directive regulate the application of certain circular fertilisers also depending on their input material – sewage sludge or livestock manure.
- The Fertilising Products Regulation and the Organic Farming Regulation are providing additional requirements for fertilisers to be marketed at EU level or to be used in organic farming.
- The Common Agricultural Policy, Carbon Removal and Carbon Farming Certification Framework, Soil Monitoring Law, Urban Waste water Treatment Directive and Taxonomy Regulation are promoting or providing financial incentives for the application of circular fertilisers.

**Table 1:** Summary of the European regulatory framework for circular fertilisers.

<b>Circular Economy and Zero Pollution Action Plans</b> <i>Supporting waste prevention, circularity and nutrient recycling</i> <b>Farm-to-Fork, EU Biodiversity and EU Soil Strategies</b> <i>Tackling nutrient losses and promoting the use of circular fertilisers</i>									
Production		Application		Marketing		Promotion / financing			
●	Waste Framework Directive	●	Nitrates Directive	●	Fertilising Regulation	●	Common Policy	Agricultural	
●	Animal By-Products Regulation	●	Sewage Directive	●	Organic Regulation	●	Carbon Removal and Carbon Certification Framework	Farming	
			Sludge			●	Soil Monitoring Law		
						●	Urban Waste water Treatment Directive		
						●	Taxonomy Regulation		

- Certain legislative provisions are significantly hindering the adoption of most FER-PLAY circular fertilisers.
- Certain legislative provisions could be refined to better encourage the adoption of most FER-PLAY circular fertilisers.
- The current legislation is either not obstructing or is actually encouraging the adoption of most FER-PLAY circular fertilisers.

### 2.2.1. The EU Green Deal strategies

The European Green Deal is an ambitious plan set forth by the European Commission to make the European Union a climate-neutral and environmentally sustainable economy by 2050. It encompasses a wide range of strategies which aim at reducing greenhouse gas emissions, promoting sustainable growth and protecting the environment and biodiversity. Several of these overarching strategies are connected to circular fertilisers.

In March 2020, the European Commission adopted the new Circular Economy Action Plan to accelerate the transition towards a regenerative growth model, reduce the EU's consumption footprint and double its circular material use rate in the coming decade. The action plan led to the

inclusion of a target for food waste reduction as part of the review of the Waste Framework Directive 2008/98/EC (European Parliament & Council of the European Union, 2008). Based on the Circular Economy Action Plan as well as the Zero Pollution Action Plan (European Commission, 2021), the Commission tabled a revision of the Urban Waste water Treatment Directive 91/271/EEC (Council of the European Union, 1991) and evaluated the Sewage Sludge Directive 86/278/EEC (Council of the European Union, 1986).

The Common Agricultural Policy was one of the key tools in implementing the Farm-to-Fork Strategy published in May 2020 by the European Commission. This strategy, which aimed at building a fair, healthy and environmentally friendly EU food system, also mentioned the opportunity to develop an Integrated Nutrient Management Action Plan (INMAP) to address nutrient losses. The INMAP was eventually abandoned by the European Commission.

In May 2020, the EU Biodiversity Strategy for 2030 (European Commission, 2020) was published and also included the objective to reduce nutrients losses by 50% and the use of fertilisers by at least 20% by 2030. Finally, the EU Soil Strategy for 2030, adopted by the European Commission in November 2021, was instrumental in the development of a proposal for a Soil Monitoring Law (European Commission, 2023).

### 2.2.2. The Waste Framework Directive

Which FER-PLAY circular fertilisers are governed by the WFD?						
UWW	IWW	SS	CBW	FM	SFD	SMS
✓	✓	✓	✓	✓	✓	✓

The Waste Framework Directive 2008/98/EC (WFD) defines basic principles related to waste management, which must be done without endangering human health and harming the environment.

The foundation of EU waste management is the five-step “waste hierarchy”, established in the Waste Framework Directive. It prioritises waste management options based on their environmental impact: 1/ prevention; 2/ preparing for re-use; 3/ recycling; 4/ other recovery, e.g. energy recovery; and 5/ disposal. The legislation is structured to encourage the highest options in the hierarchy, such as setting targets for prevention, reuse, and recycling.





**Figure 2.** Schematic representation of the Waste Hierarchy.

Source: European Commission (n.d.).

Article 2 of the WFD outlines definitions for recovery and recycling as follows:

**Table 21:** Article 2 of the Waste Framework Directive for recovery and recycling.

Recovery	Recycling
<p>“any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy”</p> <p>⇒ WFD’s Annex II sets out a non-exhaustive list of recovery operations.</p>	<p>“any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations”</p>

**When using waste input materials, the production processes for all FER-PLAY circular fertilisers can be classified as recovery operations.** Moreover, some processes, like composting of bio-waste (classified as recovery operation “R3 – Recycling/reclamation of organic substances which are not used as solvents including composting and other biological transformation processes” as defined in Annex II of the WFD), are also recycling processes.

Article 23 of the WFD mandates Member States to require any establishment or undertaking intending to carry out waste treatment operations, i.e. disposal or recovery operations set out in the WFD, to obtain a permit. Therefore, facilities that produce FER-PLAY circular fertilisers by

processing waste – such as composting plants, mushroom producers, fertiliser manufacturers, urban waste water treatment plants, and others – must obtain a permit.

Article 6 details the end-of-waste criteria which refers to the set of conditions that a waste material must meet after undergoing recycling or other recovery processes in order to cease to be waste. Article 6 of the Waste Framework Directive outlines four conditions:

- the substance or object is to be used for specific purposes;
- a market or demand exists for such a substance or object;
- the substance or object fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products; and
- the use of the substance or object will not lead to overall adverse environmental or human health impacts.

If the waste is not recycled, facilities must apply for a waste recovery operation under R10 “Land treatment resulting in benefit to agriculture or ecological” (Annex II of the WFD) when requesting a permit to apply circular fertilisers from waste on land.

Article 6 encourages Member States to take measures to set an end-of-waste criteria at national level. The objective is that, once a waste meets the end-of-waste criteria defined in national law and is no longer classified as waste, it is exempt from the stringent and burdensome waste rules in national waste legislation. However, the implementation of the Waste Framework Directive differs considerably among Member States, resulting in situations where, for example, FER-PLAY circular fertilisers derived from waste feedstocks are still classified as waste.

Article 19 of the Fertilising Products Regulation (EU) 2019/1009 (FPR) states that component materials of fertilising products reach end-of-waste status the moment the manufacturer signs the EU declaration of conformity of the EU fertilising product containing such a material. All the circular fertilisers from waste included in the FPR, i.e. struvite, compost and digestate, can therefore cease to be waste when they become part of a CE-marked fertilising product (refer to section 2.2.6).



### ***Bio-waste recycling***

The revision of the Waste Framework Directive in 2018 has introduced a number of targets and provisions driving both the prevention and the sustainable management of waste. One of them regards municipal waste which is defined by the WFD as “mixed waste and separately collected waste from households, including paper and cardboard, glass, metals, plastics, biowaste, wood, textiles, packaging, waste electrical and electronic equipment, waste batteries and accumulators, and bulky waste, including mattresses and furniture”; as well as “from other sources, where such waste is similar in nature and composition to waste from households”. By 2035, the preparation for re-use and recycling of municipal waste must increase to a minimum of 65% by weight (Article 11), with intermediary targets of 55% by 2025 and 60% by 2030.

The Waste Framework Directive defines bio-waste as “biodegradable garden and park waste, food and kitchen waste from households, offices, restaurants, wholesale, canteens, caterers and retail premises and comparable waste from food processing plants”. With a share of 34 %, bio-waste is the largest single component of municipal waste in the EU (European Environment Agency, 2023). Recycling of bio-waste is therefore key for meeting the EU target to recycle 65 % of municipal waste by 2035. Separately collecting bio-waste from other municipal waste is a prerequisite for its recycling process and its transformation into a circular fertilisers. To address this, the WFD established a complementary target: by 31 December 2023, Member States must ensure that bio-waste is collected separately and not mixed with other waste types (Article 22, Section 1). This measure aims to specifically promote the production and use of compost and digestate derived from bio-waste.

Article 11 (4) states that, for the purpose of calculating whether the targets have been attained, the amount of municipal biodegradable waste that enters aerobic or anaerobic treatment may be counted as recycled where that treatment generates **compost, digestate, or other output with a similar quantity of recycled content in relation to input**, which is to be used as a recycled product, material or substance. Where the output is used on land, Member States may count it as recycled only if this use results in benefits to agriculture or ecological improvement.

### 2.2.2.1. POLICY BARRIERS IDENTIFIED IN THE WASTE FRAMEWORK DIRECTIVE

The classification of the processes leading to the production of FER-PLAY circular fertilisers under recovery or recycling lacks clarity, leading to discrepancies in the harmonisation. The same issue applies to the end-of-waste criteria (refer to section 2.3.1).

Even though EU Member States have to increase the share of municipal waste prepared for reuse or recycled to 55% of all municipal waste generated by 2025, the target is far from being met in many Member States (refer to section 2.3.2). This prevents **compost** and **digestate** from bio-waste from reaching their full circular potential.

### 2.2.3. The Animal By-products Regulation

Which FER-PLAY circular fertilisers are governed by the APBR?						
UWW	IWW	SS	CBW	FM	SFD	SMS
			✓	✓	✓	✓

Several FER-PLAY fertilisers – compost from food waste, feather meal, solid digestate from food waste or manure and spent mushroom substrate – fall under the scope of the Animal By-Products Regulation (EC) 1069/2009 (ABPR) since they contain animal by-products.

The ABPR regulates the handling, processing and disposal of animal by-products and derived products. The objective is to prevent and minimise risks to public and animal health arising from those products, and in particular to protect the safety of the food and feed chain.

Section 4 of the regulation classifies animal by-products into three categories:

- Category 1 – Materials with the highest risk to public and animal health (Article 8)
- Category 2 – Intermediate risk materials, including manure (Article 9)
- Category 3 – Low risk materials, including catering waste (Article 10).

Article 13 and 14 of the ABPR impose restrictions on the disposal and use of animal by-products based on their category. For instance, only Category 2 and 3 materials can be composted or transformed into biogas or used for the manufacturing of organic fertilisers or soil improvers to be placed on the market.

Article 32 regulates the placing on the market and use of organic fertilisers and soil improvers derived from animal by-products. Notably, the organic fertilisers must be produced “in accordance with the conditions for pressure sterilisation or with other conditions to prevent risks arising to public and animal health” and “come from approved or registered establishments or plants”. The article also indicates that digestate or compost may be placed on the market and used as organic fertiliser or soil improver.

The ABPR also defines strict requirements for the traceability and identification of animal by-products throughout the production and processing chain, as well as requirements for storage, transportation, and processing facilities.

The Regulation (EU) 142/2011 (European Commission, 2011) implements the ABPR. Annex V includes the requirements applicable to biogas and composting plants. For instance, biogas and composting must be equipped with a pasteurisation unit (the standard transformation parameter is 1 hour at 70°C with particles no larger than 12 mm) to treat category materials 2 and 3<sup>1</sup>. However, competent authorities at national level may authorise alternative time-temperature methods for catering waste and manure.

The end point in the manufacturing for animal by-products is defined in Article 5 of the ABPR as the stage of manufacturing beyond which a derived product from an animal by-product is no longer subject to the requirements of the ABPR (refer to section 2.2.6).

### 2.2.3.1. POLICY BARRIERS IDENTIFIED IN THE ANIMAL BY-PRODUCTS REGULATION

Some challenges arise from the misalignment between the requirements of the EU Fertilising Products Regulation and the standards established under the ABPR (see 3.2.6.1).

### 2.2.4. The Nitrates Directive

Which FER-PLAY circular fertilisers are governed by the Nitrates Directive?

UWW	IWW	SS	CBW	FM	SFD	SMS
-----	-----	----	-----	----	-----	-----

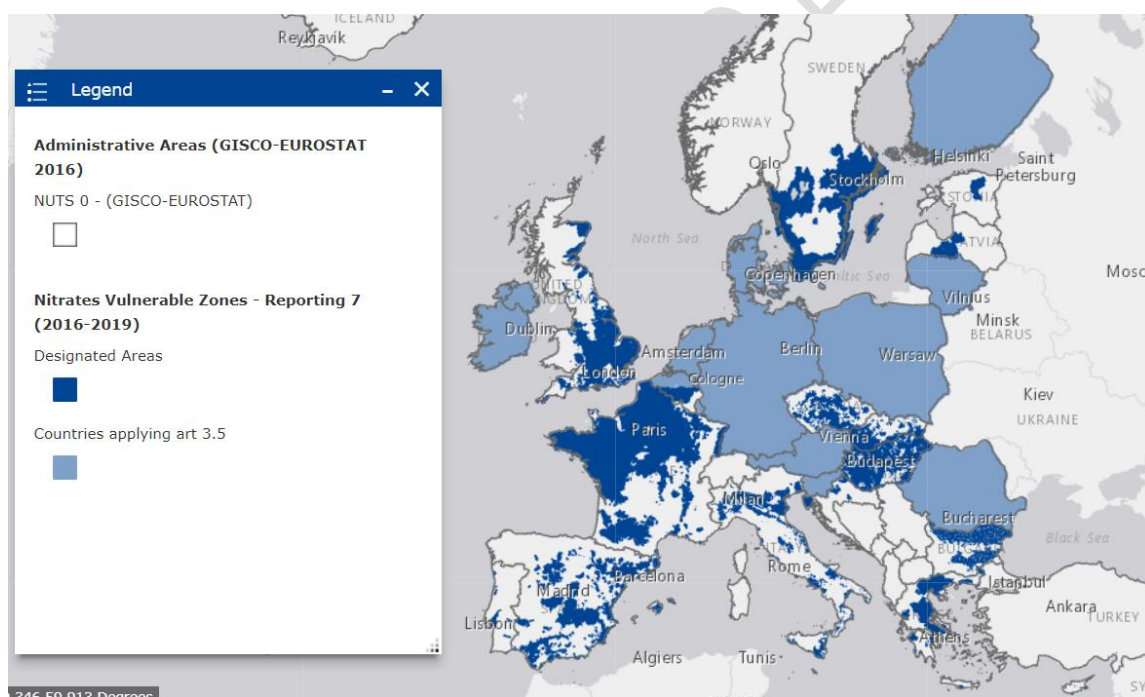
<sup>1</sup> There is one exception: manure, digestive tract and its content, milk, milk-based products, colostrum, eggs and egg products can be used in compost and biogas plants without the need for pasteurisation when the competent authority does not consider them to present a risk for the spread of any serious transmissible disease.



Adopted in 1991, the Nitrates Directive 91/676/EEC addresses the issue of nitrate pollution in surface and groundwaters, which can have adverse effects on aquatic ecosystems and human health. It sets minimum requirements that Member States should implement regarding the storage and application of nitrogen fertilisers on land and certain land management practices.

Livestock manure, residues from fish farms, and sewage sludge are considered fertilisers under Article 2 of the directive. However, the directive places a stronger emphasis on livestock manure by including additional restrictions for this type of fertilisers.

