Events

6th European Sustainable Phosphorus Conference ESPC 6 24-25 November 2026, Benguerir, Morocco

www.phosphorusplatform.eu/ESPC6

Programme with all speakers (plenaries and parallels) and details of Young Researchers' Day and site visits is now online.

ESPC is the world's leading sustainable phosphorus event, every 2-3 years. Don't miss it! ESPC 6 will include an optional site visit to an OCP phosphate mine, rock beneficiation and processing (numbers limited, book now). The 6th European Sustainable Phosphorus Conference (ESPC6) will bring together industry, policymakers, researchers and innovators working on sustainable phosphorus and nutrient management.

ESPC6 is co-organised by OCP Group and ESPP, with support of UM6P (Université Mohammed VI Polytechnique). ESPC6 will take place at UM6P, in Benguerir, 1 hour shuttle from Marrakech.

Young Researchers' Day: Monday 23rd November – register your interest now via the online conference booking site

ESPC6: Tuesday 24th – Wednesday 25th November

Site visits: Thursday 26th November, OCP phosphate rock mine near Benguerir, laboratory and agronomy research at UM6P, optional for conference registrants, limited number of places remaining, first registered first served.

Possibilities for stands or sponsoring remain open (see below). Members of ESPP and of national Nutrient Platforms are invited to present a short "success story" pitch in the conference plenary. Contact espc6@phosphorusplatform.eu

Early career poster and pitch prizes at ESPC6

ESPP is offering prizes for the best Early Career conference posters and the Young Researchers' Day contributions. Prizes will be 400€ - 200 € - 100 € and awarded work will be presented in the SCOPE Newsletter conference summary (> 110 000 circulation worldwide).

The ESPP prizes are open to Early Career candidates: persons in research or work who completed a full-time education qualification (e.g. Bachelor, Master, PhD) less than 8 years ago (time can be extended in case of official leave for maternity/paternity or health). Early Career parallel session presenters wishing to be considered for the poster prize should submit also a poster.

Late poster submissions can still be considered (contact espc6@phosphorusplatform.eu). To participate in the Young Researchers' Day (Monday 23rd November) tick this option when registering for ESPC6. www.phosphorusplatform.eu/ESPC6

Sponsorship and exhibition opportunities at ESPC6

Limited exhibition spaces are still available for organisations wishing to showcase their phosphorus solutions at ESPC6, 24–26 November 2026. Sponsorship opportunities are also available to increase visibility at the conference.

Organisations can still book an exhibition booth to present technologies, products, projects and solutions and meet participants throughout the three-day conference. Only a limited number of exhibition spaces remain available.

Sponsorship opportunities are also still available for organisations wishing to increase their visibility and engagement at ESPC6. Different sponsorship packages are available.

Contact espc6@phosphorusplatform.eu to discuss available opportunities. ***Deadline: 30th September 2026***

Phosphates+Potash 2027

16-18 March 2027, Rome. CRU's Phosphates+Potash alongside Nitrogen+Syngas and Future of Fertilizers expo-conferences, with over 1 000 participants expected. This is the world's biggest phosphate industry event, covering markets and industry strategy, operations and digitalisation, phosphate rock mining and beneficiation, phosphoric acid, fertiliser and technical phosphates production, sustainability and circularity as well as potash production and processing.

CRU Phosphates+Potash expoconference, 16-18 March 2027, Rome.

For panel proposals, sponsoring, exhibition, and abstract submission support: ava.blagoeva@crugroup.com

