Contribution ID: 2a399afe-4482-47ef-95ed-8f8ca25ddb78
Date: 08/08/2022 09:04:19

Consultation: Nutrients – Action plan for better management

Fields marked with * are mandatory.

Introduction

Nutrients are chemical compounds that are essential for life. The most common nutrients include nitrogen (N) and phosphorus (P). Nutrients are found in soil, air and water, in agricultural fertilisers, in the food we consume and throw away as well as the sewage we produce.
Human activities have significantly altered the natural processes which continuously cycle nitrogen and phosphorous in various (chemical) forms between different compartments of the environment. We consequently observe nutrient pollution that significantly affects public health, climate and the environment and at levels that exceed safe planetary boundaries. Nutrient pollution also has important economic consequences and puts at risk the sustainability of agriculture and fisheries in the EU.

In the EU, environmental legislation has sought to tackle excess nutrients. However, progress in the reduction of pollution is not uniform and harmful pollution levels for human health and the environment still exist due notably to shortcomings in specific legislation, significant implementation gaps and possibly the absence of an integrated approach on nutrient pollution encompassing air, water, soil and climate.

The Russia’s invasion of Ukraine is driving up prices in agricultural and seafood product markets and exposing the vulnerabilities of the food system: our dependence on imports of energy, fertiliser and animal feed. Natural gas is a feedstock for most mineral nitrogen fertiliser production and reducing the reliance on such fertilisers has become a key objective. More than ever, we need more resource efficient fertilisers and better management of nutrients generally.

The Commission is preparing an Integrated Nutrient Management Action Plan as announced in the EU Biodiversity and Farm to Fork strategies and the Zero Pollution Action Plan. This will help achieve the 2030 zero pollution targets with a focus on minimising pollution at source.

Guidance on the questionnaire

This public consultation aims at gathering a broad range of views about the possible elements of the Integrated Nutrient Management Action Plan. All interested stakeholders are invited to participate in this consultation including members of the public.

You are invited to respond to the following questions below regardless of your level of expertise.

The estimated time for completion is 15 minutes.

The questions cover the following topics:

1. Awareness of nutrient pollution and its impacts.
2. How to reduce nutrient pollution.
3. How to better recycle nutrients.
4. Final remarks

The European Commission will assess all responses made to this consultation when preparing the Action Plan. We will also produce a stand-alone summary of the results of the consultation.

Thank you for taking part in this consultation.

About you

*Language of my contribution

English

*I am giving my contribution as

Non-governmental organisation (NGO)

*First name

Christopher

*Surname

THORNTON

*Email (this won't be published)

info@phosphorusplatform.eu

*Organisation name

255 character(s) maximum

ESPP(European Sustainable Phosphorus Platform)

*Organisation size

Micro (1 to 9 employees)

Transparency register number

255 character(s) maximum

Check if your organisation is on the transparency register (http://ec.europa.eu/transparencyregister/public/homePage.do?redir=false&locale=en). It's a voluntary database for organisations seeking to influence EU decision-making.

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*Country of origin

Please add your country of origin, or that of your organisation.

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Belgium

The Commission will publish all contributions to this public consultation. You can choose whether you would prefer to have your details published or to remain anonymous when your contribution is published. **For the purpose of transparency, the type of respondent (for example, 'business association, 'consumer association', 'EU citizen') country of origin, organisation name and size, and its transparency register number, are always published. Your e-mail address will never be published.** Opt in to select the privacy option that best suits you. Privacy options default based on the type of respondent selected

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- ○ **Anonymous**
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1. Awareness of nutrient pollution and its impacts

The overall environmental costs of all nutrient pollution in Europe are estimated at €70–€320 billion per year. (https://www.cambridge.org/core/books/abs/european-nitrogen-assessment/summary-for-policy-makers/8C71929358438A6F1BDBEADB38E44E67)

Nutrient pollution of waters is mainly due to the leakage of fertilisers used in agriculture and the insufficient treatment of domestic and industrial wastewaters.

- The excess of nutrients in water can lead to algae blooms that suffocate life under water (a phenomenon called eutrophication). Besides ecosystems degradation in rivers, lakes and seas, eutrophication has also negative consequences on economic sectors such as fisheries and tourism. Excessive algae development can also have negative impacts on public health, due to possible development of toxic components (development of toxic algae species or toxic gas released when algae decompose).
- High nitrate and nitrite concentrations in drinking water can be toxic, especially for infant and young children and lead to a disease called methaemoglobinaemia, also known as blue baby syndrome. The Drinking Water Directive specifies safe limits for nitrates and nitrites in drinking water in order to protect human health. Compliance with these limits may require the specific treatment of drinking water or the need to look for alternative sources of drinking water, potentially leading to substantial additional costs.

Atmospheric emissions of nitrogen compounds originate from agriculture (as ammonia, NH_3) and from fossil fuel combustion (as nitrogen oxides, NOx).

- These nitrogen compounds react in the atmosphere and contribute to the formation of fine particulate matters, which were responsible for 307,000 premature deaths in the 27 Member States of the European Union in 2019. (https://www.eea.europa.eu/publications/air-quality-in-europe-2021)
- They also damage terrestrial and aquatic ecosystems when deposited back to earth: (excess) nitrogen emissions adversely affect nature areas and forests throughout Europe.

- Nitrous oxide (N2O) is an important greenhouse gas that affects the Earth's climate.
- The production of artificial fertilisers also requires a lot of energy and natural gas feedstock, and is therefore an important contributor to greenhouse gas emissions.

1.1. How well do you consider yourself informed about nutrient pollution in different media?

	Well informed	Somewhat informed	Not well informed	Not at all informed
Air	○	◉	○	○
Soil	○	◉	○	○
Water	○	◉	○	○

1.2. How well do you consider yourself informed about the impacts of nutrient pollution?

	Well informed	Somewhat informed	Not well informed	Not at all informed
Impacts on human health	○	◉	○	○
Impacts on air quality	○	◉	○	○
Impacts on water quality	○	◉	○	○
Impacts on soil quality	○	◉	○	○
Impacts on biodiversity	○	◉	○	○
Impacts on climate	○	○	◉	○
Impacts on economy	○	○	◉	○

1.3. How significant are the impacts of nutrient pollution on human health?

	Very low	Low	High	Very high
Air	○	○	○	◉
Soil	◉	○	○	○
Water	○	○	○	◉

1.4. How significant are the impacts of nutrient pollution on the environment?

	Very low	Low	High	Very high
Air	○	○	○	◉
Soil	○	○	○	◉
Water	○	○	○	◉

1.5. Are the following actors doing enough to inform the public on nutrient pollutions and actions taken to address it?

	Yes, enough	No, not enough	I don't know
National authorities	○	◉	○

EU authorities	○	◉	○
National Environment Protection Agency	○	◉	○
European Environment agency	○	◉	○
Professional associations (from the fertiliser industry, the food industry and other industries)	○	◉	○
Local authorities	○	◉	○
Civil society	◉	○	○
Media	○	◉	○

2. How to reduce nutrient pollution

In the EU, nutrient pollution has been tackled by environmental legislation since the 90s, in particular through the Urban Waste Water Treatment and the Nitrates Directives. They were complemented later by the Water Framework Directive, the Marine Strategy Framework Directive, the National Emission reduction Commitments Directive, the Industrial Emissions Directive, as well as standards on emissions from transport and energy sectors. While some progress has been made to reduce nutrients in the environment, harmful levels persist in certain areas.

The European Green Deal presents a target of reducing nutrient losses by 50% by 2030 and this will require additional efforts to cut down nutrient emissions. The Integrated Nutrient Management Action Plan is a unique opportunity to consider the nutrient cycles globally and to provide a holistic and sustainable approach to nutrient management.