Member states are required to identify areas within their territories where waters are polluted or at risk of pollution from nitrates originating from agricultural sources. These designated Nitrate Vulnerable Zones (NVZs) are subject to specific measures aimed at reducing nitrate pollution<sup>2</sup>.



**Figure 3.** Current status of Nitrates Vulnerable Zones in Europe.

Source: Joint Research Centre (n.d.).

Member states must develop and implement action programmes for each NVZ aimed at reducing nitrate pollution from agricultural activities. These action programmes typically include measures such as the implementation of nutrient management plans, restrictions on the timing and

<sup>2</sup> Member States can decide to grant the status of NVZ to their whole country according to Article 3.5 of the Nitrates Directive.

application rates of fertilisers, requirements for manure storage and application, and measures to promote the use of good agricultural practices. The measures to be included are listed in Annex III of the directive.

One of the measures prescribed is to limit the application of nitrogen from manure and processed manure to 170 kg per hectare per year in NVZ. This limitation on nitrogen fertilisers derived from manure is based on the rationale that these fertilisers have a higher leaching potential compared to other sources. However, since the publication of the Nitrates Directive in 1991, significant innovations in manure processing have emerged. Liquid fractions of digestate for instance have proven to have similar or less important nitrate leaching risk than synthetic fertilisers (Luo et al., 2022; Hendriks et al., 2022; Sigurnjak et al., 2017).

#### 2.2.4.1. POLICY BARRIERS IDENTIFIED IN THE NITRATES DIRECTIVE

1. When the nitrogen crop requirement exceeds the 170 kg of nitrogen per hectare per year limit, farmers are compelled to use chemical nitrogen fertilisers instead of relying on nitrogen fertilisers derived from processed manure. This is a major barrier for producers of **digestate** from manure and **spent mushroom substrate**.

#### 2.2.5. The Sewage Sludge Directive

Which FER-PLAY circular fertilisers are governed by the Sewage Sludge Directive?						
UWW	IWW	SS	CBW	FM	SFD	SMS
✓	✓	✓			✓	

The Sewage Sludge Directive 86/278/EEC (SSD) aims to promote the proper application of sewage sludge in agriculture while preventing adverse health and environmental effects. This directive specifically applies to sludge derived from domestic and urban waste waters<sup>3</sup>. According to Article 6 of the directive, sludge generally must be treated before agricultural use<sup>4</sup>. Treated sludge is defined as “sludge which has undergone biological, chemical or heat treatment, long-term storage or any other appropriate process so as significantly to reduce its fermentability and the health hazards resulting from its use”. The directive does not specify particular treatment

<sup>3</sup> According to Article 11, sewage treatment plants with a treatment capacity corresponding to 5 000 person equivalents can be exempted from certain analysis and record keeping obligations.

<sup>4</sup> The Directive specifies that, under conditions to be laid down by Member States, they may authorise the use of untreated sludge if it is injected or worked into the soil.

methods, so treated sewage sludge could in principle be a product resulting from any treatment, e.g. struvite from urban or industrial waste waters<sup>5</sup>, stabilised sludge, compost or digestate from sewage sludge. Consequently, several circular fertilisers must adhere to the requirements outlined in the SSD.

Article 5 of the SSD establishes various quality requirements for both sewage sludge and the soil intended for its use. Member States are mandated to prohibit the application of sewage sludge if the concentration of certain heavy metals (cadmium, copper, nickel, lead, zinc, mercury) in the soil exceeds specified limit values outlined in Annex I A<sup>6</sup>. To prevent such concentrations, Member States have two options:

- set maximum quantities of sewage sludge per unit area per year while ensuring compliance with heavy metal concentration limits in sludge as per Annex I B; or
- ensure compliance with limit values for metal quantities introduced into the soil per unit area and time as defined in Annex I C.

Furthermore, Article 9 stipulates that analyses of both sewage sludge and soil must be conducted in accordance with Annexes II A (requiring sludge analysis at least every 6 months initially, and then annually after one year), II B, and II C of the directive.

Member States are required to maintain records that register various details, including the quantities of sewage sludge supplied for agricultural use, the composition and properties of the sludge, and the location where the sludge is intended to be applied, as specified in Article 10 of the SSD.

Additionally, Article 7 requires Member States to prohibit the use of sludge in certain cases:

- On grassland or forage crops if the grassland is to be grazed or the forage crops harvested within less than three weeks of sludge application.
- On soil where fruit and vegetable crops are cultivated, excluding fruit trees.
- On land designated for growing fruit and vegetable crops that are typically in direct contact with the soil and consumed raw, during the 10 months leading up to harvest and throughout the harvest period itself.

In line with the WFD, some Member States have adopted a national 'end-of-waste' criteria recognising the status of certain materials derived from sewage sludge as product and no longer

<sup>5</sup> Industrial waste waters which are discharged in urban waste water collection systems would be in the scope of the SSD.

<sup>6</sup> When setting these limits, Member States must also take into account the pH of soils (Article 8).



waste. More information on the implementation of the Directive is available in the last evaluation of the European Commission from 2023.

### 2.2.5.1. POLICY BARRIERS IDENTIFIED IN THE SEWAGE SLUDGE DIRECTIVE

Problematic contaminants in sewage sludge should be further regulated in the Sewage Sludge Directive in order to provide high quality and safe fertilisers. This would avoid strict restrictions at national level (refer to section 2.3.4) and enhance trust of farmers in **struvite**, **compost** and **digestate** from sewage sludge as well as **stabilised sludge** in general.

### 2.2.6. The Fertilising Products Regulation

Which FER-PLAY circular fertilisers are included in the FPR?						
UWW	IWW	SS	CBW	FM	SFD	SMS
✓	✓		✓		✓	

When a manufacturer of circular fertiliser seeks to market their product nationally, they must demonstrate compliance with relevant national legislation, which can classify the product as waste, animal by-product or fertiliser depending on the legal framework in place. Alternatively, the manufacturer can choose to demonstrate compliance with the rules outlined in the Fertilising Products Regulation (EU) 2019/1009 (FPR), which aims to harmonise requirements for EU fertilising products bearing a CE mark<sup>7</sup>.

An EU fertilising product is a fertilising product which is CE marked when made available on the market. ‘Making available on the market’ is defined in the FPR as “any supply of an EU fertilising product for distribution or use on the Union market in the course of a commercial activity, whether in return for payment or free of charge”.

A manufacturer is allowed to CE mark a fertilising product only if, in accordance with the FPR (Article 4):

- It meets the requirements for the relevant product function category (PFC) set out in Annex I of the FPR.

<sup>7</sup> Compliance with the Fertilising Products Regulation is voluntary, allowing Member States the flexibility to establish their own rules for fertilising products at the national level.

- It meets the requirements for the relevant component material category (CMC) or categories set out in Annex II of the FPR.
- It is labelled in accordance with the labelling requirements set out in Annex III of the FPR.
- It has successfully passed the relevant conformity assessment procedure set out in Annex IV of the FPR.

Before making available a specific fertilising product on the market, each fertilising product manufacturer needs to fulfil two obligations outlined in Article 6: draw up the technical documentation for the product and carry out the relevant conformity assessment procedure. The conformity assessment procedure is performed by the producer of the EU fertilising product. The type of conformity assessment procedure required depends on the CMC, and in certain cases the PFC, selected for the product, as specified in Article 15 and Annex IV of the FPR. It can consist in certification by a conformity assessment body known as “notified body” under the FPR (Article 24). Not all notified bodies are allowed to perform all types of conformity assessment procedures.

Once the compliance of the product with the requirements in the FPR has been demonstrated by that conformity assessment procedure, manufacturers must draw up an EU declaration of conformity (Article 16 and Annex V) and affix the CE marking (Article 18).

**Table 2** lists the possible CMC and PFC for each FER-PLAY circular fertiliser.

**Table 2:** List of the possible Component Material Category (CMC) and Product Function Category (PFC) for each FER-PLAY circular fertiliser.

Selected FER-PLAY circular fertiliser	Potential Component Material Category (CMC)	Potential Product Function Category (PFC)
<b>Struvite from urban waste water (UWW)</b>	CMC 12 Precipitated phosphate salts and derivatives	PFC 1(C)(I)(a)(ii) Compound solid inorganic macronutrient fertiliser
<b>Struvite from industrial waste water (IWW)</b>	CMC 12 Precipitated phosphate salts and derivatives (if waste waters are from processing of foods, beverages, pet foods, animal feeds, or dairy products, other than animal by-products or derived products)	PFC 1(C)(I)(a)(ii) Compound solid inorganic macronutrient fertiliser



Selected FER-PLAY circular fertiliser		Potential Component Material Category (CMC)	Potential Product Function Category (PFC)
<b>Stabilised sludge (SS)</b>	Digestate from sewage sludge	Sewage sludge not allowed in CMC 5 Digestate other than fresh crop digestate	N/A
	Compost from sewage sludge	Sewage sludge not allowed in CMC 3 Compost	N/A
<b>Composted bio-waste from food and green waste (CBW)</b>	Digestate from food waste composted with green waste	CMC 3 Compost (if the digestate is from separately collected bio-waste)	PFC 3(A) Organic Soil Improver
<b>Feather meal (FM)</b>		No inclusion yet for feather meal in CMC10 Derived products within the meaning of Regulation (EC) No 1069/2009)	N/A
<b>Solid fraction of digestate (SFD)</b>	From food waste	CMC 5 Digestate other than fresh crop digestate (if the digestate is from separately collected bio-waste)	PFC 1(A)(I) Solid organic fertiliser; or PFC 3(A) Organic Soil Improver
	From sewage sludge	Sewage sludge not allowed in CMC 5 Digestate other than fresh crop digestate	N/A
	From manure	CMC 5 Digestate other than fresh crop digestate (if the end point for manure has been reached)	PFC 1(A)(I) Solid organic fertiliser; or PFC 3(A) Organic Soil Improver

Selected FER-PLAY circular fertiliser	Potential Component Material Category (CMC)	Potential Product Function Category (PFC)
<b>Spent Mushroom Substrate (SMS)</b>	CMC 3 Compost (if the end point for manure has been reached); and  No end point yet for the mushrooms debris in CMC10 Derived products within the meaning of Regulation (EC) No 1069/2009	N/A

The requirements for an EU fertilising product (e.g. heavy metals limits or nutrient content requirements), which depend on the chosen PFC and CMC, are assessed during the conformity assessment procedure to demonstrate compliance. The requirements related to CMCs are outlined in Annex II and those related to PFCs are in Annex I.

As mentioned in section 2.2.2, component materials of EU fertilising products certified under the FPR obtain the end-of-waste status when the manufacturer signs the EU declaration of conformity of the EU fertilising product containing such a material.

In order to be included in a CMC under the FPR, animal by-products need to reach the end point as per article 5 of the ABPR, i.e. the stage of manufacturing beyond which a derived product from an animal by-product is no longer subject to the requirements of the ABPR (refer to section 2.2.3). There is therefore a direct link between the ABPR and the FPR. At EU level, the end point in the manufacturing chain for compost and digestate derived from animal by-product to be used in fertilising products has been determined in Delegated Regulation (EU) 2023/1605. The end point consists in the digestate and compost being compliant with several requirements of the ABPR, notably the standard transformation parameter of 1h, 70°C, 12 mm particles, without recognising the alternative transformation parameters authorised by competent authorities. Additionally, the plant must be registered in the EU under “manufacturing of organic fertilisers and soil improvers” (Article 24 1. f) of ABPR) instead of for instance “transformation of animal by-products and/or derived products into biogas or compost” (Article 24 1. g) of ABPR). The end point is reached once an EU fertilising product, containing for instance compost or digestate from animal by-products as a component material, has been put to the market. At that end point, the EU fertilising product is no longer subject to the ABPR.

### 2.2.6.1. POLICY BARRIERS IDENTIFIED IN THE FERTILISING PRODUCTS REGULATION

Some requirements of the EU Fertilising Products Regulation for entering certain product categories are very stringent and challenging for producers to meet. For example, the nutrient requirements for **digestate** to be certified under 'PFC 1(A)(II) Liquid Organic Fertiliser' are impossible to achieve, even after separating the liquid and solid fractions.

Some input materials permitted at the national level are not allowed in CMCs. For instance, sewage sludge and industrial sludge are not permitted for 'CMC 3 – **Compost**' and 'CMC 5 – **Digestate** other than fresh crop digestate'. This poses a significant challenge for the marketing of **stabilised sludge**.

**Feather Meal**, in the form of hydrolysed proteins, is in the process of being included under CMC 10 but many obstacles persist<sup>8</sup>. The end point in the manufacturing chain for **Spent Mushroom Substrate** to be included under CMC 10 has not yet been determined.

There is a major discrepancy with the use of animal by-products as input materials of 'CMC 3 – **Compost**' and 'CMC 5 – **Digestate** other than fresh crop digestate'. While the end point in the manufacturing chain for digestate derived from animal by-product to be used in fertilising products has been determined in Delegated Regulation (EU) 2023/1605, it requires compost and digestate to comply with the standard transformation parameters of 1 hour at 70°C with 12 mm particles as outlined in the ABPR. This does not acknowledge the alternative transformation parameters, authorised by competent authorities, posing a major issue since most compost and digestate plants in Europe make use of the alternative transformation parameters which do not require to be equipped with a pasteurisation unit that is surely necessary to meet standard transformation parameters.

The Regulation's implementation remains incomplete in certain aspects (e.g., absence of notified bodies in some countries<sup>9</sup>, lack of published EU-harmonised standards for testing methods by CEN<sup>10</sup>).

While the EU Fertilising Products Regulation presents an opportunity for aligning circular fertilisers, its complexity poses a challenge. This often entails for a producer the need to contract with an external consultancy or to have dedicated employees in-house, which is particularly

<sup>8</sup> Feather meal needs to be hydrolysed in hydrolysed proteins to be applied to the field. The end point in the manufacturing chain for hydrolysed proteins to be used in fertilising products has been determined in Delegated Regulation (EU) 2023/1605 upon implementation of mitigation measures. However, the most widely-used and appropriate processing methods have not been recognised in the delegated regulation and the mitigation measures are unworkable. In addition, hydrolysed proteins must pass a secondary assessment for safety, agronomic efficiency, and environmental impact before inclusion in CMC 10 through another delegated regulation.

<sup>9</sup> The list of Notified Bodies under the fertilising products Regulation may be found in the [NANDO](#) database.

<sup>10</sup> The European Committee for Standardization (CEN) provides European standards and technical specifications.

difficult for small companies. Investing in FPR certification requires a strong business model for their products.

### 2.2.7. The Organic Farming Regulation

Which FER-PLAY circular fertilisers are included in the OFR?						
UWW	IWW	SS	CBW	FM	SFD	SMS
✓	✓		✓	✓	✓	✓

The Organic Farming Regulation (EU) 2018/848 is the basic act establishing the principles of organic production and laying down the rules concerning organic production, related certification and the use of indications referring to organic production in labelling and advertising.