Nitrogen+Syngas 2027 - https://nitrogenandsyngas.events.crugroup.com/

Phosphates+Potash 2027 - https://phosphates.events.crugroup.com/

EU public consultations

Consultation open: Green-Listing of certain wastes

Deadline 15th September. "Green-List" wastes benefit from reduced constraints on transport, so facilitating recycling. Consultation proposes to extend the List to some technical wastes, but fails to address nutrient or organics recycling. A first public consultation in 2025 (see ESPP eNews n°101) asked for public input on waste streams to consider for Green-Listing under the Waste Shipments Regulation 2024/1157 ("hazardous" wastes are excluded). ESPP made detailed input covering nutrient-containing ashes (sewage sludge incineration ash, "national" recycled fertilisers, bio-based streams, other nutrient rich waste streams (e.g. fire extinguishers …). However, the proposals submitted now to consultation cover only polymer-fibre materials, construction demolition wastes, mattresses and WEEE (waste electric and electronic equipment), permanent magnets and End-of-Life Vehicle materials. The Commission's 'Explanatory Memorandum' to the proposal indicates that input to the 2025 consultation put forward "other" wastes, with no mention of nutrient or organic wastes, and no explanation why these are not considered. ESPP will input to the current consultation reminding of the importance of nutrient circularity in the context of the current fertiliser supply crisis (Russia's was on Ukraine, Hormuz Strait) and of Food Security and Bio-Economy objectives. ESPP will remind of our input to the 2025 consultation and ask that inclusion of secondary nutrient, bio-economy and organic streams into Green Listing be specifically studied: clear definitions, contaminant limits, Waste Classes and other conditions for eligible materials, assessment of tonnage potential, etc.

EU public consultation "Green-listing certain waste for the purposes of shipments to recovery between Member States" (draft Act), ***open to 15th September 2026*** *https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/14712-Green-listing-certain-waste-for-the-purposes-of-shipments-to-recovery-between-Member-States_en*

ESPP input submitted to public consultations, including on Green-Listing of Wastes (October 2025) www.phosphorusplatform.eu/regulatory

Consultation open: Do No Significant Harm (DNSH) conditionality for all EU funding

Deadline 16th September 2026. Consultation on approach to fixing general DNSH environmental criteria applicable to all EU policies and to projects receiving EU funding under the next EU budget, as per the proposed 'Performance Regulation' for the next EU MFF (2028-2034 Multiannual Financial Framework). This is part of the Commission's effort to apply

horizontal principles across the EU budget. The meaning of 'DNSH' is clarified in art. 17 of the EU Taxonomy Directive 2019/2088 and includes the circular economy, waste prevention and recycling.

The consultation consists of questions based on a Commission 'Concept Paper' which proposes general principles of how DNSH would apply across EU policies, and lists sectors and activities considered a priori to be harmful unless subject to specific sectorial criteria or exemptions (to be defined).

ESPP will input to:

- welcome the overall principle of DNSH across EU policies, noting that DNSH includes circularity and resource use,
- underline that DNSH should include the aim of reducing virgin material consumption, in particular improving Nutrient Use Efficiency and developing nutrient circularity,
- underline the importance of applying the DNSH to EU agriculture funding (CAP). This is in theory already the case through 'conditionality' requirements (obligation to respect EU environment and health regulations, such as Nitrates Directive, Water Framework Directive …) and should be reinforced in the next CAP and in thematic policies such as the EU Livestock Policy, Fertiliser Action Plan, Aquaculture Strategy,
- sewage sludge mono-incineration installed to enable phosphorus recovery, subject to energy and recovery residue valorisation, should be 'carved out' of the specification of 'Waste incineration' as an "activity considered to do significant harm". ESPP welcomes that the proposal already 'carves out' heat recovery, carbon capture and recycling of materials from ashes from this specification.
- as in the Commission's proposed document, pyrolysis or gasification for biochar or biofuel production, subject to nutrient recycling, should not be listed as an "activity considered to do significant harm",
- fertigation enabling nutrient recycling should be 'carved out' of the specification of 'Investment in irrigation' as an "activity considered to do significant harm".

EU "Targeted public consultation - draft guidance on the application of the 'do no significant harm' principle under the 2028-2034 Multiannual Financial Framework (MFF)", ***open to 16th September 2026*** *https://commission.europa.eu/strategy-and-policy/eu-budget/performance-and-reporting/performance-regulation_en*

Consultation open: European Environment Agency & Observation Network

Deadline 21st September 2026. Evaluation of the European Environment Agency (EEA) and European Environment Information and Observation Network (EIONET). The EEA's objective is to develop reliable environmental data to support policymaking and raise public awareness. EIONET is a partnership between the EEA and national institutes in 40 countries to gather relevant environment and climate data. This consultation aims to collect input to prepare the evaluation of EEA and EIONET, as regards performance, organisation, budget and governance.