A higher efficiency of fertilisers, through optimised manure management and fertilisation practices, is also lowering our dependency on the ones we import, or for the production of which we import natural gas.

Dietary habits have also an impact on nutrient pollution. Nitrogen losses in the environment is 25 times higher for beef protein than for cereal protein. A 50% reduction in livestock product consumption and production would reduce nitrogen emission by 42%. (https://www.pbl.nl/sites/default/files/downloads/Nitrogen_on_the_Table_Report_WEB.pdf) Food waste also contributes to nutrient pollution.

2.1. What would be the most effective level of action to tackle nutrient pollution?

	Completely agree	Somewhat agree	Neither agree nor disagree	Completely disagree	I don't know
International/ global level	○	◉	○	○	○
EU level	◉	○	○	○	○
National level	○	◉	○	○	○
Regional level	○	◉	○	○	○
River basin level	◉	○	○	○	○

2.2. To what extent are the following EU policies effective to address nutrient pollution?

	Very effective	Sufficiently effective	Insufficiently effective	I don't know
Air legislation	○	○	◉	○
Water legislation	○	○	◉	○
Nitrates Directive	○	○	◉	○
Waste legislation	○	○	◉	○
Sewage sludge directive	○	○	◉	○
Industrial emission legislation	○	○	◉	○
Fertilisers legislation	○	◉	○	○
Common Agricultural Policy	○	○	◉	○

2.3. Would you say that the above EU policies are sufficiently coherent and complement each other?

- ○ Yes
- ◉ No

If you answered no, please explain what could be improved

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Improve nutrient monitoring in CAP
Integrate Water Framework Directive and Emissions Ceiling Directive obligations into
CAP, including in CAP funding criteria.
Remove obstacles to safe recycling of nutrients from animal by-products to
fertilisers, to animal feeds
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2.4. Are the EU and the Member States sufficiently equipped to tackle nutrients pollution?

	Completely agree	Somewhat agree	Neither agree nor disagree	Completely disagree	I don't know
Legislation is sufficiently developed	○	○	○	◉	○
Monitoring tools allow identification of the pollution source and diffusion	○	○	◉	○	○
Targets and expected results are clearly defined and known	○	○	◉	○	○
Public authorities at EU, national and regional levels are sufficiently equipped to enforce the rules	○	○	○	◉	○

2.5. Which aspects should be reinforced in addressing nutrient pollution for elaborating the Integrated Nutrient Management Action Plan?

	Needs reinforcing	No reinforcing needed	I don't know
Air quality	◉	○	○
Fresh and marine water quality	◉	○	○

Soil quality	◉	○	○
Biodiversity	○	○	◉
Climate	◉	○	○
Human health	◉	○	○
Social impact	○	○	◉
Economic impact	○	○	◉

2.6. What actions should the Integrated Nutrient Management Action Plan focus on?

	Completely agree	Somewhat agree	Neither agree nor disagree	Completely disagree	I don't know
Reinforced coherence between existing policies	◉	○	○	○	○
Reinforced controls of existing legislation	○	◉	○	○	○
Reinforced implementation and enforcement of existing legislation	○	◉	○	○	○
Introduce new legislation	○	◉	○	○	○
Non legislative measures (guidance, recommendations, cooperation, exchange of best practices)	○	◉	○	○	○
Financial incentives	◉	○	○	○	○
Tax on polluting activities	◉	○	○	○	○
Raising awareness about nutrient pollution	○	◉	○	○	○
Increasing knowledge transfer on environmentally friendly practices (by training, advisory services, platform for sharing of best practices)	○	◉	○	○	○
Research and innovation	◉	○	○	○	○

You can specify the main focus here

Need for coherent policy and EU legislation on phosphorus.
Fiscal and market tools to monetarise the environmental and social impacts of nutrient consumption and support nutrient recycling.
Dietary shift. Healthier, more sustainable diets will have lower climate impact and reduce nutrient use in fertilisers and animal feed.
Climate change. Address links between climate change and increasing nutrient losses and eutrophication; between nutrient losses and climate emissions.
Implementation of Green Deal nutrient loss reduction targets and Water Framework Directive Quality Status obligations, and resulting water basin catchment plan actions, in CAP.

2.7. How effective are the following ways of tackling nutrient pollution?

	Very effective	Somewhat effective	Neither effective nor ineffective	Somewhat ineffective	I don't know
Good farming practices to manage nutrients (balanced fertilisation, precision fertilisation, manure management)	◉	○	○	○	○
Advisory services for farmers	○	◉	○	○	○
Stronger or new regulatory targets for nutrients pollution in air, water, soil	◉	○	○	○	○
Adopting reinforced measures on pollution hotspots	◉	○	○	○	○
Increasing controls and sanctions in case of non-compliance with the environmental legislation	○	◉	○	○	○
No or limited fertilisation near nature sensitive/ risk areas	○	○	○	○	◉
Developing organic farming	○	○	○	○	◉
Reducing livestock density	◉	○	○	○	○
Developing land-based or mixed livestock farming practices	○	○	○	○	◉
Limiting industrial emissions	○	◉	○	○	○
Optimising waste waters treatment	◉	○	○	○	○
Optimising sludge treatment before application on land	◉	○	○	○	○
Reducing food waste	○	◉	○	○	○
Reducing other biowaste	○	◉	○	○	○
Recycling nutrients from waste	◉	○	○	○	○
Investing in nature based solutions (afforestation, filtering ditches, large buffer strips)	◉	○	○	○	○
Investing in drinking water and wastewater infrastructure	◉	○	○	○	○
Building citizen awareness on nutrient pollution and the impact of consumer choices	○	◉	○	○	○
Investing in research and development	○	◉	○	○	○
Reducing emissions from energy (more renewable energy) and transport (stricter standards limiting motor emission, stricter speed limits)	○	○	○	○	◉

2.8. How much can citizens contribute to reducing nutrient pollution?

	More	Same as currently	Less	I don't know
By dietary choices favouring more vegetable protein than animal proteins	◉	○	○	○

By consuming products produced with less fertiliser (e.g., Organic Farming)	◉	○	○	○
By better sorting your waste, separating food waste from other waste	◉	○	○	○
By reducing food waste	◉	○	○	○
By choosing greener transport means	○	○	○	◉
By choosing renewable energy sources	○	○	○	◉

2.9. As a consumer, would you be willing to contribute to the reduction of nutrient pollution?

	Yes, absolutely	Maybe, I would be ready to try	Not at all	I don't know
By dietary choices favouring more vegetable protein than animal proteins	○	○	○	◉
By consuming products produced with less fertiliser (e.g., Organic Farming)	○	○	○	◉
By better sorting your waste, separating food waste from other waste	○	○	○	◉
By reducing food waste	○	○	○	◉
By choosing greener transport means	○	○	○	◉
By choosing renewable energy sources	○	○	○	○

2.10. Should the scope of the initiative also extend to other nutrients than nitrogen and phosphorus?

- ◉ Yes
- ○ No

If you answered yes, please mention which one(s) and why

Recycling of other nutrients should be considered

3. How to better recycle nutrients

At the moment, nutrients such as nitrogen and phosphorus, are lost along the entire food chain, with negative impacts on human health, environment and economy. Closing the loop of the nutrient cycles is part of the concept of circular economy and the Integrated Nutrient Management Action Plan will aim to stimulate the markets for recovered nutrients.

In the EU, animal manure, compost and sewage sludge have been applied as fertilizer, but there are many other bio products rich in nutrients that could be better recycled such as food waste and other biowaste, which will have to be collected separately from other waste from 2023.