Point 1.9 of Annex II of the Organic Farming Regulation (OFR) lists the detailed production rules regarding fertilisation and soil management. It states that “only fertilisers and soil conditioners that have been authorised pursuant to Article 24 for use in organic production shall be used, and only to the extent necessary”. The use of mineral fertilisers is banned.

Article 24 of the OFR is implemented through the Implementing Regulation (EU) 2021/1165 which lays down conditions for the authorisation of substances and products for use in organic production. Article 2 of the Implementing Regulation states that only the products and substances listed in Annex II to this Regulation can be used in organic production as fertilisers, soil conditioners and nutrients for plant nutrition, litter improvement and enrichment or algae cultivation or husbandry environment of aquaculture animals.

The table below outlines the materials allowed and the requirements for using each FER-PLAY circular fertiliser in organic farming:

**Table 4:** Materials allowed and the requirements for using each FER-PLAY circular fertiliser in organic farming.

Selected FER-PLAY circular fertiliser	Authorised material	Additional requirements
Struvite from urban waste water (UWW)	Recovered struvite and precipitated phosphate salts	Products must meet the requirements laid down in Regulation (EU) 2019/1009 animal

Selected FER-PLAY circular fertiliser		Authorised material	Additional requirements
			manure as source material cannot have factory farming origin
<b>Struvite from industrial waste water (IWW)</b>		Recovered struvite and precipitated phosphate salts	Products must meet the requirements laid down in Regulation (EU) 2019/1009 animal manure as source material cannot have factory farming origin
<b>Stabilised sludge (SS)</b>	Digestate from sewage sludge	Not included	N/A
	Compost from sewage sludge	Not included	N/A
<b>Composted bio-waste from food and green waste (CBW)</b>	Digestate from food waste composted with green waste	Composted or fermented bio-waste (Directive 2008/98/EC of the European Parliament and of the Council (2))	<ul style="list-style-type: none"> <li>Product obtained from separate bio-waste collection at source, which has been submitted to composting or to anaerobic fermentation for biogas production</li> <li>Only vegetable and animal bio-waste</li> <li>Only when produced in a closed and monitored collection system, accepted by the member state</li> <li>Maximum concentrations in mg/kg of dry matter: cadmium: 0,7; copper: 70; nickel: 25; lead: 45; zinc: 200; mercury: 0,4; chromium (total): 70; chromium (vi): not detectable</li> </ul>

Selected FER-PLAY circular fertiliser		Authorised material	Additional requirements
		Composted or fermented mixture of vegetable matter	Product obtained from mixtures of vegetable matter, which have been submitted to composting or to anaerobic fermentation for biogas production
Feather meal (FM)		Feather, hair and skin meal ('chiquette')	<p>(1) Maximum concentration in mg/kg of dry matter of chromium (VI): not detectable</p> <p>(2) Not to be applied to edible parts of the crop</p>
Solid fraction of digestate (SFD)	From food waste	Composted or fermented bio-waste (Directive 2008/98/EC of the European Parliament and of the Council (2))	<ul style="list-style-type: none"> <li>Product obtained from separate bio-waste collection at source, which has been submitted to composting or to anaerobic fermentation for biogas production</li> <li>Only vegetable and animal bio-waste</li> <li>Only when produced in a closed and monitored collection system, accepted by the member state</li> <li>Maximum concentrations in mg/kg of dry matter: cadmium: 0.7; copper: 70; nickel: 25; lead: 45; zinc: 200; mercury: 0.4; chromium (total): 70; chromium (vi): not detectable.</li> </ul>
	From sewage sludge	Not included	N/A

Selected FER-PLAY circular fertiliser		Authorised material	Additional requirements
	From manure	Biogas digestate containing animal by-products co-digested with material of plant or animal origin as listed in this Annex	<ul style="list-style-type: none"> <li>Animal by-products (including by-products of wild animals) of category 3 and digestive tract content of category 2 (categories as defined in Regulation (EC) No 1069/2009)</li> <li>Factory farming origin forbidden</li> <li>The processes have to be in accordance with Regulation (EU) No 142/2011</li> <li>Not to be applied to edible parts of the crop</li> </ul>
<b>Spent Mushroom Substrate (SMS)</b>		Mushroom culture wastes	The initial composition of the substrate shall be limited to products of this Annex

### 2.2.7.1. POLICY BARRIERS IDENTIFIED IN THE ORGANIC FARMING REGULATION

Although compliance with the FPR is intended to be optional for producers who can market their products under national law, the requirement for **struvite** to meet FPR standards for use in organic farming is challenging, especially for small producers.

The concept of “factory farming” has not been defined at EU level<sup>11</sup>, resulting in varying interpretations among Member States and a lack of harmonisation. In many countries, the use of animal by-product originating from conventional agriculture as input materials for fertilisers used in organic farming is forbidden. This restriction hinders the uptake of **digestate** from manure and **spent mushroom substrate**.

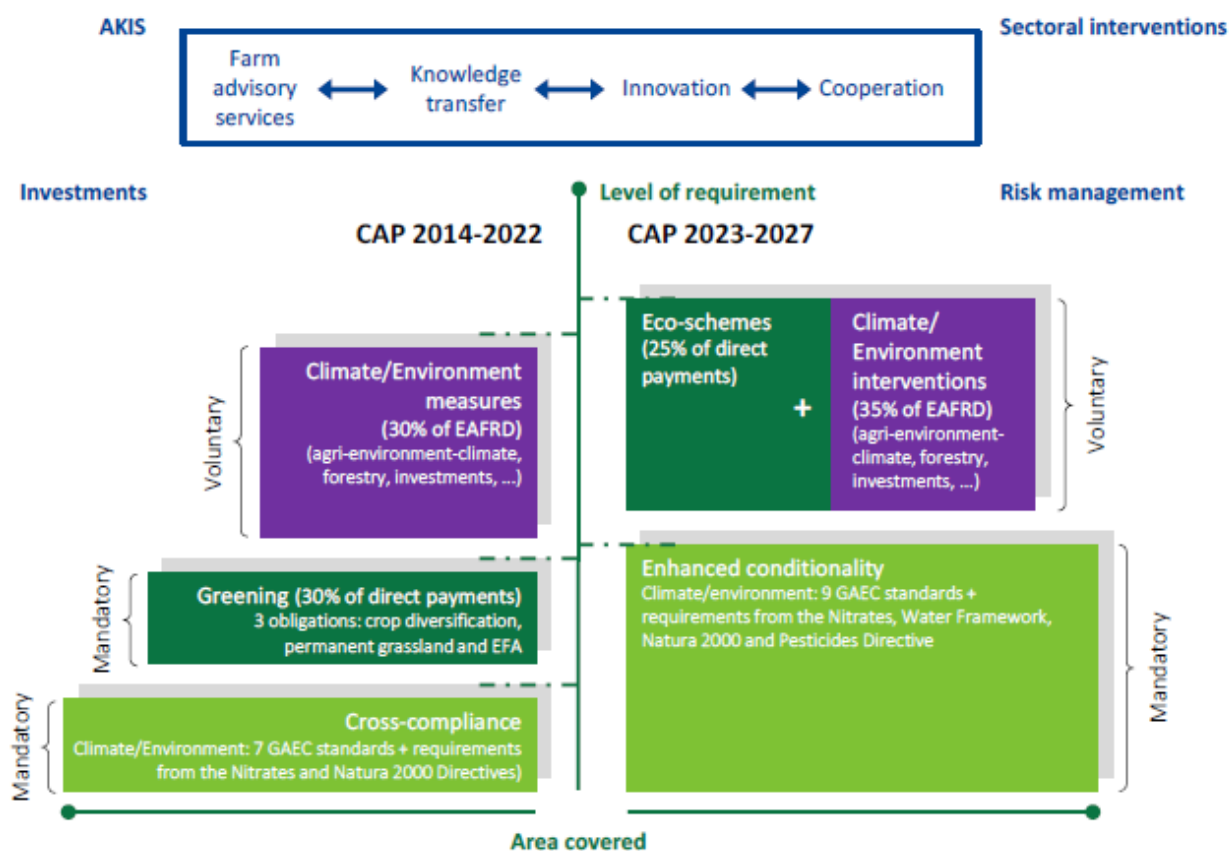
<sup>11</sup> The EU Commission only published guidelines in 1995 (Commission of the European Communities, 1995).

## 2.2.8. The Common Agricultural Policy

Which FER-PLAY circular fertilisers are included in the CAP?

UWW	IWW	SS	CBW	FM	SFD	SMS
✓	✓	✓	✓	✓	✓	✓

The 2023-2027 Common Agricultural Policy (CAP) entered into force on 1 January 2023. It is structured around the CAP legal framework, which includes three basic EU regulations (Regulation (EU) 2021/2116, Regulation (EU) 2021/2115 and Regulation (EU) 2021/2117) and the choices made by Member States outlined in the CAP Strategic Plans (CSPs), as approved by the Commission. The CSPs are designed to make a significant contribution to the ambitions of the European Green Deal, Farm to Fork Strategy and Biodiversity Strategy. The CAP is financed by two funds: the European Agriculture Guarantee Fund (EAGF) and European Agriculture Fund for Rural Development (EAFRD).



Source: Project team, 2023, based on European Commission (2023c)

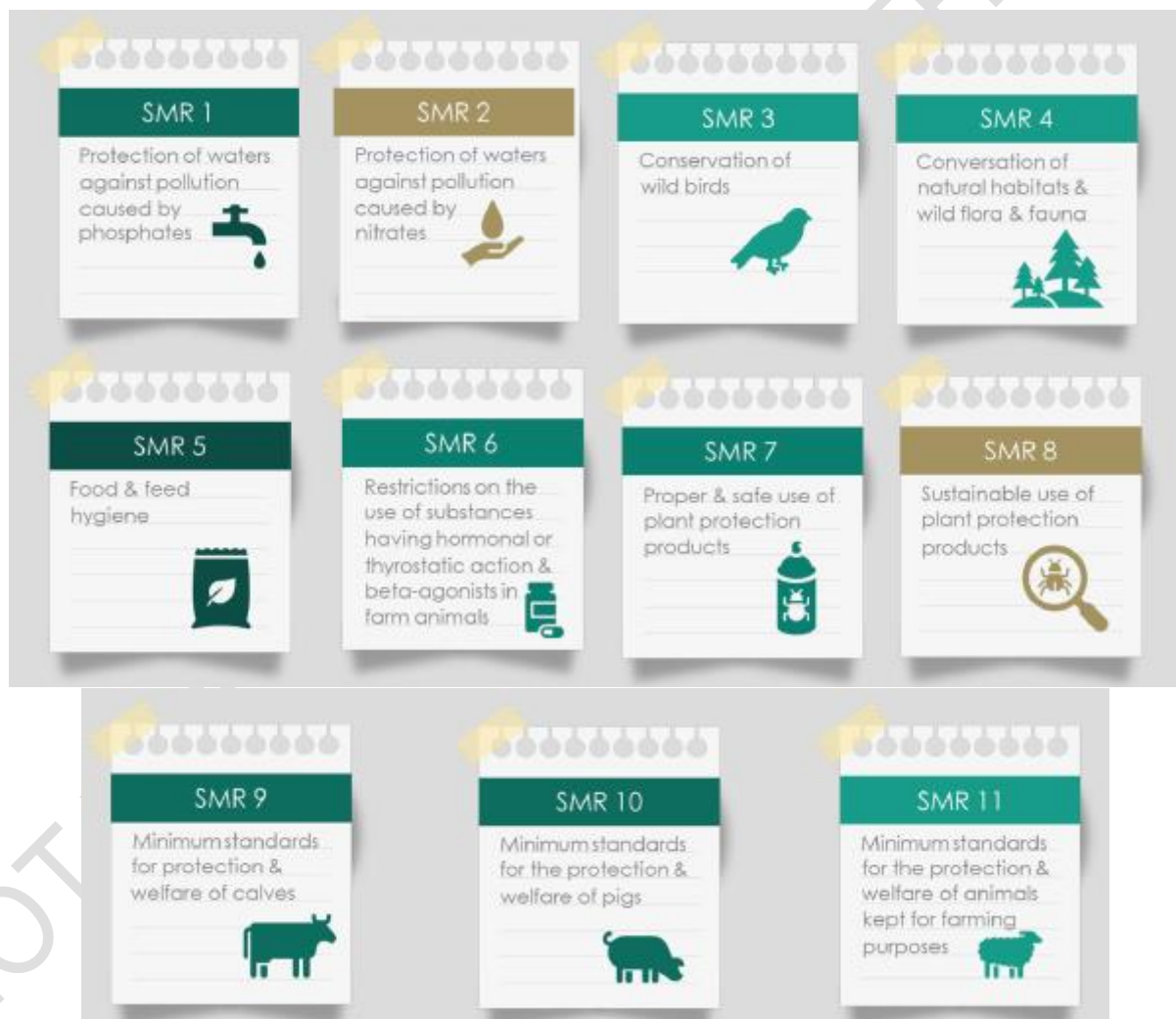


**Figure 4.** Architecture of the Common Agricultural Policy 2023-2027 vs. previous Common Agricultural Policy.

Source: European Parliament (2023).

The CAP 2023-2027 is made of three funding components:

- The **enhanced conditionality** which consists in income support through direct payments and requires beneficiaries to meet a set of mandatory rules: the Statutory Management Requirements (SMRs) and Good Agricultural and Environmental Conditions (GAECs). SMRs include existing EU rules on public, animal and plant health, animal welfare and the environment, while GAEC basic requirements are set out for all Member States, with options to adapt them to respond to national situations.



**Figure 5.** List of Statutory Management Requirements in Common Agricultural Policy 2023-2027.

Source: Government of Ireland (n.d.).

- The 2023-2027 Common Agricultural Policy (CAP) does not include mandatory measures, under SMRs or GAECs, requiring farmers to produce or use circular fertilisers.

- The **eco-schemes** which are new voluntary schemes<sup>12</sup> to support climate, environment and animal welfare activities that go beyond conditionality. They represent a dedicated part of direct payments (at least 25%). They must be implemented in at least two out of eight areas of action (Article 31 of Regulation (EU) 2021/2115): climate change mitigation, climate change adaptation, water protection, soil protection, protection of biodiversity, sustainable and reduced use of pesticides, enhance animal welfare or combat anti-microbial resistance. Member States have the flexibility to customise the eco-schemes to specific national environmental and climate needs. In the current CAP, Member States have set out a total of 158 eco-schemes in their own national CSPs.



**Figure 6.** List of Good Agricultural and Environmental Conditions in Common Agricultural Policy 2023-2027.

<sup>12</sup> Voluntary for farmers but mandatory for Member States.

Source: Government of Ireland (n.d.).

	AT	BE-FL	BE-WA	BG	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	RO	SE	SI	SK
Integrated production/High environmental value													HVE															
IPM/pesticide management																												
Fertilisation																												
Soil conservation practices																												
Organic farming																												
Landscape and biodiversity																												
Wetlands and peatlands																												
Grassland and grazing																												
Animals and animal welfare																												
Precision agriculture																												
Water management																												

**Figure 7.** Thematic coverage of eco-schemes in Common Agricultural Policy Strategic Plans.

Source: European Commission (2023).