EU public consultation "European Environment Agency & the European Environment Information & Observation Network (evaluation covering 2022-2026)" ***open to 21st September 2026*** *https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/18801-European-Environment-Agency-the-European-Environment-Information-Observation-Network-evaluation-covering-2022-2026-_en*

Non-Organic protein in Certified Organic Farming

Proposal to authorise up to 5% non-Organic protein in feed for young pigs and poultry in Certified Organic Farming to address a current structural shortage of Certified Organic protein feed for pigs and poultry. Use would be authorised by Member States on the basis of evidence of shortages and to fulfil specific amino acid requirements of young pigs and poultry.

EU public consultation "Organic farming – authorisations for the use of non-organic protein feed". Closed 31st August 2026.
https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/17673-Organic-farming-authorisations-for-the-use-of-non-organic-protein-feed_en

ESPP inputs to consultations

ESPP submitted input to EU consultations on BioTech Act and bio-based / recycled fertilisers and on proposed EU Critical Raw Materials Centre. For detail of these consultations see ESPP eNews n°109 and ESPP submitted input at www.phosphorusplatform.eu/regulatory.

ESPP's input to the public consultation on BioTech I Act (closed 5th August) underlined that the BioTech Act (or Acts I and II) should address both resilient nutrient supply to feed crops to input to the bioeconomy and also the need to recycle nutrients from bio-economy residue streams. ESPP noted that the consultation accompanying documents seem to inappropriately use the term "bio-fertilisers" to mean "genetically modified micro-organism biostimulants" and emphasised the need to establish a clear legal definition of "bio-based - " and "recycled - " for fertilisers, for fertilising products and for nutrients. ESPP submitted the proposal for wording such formal definition developed in wide consultation with stakeholders, as a discussion proposal.

All ESPP inputs to public consultations are here: www.phosphorusplatform.eu/regulatory

ESPP stakeholder proposed definitions of "bio-based - " and "recycled - " fertilisers, fertilising products and nutrients, July 2026
https://www.phosphorusplatform.eu/images/Regulatory%20activities/ESPP%20proposal%20Definition%20Bio-Based%20%20Recycled%20Fertiliser%20v8_7_26.pdf

Policy

EU "Livestock Strategy"

European Commission underlines the need to address spatial distribution of livestock nutrients, nutrient management and nutrient recycling (in particular via digestates), and outlines future policy actions including in the next CAP.

The European Commission's Livestock Strategy communication states that livestock farming represents around 40% of EU agricultural added value with 400 billion €/year turnover and employing 7 million people and considers that livestock play a key role in food security by providing high quality protein, with a positive contribution to the EU trade balance and world-leading standards for quality and sustainability. The Strategy underlines the need for circularity as essential for the livestock sector's future, to reflect societal expectations, improve profitability and to achieve climate neutrality by 2050. Improving on-farm nutrient management, spatial planning to address regional livestock concentration hotspots and nutrient transfer from surplus to deficit regions are identified as important actions.

The Strategy indicates a funding gap for the livestock sector of 16 billion € (EU Fi-Compass), citing manure management as a funding need and stating that Commission recommendations to Member States for the next CAP (Common Agricultural Policy) will include investments in advanced manure management (e.g. biogas, treatment technologies) and inclusion of manure digestate for fertilisers in CAP National and Regional Partnership Plans. The future CAP is presented as an opportunity for Member States to support improved manure management and nutrient recycling, noting the possibility to use digestate of biowaste (separately collected household organic waste) as a biobased fertiliser.

The Commission indicates plans to assess in 2026 possible extension of the 'RENURE' Nitrates Directive exemptions to liquid manure digestates (see ESPP eNews n°106) and to progress work on facilitating the circularity of animal by-products. The Commission announces the development of a Roadmap to support practical implementation of improved livestock nutrient management and sustainable circulation of nutrients across the EU, addressing logistics, nutrient pressure, coherent implementation of the regulatory framework.

ESPP input to the public consultation to develop the Livestock Strategy (April 2026) emphasising the need to include nutrient management and nutrient recycling in the Strategy and submitting the 25 key messages from the stakeholder workshop on phosphorus sustainability in livestock, organised in Saint Malo, Brittany, France, 5-7 March 2025, by ESPP with TIMAC AGRO (Roullier Group), Cooperl, BETA (Vic Spain), CEH UK, as part of the United Nations UNEP GEF uPcycle project. In particular, the 25 key messages of this workshop constitute a one-page contribution, included in the workshop summary (page 17 of SCOPE Newsletter n°155, 2025).