Global availability of phosphorus is limited. Food production uses approximately 90% of all phosphorus mined but it is rarely recycled, which raises concerns about the scarcity of future supplies and market prices.

The Russia's invasion of Ukraine also increased chemical nitrogen fertilisers cost because of the natural gas their production consume, and jeopardize the import of phosphorus and potash fertilisers from certain countries. Reducing our dependency on these fertilisers by a better nutrient circularity is also necessary to increase the resilience of our food chain.

3.1. What are the main obstacles to nutrient recycling?

	Completely agree	Somewhat agree	Neither agree nor disagree	Completely disagree	I don't know
Lack of information about the current possibilities to recycle nutrients	○	◉	○	○	○
Regulatory constraints	◉	○	○	○	○
Presence of contaminants (heavy metals, pathogens or pharmaceuticals) in recycled nutrient products	○	◉	○	○	○
Lack of demand for recycled nutrient products	◉	○	○	○	○
Higher cost of recycled nutrient products compared with conventional products	◉	○	○	○	○
Consumer reluctance due to the risk of food contamination	○	◉	○	○	○
Odour and troublesome traffic in rural areas associated with storage, transport and spreading of recovered nutrients	○	○	○	○	◉

If you identify another obstacle to nutrient recycling, could you please mention it, as well as the reason why it constitutes an obstacle?

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Absence of regulatory tools for nutrient recycling in most EU countries (only in
Germany)
Inadequate tools for nutrient recycling in Common Agricultural Policy
Importance to implement EU ban on PFAS - a problematic contaminant for nutrient
recycling
Need for full-scale nutrient recycling demonstration projects
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If you mentioned regulatory constraints as an obstacle to nutrient recycling, could you please explain what the problem is?

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Absence of EU End-of-Waste status for non-fertiliser uses of recycled nutrients and
for materials recovered from wastewaters
Obstacles from local regulators to factories wishing to take in waste materials
(secondary nutrients) for recycling to partially replace virgin nutrient materials
(operating permit)
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3.2. At what level could nutrient recycling be improved?

	Completely agree	Somewhat agree	Neither agree nor disagree	Completely disagree	I don't know
Farming	◉	○	○	○	○

Food and drink processing	◉	○	○	○	○
Wastewater treatment / sewage sludge	◉	○	○	○	○
Food waste	◉	○	○	○	○
Other biowaste	○	◉	○	○	○

3.3. Which of the following would be the most effective ways of boosting nutrient recycling?

	Very effective	Somewhat effective	Neither effective nor ineffective	Somewhat ineffective	I don't know
Information campaigns to citizens, consumers, local authorities, companies and farmers	○	◉	○	○	○
Better separating waste streams	◉	○	○	○	○
Ensuring better enforcement of existing legislation	○	◉	○	○	○
Remove legal obstacle to nutrient recycling	◉	○	○	○	○
Funding streams to support investment in infrastructure for nutrient recycling	◉	○	○	○	○
Tax on conventional chemical nutrients in fertilisers	○	○	○	○	◉
Target on nutrient recycling for different waste streams	◉	○	○	○	○
Setting legally binding targets for nutrient recycling	◉	○	○	○	○
Investing in research and development to find technological solutions	◉	○	○	○	○

4. Final remarks

If you wish to provide additional evidence in relation with this initiative, please add it here.

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Links between nutrients and climate change www.phosphorusplatform.eu/Scope137
```

If you wish to add a specific short contribution - within the scope of this questionnaire - please add it here.