Member States can propose eco-schemes rewarding the use of circular fertilisers in their CSPs. This would have an impact on several areas of actions including climate change mitigation, climate change adaptation, water protection, soil protection and protection of biodiversity.

The **rural development measures**, through national and regional programmes, are designed to address the specific needs and challenges of rural areas. Unlike direct payment instruments, these measures are accessible to beneficiaries beyond just farmers, are multiannual rather than annual, and include funding components from both the EAFRD and national co-financing. They include **agri-environment-climate commitments** (AECCs) defined in Article 31 of Regulation (EU) 2021/2115. For the current CAP, Member States have proposed 213 types of interventions in their CSPs. Member States can also propose AECCs rewarding the use of circular fertilisers in their CSPs.

	AT	BE-FL	BE-WA	BG	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	RO	SE	SI	SK
Plant Protection																												
Fertilisation and Soil Amendment																												
Manure Storage																												
Soil Management																												
Crop Rotation Diversification																												
Landscape																												
Forestry																												
Grasslands and Grazing																												
Animals																												
Genetic Resources and Protection of Wildlife																												
Water management																												
Bioeconomy Energy Efficiency																												
Management Plans																												
Precision Farming																												
Certification Schemes																												
Organic Farming																												
Low Input Systems																												
Training																												

**Figure 8.** Thematic coverage of agri-environment-climate commitments in Common Agricultural Policy Strategic Plans.

Source: European Commission, 2023.

In general, the EAGF will be used for direct payments and eco-schemes, while the EAFRD supports rural development interventions.

### 2.2.8.1. POLICY BARRIERS IDENTIFIED IN THE COMMON AGRICULTURAL POLICY

1. The absence of mandatory measures, under SMRs or GAECs, requiring farmers to produce or use circular fertilisers in the CAP 2023-2027 is not contributing to encourage the uptake of circular fertilisers.

### 2.2.9. The Carbon Removals and Carbon Farming Certification Framework

Which FER-PLAY circular fertilisers are included in the CRCF?

UWW	IWW	SS	CBW	FM	SFD	SMS
✓	✓	✓	✓	✓	✓	✓

On 30 November 2022, the European Commission released its proposal for a Union Certification Framework for Carbon Removals, which sets up an EU certification framework for carbon removals to boost their uptake and help achieve EU climate neutrality by 2050. Following the EU legislative procedure, the European Parliament adopted the final agreement on the text on 10 April 2024. The final text has been renamed “EU Carbon Removals and Carbon Farming (CRCF) Certification Regulation” reflecting the increasing significance of carbon farming practices. After the EU elections, the text will have to be formally approved by the new European Parliament and by the Council of the EU before it is published in the Official Journal of the European Union and enters into force.

The objective of the CRCF is to boost the development of carbon removals across the EU and to fight greenwashing by setting an EU-wide voluntary framework for carbon removals.

In the CRCF, carbon removals are divided in three broad categories of activities or projects:

- **Permanent carbon removals:** they include a broad range of industrial technologies designed to capture carbon from the atmosphere and store it securely for several centuries, preventing its release back into the air. This storage occurs in geological formations, reactive minerals or through permanently chemically bound carbon in products. Examples include technologies such as direct air carbon capture with storage and biomass with carbon capture and storage.
- **Carbon farming:** Carbon farming involves a variety of practices and processes applied agricultural lands, wetlands, forests, and coastal environments to store and sequester carbon from the atmosphere through biological means or to reduce greenhouse gas emissions from soils. Examples of carbon farming practices include reduced tillage, the introduction of legume or rotation crops, improved forest management, reforestation, and agroforestry. Some carbon farming activities, such as peatland rewetting, can both reduce soil carbon emissions and increase biogenic carbon removals. Carbon farming activities can also reduce emissions of nitrous oxide associated with the excessive use of fertilisers.
- **Carbon storage in products:** atmospheric or biogenic carbon can also be captured and stored in long-lasting products, such as wood-based construction elements of buildings or bio-based insulation materials. For carbon storage in products to be considered effective, it must be guaranteed over the long term, which excludes short-lived products like paper or furniture<sup>13</sup>.

Each type of activity can generate certified units, as presented in **Table5**.

---

<sup>13</sup> Activities in this category do not include fossil Carbon Capture and Storage (CCS) or Utilisation (CCU). While these technologies do help storing or recycling fossil CO<sub>2</sub> emissions, they do not remove carbon from the atmosphere.

**Table 5:** List of activities and its associated certified units.

Type of activity	Certified unit
Permanent carbon removals	Permanent carbon removal unit
Carbon farming	Carbon farming sequestration unit, or Soil emission reduction unit
Carbon storage in products	Carbon storage in product unit

To be certified, eligible activities need to meet the four criteria (so-called ‘QU.A.L.ITY’ criteria’):

- **Quantification** (article 4): certified activities need to deliver a measurable net benefit for the climate. Therefore, carbon removals or soil emission reductions generated by activities over their entire duration (called ‘activity period’) need to go beyond a baseline and need to outweigh any direct or indirect greenhouse gas (GHG) emissions associated with the implementation of the activity.
- **Additionality** (article 5): certified activities need to be additional, i.e. they need to go beyond the standard practice. In other words, operators must carry out activities that are not already imposed upon them by the applicable law.
- **Long-term storage** (article 6): to ensure that carbon is stored permanently or over the long term, operators need to monitor and guarantee the storage of carbon over a given period (so-called “monitoring period”) – and are liable for any carbon reversal occurring during the monitoring period. For instance, permanent carbon removals need to be stored for several centuries (i.e. at least 200 years), carbon storage in long-lasting products for at least for 35 years and carbon farming for at least 5 years.
- **Sustainability** (article 7): to contribute to the wider sustainability objectives, activities need to meet minimum sustainability requirements, which will build as appropriate on the “Do No Significant Harm” Screening Criteria set out under the Taxonomy Regulation.

To operationalise the quality criteria, the Commission will develop EU certification methodologies for a wide range of carbon removal activities, by means of delegated acts (Article 8). Under the Regulation (article 9), the European Commission will recognise (public or private) certification schemes that will be responsible for implementing the certification framework on the ground. The



recognition will be granted for five years and is based on a thorough assessment of the scheme's governance, rules and procedures.

This first legislative step paves the way for certifying the use of circular fertilisers as a carbon farming activity, as they contribute to carbon storage in the soil (for compost, digestate, feather meal, spent mushroom substrate, stabilised sludge) and reduce soil emissions (e.g. struvite produces fewer nitrous oxide emissions compared to synthetic fertilisers)<sup>14</sup>. This could significantly drive the adoption of circular fertilisers. However, developing EU certification methodologies for the diverse range of carbon removal activities will likely be a lengthy process.

### 2.2.9.1. POLICY BARRIERS IDENTIFIED IN THE CARBON REMOVAL CERTIFICATION FRAMEWORK

None identified.

### 2.2.10. The Soil Monitoring Law

Which FER-PLAY circular fertilisers are included in the Soil Monitoring Law?						
UWW	IWW	SS	CBW	FM	SFD	SMS
		✓	✓	✓	✓	✓

In July 2023, the European Commission released a proposal for a new Directive on Soil Monitoring and Resilience, also known as the Soil Monitoring Law (SML). The objective of the proposal is to address soil degradation in Europe, driven by the evidence that 70% of soils across the EU were estimated to be unhealthy. The directive aims to establish a comprehensive soil monitoring framework and set the goal of achieving healthy soils by 2050.

Article 10 of the initial EU Commission proposal requires Member States to define sustainable soil management practices to be gradually implemented on all managed soils. These practices must respect the sustainable soil management principles listed in Annex III which notably include the following principle (e): “when fertilisation is applied, ensure adaptation to the needs of the

<sup>14</sup> Also compared to the use of synthetic fertilisers.

plant and trees at the given location and in the given period, and to the condition of soil and prioritise circular solutions that enrich the organic content”.

Although these practices are not mandatory, their inclusion represents a positive shift towards promoting circular fertilisers that enhance the organic content of soils (FER-PLAY & NOVAFERT, 2023). This applies to stabilised sludge, feather meal, compost, digestate and spent mushroom substrate.

Following the EU legislative procedure, the European Parliament adopted its final text in April 2024 which removed the provisions related to sustainable soil management. During the ENVI Council of June 2024, the Council adopted its own negotiating position on the Commission's proposal which does include the articles related to soil management practices. The negotiations between the Council, Parliament, and Commission will start during the next legislature by the end of 2024.

2.2.10.1. POLICY BARRIERS IDENTIFIED IN THE SOIL MONITORING LAW

None identified.

2.2.11. The Urban Waste Water Treatment Directive

Which FER-PLAY circular fertilisers are included in the UWWTD?						
UWW	IWW	SS	BW	BBP	DIG	TM
✓	✓	✓			✓	

On 26 October 2022, the European Commission released its proposal for the recast of the Urban Waste water Treatment Directive (UWWTD) which aims to further improve water quality by addressing residual pollution from urban waste water, enhance access to sanitation, and reduce energy use and greenhouse gas emissions. Following the EU legislative procedure, the European Parliament adopted the final agreement on the text on 10 April 2024. After the EU elections, the



text will have to be formally approved by the new European Parliament and by the Council of the EU before it is published in the Official Journal of the European Union and enters into force.

The scope of the Directive will ultimately be expanded as Article 3 requires Member States to ensure that agglomerations between 1 000 and 2 000 p.e. (population equivalent) comply with the requirements of collecting systems and connection of domestic waste water to the collecting system by 31 December 2035.

Article 7 sets the thresholds and timelines for tertiary treatment which has been defined as the reduction of nitrogen and/or phosphorus (Article 2(13)). By 31 December 2039, Member States must ensure the application of tertiary treatment to all urban waste water treatment plants treating a load of 150 000 p.e. and above. Article 7 includes intermediate targets in 2033 and 2036.

More importantly, Article 20 requires Member States to encourage the recovery of valuable resources and take the necessary measures to ensure that sludge management routes are conform to the waste hierarchy of the WFD. Sludge management routes must prepare for reuse, recycling and other recovery of resources, in particular phosphorus and nitrogen.

Additionally, Article 20 empowers the European Commission to adopt delegated acts (by 3 years after the entry into force of the Directive) aimed at specifying a combined minimum reuse and recycling rate for phosphorus from sludge and from urban waste water. This new provision would be a major driver for phosphorus recovery. Contrary to earlier version of the agreement, the final text does not include the specification of a recycling rate for nitrogen. However, Recital 54 indicates that “In the evaluation, particular attention should be given to [...] the opportunity and feasibility to set Union minimum reuse and recycling rates for nitrogen from sludge and/or from urban waste water”.

### 2.2.11.1. POLICY BARRIERS IDENTIFIED IN THE URBAN WASTE WATER TREATMENT DIRECTIVE

1. The omission of a minimum reuse and recycling rate for nitrogen from the future delegated acts to be adopted will not support the development of a nitrogen recycling market.

### 2.2.12. The European Taxonomy

Which FER-PLAY circular fertilisers are included in the  
Taxonomy Regulation?

UWW	IWW	SS	CBW	FM	SFD	SMS
-----	-----	----	-----	----	-----	-----



The European Taxonomy<sup>15</sup> is a green classification system that translates the EU's climate and environmental objectives into criteria for specific economic activities for investment purposes. It recognises as green, or 'environmentally sustainable', economic activities that make a substantial contribution to at least one of the EU's climate and environmental objectives, while at the same time not significantly harming any of these objectives and meeting minimum social safeguards.

The **Taxonomy Regulation** (European Parliament & Council of the European Union, 2020) introduces mandatory disclosure obligations on some companies and investors, requiring them to disclose their share of Taxonomy-aligned activities. This disclosure of the proportion of Taxonomy-aligned activities will allow for the comparison of companies and investment portfolios. In addition, it can guide market participants in their investment decisions.

Article 9 of the Taxonomy Regulation lays out six EU environmental objectives: climate change mitigation, climate change adaptation, sustainable use and protection of water and marine resources, transition to a circular economy, pollution prevention and control, and protection and restoration of biodiversity and ecosystems.

Additionally, Article 3 of the Taxonomy Regulation sets out 4 overarching conditions that an economic activity has to meet in order to qualify as environmentally sustainable:

- making a substantial contribution to at least one environmental objective (see Articles 10 to 16 for each objective);
- doing no significant harm to any other environmental objective (defined in Article 17);
- complying with minimum social safeguards;
- complying with the technical screening criteria.

The technical screening criteria are developed in delegated acts. For each economic activity considered, the technical screening criteria outline environmental performance requirements that ensure that the activity significantly contributes to the relevant environmental objective while causing no significant harm to other environmental objectives.

The **Climate Delegated Act** (European Commission, 2021) outlines the technical screening criteria for sustainable activities contributing to climate change mitigation (Annex I) and climate change adaptation (Annex II). The **Environmental Delegated Act** (European Commission, 2023)

---

<sup>15</sup> Detailed information is available in the Sustainable finance taxonomy FAQ (European Commission, n.d.).

outlines the technical screening criteria for sustainable activities contributing to sustainable use and protection of water and marine resources (Annex I), transition to a circular economy (Annex II), pollution prevention and control (Annex III), and protection and restoration of biodiversity and ecosystems (Annex IV).

The Climate Delegated Act includes three activities of interest to stimulate the use of several FER-PLAY circular fertilisers:

- 5.6 Anaerobic digestion of sewage sludge (Annex I and II) for stabilised sludge
- 5.7 Anaerobic digestion of bio-waste (Annex I and II) for digestate from bio-waste
- 5.8 Composting of bio-waste (Annex I and II) for compost from bio-waste.

In the Environmental Delegated Act, two activities are of interest for circular fertilisers:

- 2.1 Phosphorus recovery from waste water (Annex II) for struvite from both urban and industrial waste waters
- 2.5 Recovery of bio-waste by anaerobic digestion or composting (Annex II) for compost and digestate from bio-waste.

Proposing dedicated taxonomy activities related to the production of circular fertilisers will help channel investments into the sector.

#### 2.2.12.1. POLICY BARRIERS IDENTIFIED IN THE EU TAXONOMY

1. Activities related to circular fertilisers are scattered across various activities and even different delegated acts, leading to inconsistencies. For example, under the Environmental Act, activity 2.1 could include nitrogen recovery from waste water, not just phosphorus, and activity 2.5 could encompass the recovery of manure, not just bio-waste. Streamlining these activities by proposing a unified category, such as “Nitrogen and phosphorus recycling from waste water, manure, or other organic waste and by-products” could simplify the taxonomy and ensure that producers can easily claim and benefit from its provisions.

## 2.3. National level

At the national level, additional legal conditions may hamper the uptake of circular fertilisers. The diversity of implementation or interpretation at national level of the EU legislations introduced in the previous section can cause issues. This section examples of regulatory obstacles in Austria, Belgium, Denmark, France, Germany, Greece, Italy, the Netherlands, Spain and Sweden.