"EU strategy on livestock" European Commission communication 7th July 2026, COM (2026) 576 https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/16832-EU-livestock-strategy_en

EU "Protein Action Plan"

Commission document sets out strategy to reduce the EU's plant protein deficit: the EU produces 67 Mt/y of plant protein in crops and fodder, whereas its livestock consumes 74 Mt/y, and a further 6 Mt/y goes to other uses. The EU is self-sufficient for low-protein content animal feed, whereas three quarters of high-protein feeds are imported (oilseed and protein crops). The Commission considers that addressing this EU plant protein deficit is necessary to reduce vulnerability to global market fluctuations, avoid supply chain disruptions and enable progress on livestock sustainability. Accession of Ukraine to the EU would significantly reduce the EU's protein import dependency.

The Protein Action Plan proposes to expand EU plant protein production including by incentivising farmers to produce protein crops, sustainable grassland and fodder crops in the Common Agricultural Policy (CAP), via carbon and nature credits and through protein value chain investment support. The Plan particularly cites diversified production systems with reduced fertiliser needs. The Plan also aims to improve efficiency of livestock systems, including optimising feed use, regional and local feeds, support for EU production of feed inputs and additives. The Plan also mentions diversification of human diets towards more plant-based proteins, but with responsibility for this pushed towards national policy tools "such as taxation, education, dietary guidelines and information … public catering … consumer information, including labelling and advertising ..." The protein value for animal feeds of bioeconomy secondary streams is noted.

"Reducing the plant protein deficit of the European Union", European Commission, 7th July 2026
https://agriculture.ec.europa.eu/farming/crops/cereals/reducing-plant-protein-deficit-eu_en#protein-action-plan

"Action Plan for resilience, strategic autonomy and sustainability of the EU protein system", COM(2026) 355 final, 7th July 2026 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2026:355:FIN

European Commission report on implementation of the Polluter Pays Principle

The Commission's Fitness Check report addresses effectiveness of the Polluter Pays Principle (PPP) across 76 different EU legislations and underlines that the principle is very incompletely applied. Environmental taxes are estimated at around 320 billion €/year in the EU, very much lower than estimates of environmental damage (e.g. industrial air pollution is of this order of magnitude), whereas contrary fossil fuel subsidies are 123 bn€.

The report concludes that the principle can be an effective mechanism for providing price signals to increase efficiency of environmental policy. The principle can be important for social justice if pollution costs are born by polluters not by the taxpayer or by people impacted by the pollution. The report concludes that overhead costs of implementing the principle are largely justified. It concludes that the Polluter Pays Principle is highly relevant for achieving EU climate and environmental objectives, and that it is important that it be implemented at the EU level to ensure consistency across Member States.

European Commission, Fitness Check of the Polluter Pays Principle (PPP), SEC(2026)404 - SWD(2026)402, 16th July 2026 https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52026SC0404

German Federal / Regions report on P-recovery implementation

LAGA Working Group conclusions address cost recovery from water users, inclusion in sewage and sludge service tenders and "temporary" storage of sewage sludge ash for later P-recovery.

The LAGA report confirms the expert analysis published by UBA (German Federal Environment Agency, see ESPP eNews n°100) stating that all costs relating to preparation, testing and monitoring, investment and implementation of phosphorus recovery, as required by German legislation from 2029, can be passed on to water consumers, including costs engaged before the legal implementation deadline. LAGA suggest that in some German Länder, changes in law might be useful to ensure legal certainty.

The report considers that P-recovery as required by the German legislation, should be included into service contract tenders for sewage treatment and sewage sludge management. Because significant investments are necessary, tenders should be for ten years with extension options. Separate prices should be requested for sewage sludge management (e.g. mono-incineration) and for phosphorus recovery, and that specification of the phosphorus recovery route and process should be required. LAGA recommends that these guidelines be widely shared with municipalities, sewage and sludge operators and with relevant industry.