```
Key pillars of INMAP should therefore be:
  reducing nutrient losses (Farm-to-Fork target)
  nutrient recycling (Circular Economy)
  R&I to support these objectives and to understand nutrient planetary boundaries and
nutrient flows
ESPP suggests that INMAP should ensure synergy between nutrients and other key EU
strategies:
  climate change
  sustainable and healthy diet (Farm-to-Fork strategy)
  water policy, including integrating nutrient recycling into the Sewage Sludge
Directive
  Critical Raw Materials (phosphate rock, phosphorus)
  Specific policies: Methane Strategy (biogas), Emissions Ceilings Directive
(ammonia), Algae Initiative, Aquaculture, Soil Strategy, chemicals and
pharmaceuticals policies (reducing contaminants), etc.
```

If you wish also to complement it with a more extended contribution you can also upload a short separate document. (The maximum file size is 1 MB) Only files of the type pdf,txt,doc,docx,odt,rtf are allowed.

Please note that the uploaded document will be published alongside your response to the questionnaire which is the essential input to this open public consultation. The document is an optional complement and serves as additional background reading to better understand your inputs.

Please upload your file(s)

ESPP_input_INMAP_v27_3_21.pdf

Contact

ENV-INMAP@ec.europa.eu

ESPP input for the EU's "Integrated Nutrient Management Action Plan" (INMAP)

One-page summary:

Action on nutrients is core to EU policy objectives

The development of an 'Integrated Nutrient Management Action Plan' (INMAP) is an action of the EU **Farm-to-Fork Strategy** (May 2020) and of the **Circular Economy Action Plan** (March 2020). Also, the **Horizon Europe** orientations aim to move the EU within planetary boundaries for nutrient flows.

Key pillars of INMAP should therefore be:

- **reducing nutrient losses** (Farm-to-Fork target)
- **nutrient recycling** (Circular Economy)
- **R&I** to support these objectives and to understand nutrient planetary boundaries and nutrient flows

ESPP suggests that INMAP should ensure synergy between nutrients and other key EU strategies:

- **climate change**
- **sustainable and healthy diet** (Farm-to-Fork strategy)
- **water policy,** including integrating nutrient recycling into the Sewage Sludge Directive
- **Critical Raw Materials** (phosphate rock, phosphorus)
- **Specific policies:** Methane Strategy (biogas), Emissions Ceilings Directive (ammonia), Algae Initiative, Aquaculture, Soil Strategy, chemicals and pharmaceuticals policies (reducing contaminants), etc.

ESPP's proposed priorities for integrated EU action on nutrients

- ✓ **Climate change**. Address links between climate change and increasing nutrient losses and eutrophication; between nutrient losses and climate emissions.
- ✓ **Dietary shift**. Healthier, more sustainable diets will have lower climate impact and reduce nutrient use in fertilisers and animal feed.
- ✓ **Fiscal and market tools** to monetarise the environmental and social impacts of nutrient consumption and support nutrient recycling.
- ✓ **Fix targets for nutrient recycling,** defined at EU, Member State and regional levels.
- ✓ Integrate nutrient recycling into **EU water policy** and the Sewage Sludge Directive.
- ✓ **Demonstration projects**: nutrient recycling, optimising fertiliser use or animal or aquaculture feed, reducing field nutrient losses …
- ✓ **Synergies** between nutrient recycling and biogas production, algae initiative.
- ✓ **Address contaminants at source**, to improve quality of sewage biosolids, manure and other secondary nutrient streams, especially pharmaceuticals and veterinary medicines, microplastics, industrial and consumer chemicals (especially PFAS/perfluorinated compounds, persistent plastics additives …)
- ✓ **Common Agricultural Policy (CAP):** key to implementing the Farm-to-Fork nutrient loss reduction target:
  - **Improve Nutrient Use Efficiency** (**NUE**) at farm level.
  - **CAP FaST tool**, mandatory, to ensure monitoring of nutrients, support NUE and reduce nutrient losses.
  - **Incentives** for nutrient efficiency, reducing soil erosion, climate, soil organic carbon, biodiversity.
  - **Nutrient BEMPs** (Best Environmental Management Practices)**:** update knowledge, disseminate, implement.
  - **Optimise fertilisation:** management of organic fertilising materials (manures, organic fertilisers …), precision fertilisation, controlled delivery fertilisers, biostimulants.
- ✓ **Data and science** on nutrient flows, nutrient recycling and fertiliser LCAs, contaminant risk assessments
- ✓ **Dialogue with stakeholders and industry**, in particular farmers and advisory services and the food industry

How is INMAP specified in EU policy documents?

The development of an Integrated Nutrient Management Action Plan is specified in the Farm-to-Fork Strategy and the Circular Economy Action Plan, and is linked to the Horizon Europe orientations:

Farm-to-Fork Strategy

The EU Farm-to-Fork Strategy, COM(2020)381, 20th May 2020), states:
"The excess of nutrients (especially nitrogen and phosphorus) in the environment, stemming from excess use and the fact that not all nutrients used in agriculture are effectively absorbed by plants, is another major source of air, soil and water pollution and climate impacts. It has reduced biodiversity in rivers, lakes, wetlands and seas. The Commission will act to reduce nutrient losses by at least 50%, while ensuring that there is no deterioration in soil fertility. This will reduce the use of fertilisers by at least 20% by 2030. This will be achieved by implementing and enforcing the relevant environmental and climate legislation in full, by identifying with Member States the nutrient load reductions needed to achieve these goals, applying balanced fertilisation and sustainable nutrient management and by managing nitrogen and phosphorus better throughout their lifecycle. The Commission will develop with Member States an ***integrated nutrient management action plan*** *to address nutrient pollution at source and increase the sustainability of the livestock sector. The Commission will also work with Member States to extend the application of precise fertilisation techniques and sustainable agricultural practices, notably in hotspot areas of intensive livestock farming and of recycling of organic waste into renewable fertilisers. This will be done by means of measures which Member States will include in their CAP Strategic Plans such as the Farm Sustainability Tool for nutrient management, investments, advisory services and of EU space technologies (Copernicus, Galileo)."*

Circular Economy Action Plan

The European Commission's EU Circular Economy Action Plan 11th March 2020 includes "Food, water and nutrients" as one of the seven key targeted value chains and specifies as actions to include:

- "*develop an* ***Integrated Nutrient Management Plan*** *with a view to ensuring more sustainable application of nutrients and stimulating the markets for recovered nutrients*" including possible "*reviewing directives on wastewater treatment and sewage sludge and will assess natural means of nutrient removal such as algae*".
- reduce food waste (as a key action of the Farm-to-Fork Strategy)
- facilitate water reuse
- continue the Bioeconomy Action Plan
- define a policy framework on compostable, biodegradable and bio-based plastics (ESPP comment: this is important for digestates and composts)
- address microplastics and to better understand their risk and occurrence
- improve monitoring of resource recycling, proposing a "*market observatory for key secondary materials*", a "*Monitoring Framework for the Circular Economy*" and "*Indicators on resource use, including consumption and material footprints*"
- integrate the circular economy into Member States fiscal policies, via the European Semester

Horizon Europe

The Horizon Europe Orientations document states "***A comprehensive EU policy to balance nutrient cycles is not yet well developed. Research and innovation is needed to look at how the EU could move to living within the planetary boundaries, with regards to nutrient flows.***"

ESPP's proposals for INMAP

Integration and implementation

An Integrated Nutrient Management Action Plan should

- **address nutrients across all existing areas of EU policy** (agriculture, environment, water, air, soil, industrial emissions, waste legislation, circular economy, food and diet, animal feed, fertilisers, raw materials, climate change, trade …).
- **cover all plant nutrients**: nitrogen, phosphorus, other nutrients (e.g. sulphur) and micro-nutrients which can impact crop yield, and also soil organic carbon, which is linked to climate change and soil health. **Prioritise phosphorus and nitrogen**, for which action will have significant benefits for the environment by 2030.
- **integrate existing policy implementation structures** (e.g. water basin management organisations, agricultural and rural development funding, farm advisory services, Nitrates Committee, regional bodies such as HELCOM …) in order to be implemented by companies and by local/regional territories.

Tools need to be defined and implemented to address the low market price of nutrients and the absence of a monetarised price on nutrient environmental impacts (externalities), which combine to generally make nutrient removal and nutrient recycling "not economic". Such tools can include regulatory requirements, nutrient reuse targets, incentives, and fiscal shifts.

More widely, food prices must integrate environmental protection and a fair income for farmers.

Integration across EU directorates