### 2.3.1. Implementation of the Waste Framework Directive: the lack of harmonisation of the end-of-waste criteria

Article 6 of the WFD encourages Member States to take measures to set an end-of-waste criteria at national level. The objective is to encourage the use of the output materials from recovery operations by exempting them from the stringent and burdensome waste rules in national waste legislation. Member States are supposed to set a number of requirements which, once met, lead to the output material being classified as no longer waste but a product/fertiliser.


However, Member States have implemented the end-of-waste criteria in various ways:

In some countries, there is no end-of-waste criteria for certain/all circular fertilisers. In that case, the output material from the recovery process will remain waste. For instance, producers must obtain a specific authorisation/certificate of use to apply their material or respect a spreading plan (that will need to be frequently updated). This typically entails a high administrative burden and does not facilitate changes in the feedstocks used in the production process.


In other countries, the output materials can be categorised as fertilisers/products but without having received an end-of-waste criteria. The effect can actually be very similar to having an end-of-waste status.

Finally, in some countries, the output materials can receive the end-of-waste status and be categorised as fertilisers/products through national law. While this is ideally the best-case scenario, in certain instances, it does not reduce the administrative burden.


Setting an end-of-waste criteria is not always the primary concern. The key factor is to have clear legislation providing legal certainty for all types of products and requirements that can be easily operationalised, thus avoiding red-tape. Indeed, maintaining the waste classification may not significantly affect administrative burden or lead to regulatory obstacles but will primarily influence the public perception of circular fertilisers. As long as circular fertilisers are classified as waste, their value is diminished, hindering their broader acceptance and utilisation.

 The Compost Ordinance of 2001 (Federal Minister for Agriculture and Forestry, Environment, and Water Resources, 2009), which is currently under revision, sets up quality requirements for **compost** produced from waste in Austria. Compost that meets these requirements is granted end-of-waste status.


The Fertiliser Act (Federal Ministry for Agriculture, Regions and Tourism, 2021) and the Fertiliser Ordinance (Federal Ministry for Agriculture, Forestry, Environment and Water Management, 2004) regulate the placement of fertilisers in the market. Certain **digestates** can be classified as “biogas slurry” according to these legislations but they remain waste until proper recovery on the soil.

 In Belgium, the Royal Decree on marketing and use of fertilisers, soil improvers and cultivation substrates (Royal Decree, 2013) includes **struvite**, **compost**, **stabilised sludge**, **feather meal** and **spent mushroom substrate**. These products can be granted end-of-waste status when quality requirements are fulfilled.

While it is not included in the Royal Decree, **digestate** can still receive end-of-waste status in Flanders when compliant with the Flemish Regulation on Sustainable Management of Material Cycles and Waste Materials (VLAREMA, Flemish Government, 2012) and the VLACO certification.


 Order No. 1001 on the use of waste for agricultural purposes (Danish Ministry of Environment and Food, 2018) contains rules applicable to **compost**, **digestate** and **stabilised sludge**.


If livestock manure makes up more than 75% of the feedstock, digestate can be applied according to a specific Order on commercial animal husbandry, animal manure, silage (Danish Ministry of Environment and Energy, 1992). If waste constitutes more than 25% of the feedstock, the digestate producer is required to prepare a declaration, and authorities must be informed regarding the application of digestate as fertiliser.


 **Compost** can be classified as a product rather than waste in France when compliant with the NFU standard 44-051 for organic amendment (AFNOR, 2023). When the compost includes sewage sludge, French standard NF U44-095 applies (AFNOR, 2002).


The utilisation and commercialisation of **digestate** is governed by the Rural and Maritime Fishing Code (articles 255.2 to 255.5, Legifrance, 2024). Most digestates are managed under a spreading plan according to waste legislation, and as a result, digestate maintains its status as waste. Several options are available to obtain end-of-waste status, including securing a marketing authorisation (AMM) issued by ANSES (French Agency for Food Safety).


**Struvite** remains under waste status in France.

 In Germany, the revised Bio-waste Ordinance (BioAbfV, Germany, 2021) sets requirements on suitable input materials, processes, quality, and hygiene of **compost** and **digestate** and their application, and obligations to prove the compliance with the requirements. The Fertiliser Ordinance (Germany, 2021) set minimum quality criteria for contaminants and useful components. Compost and digestate are considered waste until they have been applied to soil (in the case of agricultural use). However, the waste law-based regulatory controls are reduced considerably if a quality assurance system is applied.

 The Ministerial Decree of 19 June 2023 (Greece, 2023) classifies **compost**, **digestate** and **stabilised sludge** as soil improvers but do not grant them end-of-waste status.

 According to the Italian Legislation (Legislative Decree of 29 April 2010, n 75, Italy, 2010) the end-of-waste status of bio-waste can only be achieved via **compost**, which is classified as a soil improver. In Italy, **digestate** is always considered waste and the only way to gain the status of product for digestate is to undergo a post-composting treatment and be marketed as compost.

 In the Netherlands, the regulation of fertilisers is governed by the Fertilisers Act (Netherlands, 2024), the Implementation Decree on the Fertilisers Act (Netherlands, 2024) and the Fertilisers Act Implementation Regulations (Netherlands, 2024) which oversee aspects such as production, use, trade, and export. They include **compost**, **digestate**, **stabilised sludge** and **spent mushroom substrate** but they remain under waste legislation.

 Sweden does not have specific legislation for fertilisers or end-of-waste criteria. Instead, materials can be certified through quality assurances schemes. **Compost** can be certified under SPCR 152 certification system, **digestate** as “biofertiliser” under the SPCR 120 (Avfall Sverige, 2024) and digestate derived from sewage sludge under the REVAQ system (SPCR 167).

### 2.3.2. Implementation of the Waste Framework Directive: Member States delay to reach the EU recycling and bio-waste separate collection targets

The EU Waste Framework Directive mandates that Member States increase the proportion of municipal waste prepared for reuse or recycling to 55% by 2025. To support this goal, starting 31 December 2023, separate collection of bio-waste has become mandatory across the EU, with the aim of enhancing recycling rates. These requirements were introduced in the 2018 revision of the Waste Framework Directive. Member States must adjust their waste management systems and



potentially offer relevant incentives to meet these objectives. Currently, many Member States are at risk of falling short of these targets.

The revised WFD adopted in 2018 established a system of early warning reports to identify shortcomings and enable timely corrective actions before target deadlines. The Commission was tasked, in cooperation with the European Environment Agency, to prepare reports on the progress of Member States towards the attainment of the targets. In June 2023, a second Early Warning Report was issued by the European Commission. This overall report assesses Member States' likelihood of meeting the 2025 targets including the minimum target of 55% preparing for re-use and recycling of municipal waste but also other requirements such as implementing separate collection of waste. The report identified 18 Member States at risk of missing the 55% target. Among the 10 countries of interest in FER-PLAY, four are at risk: France, Greece, Spain, and Sweden.

In another report in 2023, the European Environment Agency (EEA) analysed the key economic instruments for improving municipal waste management:

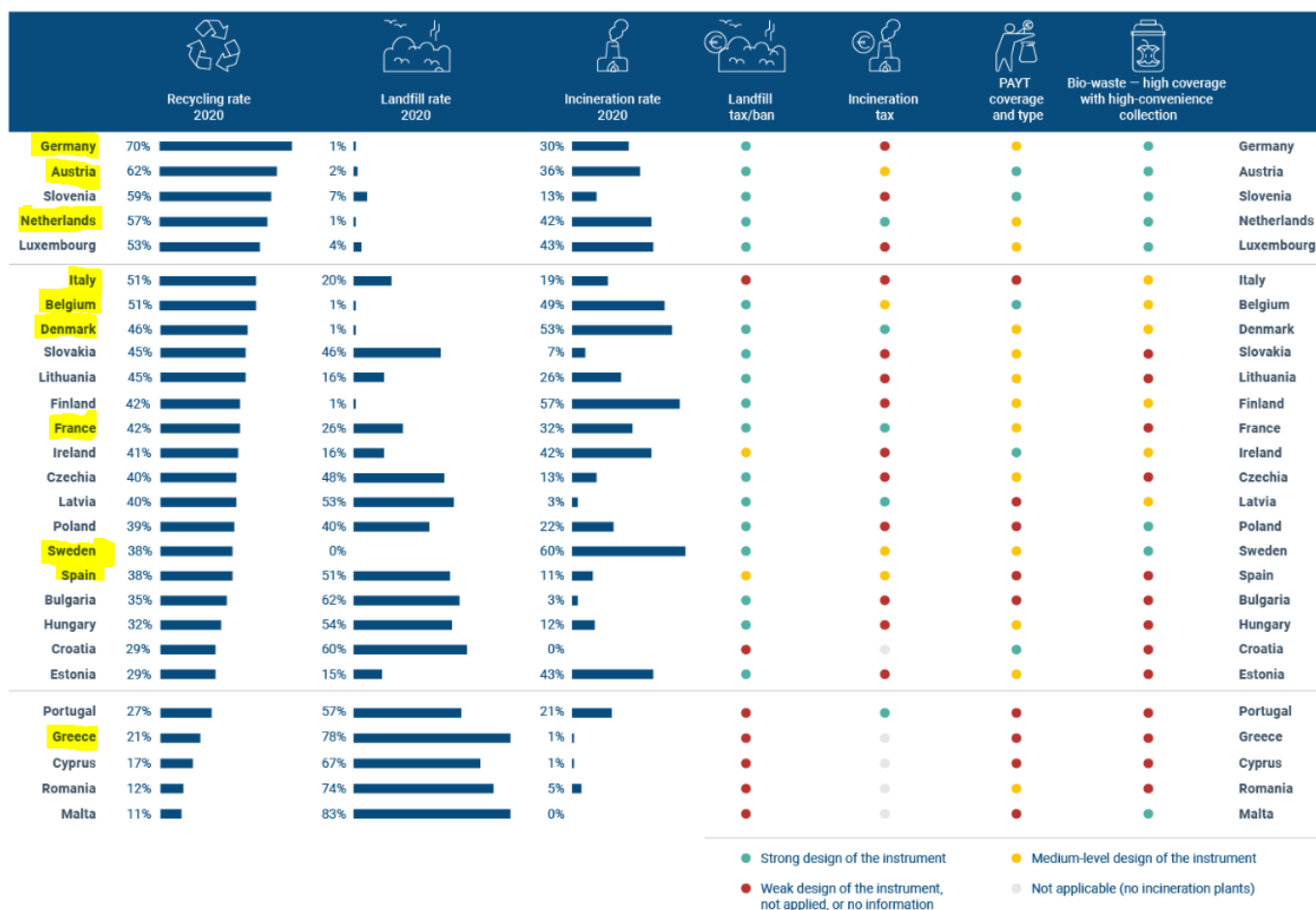
- **Landfill taxes** are levied on the landfilling of certain wastes. They aim to make landfilling these wastes more expensive and thus recycling and prevention more competitive, to incentivise pre-treatment and/or generate revenue that can be invested in better waste management.
- **Incineration taxes** are levied on the incineration of certain wastes with the aim of making incinerating them more expensive and thus recycling and prevention more competitive. They are sometimes set at a lower level if incineration with energy recovery is used than if incineration without energy recovery is used.
- **Pay-as-you-throw systems** follow the polluter-pays principle and involve charging waste producers a fee for waste collection services in proportion to the amount of mixed municipal waste they generate. Fees are reduced or eliminated for recyclables that have been separated at source.
- **Separate collection systems** require that waste producers (i.e. citizens, public or private entities) separate their waste at source into different waste materials or combinations of materials that are then collected separately for further processing. As previously mentioned, increasing the availability of source-separated bio-waste is particularly important to drive the production of circular fertilisers, such as compost and digestate from bio-waste.

The EEA report also provided an overview of the current rates of recycling, landfill and incineration in the 27 EU Member States along with the main economic instruments applied and the coverage of the population with high-convenience separate collection systems for bio-waste. NB: It should be noted that some of the results in this report are based on data from previous years, dating back to 2019 or 2020.



From the 10 FER-PLAY targeted countries:

- Germany, Austria and the Netherlands have already met the 2025 recycling target and are recognised for their strong bio-waste collection systems (featuring high coverage with high convenience collection).
- Italy, Belgium and Denmark are close to reaching the recycling target and considered to have a medium-level bio-waste collection system.
- France, Sweden and Spain, France, Sweden, and Spain are performing relatively well in terms of meeting recycling targets. However, France and Spain have weaker bio-waste collection systems while Sweden has a strong system.
- Greece is not on track to achieve the recycling target and its bio-waste collection system is also considered to be weak.




**Figure 9.** Overview of waste management systems in Europe.


Source: European Environment Agency (2023).

Member States need to develop strategies to expand the population coverage with separate collection systems for bio-waste or to improve the effectiveness of collection systems already in place. To achieve optimal results, these collection systems should be easily accessible and convenient for citizens and other waste producers to encourage participation in recycling efforts. Effective communication and incentives for source separation can further improve collection results. Individualised models, such as door-to-door schemes, which identify users and monitor quality, tend to perform well. Additionally, adjusting the frequency of bio-waste collection to match storage capabilities and climate conditions is crucial.

In addition to the quantity of bio-waste separately collected, quality is equally important. To ensure the return of circular fertilisers from bio-waste to the soil, bio-waste recycling must achieve low levels of impurities and contaminants and guarantee high-quality products. Besides being source-separated, the quality of materials entering composting and biogas plants must be controlled at source.

Examples of best practices in EU municipalities (Zero Waste Europe, 2020):


 Milan exemplifies successful residential food waste collection in a large, densely populated city. In 2019, Milan captured approximately 105 kg of food waste per capita annually, close to the estimated total generation of 120 kg per capita. Launched in 2014, Milan's food waste collection involved an extensive information campaign, providing households with a 10-liter vented kitchen bin and 25 compostable bags. The program maintains a low contamination rate of about 5%. Milan's success partly came from being the last municipality in the region to adopt bio-waste collection so residents were already familiar with the practice. A dedicated caretaker service sets out and retrieves bins, and a door-to-door scheme with transparent bags allows for visual inspections and fines for improper sorting.


 Catalonia's landfill tax and refund scheme is another example of how public authorities can effectively promote municipal waste recycling and separate bio-waste collection. Though Spain lacks a national landfill tax, Article 16 of the Spanish Waste Act allows regional authorities to implement economic incentives for waste prevention and separate collection. Catalonia's scheme, managed by the Waste Agency of Catalonia (ARC), ensures that bio-waste collection and treatment are cheaper than landfill or incineration. At least 50% of the landfill tax revenue funds biological and mechanical-biological waste treatment, with the rest refunded to local authorities based on their bio-waste collection performance. Quality coefficients are included, requiring mandatory waste composition analyses funded by the

tax. The landfill tax, set at €47.1/t in 2020, will rise to €70/t in 2024 to further encourage bio-waste collection. Municipalities without an implementation plan will face higher taxes.