Regarding storage of sewage sludge mono-incineration ash for P-recovery at a later date, LAGA notes that such "temporary" storage is an authorised option under the German P-recovery legislation, but that the storage will inevitably be for some years it cannot be considered "interim" under German legislation, so will require permitting as for permanent landfill. Fluidised bed sewage mono-incineration results in fine particle ash (mainly 70 – 400 µm). The ash is mostly landfill class II. The landfill storage will require moistening and coverage, collection and treatment of leachates, specific landfill design to enable re-extraction for later P-recovery and to separate ashes from different producers which will have different characteristics, so costs will be considerably higher than the current landfill costs for moistened sludge ash of 50 – 70 €/tonne. Taking into account the re-extraction of the ash and P-recovery, estimates of total costs vary from 200 to 500 €/tonne, but it is not possible to make reliable estimates. LAGA concludes that the option of "temporary" landfill is appropriate only for exceptional cases, for short durations, where P-recovery installations are expected to be operational in the foreseeable future.

LAGA is the German Federal / Länder (regional states) Working Group on Waste, established by the Conference of Länder Environment Ministers sixty years ago with the aim of ensuring uniform enforcement of waste law across the German Federal Republic.

LAGA "Sicherstellung der Phosphorrückgewinnung bis 2029", Statusbericht an den Technischen Ausschuss der ATA Ad-hoc Ausschuss (Ensuring phosphorus recovery by 2029, Status report to the Ad-Hoc Technical Committee) https://www.laga-online.de/documents/03-umk-ulv-11-2026-statusbericht-des-ad-hoc-ausschuss_1777546899.pdf

Evaluation of Nitrates Directive: effective, implementation should be improved

The official Evaluation considers that the EU Nitrates Directive is effective in addressing agricultural nitrate pollution but that implementation should be simplified and should better target Nutrient Use Efficiency and nutrient circularity. The evaluation says the Directive should be maintained, to provide an EU environmental protection baseline, and that action to improve implementation should centre on reducing administrative burden (especially for small farms) and on improving nutrient management at the farm level adapted to local circumstances. The Evaluation underlines that better use of nutrients can reduce dependence on imported fertilisers. It notes that the European Commission intends to widen the RENURE exemptions (see ESPP eNews n°106) to allow the use of "certain types of liquid digestates based on manure with appropriate environmental safeguards … (after) a first preliminary scientific assessment later this year". The Evaluation notes that nutrient pollution remains too high in regions with high livestock concentrations and refers to the EU Livestock Strategy (see above in this eNews). The Evaluation includes country reports for each Member State, including recommendations in each case to improve implementation of the Directive.

"EU law on nitrates pollution remains effective, with scope for smarter implementation", and "Evaluation of the Nitrates Directive" SWD(2026)234, European Commission, 15th July 2026 https://ec.europa.eu/commission/presscorner/detail/en/ip_26_1594

"Assessing the effectiveness of the Nitrates Directive: implications for agriculture and for water, soil and air quality", JRC 2026, B. Grizetti et al., JRC143163, https://data.europa.eu/doi/10.2760/6539397

"Phosphorus" (P_4) in Netherlands list of 17 critical raw materials

The Netherlands Government has established a national list of 17 critical raw materials including 'Phosphorus' (meaning P_4). The list should orientate government support for recycling, refining and logistics for these materials, including investment support and accelerating permitting. The CBS report (September 2025) makes clear that the term 'Fosfor' ('Phosphorus') in the designated Netherlands list refers to P_4 (white phosphorus), as distinguished from Phosphate Rock (which

is not included in the Netherlands list). The Netherlands list is not the same as the EU list. The EU has classified (in the Critical Raw Materials Ac 2024/1252) 34 materials as "critical (including Phosphate Rock and "Phosphorus" = P_4) and 17 of these as 'Strategic' (neither Phosphate Rock nor Phosphorus). The Netherlands list of 17 critical raw materials is compared below to the EU lists. **ESPP suggests that it is not helpful that EU Member States publish their own, different, critical raw materials. This will cause confusion and complication without bringing any added-value**.