An EU Integrated Nutrient Management Action Plan should engage across EU services and policies:

- DG AGRI: CAP: nutrient management under cross-compliance with water policy, eco-schemes, mandatory FAST tool. Farm advisory services. Update of 'fact sheets' on nutrient BEMPs. EIP-AGRI: follow-up of EIP-AGRI Focus Group on Nutrient Recycling Horizon Europe R&D on nutrient management and nutrient recycling. Inclusion of recycled nutrient products as authorised fertilisers for Organic Farming.
- DG ENVI: Circular Economy. Industrial Emissions Directive: resource efficiency and recycling in BREFs, horizontal BREF on resource efficiency, resources efficiency and recycling in KEIs, BREF on large cattle and aquaculture units. Site operating permits to accept secondary materials. Study into contaminants in fertilisers (currently underway). Soil Strategy. Strategic Approach to Pharmaceuticals in the Environment. EMAS BEMPs for agricultural nutrient management and nutrient loss mitigation. Water policy and Sewage Sludge Directive. Soil Strategy. LIFE: funding of nutrient recycling demonstration projects.
- DG GROW: Fertilising Products Regulation. REACH: art. 7(2), restrictions on problematic consumer/industry chemicals. Critical Raw Materials (phosphate rock). Circular Economy.
- DG ENER: Methane Strategy (biogas and digestate).
- DG MARE: Strategic Guidelines for EU Aquaculture, Algae Strategy
- DG RTD: Horizon Europe objective of "*a comprehensive EU policy to balance nutrient cycles"* and funding of research and recycling demonstration actions in Horizon Europe. Water4All Partnership. Mission Healthy Oceans, Seas, Coastal and Inland Water. Mission Soil Health and Food. Circular Bio-Based Europe Partnership. R&D into risk assessment of contaminants, especially pharmaceuticals, microplastics. R&D into nutrient management and climate change. Follow-up of COST 869: agricultural nutrient BEMP fact sheets. Coordination actions with long-term perspectives.
- DG SANTE: Farm-to-Fork: dietary choices, nutrient footprinting and food product phosphorus-content information, nutrient and nutrition content of food waste (with the food & beverage industry). Animal by-

products in the Fertilising Products Regulation. Recycling of phosphorus in Cat1 ABP ash. Recycled nutrients in Animal Feed Regulation.

- DG REGIO: Nutrient Circular Economy projects in Interreg A, B and C
- DG TRADE: Nutrient footprints of imported food, feed. Tariffs on imported food, feed not respecting EU agricultural and nutrient sustainable production criteria.
- SecGen & DG ECFIN: European Semester: fiscal incentives for nutrient recycling, fiscal burden shift from jobs to resource consumption, including in VAT policy.

Improve knowledge on nutrient flows

Data is already gathered for nitrogen emissions (because of links to climate change, Emissions Ceilings Directive, Nitrates Directive) but substance flow analysis **data (and data collection mechanisms) are lacking or insufficient concerning phosphorus (poorly monitored except for under water policy), concerning nitrogen recycling potential, and concerning integration with organic carbon and other nutrients and micronutrients[1].** Regionalised data on nutrient flows is rarely available, whereas this is important for developing recycling and for optimising action on nutrient losses, because there are significant differences between regions and between Member States. Ongoing Horizon 2020 projects will contribute to increase knowledge.

Data on nutrient content and fate of many nutrient-containing wastes and by-products is largely inadequate to support development of recycling.

Nutrient footprinting of food products, data on nutrient content of food waste (not just "tonnage") are needed[2] to support decision making.

Integrate existing data (e.g. on wastewater, environmental data, industrial emissions ...) and between nutrients (N, P, K, sulphur and other plant nutrients and micronutrients, and also soil organic carbon), including in particular coordination with data sets of EUROSTAT, EEA, FADN … Develop common metrics and language (nutrient flows, loads, stocks) and tools to ensure understandability for decision makers and stakeholders. Integrate data needs of EU policies: climate policy, Critical Raw Materials, CAP, Water Framework Directive, Sewage Sludge Directive and water policy, Circular Economy and Fertilising Products Regulation, air policy and Emissions Ceilings Directive …

Data should be:

- user (management) orientated, in particular identifying hotspots and flows which can be targeted to reduce impacts, to reduce diffuse pollution at the farm level, to reduce primary resource consumption and to develop recycling
- recycling requires information on accessibility / usability (e.g. dilution), crop fertiliser value (e.g. of different livestock manures and secondary materials) and contaminants
- feasible to monitor and update to support policy decision making
- transparent and comparable across the EU

It is needed to develop, and agree between different industry sectors and across the EU, robust substance flow analysis methods[3] for nutrients, including calculations of nutrient use efficiencies, losses to water and to air, taking into consideration regional agricultural practices, climate, etc.

This should be integrated into the Circular Economy Action Plan's proposed "*Monitoring Framework for the Circular Economy*", "*Indicators on resource use, including consumption and material footprints*" and "*market observatory for key secondary materials*".

In particular, **develop pilot actions at the regional or catchment level to assess or implement integrated nutrient management** at this scale, with the aim of reducing nutrient losses as foreseen in the Farm-to-Fork strategy, and of meeting Planetary Boundaries[4] for nutrients to the regional scale, including "imported" nutrient footprints[5].

The **FaST tool** at the farm level, if mandatory, will provide essential data for nutrient management, both at the on-farm level, for water basin management and for EU policy makers.

Integrate nutrient management and climate change policies

Climate change is likely to accentuate land nutrient losses (especially through modified precipitation and increased storm runoff events, soil nutrient mineralisation) and to **worsen eutrophication and harmful algal blooms** (accentuated nutrient losses combined with increased temperatures, lower river flows during droughts). Climate change can also deteriorate crop Nutrient Use Efficiency[6]. However, **nutrient losses and eutrophication will also accentuate climate change emissions, in particular aquatic methane emissions**[7] and in some cases CO2 efflux from surface waters**.** Ammonia emissions, for which manure is the greatest source, as well as other nitrogen losses from leaching and runoff, increase biogenic production of nitrous oxide.

Further research is needed to support policy action addressing links between climate change and nutrient losses / eutrophication, and between nutrient management and climate emissions, including in different climatic regions of Europe.

Food production is a key driver of climate change, and profound changes to diet and to how we produce food are necessary[8]. **Moving to more sustainable diets and agriculture**, with lower climate impacts, will require major changes in nutrient supply and management, and should enable considerable improvement of nutrient sustainability.

Improving management and recycling of organic wastes (manure, sewage biosolids, food waste …) can have significant climate benefits, in terms of reduced GHG emissions, as well as increasing SOC (soil organic carbon) and so carbon sequestration.
This is particularly true for manure, because of ammonia emissions. The Circular Economy Action Plan should aim to combine increased efficiency of nutrient recycling in livestock manures (use of manures adapted to crop uptake of both N and P, transfer of any regional surplus manure nutrients to crop-producing regions) and reduced manure GHG and ammonia emissions (Emissions Ceilings Directive). A broad range of approaches and technologies for improving manure nutrient management and nutrient recycling from manure should be further assessed, demonstrated and supported for implementation[9], including:

- Overall on-farm nutrient efficiency and loss minimization: animal feed optimization, low emission (and welfare) animal housing, manure management and processing, nutrient application, crop and soil stewardship …
- Promotion of anaerobic digestion of manure and of digestate processing to valorise its energy potential and improve its nutrient use potential.
- Requiring the use of Best Available Techniques for manure storage, handling and application (e.g. acidification, injection application …).
- Processing of manure to performance, consistent, recycled organic fertiliser products with nutrient composition and release characteristics adapted to crop requirements, and to reduce ammonia, NOx and methane losses, including plasma treatment combining atmospheric nitrogen fixation with improved manure nitrogen fertiliser efficiency.
- Development of precision farming techniques for manure application and optimisation of application in combination with other fertilising products as a function of crop requirements
- ….

More targeted fertiliser nutrient management can contribute to a higher efficiency of nutrient and especially nitrogen use, and thus contribute to reducing GHG emissions, especially N_2O emissions.

Some nutrient recycling routes offer clear climate benefits, such as **biogas production** (nutrients in digestate), **algae production using wastewater nutrients** and CO2 trapping.