### 2.3.3. Implementation of the Nitrates Directive: the issue of nitrogen efficiency for circular fertilisers

In addition to the discriminatory barrier resulting from the 170 kg limit for processed manure in NVZ, another common barrier is found in the implementation of Annex III. Indeed, point 1.3(c) of Annex III requires Member States to include rules in their action programmes regarding the "limitation of the land application of fertilisers". These rules must "be based on a balance between (i) the foreseeable nitrogen requirements of the crops, and (ii) the nitrogen supply to the crops from the soil and from fertilisation". In accordance with this provision, Member States are required to define in their national legislation how to calculate this balance. However, in some countries, the method used for calculating this balance may disadvantage circular fertilisers, leading to their under-utilisation and potentially sub-optimal crop yields.

 For instance, the Italian Legislative Decree 3 April 2006, n. 152 on Environmental regulations allows each region to set a nitrogen use efficiency value for different nitrogen fertiliser. Typically, urea has a nitrogen use efficiency (NUE) of 1, meaning that 100% of the nitrogen supplied is utilised by the plant. However, in several regions, compost or digestate from manure and biowaste are also assigned an NUE of 1, despite their lower efficiency compared to synthetic fertilisers. This discrepancy represents a significant barrier for the end-users of these circular fertilisers.








 Bavaria encounters a similar issue. When a farmer applies for a payment under the Cultural Landscape Programme (KULAP), the region considers that all circular fertilisers (including compost and digestate from manure as well as spent mushroom substrate) have a NUE of 1, resulting in a reduced use.



### 2.3.4. Implementation of the Sewage Sludge Directive: a lack of harmonisation due to a low EU standard

The Sewage Sludge Directive has never been substantially amended since its adoption nearly 40 years ago. In contrast, in parallel to progress on the knowledge of sludge properties, treatment and use, the wider environmental legislative and policy framework has advanced considerably.

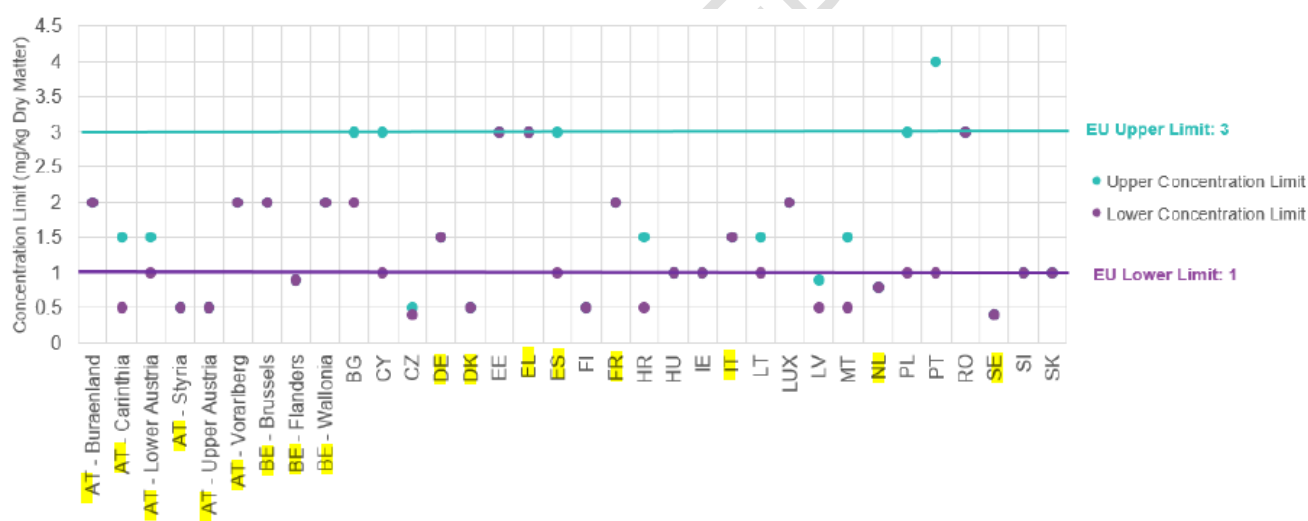
In May 2023, the European Commission released its latest evaluation of the SSD. This evaluation reveals considerable variability in implementation, largely due to the influence of local conditions and policy choices by Member States.

Firstly, 17 Member States have set more stringent concentration limits for heavy metals in soil and sludge than those specified in the Directive.

Among the 10 FER-PLAY targeted countries, this applies to 7 of them:  Austria,  Belgium,  Denmark,  France,  Germany,  the Netherlands and  Sweden.

Alternatively,  Spain and  Greece have typically established limits for heavy metals that align with the upper thresholds defined in the SSD.

For example, the limit for the concentration of cadmium in soils is as follows:



**Figure 10.** EU Member State limit values for the concentration of cadmium in soils.




Source: European Commission, Directorate-General for Environment, 2022.

Among the 10 FER-PLAY targeted countries, Sweden has established the most stringent limits for cadmium.

Secondly, many Member States have also set rules for additional pollutants. The majority of Member States have set limit values for chromium in soil and sludge. Most countries have set limit values for chromium in soil and sludge, with the Netherlands and Austria applying the most stringent upper limits. Over half of the Member States have also introduced limits for additional

substances such as other heavy metals, arsenic, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and absorbable organic halogens (AOX).

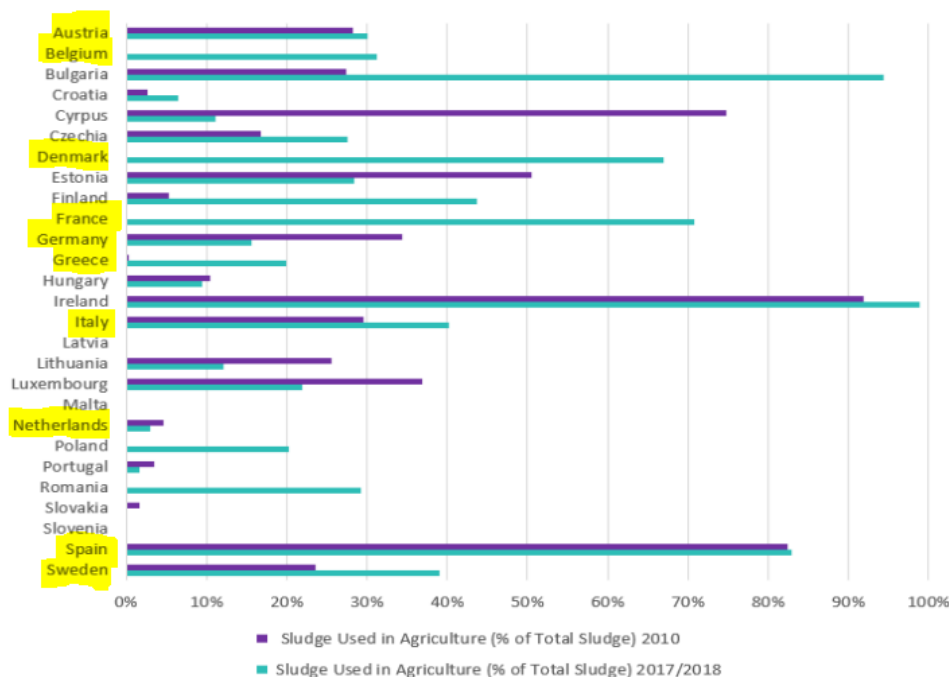
Thirdly, some Member States have totally banned the use of sewage sludge in agriculture.

In the 10 FER-PLAY targeted countries, this situation applies to  some regions of Austria (Vienna, Salzburg and Tyrolia), the  Brussels and Flanders regions of Belgium and  the Netherlands (since 1995).

Germany and Austria have implemented obligations for phosphorus recovery and recycling from sewage sludge. In Germany, starting in 2032, urban waste water treatment plants serving over 50,000 p.e. must either recover phosphorus if the sludge contains more than 2% phosphorus by dry solids or incinerate the sludge in mono-incinerators. Meanwhile, Austria requires plants serving over 20,000 p.e. to either incinerate their sewage sludge with phosphorus recycling or recover 60% of the phosphorus from the sewage works inflow by 2033.

Regarding the use of sewage sludge in agriculture, as shown in **Figure 11**, the EU average stands at just 31%. Among the 10 FER-PLAY targeted countries, Austria, Germany, Greece, and the Netherlands fall below this EU average. In contrast, Belgium, Denmark, France, Italy, Spain, and Sweden exceed it, with Spain recycling over 80% of its sewage sludge in agricultural applications.

Share of sewage sludge used in agriculture (as % of total sludge produced)



Source: Member State Implementation Reports

**Figure 11.** Share of sewage sludge used in agriculture.

Source: European Commission, Directorate-General for Environment (2022).

Apart from using sewage sludge in agriculture, some countries incinerate a large proportion of their sewage sludge, such as the Netherlands, Belgium, and Germany (82-98%). Some countries, such as Greece and Italy, dispose of significant amounts of sludge in landfills.

In general, public and farmer confidence in the use of sewage sludge varies across the EU. This mixed confidence largely originates from concerns about safety and odour nuisances, which can lead to lower acceptance of sludge by farmers. There is often a lack of understanding about the safety of using sewage sludge, which can even result in resistance from food retailers and consumers regarding crops grown in soil fertilised with sewage sludge.


In line with the EU's objective of transitioning to a circular and sustainable economy, the SSD plays a crucial role in driving the return of nutrients to soil. By establishing stricter environmental protection standards, such as more stringent pollutant limits and/or the inclusion of additional pollutants, the directive could enhance public perception and positively influence the acceptance and use of circular fertilisers derived from sewage sludge.

### 2.3.5. The unnecessary alignment of the national legislation with the EU Fertilising Products Regulation

Unlike EU regulations, the EU Fertilising Products Regulation operates in parallel to national legislation and mutual recognition, offering only optional harmonisation. The FPR does not prevent fertilising products from being made available on the internal market based on national law and general free movement rules. Consequently, Member States can establish their own requirements to place a product on the market as soil improver or fertiliser. It is up to a manufacturer to decide whether it applies for a CE mark to benefit from free circulation in the EU's internal market.

The FPR is aiming at the highest level of protection of human, animal, and plant health, of safety and of the environment. However, Member States have the flexibility to establish less stringent requirements on aspects such as the nutrient content or contaminants limits depending also on local conditions. They may also choose to implement more affordable and streamlined conformity assessment procedures to facilitate market access for smaller producers.

Consequently, Member States which decide to align their national legislation with the FPR may generate significant barriers for producers. Policy makers at the national level should be aware that the regulation of circular fertilisers as a fertilising product without CE marking remains essential.


 The Spanish Royal Decree 506/2013 on Fertilisers products (amended by Royal Decree 529/2023) regulates struvite, compost and digestate. The requirements in the Decree, which confer end-of-waste status to the materials, are derived from the EU Fertilising Products Regulation and therefore challenging for many manufacturers to meet.


Since December 2022, the Royal Decree 1051/2022 on sustainable nutrition in agricultural soils governs the application of these fertilisers to soil. Although this decree focuses on application rather than commercialisation, it also includes certain requirements from the EU Fertilising Products Regulation (such as exclusions of certain input materials and limits for heavy metals) that can be difficult for manufacturers to comply with. This poses a significant barrier to the widespread application of these circular fertilisers.

### 2.3.6. Implementation of the Common Agricultural Policy: potential for further voluntary measures to support circular fertilisers

The Common Agricultural Policy (CAP) of the European Union establishes a framework for Member States to promote sustainable agricultural practices, including the use of circular fertilisers. While SMRs and GAECs are required at the EU level and mandatory for all Member States, there is flexibility for Member States to introduce additional voluntary measures under eco-schemes and rural development programmes to further support the uptake of circular fertilisers. Nonetheless, this practice is not widely adopted across Member States in the CAP 2023-2027.

Examples of voluntary measures supporting the uptake of circular fertilisers:

 The Austrian CAP Strategic Plan includes the intervention 70-08 “Ground-level application of liquid manure and liquid manure separation”. This payment under agri-environment-climate commitments (AECCs) is designed to reduce ammonia emissions by providing financial support for equipment that safely injects manure or digestate directly into the soil, such as drag hose distributors or manure injectors. This also contributes to prevent nutrient losses and reduce GHG emissions. The intervention also supports the separation of manure concentrate into a solid and a liquid phase.

 The intervention 70.24 “Revitalisation and protection of soils” focuses on Corsica. This payment, part of AECCs, aims to support soil preservation, revitalisation and protection for sustainable land use. Recognising that “green/organic fertilisers” provide essential nutrients while contributing to revitalising soils, the intervention supports practices such as restoring



soil fertility with locally produced compost and improving soil structure through the use of green fertilisers in viticulture and cereal cultivation.

🇬🇷 In Greece, the eco-scheme 31.4 “Circular economy applications in agriculture” aims to promote circular economy practices by ensuring that all agricultural biomass is biodegraded and returned to the field as a soil improver. In concrete terms, this eco-scheme provides funding for the supply and application of compost, digestate, and stabilised sludge.

🇮🇹 The Italian CAP Strategic Plan includes the AECC SRA04 "Supply of Organic Matter to the Soil". This intervention provides financial support to beneficiaries across various regions who commit to enhancing soil health through the application and maintenance of organic fertilisers or soil improvers. Depending on the regions, compost, digestate, stabilised sludge and/or spent mushroom substrate are eligible.

## 2.4. Conclusions

At international level, several regulatory initiatives have been identified at international level with the objective of harmonising standards, sharing best practices and facilitating cooperation among countries to promote the broader uptake of circular fertilisers. These initiatives are classified as “soft law”, meaning they consist of political commitments rather than legally binding regulations. While they play an important role in setting expectations and guiding the behaviour of stakeholders, they do not impose mandatory requirements on the producers or users of circular fertilisers.

At the European level, the analysis found three types of cases:

- Legislations containing legislative provisions which are **significantly hindering the adoption** of most FER-PLAY circular fertilisers: the Waste Framework Directive and the Fertilising Products Regulation.
- Legislations containing legislative provisions which **could be refined to better encourage the adoption** of most FER-PLAY circular fertilisers: the Nitrates Directive, the Sewage Sludge

Directive, the Organic Farming Regulation, the Common Agricultural Policy, the Urban Waste Water Treatment Directive and the Taxonomy Regulation.

- Legislations containing legislative provisions which are either **not obstructing the adoption** of most FER-PLAY circular fertilisers (the Animal By-Products Regulation) or are actually **encouraging it** (the Carbon Removals and Carbon Farming Certification Framework and the Soil Monitoring Law).

At the national level, the implementation of the European legislations can create further challenges, whether due to inconsistencies between national laws (implementation of the Waste Framework Directive and of the Sewage Sludge Directive), delays (implementation of the Waste Framework Directive), excessive strictness (implementation of the Nitrates Directive and the Sewage Sludge Directive and alignment of the national legislation with the optional Fertilising Products Regulation) or a lack of ambition (implementation of the Common Agricultural Policy).