Further **Life Cycle Analysis** studies of different nutrient management routes and nutrient recycling technologies are needed, in order to assess long-term benefits including climate change impacts, contaminants, nutrient conservation, and to ensure sustainability of long-term investment decisions in manure, food waste and sewage biosolids management. These LCA studies should integrate the climate impacts of composting, anaerobic digestion or pyrolysis (biochars), in particular concerning the form of organics returned to soil, biogas production.

Nutrient management and biodiversity

Preservation of biological diversity is one of the key objectives of the Farm to fork strategy for sustainable food in the European Green Deal[10] and should particularly address farmland biodiversity and soil biodiversity, including the microbiological communities underground that guarantee soil health, productivity, carbon sequestration and other, both known and untapped, ecosystem services. **Nutrient recycling, from manure and other organic materials, can help restore and maintain soil organic carbon which supports soil microbiological communities**.

Insect and soil biodiversity are important in ensuring nutrient cycling in soil, so limiting losses to surface waters and making nutrients available for crops[11]. Beetles have also been shown to reduce methane greenhouse gas emissions from manure pats[12]. **Dung beetles and other insects can be negatively impacted by veterinary pharmaceuticals in manure[13]**. Studies and risk assessments should be developed to assess such impacts on insects of chemicals in manure, and appropriate risk reduction measures should be engaged where impacts are identified.

Reducing nutrient losses from fields and **ammonia emissions from manure** will positively affect biodiversity in both terrestrial and aquatic environments. The EU Biodiversity Strategy (May 2020) states "*The Commission will promote the goal of zero pollution from nitrogen and phosphorus flows from fertilisers*" through the Key Commitment (n°10 of 14) and states (as in the Farm-to-Fork strategy) "*The losses of nutrients from fertilisers are reduced by 50%, resulting in the reduction of the use of fertilisers by at least 20%.*"

It is also important to note that the European Court of Justice judgements, concerning the Habitats Directive, impact projects (such as housing construction, roads or airports) which would cause nutrient emissions susceptible to deteriorate protected habitats[14].

Nutrient recycling and organic carbon in water policy

Integrate the circular economy (nutrient recycling and resources recovery) into the EU Urban Waste Water Treatment Directive and into the Sewage Sludge Directive, **including defining nutrient recycling objectives**. Action should address: resource recovery monitoring, cost recovery for nutrient and organic carbon recycling, synergies between nutrient recycling and nutrient removal (nutrient discharge consents), synergy with biogas and energy recovery, ensuring safety of contaminants.

Prioritise in water policy and in the Sewage Sludge Directive, **reduction at source of contaminants** in wastewaters to detoxify nutrient cycles.

Reinforce actions to identify and **reduce nutrient emissions from small settlements, isolated households and small livestock production farms** in the Urban Waste Water Framework Directive and via the Water Framework Directive.

Recycling should first target phosphorus and organic carbon (either by return to soil or by energy recovery) but nitrogen recovery and recycling should also be considered.

A **wide range of different routes are today available for phosphorus recycling from sewage sludge**, most of which are also applicable to other organic waste streams (manure, food industry wastewaters, food waste digestate …) :

- **use of appropriately treated sewage sludge on farmland** (e.g. after anaerobic digestion and/or composting to ensure stability, avoid odour and remove pathogens), to supply nutrient needs of crops, so also returning organic carbon and micronutrients to soil. See "State of science on sewage biosolids" update on use in agriculture, 2018, ESPP SCOPE Newsletter n°129 www.phosphorusplatform.eu/Scope129
- **growing algae or plants** (micro-algae, duckweed, willow trees, phragmites reeds …) which can fix nutrients into biomass which can then be processed or used in production of cosmetics or biofuels, energy production, fertilisers, animal feed …

- **precipitation of phosphate salts** from sludge dewatering liquors, e.g. struvite, vivianite
- **recovery of ammonia salts** from digestor gas stripping
- **use of adsorbents to remove P** and recycling either by release of the P from the adsorbent and regeneration (recovery as a phosphorus chemical) or use of the P-loaded adsorbent as a fertiliser (e.g. use of natural minerals or biological secondary materials as adsorbents[15]). Several recent science reviews of adsorbents are here www.phosphorusplatform.eu/Scope138
- **pyrolysis / gasification of sewage sludge** to recover energy, sanitise and produce a biochar or pyrolysis material which can be used directly as a fertiliser, or used as an active carbon for nutrient removal, before recycling
- **chemical or thermochemical P-recovery from sewage sludge or sewage sludge incineration ash** (e.g. Ash2Phos/EasyMining, Outotec AshDec, ZAR/Phos4Life, Pyrophos, Remondis…)
- **use of sewage sludge incineration ash as a raw material in fertiliser production** (adaptation of process to take ash as well as phosphate rock)
- **electro-thermal reduction of sewage sludge or sewage sludge incineration ash** to produce P4 (e.g. Italmatch/Recophos)
- **innovative processes** currently at the lab/pilot scale: electrolysis cells operating on sewage sludge or sludge ash, producing hydrogen and releasing phosphorus: ion exchangers …

Farm to Fork

Dietary choices are probably the biggest driver of nutrient use and of nutrient losses. Nonetheless, improvements can be made at farm level, if EU farmers are incentivised and equipped with effective tools (FaST, precision farming, advanced fertilizing products, better information on nutrient content of manure and slurry).

The Farm to Fork Strategy should fix overall EU objectives to improve Nutrient Use Efficiency (NUE) in the EU by 2030, for nitrogen and for phosphorus, to be adapted at national/regional level and or by crop type/agricultural sector, because farm conditions vary within the EU. This will ensure that phosphorus and nitrogen are more effectively taken up by the plants, while losses to the environment will be decreased and crop and livestock productivity will be maintained/increased. This will contribute to securing a profitable business model for farmers.

Improving **Nutrient Use Efficiency** requires a range of actions, which will also reduce nutrient losses, in particular:

- Improve data on farm and field level nutrient balances (the **FaST tool** in CAP is critical);
- Continue to develop efficient fertilisers (e.g. controlled release, foliar, …), biostimulants, precision fertilisation methods, nutrient-efficient agronomic practices …
- Improve data, understanding and implementation on nutrient-efficient application of manures and other nutrient-rich secondary materials and of organic fertilisers.

Development of nutrient footprinting of diets and of food products should be furthered[16], engaging the food industry[17] and retailers. Address the nutrient and nutrition content of food waste, rather than just the tonnage.

Work on information on phosphorus content of food products with the food industry: this can vary widely in processed foods[18] and is extremely important[19] for kidney disease patients (CKD) - that is maybe around 30 million persons in Europe[20].

Engage with DG SANTE to facilitate nutrient recycling from animal by-products, including Cat1 ABP incineration ash, without compromising health and safety, whilst respecting the waste hierarchy (consumer less, reduce losses, reuse in human food chain, animal feed, fertiliser, energy valorisation). This must take into account the current Covid media backlash, where recycling of animal by-products and BSE may be imagined to represent “the same dangers as eating bats”.

Nutrient efficiency of animal feed must be addressed, including in **aquaculture** and aquaponics (both open water and land-based systems).

Healthy Oceans, Seas, Coastal and Inland Water

Eutrophication, leading to ecosystem unbalances, toxic algal blooms and anoxic zones are an increasing threat to inland waters, coastal ecosystems and oceans ('dead zones'), and are linked to climate emissions. As Commissioner Vella indicated, the Horizon Europe Mission Healthy Oceans, Seas, Coastal and Inland Water should take eutrophication as one of the key challenges to improve the outlook of aquatic ecosystems.

Promotion of **consumption of currently under-valued fish species**[21], in particular those which feed on zooplankton[22], can contribute to limiting eutrophication impacts, provide sustainable protein, generate local jobs, and offer a route to effectively recycle nutrients back from eutrophic lakes, rivers or seas to the food chain.

Agriculture

A critical priority is implementation of the proposed CAP FAST tool[23] (Farm Sustainability Tool for Nutrients) for all farmers across Europe, as an obligatory condition for CAP funding, as well as inclusion of sustainable nutrient management as a key pillar of Farm Advisory Services to be established in the EU Member States. These actions to improve farm nutrient use should be **integrated with support to farmers for nutrient circularity and recycling.**

Update knowledge on long-term effectiveness, cost and feasibility of nutrient-loss mitigation actions, in different farming systems (e.g. buffer strips, retention ponds, no-till, crop rotation – crop diversity and inter-cropping …), and updating of online fact sheets and other tools for communicating this information to farmers, agricultural outreach services and to water basin managers (c.f. update from COST Action 869 which terminated in 2011[24]). This should be coordinated with **EMAS BEMPs**[25] (**Best Environmental Management Practice**) for agricultural nutrient management.

Manure management is a key factor in agriculture nutrient sustainability: there is more phosphorus in manures in the EU than is used annually in mineral fertilisers[26], and manure is an important source of nitrogen emissions.

Improved nutrient management should be included in the update of **EU aquaculture policy**[27], including reduction of nutrient footprint of feed materials, improving feed nutrient use efficiency, reducing nutrient losses and developing recovery and recycling of nutrients in discharges.

Follow-up should be ensured of conclusions of the **EIP-AGRI Focus Group on Nutrient Recycling**[28]: LCA, Nutrient Use Efficiency assessment methods[29], organic contaminants (impacts, mitigation), perception and acceptance of recycled nutrients, remote sensing to support precision fertilisation using biobased fertilisers, on-farm techniques for nutrient recovery and for measuring nutrient content in manures, production of recycled nutrient products adapted to specific crops and with reliably consistent composition.

The question of nutrient use and losses in **biofuels** should be specifically addressed, including for phosphorus: phosphate fertiliser needs for biofuel crop production, resulting phosphorus resource consumption and losses to surface waters, possibilities for recycling phosphorus from biofuel production (preferably to animal feed, or if not to fertiliser).

Address contaminants

Contamination of secondary resources of nutrients and of organic carbon flows are obstacles to recycling, because of costs of depollution or consumer rejection. Reduction at source of contaminants should be engaged as an active priority. In particular, contaminants in municipal wastewater are an obstacle to agricultural valorisation of composted or digestated sewage biosolids. Levels of veterinary pharmaceuticals, copper and zinc in manures are also a problem.

Pharmaceuticals and veterinary pharmaceuticals:
- reduce pharmaceuticals contamination at source of sewage and manures, improve biodegradability[30]
- risk assessment for pharmaceuticals in biosolids used in agriculture

- risk assessment for veterinary pharmaceuticals found in manure (impact on dung beetles, soil bacteria …)
- R&I into removal of pharmaceuticals in composting and in anaerobic digestion

Microplastics:
- already being addressed by ECHA for deliberately produced microplastics
- addressed in the Circular Economy Action Plan[31]
- reduction at source should be implemented where possible
- develop and render obligatory plastics which are fully biodegradable in sewage works and in the environment
- R&I into whether microplastics in biosolids and other recycled nutrient flows (e.g. food wastes) pose health or environmental risks

Consumer / industrial chemicals:
- where chemicals are identified as posing obstacles to biosolids valorisation, they should be fast-tracked for REACH restriction (cf study currently underway for DG ENVI[32])
- priorities to address should be perfluorochemicals (PFAS[33] and related chemicals), halogenated flame retardants and other halogenated industrial chemicals (including chlorinated paraffins and naphthalenes)[34]

Fiscal and market tools

The market for recycled nutrient products is often not "economic", because recycling (relatively small scale processing, contaminants and safety requirements, decentralised logistics) is often more costly than primary fertilisers, and because the EU regulatory and fiscal framework does not monetise environmental or social benefits such as pollution abatement, soil preservation, primary resource savings, local job creation ….

However, the EU trade balance for key nutrients (N, P, K) is negative[35] and a significant part of these nutrients is lost to the environment.

Monetisation of external environmental and social costs (True Costing) for nutrient use, nutrient losses and nutrient recycling should be a priority, through fiscal, market price or other mechanisms. Financial balance mechanisms should ensure that, overall, farmers are not penalised.

Tools to support markets for secondary nutrients should be tested to avoid unintended impacts, and implemented across the EU to avoid market distortion, in cooperation with Member States **(c.f. European Semester,** see IEEP proposals 2020[36]). These should combine: price-based instruments (e.g. subsidy or tax), rights- or quantity-based instruments (tradable permits and certificates) and market friction instruments (information) in order to be effective:

- Rewarding farmers for practices which maintain or increase carbon storage in soils and for sustainable nutrient balances as part of the CAP, in coherence with mandatory FaST tool;
- Market support tools: e.g. modulated VAT to support fertilisers with recycled nutrient content, ecotaxes or resource import taxes which favour sustainable fertiliser production. Income from nutrient fiscality should be used to support recycling and returned to farmers, so that net overall impact for agriculture is not financially penalising;
- Transfer of taxes and contributions from jobs (social contributions, VAT) to ecotaxes on resources and on nutrient emissions;
- If imported products (fertilisers, animal feed, food products …) are not subject to the same sustainability constraints or ecotaxes, then this must be compensated by import taxation (this should include food products or feed crop if grown by farmers not subject to the same sustainability constraints as in Europe);
- Definition of recycled nutrient content objectives coherent with implementation of recycling technologies able to reliably deliver corresponding quantities conform to quality and safety requirements;
- Integration of nutrient recycling into Public Procurement[37];
- Development of nutrient emissions trading to improve cost-effectiveness of water policy objectives, in particular between waste water treatment and agriculture, including development of nutrient certificates / nutrient credits;

- Communications, via nutrient footprints on food products, in cooperation with the food & beverage industry;
- Studies of environmental and social costs of nutrient losses and benefits of nutrient recycling, in order to support fiscal policies aiming to internalise these externality costs and benefits;
- Nutrient recycling objectives at national and/or regional levels.

A Circular Economy Directive with clear objectives to be achieved by member states (similar to REDII for energy) could provide a consistent and obligatory framework for CE policies.

Support nutrient stewardship and recycling demonstration sites

Under Horizon Europe, Interreg, LIFE, support test and demonstration actions for nutrient footprinting, nutrient stewardship and nutrient recycling.

Include nutrient recycling, including developing, extended field testing and taking to market of recycled nutrient products in the Circular Bio-Based Partnership[38].

Policies and tools developed and implemented by European cities (Helsinki, Amsterdam and many others) should be evaluated for their potential of upgrading to EU policies[39].

End-of-Waste and other regulatory obstacles

The new EU Fertilisers Product Regulation 2019/2009 (FPR) will resolve significant regulatory obstacles to nutrient recycling, on condition that the proposed STRUBIAS[40] annexes are adopted, with not only the CE-mark but also End-of-Waste. This will open the market both for secondary nutrient products, and also for nutrient recycling technologies.

- Additional materials need to be assessed for inclusion in annexes, or clarification of their status, in particular: recovered nitrogen and potassium salts from gas cleaning, algae and other biomass grown as wastewater treatment, insect frass[41], fish manure, Cat1 animal by-product incineration ash …
- The annex for animal by-products needs to be prepared (CMC10)
- The annex (CMC11) for by-products needs to be developed (underway), both for organic and inorganic materials

However, **regulatory obstacles (in particular End-of-Waste) need to be clarified for sectors other than fertilising products**:

- Use of sewage sludge or animal by-product incineration ash, after chemical processing, to produce animal feed additives[42], with removal of contaminants and guaranteeing safety,
- Non-fertiliser products recovered from municipal wastewaters,
- Non-fertiliser products recovered from flue gas cleaning and ash, including from municipal solid waste incineration.

Specific secondary material streams form wastewaters (for specified use destinations), should be included in the priority material streams for assessment of possible **EU End-of-Waste criteria**.

A temporary “proof of concept” permitting regime should be instigated, to allow **start-up of new recycling processes** at an initial limited scale, with appropriately adapted safety and risk assessment and documentation.

Companies wishing to replace primary raw materials by secondary materials can face permitting problems if the secondary material is “waste”[43]. Coordination of national permitting authorities, and transfer of experience, could facilitate such **re-permitting to facilitate use of secondary materials**.