## 2.5. Recommendations

### 2.5.1. Tackling regulatory barriers at European and national level

Several recommendations could be implemented to overcome the issues identified in the European legislations, both in the initial text and at national level:

1. The Waste Framework Directive should not be revised during the 2024-2029 mandate of the EU Institutions, as it underwent a targeted revision in the previous term. However, several recommendations should be addressed for a future revision:
  - To promote the use of circular fertilisers, all processes involved in their production should be classified under recycling within the waste hierarchy.
  - Member States should establish legislation providing legal certainty for all types of end products, i.e. circular fertilisers. Once reasonable requirements are met, these products

should be granted end-of-waste status, enhancing their value and encouraging broader acceptance and use. Additionally, setting-up quality assurance schemes at national level can be beneficial for circular fertilisers derived from biowaste and sewage sludge, as these sources often raise concerns about toxicity and environmental impact. Thorough monitoring to ensure compliance with hygienic standards and testing for additional contaminants will result in high-quality products that can gain public trust.

- It is essential for Member States to develop strategies to achieve the target of 55% of municipal waste being prepared for reuse or recycling by 2025. New systems for the separate collection of biowaste must be introduced and the effectiveness of existing systems must be improved. Furthermore, to encourage the use of circular fertilisers derived from biowaste, recycling processes must produce products with low levels of impurities and contaminants, ensuring high quality products.

It is uncertain whether the **Animal By-Products Regulation** will be revised in the near future.

The **Nitrates Directive** is currently under evaluation by the European Commission.

- To create a level playing field between synthetic fertilisers and circular fertilisers, such as the solid fraction of digestate and spent mushroom substrate, the discriminatory limit for manure (e.g., 170 kg of N/ha/year) could be replaced with a maximum limit for nitrogen surplus. This new limit would consider nitrogen inputs from all sources, including manure, fertilisers, nitrogen fixation, and atmospheric deposition. This approach targets the core issue of nitrate leaching, which is caused by the nitrogen surplus not absorbed by crops, irrespective of the nitrogen source. It would also give farmers the flexibility to choose the best practices to stay within this limit.
- Furthermore, when Member States define the calculation for the nitrogen balance, they should consider that some circular fertilisers, like compost or digestate, have a lower nitrogen use efficiency compared to synthetic fertilisers. The nitrogen use efficiency for these circular fertilisers should not be assumed to be equal to 1.

Since the last evaluation of the **Sewage Sludge Directive** found that it continues to maintain its added value and relevance, no revision is currently planned.

- However, to prevent inconsistencies between Member States and overly stringent national restrictions, the Sewage Sludge Directive should be updated to potentially include stricter concentration limits for heavy metals and set limits for additional pollutants. This revision would increase farmers' trust in products like struvite, compost, and digestate derived from sewage sludge, as well as stabilised sludge, thereby promoting their use in agriculture.

The **Fertilising Products Regulation** is continually updated, with delegated acts adopted to include new input materials or processes in CMCs for instance.

- The FPR's requirements should be reviewed to establish achievable standards for producers, such as the nutrient content requirement for 'PFC 1(A)(II) Liquid Organic Fertiliser'. The regulation should also expand to include new materials like sewage sludge and industrial sludge in 'CMC 3 – Compost' and 'CMC 5 – Digestate other than fresh crop digestate'.
- The inclusion of feather meal and Spent Mushroom Substrate in CMC 10 should be sped up. Additionally, the FPR needs to recognise the most common processing methods for feather meal.
- Alternative transformation parameters authorised by competent authorities under the ABPR should be permitted to treat animal by-products that will be used as input materials for 'CMC 3 – Compost' and 'CMC 5 – Digestate other than fresh crop digestate'.
- The operationalisation of the FPR must be completed by establishing new notified bodies and publishing EU-harmonised standards for testing methods through CEN. In the longer term, simplifying procedures and making certification more accessible for smaller companies is desirable.
- Due to the numerous barriers still present within the FPR, it is crucial for Member States to maintain a separate national legislative framework, setting their own requirements for marketing products as soil improvers or fertilisers. This framework should adapt to local conditions, offering more flexible requirements and simplified procedures to facilitate market access for producers.

The possibility of a revision to the **Organic Farming Regulation** in the near future remains uncertain.

- However, the regulation should be updated to allow the use of struvite certified under national legislation (not just under the FPR) in organic farming.
- Additionally, the concept of "factory farming" needs to be clearly defined at the EU level, or further guidance should be provided for Member States to establish their own definition. This would stimulate the production and use of fertilisers derived from animal by-products in organic farming.

In 2025, the European Commission will conduct a first performance review of each **Common Agricultural Policy** strategic plan and may request specific follow-up actions to EU countries. An interim evaluation of the CAP 2023-2027 is scheduled for 2026.

- The CAP should include mandatory measures, either under Statutory Management Requirements (SMRs) or Good Agricultural and Environmental Conditions (GAECs), that require farmers to produce or use circular fertilisers.
- In their CAP Strategic Plans, Member States should introduce additional voluntary measures under eco-schemes and rural development programmes to further support the uptake of circular fertilisers.

The **Carbon Removal and Carbon Farming Certification Framework** will require formal approval of the new European Parliament and the Council of the EU before being published in the Official Journal of the European Union and coming into force.

Negotiations between the Council, Parliament, and Commission on **the Soil Monitoring Law** will start during the next legislature by the end of 2024.

The **Urban Waste Water Treatment Directive** will also require formal approval of the new European Parliament and the Council of the EU before being published in the Official Journal of the European Union and coming into force.

- In a future revision, including a minimum reuse and recycling rate also for nitrogen would further support the production of circular fertilisers derived from sewage sludge.

The next cut-off date for the Taxonomy Stakeholder Request Mechanism is at the end of 2024. It allows stakeholders to propose new activities for inclusion in the **Taxonomy Regulation** or suggest amendments to the technical screening criteria for existing activities.

- Streamlining taxonomy activities related to the production of circular fertilisers by proposing a unified category, such as “Nitrogen and phosphorus recycling from waste water, manure, or other organic waste and by-products”, could simplify the taxonomy and ensure that producers can easily claim and benefit from its provisions.

### 2.5.2. Introducing new regulatory drivers at European level

In addition to addressing the policy barriers identified in the analysis, new regulatory drivers could be introduced to promote the uptake of circular fertilisers. FER-PLAY offers several recommendations:

#### Revitalising the Integrated Nutrient Management Action Plan

FER-PLAY strongly advocates for the reintroduction of the European Commission's Integrated Nutrient Management Action Plan (INMAP), a critical initiative that was unfortunately abandoned. INMAP had the potential to significantly advance policy measures aimed at closing the nutrient

cycle and preventing nutrient losses. By establishing a comprehensive and holistic framework, INMAP could facilitate the widespread adoption of circular fertilisers, promoting more efficient nutrient use in agriculture. This initiative aligns with the EU's broader environmental and climate objectives, supporting efforts to reduce pollution, enhance soil health, and achieve agricultural sustainability.

Revitalising the INMAP would not only provide crucial policy incentives but also foster innovation and collaboration across Member States, driving the transition towards a circular economy in nutrient management. Additionally, it would stimulate research and development in sustainable fertiliser technologies, contributing to economic growth and resilience in the agricultural sector.

### **Establishing a European Nutrients Recycling Target**

FER-PLAY recommends the implementation of a European Nutrients Recycling Target to promote the recycling of essential nutrients such as phosphate and nitrogen within specific sectors. This target would mandate a minimum percentage of recycled nutrients to be used in fertilisers sold across the European Union.

However, this nutrients target risks only incentivising the blending of recycled nutrients within synthetic fertilisers. Therefore, it might not benefit producers of organic fertilisers like compost or digestate which will need to benefit from other types of targets which take into consideration the essential role of organic fertilisers in enriching the soil organic content.

Such a target should also not lead to price increases for fertilisers, which could exacerbate the current agricultural crisis. Nonetheless, if the burden is shared across fertiliser producers and includes cooperation throughout the entire food value chain, these issues can be mitigated.

A similar target could be implemented for the use of organic matter derived from recycling processes, for instance in the production of growing media. This would incentivise EU producers to replace traditional materials, such as peat and coconut shell/fiber, with locally sourced resources from the recycling of waste and by-products.

### **Implementing fiscal tools for sustainable nutrient management**

FER-PLAY advocates for the adoption of fiscal tools to promote sustainable nutrient management and the use of circular fertilisers. We propose the introduction of tax incentives, such as a reduced VAT rate on recycled nutrients, to encourage the production and use of these environmentally sustainable alternatives. Additionally, eco-taxes on primary nutrients found in synthetic fertilisers and chemicals could be implemented to internalise the environmental costs associated with their use. These fiscal measures would create economic incentives for producers, markets, and users to shift towards more sustainable practices.



Other potential tools include monetising external costs, establishing use quotas or rewards for sustainable practices, implementing border tariffs to ensure fair competition, and promoting eco-labels and public procurement policies which prioritise circular fertilisers.

### **Considering the integration of agriculture into the Emissions Trading System**

FER-PLAY recommends extending the benefits of the Emissions Trading System (ETS) to farmers who utilise low CO<sub>2</sub> footprint fertilisers. This integration would enable food retailers to compensate for their environmental footprint by prioritising low carbon footprint products, thus promoting sustainable agricultural practices. Circular fertilisers could be recognised for ETS credits due to their potential for significantly reduced GHG emissions compared to synthetic fertilisers.

This measure would incentivise the use of fertilisers with the lowest GHG emissions, encouraging farmers and agri-businesses to adopt practices that contribute to climate goals. Recognising and rewarding the use of low carbon fertilisers within the ETS framework would reduce the agricultural sector's carbon footprint and support the EU's broader climate objectives.

### **Enhancing Research and Innovation in sustainable nutrient management**

FER-PLAY highlights the critical need for strong support for research and innovation in sustainable nutrient management, leveraging programmes like Horizon Europe. We recommend increasing funding and creating targeted calls for projects that develop innovative solutions for nutrient recycling, circular fertilisers, and sustainable agricultural practices. By prioritising research in this area, we can accelerate the development of new technologies and practices that minimise nutrient losses, reduce environmental pollution and enhance soil health.

Furthermore, fostering collaborations between academia, industry and farmers will ensure that innovative solutions are practical, scalable, and effectively integrated into agricultural systems. Establishing research networks and innovation clusters focused on nutrient management can also facilitate knowledge exchange and the dissemination of best practices across the EU.

## **2.6. References**

ACR+ (2024). *Letter on sustainable resource management*. ACR+. [https://www.acrplus.org/images/position-papers/2024\\_04\\_Letter-Sustainable\\_Resource.pdf](https://www.acrplus.org/images/position-papers/2024_04_Letter-Sustainable_Resource.pdf)

AFNOR. (2002, May). *NF U44-095: Amendements organiques - Composteurs contenant des matériaux d'intérêt agronomique, issus du traitement des eaux*. AFNOR.



<https://www.boutique.afnor.org/fr-fr/norme/nf-u44095/amendements-organiques-composts-contenant-materiaux-d-interet-agronomique-issus-du-traitement-des-eaux/fa125065/754>

AFNOR. (2023). *NF U44-051: Amendements organiques—Dénominations, spécifications et marquage*. AFNOR. <https://www.boutique.afnor.org/fr-fr/norme/nf-u44051/amendements-organiques-denominations-specifications-et-marquage/fa125064/754>

Avfall Sverige. (2024). *Certifieringsregler för biogödsel vägledning SPCR 120* [Certification rules for biogas fertilisers, guidance SPCR 120]. [https://www.avfallsverige.se/media/5jylwf4/spcr120\\_2024\\_va-gledning.pdf](https://www.avfallsverige.se/media/5jylwf4/spcr120_2024_va-gledning.pdf)

Bavarian State Ministry of Food, Agriculture and Forestry. (n.d.). *Förderung von Agrarumweltmaßnahmen in Bayern* (KULAP). <https://www.stmelf.bayern.de/foerderung/foerderung-von-agrarumweltmassnahmen-in-bayern/index.html>

Commission of the European Communities. (1995). *Guidelines for the use of livestock excrements in organic farming*. Orgprints. <https://orgprints.org/id/eprint/45435/>

Council of the European Union. (1986). *Council Directive 86/278/EEC of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture*. Official Journal of the European Communities. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A31986L0278>

Council of the European Union. (1991). *Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment*. Official Journal of the European Communities. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A31991L0271>

Council of the European Union. (1991). *Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources*. Official Journal of the European Communities. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A31991L0676>

Council of the European Union. (2024). *New strategic agenda*. [https://www.consilium.europa.eu/media/4aldqfl2/2024\\_557\\_new-strategic-agenda.pdf](https://www.consilium.europa.eu/media/4aldqfl2/2024_557_new-strategic-agenda.pdf)

Danish Ministry of Environment and Energy. (1992, January 6). *Order No. 11 on the use of waste for agricultural purposes*. Retsinformation. <https://www.retsinformation.dk/eli/lta/1992/11>

Danish Ministry of Environment and Food. (2018, June 27). *Order No. 1001 on the use of waste for agricultural purposes*. Retsinformation. <https://www.retsinformation.dk/Forms/R0710.aspx?id=200077>

European Commission, Directorate-General for Environment. (2022). *Support to the evaluation of the Sewage Sludge Directive – Final implementation report*. Publications Office of the European Union. <https://data.europa.eu/doi/10.2779/758730>

European Commission. (2011). *Commission Regulation (EU) No 142/2011 of 25 February 2011 implementing Regulation (EC) No 1069/2009 of the European Parliament and of the Council laying down health rules as regards animal by-products and derived products not intended for human consumption and implementing Council Directive 97/78/EC as regards certain samples and items exempt from veterinary checks at the border under that Directive*. Official Journal of the European Union. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32011R0142>

European Commission. (2020). *A farm to fork strategy for a fair, healthy and environmentally-friendly food system* (COM/2020/381 final). European Commission. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020DC0381>

European Commission. (2020). *A new circular economy action plan: For a cleaner and more competitive Europe* (COM/2020/98 final). European Commission. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020DC0098>

European Commission. (2020). *Biodiversity strategy for 2030: Bringing nature back into our lives* (COM/2020/380 final). European Commission. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020DC0380>

European Commission. (2021). *Commission delegated regulation (EU) 2021/2139 of 4 June 2021 supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council by establishing the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to climate change mitigation or climate change adaptation and for determining whether that economic activity causes no significant harm to any of the other environmental objectives*. Official Journal of the European Union. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32021R2139>

European Commission. (2021). *Implementing Regulation (EU) 2021/1165 of 15 July 2021 authorising certain products and substances for use in organic production and establishing their lists*. Official Journal of the European Union. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32021R1165>

European Commission. (2021). *Pathway to a healthy planet for all: EU action plan ‘Towards zero pollution for air, water, and soil’* (COM/2021/400 final). European Commission. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021DC0400>

European Commission. (2021). *Soil strategy for 2030: Reaping the benefits of healthy soils for people, food, nature, and climate* (COM/2021/699 final). European Commission. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021DC0699>

European Commission. (2022). *Proposal for a regulation of the European Parliament and of the Council establishing a Union certification framework for carbon removals*, COM/2022/672 final. European Commission. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022PC0672>

European Commission. (2023). *Approved 28 CAP strategic plans 2023-2027*. European Commission. [https://agriculture.ec.europa.eu/document/download/7b3a0485-c335-4e1b-a53a-9fe3733ca48f\\_en?filename=approved-28-cap-strategic-plans-2023-27.pdf](https://agriculture.ec.europa.eu/document/download/7b3a0485-c335-4e1b-a53a-9fe3733ca48f_en?filename=approved-28-cap-strategic-plans-2023-27.pdf)

European Commission. (2023). *Commission Delegated Regulation (EU) 2023/1605 of 22 May 2023 supplementing Regulation (EC) No 1069/2009 of the European Parliament and of the Council as regards the determination of end points in the manufacturing chain of certain organic fertilisers and soil improvers*. Official Journal of the European Union. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32023R1605>

European Commission. (2023). *Commission delegated regulation (EU) 2023/2486 of 27 June 2023 supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council by establishing the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to the sustainable use and protection of water and marine resources, to the transition to a circular economy, to pollution prevention and control, or to the protection and restoration of biodiversity and ecosystems and for determining whether that economic activity causes no significant harm to any of the other environmental objectives and amending Commission Delegated Regulation (EU) 2021/2178 as regards specific public disclosures for those economic activities*. Official Journal of the European Union. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32023R2486>

European Commission. (2023). *Commission staff working document: Evaluation of Council Directive 86/278/EEC of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture* (SWD(2023) 157 final). <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52023SC0157>

European Commission. (2023). *Evaluation of the Sewage Sludge Directive* (SWD (2023) 157 final). European Commission. [https://ec.europa.eu/environment/waste/sludge/pdf/swd\\_2023\\_157\\_final.pdf](https://ec.europa.eu/environment/waste/sludge/pdf/swd_2023_157_final.pdf)

European Commission. (2023). *Proposal for a directive of the European Parliament and of the Council on soil monitoring and resilience (Soil Monitoring Law)*. European Commission. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023PC0416>

European Commission. (2023). *Waste early warning report*. [https://environment.ec.europa.eu/publications/waste-early-warning-report\\_en](https://environment.ec.europa.eu/publications/waste-early-warning-report_en)

European Commission. (2023, July 5). *Proposal for a directive of the European Parliament and of the Council on soil monitoring and resilience (Soil Monitoring Law) (COM(2023)0416)*. European Commission. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023PC0416>

European Commission. (n.d.). *CAP strategic plans: My country*. European Commission. [https://agriculture.ec.europa.eu/cap-my-country/cap-strategic-plans\\_fr](https://agriculture.ec.europa.eu/cap-my-country/cap-strategic-plans_fr)

European Commission. (n.d.). *Sustainable finance taxonomy FAQ*. European Commission. [https://finance.ec.europa.eu/document/download/a3c5fc94-6bc8-4c65-bc6c-de37cf3848b0\\_en?filename=sustainable-finance-taxonomy-faq\\_en.pdf](https://finance.ec.europa.eu/document/download/a3c5fc94-6bc8-4c65-bc6c-de37cf3848b0_en?filename=sustainable-finance-taxonomy-faq_en.pdf)

European Commission. (n.d.). *Waste framework directive*. European Commission. [https://environment.ec.europa.eu/topics/waste-and-recycling/waste-framework-directive\\_en](https://environment.ec.europa.eu/topics/waste-and-recycling/waste-framework-directive_en)

European Environment Agency. (2023). *Accelerating the circular economy in Europe: State and outlook 2024* (EEA Report No. 13/2023). European Environment Agency. <https://www.eea.europa.eu/publications/accelerating-the-circular-economy-in-europe>

European Environment Agency. (2023). *Bio-waste in Europe: Turning challenges into opportunities* (EEA Report No. 12/2023). European Environment Agency. <https://www.eea.europa.eu/publications/bio-waste-in-europe>

European Environment Agency. (2023). *Economic instruments and separate collection*. <https://www.eea.europa.eu/publications/economic-instruments-and-separate-collection>

European Parliament & Council of the European Union. (2008). *Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain directives*. Official Journal of the European Union. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32008L0098>

European Parliament & Council of the European Union. (2009). *Regulation (EC) No 1069/2009 of the European Parliament and of the Council of 21 October 2009 laying down health rules as regards animal by-products and derived products not intended for human consumption and*

*repealing Regulation (EC) No 1774/2002.* Official Journal of the European Union. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32009R1069>

European Parliament & Council of the European Union. (2018). *Regulation (EU) 2018/848 of the European Parliament and of the Council of 30 May 2018 on organic production and labelling of organic products and repealing Council Regulation (EC) No 834/2007.* Official Journal of the European Union. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32018R0848>

European Parliament & Council of the European Union. (2019). *Regulation (EU) 2019/1009 of the European Parliament and of the Council of 5 June 2019 laying down rules on the making available on the market of EU fertilising products and amending Regulations (EC) No 1069/2009 and (EC) No 1107/2009 and repealing Regulation (EC) No 2003/2003.* Official Journal of the European Union. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019R1009>

European Parliament & Council of the European Union. (2020). *Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088.* Official Journal of the European Union. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32020R0852>

European Parliament & Council of the European Union. (2021). *Regulation (EU) 2021/2116 of the European Parliament and of the Council of 2 December 2021 on the financing, management and monitoring of the common agricultural policy and repealing Regulation (EU) 1306/2013.* Official Journal of the European Union. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32021R2116>

European Parliament & Council of the European Union. (2021). *Regulation (EU) 2021/2115 of the European Parliament and of the Council of 2 December 2021 establishing rules on support for national CAP strategic plans and repealing Regulations (EU) 1305/2013 and 1307/2013.* Official Journal of the European Union. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32021R2115>

European Parliament & Council of the European Union. (2021). *Regulation (EU) 2021/2117 of the European Parliament and of the Council of 2 December 2021 amending Regulation (EU) 1308/2013 on the common organisation of the agricultural markets; Regulation (EU) No 1151/2012 on quality schemes for agricultural products; Regulation (EU) No 251/2014 on geographical indications for aromatised wine products; and Regulation (EU) No 228/2013 laying down measures for agriculture in the outermost regions of the EU.* Official Journal of the European Union. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32021R2117>



European Parliament. (2023). *I POL\_STU(2023)747255*. European Parliament. [https://www.europarl.europa.eu/thinktank/en/document/I POL\\_STU\(2023\)747255](https://www.europarl.europa.eu/thinktank/en/document/I POL_STU(2023)747255)

European Parliament. (2024). *Resolution of 11 July 2024 on the European Green Deal and the EU's climate ambitions*. European Parliament. [https://www.europarl.europa.eu/doceo/document/TA-9-2024-0222\\_EN.pdf](https://www.europarl.europa.eu/doceo/document/TA-9-2024-0222_EN.pdf)

European Parliament. (2024). *Resolution of 11 July 2024 on the implementation of the EU's climate goals and the future of the EU's carbon pricing system*. European Parliament. [https://www.europarl.europa.eu/doceo/document/TA-9-2024-0195\\_EN.html](https://www.europarl.europa.eu/doceo/document/TA-9-2024-0195_EN.html)

FEAD. (2024). *Circular resources for a European industrial deal: Why Europe needs a circular material use act*. FEAD. <https://fead.be/wp-content/uploads/2024/05/FEAD-Manifesto-2024.pdf>

Federal Minister for Agriculture and Forestry, Environment, and Water Resources. (2009). *Ordinance on quality requirements for compost from waste*. FAOLEX. <https://faolex.fao.org/docs/pdf/aut90980.pdf>

Federal Ministry for Agriculture, Forestry, Environment and Water Management. (2004). *Ordinance laying down provisions for the implementation of the Fertiliser Act 1994 (Fertiliser Ordinance 2004)*. RIS. <https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20003229>

Federal Ministry for Agriculture, Regions and Tourism. (2021). *Federal law on the trade in fertilisers and other fertiliser products (Fertiliser Act 2021 - DMG 2021)*. <https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20011073>

FER-PLAY & NOVAFERT. (2023, November 2). *Answer to the public consultation on the Commission proposal for a Soil Monitoring Law*. European Commission. [https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13350-Soil-health-protecting-sustainably-managing-and-restoring-EU-soils/F3441788\\_en](https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13350-Soil-health-protecting-sustainably-managing-and-restoring-EU-soils/F3441788_en)

Flemish Government. (2012, February 17). *VLAREMA: Flemish Regulation on the sustainable management of material cycles and waste*. <https://navigator.emis.vito.be/detail?wold=43991>

Food and Agriculture Organization. (2019). *The international code of conduct for the sustainable use and management of fertilisers*. Food and Agriculture Organization of the United Nations. <https://www.sieusoil.eu/wp-content/uploads/2019/10/12.-FAO-The-international-Code-of-Conduct-2019.pdf>

Foreign Agricultural Service. (2022, June 17). *Global fertiliser challenge*. United States Department of Agriculture. <https://fas.usda.gov/newsroom/global-fertiliser-challenge>

France. (2020, April 1). *Order establishing the composition of application files relating to marketing authorizations and permits for fertilising materials, adjuvants for fertilising materials, and growing media, and the criteria to be taken into account in the preparation of the elements required for assessment*. Legifrance. <https://www.legifrance.gouv.fr/loda/id/JORFTEXT000041784314/>

Germany. (2021). *Bioabfallverordnung: Ordinance on the utilization of biowaste*. Gesetze im Internet. <https://www.gesetze-im-internet.de/bioabfv/>

Germany. (2021). *Ordinance on the placing on the market of fertilisers, soil additives, growing media and plant additives*. Gesetze im Internet. <https://www.gesetze-im-internet.de/xyz>

Government of Ireland. (n.d.). *Conditionality*. Government of Ireland. <https://www.gov.ie/en/collection/e11a2-conditionality/>

Greece. (2023, June 19). *Ministerial decree on the placing on the market of fertilisers, soil additives, growing media, and plant additives* (FEK 3946/190623/YA1384). Hellenic Ministry of Rural Development and Food. [https://www.minagric.gr/images/stories/docs/agrotis/KAP2023\\_2027/fek3946\\_190623\\_ya1384.pdf](https://www.minagric.gr/images/stories/docs/agrotis/KAP2023_2027/fek3946_190623_ya1384.pdf)

Hendriks, C. M., Shrivastava, V., Sigurnjak, I., Lesschen, J. P., Meers, E., Noort, R. V., ... & Rietra, R. P. (2022). Replacing mineral fertilisers with bio-based fertilisers in potato growing on sandy soil: A case study. *Applied Sciences*, 12(1), 341. <https://doi.org/10.3390/app120100341>

Italian Legislative Decree. (2006). *Legislative Decree 3 April 2006, n. 152 on environmental regulations*. Bosetti & Gatti. [https://www.bosettiegatti.eu/info/norme/statali/2006\\_0152.htm](https://www.bosettiegatti.eu/info/norme/statali/2006_0152.htm)

Italy. (2010, April 29). *Legislative decree No. 75 of April 29, 2010*. Ministry of Agricultural, Food and Forestry Policies. <https://www.politicheagricole.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/10087>

Italy. (2016, February 25). *Interministerial decree No. 5046 of February 25, 2016: General technical criteria and standards for the regional regulation of the agronomic use of livestock effluents and waste water, and for the production and agronomic use of digestate*. Ministry of Agricultural, Food and Forestry Policies. <https://www.politicheagricole.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/9780>



Joint Research Centre. (n.d.). *Water quality monitoring map*. European Commission. Retrieved July 31, 2024, from <https://water.jrc.ec.europa.eu/portal/apps/webappviewer/index.html?id=b33a220c1b284583851e93a245da02ef>

Legifrance. (2024, February 13). *Article L. 212-1 du Code de l'environnement relatif aux amendements organiques et aux composts*. [https://www.legifrance.gouv.fr/codes/article\\_lc/LEGIARTI000030678452/2024-02-13](https://www.legifrance.gouv.fr/codes/article_lc/LEGIARTI000030678452/2024-02-13)

Luo, H., Dewitte, K., Landschoot, S., Sigurnjak, I., Robles-Aguilar, A. A., Michels, E., ... & Meers, E. (2022). Benefits of biobased fertilisers as substitutes for synthetic nitrogen fertilisers: Field assessment combining minirhizotron and UAV-based spectrum sensing technologies. *Frontiers in Environmental Science*, 10, 2375. <https://doi.org/10.3389/fenvs.2022.836870>

Netherlands. (2024). *Fertilisers Act* (BWBR0004054). Government of the Netherlands. [https://wetten.overheid.nl/BWBR0004054/2024-01-01/#HoofdstukIII\\_Artikel8](https://wetten.overheid.nl/BWBR0004054/2024-01-01/#HoofdstukIII_Artikel8)

Netherlands. (2024, January 1). *Implementation Decree Fertilisers Act* (BWBR0019031). Government of the Netherlands. <https://wetten.overheid.nl/BWBR0019031/2024-01-01/#BijlageI>

Netherlands. (2024, January 1). *Implementation regulation of the Fertilisers Act* (BWBR0018989). Government of the Netherlands. <https://wetten.overheid.nl/BWBR0018989/2024-01-01>

Royal Decree on the marketing and use of fertilisers, soil improvers and cultivation substrates. (2013, January 28). *Official Journal*. [https://etaamb.openjustice.be/nl/koninklijk-besluit-van-28-januari-2013\\_n2013024068](https://etaamb.openjustice.be/nl/koninklijk-besluit-van-28-januari-2013_n2013024068)

Sigurnjak, I., Vaneeckhaute, C., Michels, E., Ryckaert, B., Ghekiere, G., Tack, F. M. G., & Meers, E. (2017). Fertiliser performance of liquid fraction of digestate as synthetic nitrogen substitute in silage maize cultivation for three consecutive years. *Science of the Total Environment*, 599, 1885-1894. <https://doi.org/10.1016/j.scitotenv.2017.05.149>

Spain. (2013). *Real Decreto 506/2013, de 28 de junio, sobre productos fertilizantes*. Boletín Oficial del Estado. <https://www.boe.es/buscar/pdf/2013/BOE-A-2013-7540-consolidado.pdf>

Spain. (2022). *Real Decreto 1051/2022, de 27 de diciembre, por el que se establecen las normas para una nutrición sostenible en los suelos agrícolas*. Boletín Oficial del Estado. <https://www.boe.es/buscar/doc.php?id=BOE-A-2022-23052>

Spain. (2023). *Real Decreto 529/2023, de 20 de junio, por el que se modifica el Real Decreto 506/2013, de 28 de junio, sobre productos fertilizantes*. Boletín Oficial del Estado. [https://www.boe.es/diario\\_boe/txt.php?id=BOE-A-2023-15736](https://www.boe.es/diario_boe/txt.php?id=BOE-A-2023-15736)

United Nations. (n.d.). *Food security and nutrition and sustainable agriculture*. United Nations Department of Economic and Social Affairs. <https://sdgs.un.org/topics/food-security-and-nutrition-and-sustainable-agriculture>

World Bank. (2023). *Overview: GAFS priority actions*. World Bank. <https://thedocs.worldbank.org/en/doc/3da165e0bcb0ed7dddba9939afb21fda-0590012023/related/Overview-GAFS-Priority-Actions.pdf>



*"This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement N° 101060426."*

fer  play 



*Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Research Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.*



NOT YET APPROVED BY THE EC