The proposed update of the **Industrial Emissions Directive[44] should better integrate recycling, as a part of resource efficiency objectives**: use of secondary raw materials in production, recovery of materials in processes, and recycling of waste or by-product streams. This should integrate nutrients, and should particularly target the EU Critical Raw Material “phosphate rock”. Resource efficiency and recycling, including nutrients, should be integrated into the Key Environmental Indicators (KEIs) for BAT[45].

Cattle farms, other livestock production and aquaculture, above certain size limits, should be integrated into the BREF[46] for "intensive rearing of poultry or pigs".

Also, the **application of REACH art. 2(7) "recovered" substances needs to be clarified**. This article is important to facilitate recycling, which often takes place in small, distributed sites owned by organisations not accustomed to chemical regulations (e.g. local authorities for sewage works) so that REACH Registration of each producer and site would prevent implementation. However, the exoneration from Registration means that there is no obligation to share costs for the REACH dossier preparation, management and updates[47].

Also, recycled nutrient materials adapted to the principles of **Organic Farming**[48] should be authorised for use in Organic Farming, starting with struvite and calcined phosphates recovered from municipal wastewater (EGTOP Opinion of 2/2/2016).

Importance of value-chain stakeholder dialogue

Facilitate dialogue through value-chains, including farmers and agricultural advisory services (nutrient users), recycling and waste valorisation industries, chemical and fertiliser industries (in particular, **organic fertilisers which today lack European industry coordination**), regional strategy organisation (e.g. HELCOM), regulators, consumers.

At the EU level (e.g. via EIP-AGRI), a **data-base of recycled nutrient materials and organic fertilisers**, both generic and company-specific, should be established, including agronomic trial data and farmer experience, in order to build farmer confidence, provide information and promote success stories. To be meaningful, this needs long-term engagement and funding, both from policy makers and from relevant industries and stakeholders, and not a temporary "project" approach.

Commission actions to support stakeholder dialogue should ensure cooperation with industry federations and with existing platforms functioning with industry engagement and not undermine these with exogenous or temporary (project lifetime) funding.

In particular, **the European Commission should engage with the food and beverage industry on nutrient footprinting, food product phosphorus content information, nutrition and nutrient content of food waste**.

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[1][1] See conclusions of the DONUTSS workshop (Data on Nutrients to Support Stewardship), 2015 www.phosphorusplatform.eu/eNews117

[2] See e.g. http://wp.lancs.ac.uk/rephokus/

[3] http://www.oecd.org/cfe/regional-policy/Ekins-2019-Circular-Economy-What-Why-How-Where.pdf

[4] https://www.stockholmresilience.org/research/planetary-boundaries/planetary-boundaries/about-the-research/the-nine-planetary-boundaries.html

[5] https://www.footprintnetwork.org/our-work/ecological-footprint/

[6] See SCOPE Newsletter n° 137 summarising current scientific understanding of links between nutrient losses to surface waters and nutrient management, climate change, eutrophication and crop Nutrient Use Efficiency at https://phosphorusplatform.eu/scopenewsletter

[7] See SCOPE Newsletter n° 135 summarising current scientific understanding of links between nutrients and aquatic methane emissions at https://phosphorusplatform.eu/scopenewsletter

[8] FAO, 2018, Chair's Summary. 2nd International Symposium on Agroecology Scaling up agroecology to achieve the Sustainable Development Goals http://www.fao.org/family-farming/detail/en/c/1192634/

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[10] https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en - https://ec.europa.eu/food/farm2fork_en

[11] Losey et al. 2006 https://doi.org/10.1641/0006-3568(2006)56[311:TEVOES]2.0.CO;2 - Finch et al (2020) https://setac.onlinelibrary.wiley.com/doi/abs/10.1002/etc.4671 - See also http://www.dungbeetlesforfarmers.co.uk/information-for-farmers

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[13] Implications of Endectocide Residues on the Survival of Aphodiine Dung Beetles: A Meta-Analysis, D. Finch et al., Environmental Toxicology and Chemistry—Volume 39, Number 4—pp. 863–872, 2020 https://doi.org/10.1002/etc.4671

[14] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:62017CA0293

[15] E.g. FILTRAFLO™-P crab carapace-based P-adsorbent https://www.nweurope.eu/media/12161/phos4you_p-rich_biomass_en_nov2020.pdf

[16] Integrating the work underway at JRC with the Gothenburg TFRN (Task Force on Reactive Nitrogen) and "Footprint Family" project

[17] http://www.fooddrinkeurope.eu/uploads/publications_documents/FoodDrinkEurope_Product_Environmental_Footprinting.pdf

[18] Dietary Phosphate and the Forgotten Kidney Patient: A Critical Need for FDA Regulatory Action, M. Calvo, R Shermann & J. Uribarri, Am J Kidney Dis. April 2019, vol. 73, Issue 4, pp. 542–551 https://doi.org/10.1053/j.ajkd.2018.11.004

[19] "Re-evaluation of phosphoric acid–phosphates – di-, tri- and polyphosphates (E 338–341, E 343, E 450–452) as food additives and the safety of proposed extension of use", EFSA Panel on Food Additives and Flavourings (FAF), adopted 4th June 2019, EFSA Journal 2019;17(6):5674 www.efsa.europa.eu/en/efsajournal/pub/5674f

[20] Estimate based on the indication of 10% of the population by EFSA 2019 (reference above) or 7% of the population by Ketteler in "Clinical aspects of natural and added phosphorus in foods", Humana Press (Springer), 260 pages, 2017, editors O. Gutiérrez, K. Kalantar-Zadeh and R. Mehrotra www.springer.com/us/book/9781493965649

[21] See e.g. Järki Särki project, developing valorisation of roach in the Baltic https://www.jarkisarki.fi/#!home/bqldb

[22] zooplankton are the aquatic "grazers" which can naturally control algal blooms, e.g. daphnia

[23] https://phosphorusplatform.eu/scope-in-print/enews/1826-enews031#_Toc2766002

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[28] https://ec.europa.eu/eip/agriculture/en/focus-groups/nutrient-recycling

[29] c.f. EU Nitrogen Expert Panel www.eunep.com

[30] c.f.: EU "Strategic Approach to Pharmaceuticals in the Environment"

[31] COM(2020)98, $3.4 addresses both intentionally produced and unintentionally generated microplastics

[32] "Contaminants in fertilisers": Assessment of the Risks from their Presence and of the Socio-economic Impacts of a Possible Restriction under Reach" https://etendering.ted.europa.eu/cft/cft-display.html?cftId=5131

[33] PFAS is being addressed as a priority under the EU Chemical Strategy towards a Toxic-Free Environment, see COM document on PFAS (per- and polyfluoralkyl substances) SWD(2020)249, 14th October 2020 https://ec.europa.eu/environment/pdf/chemicals/2020/10/SWD_PFAS.pdf

[34] UK Water Industry Research Report 18/SL/01/9 (2018) ISBN 1 84057 864 5 "Biosolids to market – a strategic proposal to explore the threats to biosolids to land – now and in the future" https://ukwir.org/biosolids-to-market-a-strategic-proposalto-explore-the-threats-to-biosolids-to-land-now-and-in-the-future-sl-850/sl-1072-sl-1060-combined-0

[35] See graph fig. 4 in https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/farming/documents/market-brief-fertilisers_june2019_en.pdf

[36] "Delivering the Green Deal: the role of a reformed European Semester within a new sustainable economy strategy", IEEP, C. Charveriat & E. Bodin, 2020 https://ieep.eu/publications/role-of-a-reformed-european-semester-within-a-new-sustainable-economy-strategy

[37] https://ec.europa.eu/info/policies/public-procurement_en

[38] https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2019-4972449/public-consultation_en

[39] https://www.oecd.org/cfe/regional-policy/Wijkman-2019-Circular-Economy-Cities-Requires-Systems-Approach.pdf

[40] STRUBIAS : precipitated phosphate salts & derivates, thermal oxidation materials &

derivates and pyrolysis & gasification materials" http://dx.doi.org/10.2760/186684

[41] Insect excreta, exoskeletons, un-eaten feed substrate, from insect production https://en.wikipedia.org/wiki/Frass

[42] see: Animal Feed Marketing and Use Regulation 767/2009: art. 6.1 and Annex III 1.1 and 1.5

[43] Example: fertiliser factories wishing to replace phosphate rock as input material by sewage sludge incineration ash

[44] Consultation open to 21/4/2020 https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12306-EU-rules-on-industrial-emissions-revision

[45] http://eippcb.jrc.ec.europa.eu/reference

[46] https://ec.europa.eu/jrc/en/news/new-eu-environmental-standards-large-poultry-and-pig-farms

[47] Currently the struvite REACH dossier no longer has an active Lead Registrant, is inadequate, and needs updating: read-across is used for acute oral and dermal toxicity and 'in vitro' for eye irritation, whereas this not applicable for these end-points for inorganic phosphates; there are other technical problems with the dossier; newly available data must legally be added to the dossier (since 2013).

[48] Regulation 2018/848 (replaces 834/2007) art.5(c) specifies as a "general principle" of Organic Farming "the recycling of wastes and by-products of plant and animal origin as input in plant and livestock production"