EU Critical Raw Materials list	EU "Strategic" list	Netherlands Critical list
Antimony		
Arsenic		
Bauxite/alumina/aluminium	YES	
Baryte		
Beryllium		YES
Bismuth	YES	
Boron	YES (metallurgy grade)	
Cobalt	YES	YES
Coking coal		YES
Copper	YES	
Feldspar		
Fluorspar		YES
Gallium	YES	YES
Germanium	YES	YES
Hafnium		
Helium		
Heavy rare earth elements Light rare earth elements	YES: rare earth elements for permanent magnets: Light: Ce, Pr, Nd, Sm, Gd. Heavy: Tb, Dy.	YES
Lithium	YES (battery grade)	YES
Magnesium	YES (magnesium metal)	YES (magnesium metal)
Manganese	YES (battery grade)	
Graphite	YES (battery grade)	YES
Nickel — battery grade	YES (battery grade)	
Niobium		YES
Phosphate rock		
Phosphorus		YES
Platinum group metals	YES	
Scandium		YES
Silicon metal	YES	YES
Strontium		
Tantalum		
Titanium metal	YES	
Tungsten	YES	YES
Vanadium		YES

Netherlands Government announcement of national critical raw materials list, 7th July 2026
https://www.rijksoverheid.nl/actueel/nieuws/2026/07/07/kritieke-grondstoffenlijst-vastgesteld-snellere-uitvoering-grondstoffenstrategie
NMO (Netherlands National Materials Observatory) page with the list of 17 materials designated critical
https://nederlandsmaterialenobservatorium.nl/nieuws/nmo-adviseert-nationale-lijst-17-kritieke-grondstoffen/
CBS report "Nederlandse afhankelijkheid van kritieke materialmen" (The Netherlands' Dependence on Critical Materials), September 2025
https://www.cbs.nl/-/media/_pdf/2025/40/nederlandse-afhankelijkheid-van-kritieke-materialen.pdf

European Parliamentary Question on bio-based materials in EU Circular Economy Act

Question from Katri Kulmuni (MEP, Finland, Renew) asks whether renewable and bio-based materials will be addressed in the upcoming Circular Economy Act and in the Ecodesign for Sustainable Products Regulation. The answer from European Commissioner for the Environment and Circular Economy is somewhat vague, but suggests that bio-based materials and bio-wastes will be covered by the Circular Economy Act and that circularity and bio-based materials are included in Ecodesign approaches.

European Parliament question for written answer, Katri Kulmuni, E-002355/2026, 9th June 2026 "Recognising renewable bio-based materials as circular solutions" https://www.europarl.europa.eu/doceo/document/E-10-2026-002355_EN.html
European Commission answer, Jessika Roswall, 25th August 2026 https://www.europarl.europa.eu/doceo/document/E-10-2026-002355-ASW_EN.pdf

Nutrient recycling

Why radio isotope tracing cannot identify recycled or bio-based fertilisers

Public policies to support nutrient recycling and private purchasing criteria for recycled fertilisers both require both a clear legal definition (see below), and methodologies for assessing and documenting recycled nutrient content.

As indicated in eNews n°109, ESPP has submitted to the European Commission (in the context of the proposed Biotech and Circular Economy Acts) a proposed discussion document on legal definitions of "recycled", "bio-based" or "secondary" for fertilisers, fertilising products and other uses of nutrients (here www.phosphorusplatform.eu/regulatory).

Recycled or bio-based carbon can be measured using radio isotopes (EN 16785-1 radiocarbon analysis). However, it is ESPP's conclusion that no comparable method can function for nutrients (N, P, K …) for the following reasons.

Nitrogen radio isotopes and bio-based versus mineral N:

Atmospheric N_2 has a consistent ^{15}N / ^{14}N ratio (c. 272). The difference in ^{15}N / ^{14}N ratio between a given material and the atmosphere is expressed as delta ($\delta^{15}N$).
Biological processes tend to discriminate against the heavier isotope (^{15}N), in particular biological denitrification, resulting (counter intuitively) in a positive $\delta^{15}N$ in historically accumulated N in biomass in oceans.
The average $\delta^{15}N$ in deep ocean biomass (from long-term biological metabolism balances) is very small: c. 0.5% (Ryabenko 2013, pages 11, 23, secondary data).
Tests show that $\delta^{15}N$ ratios in plant biomass are widely variable, e.g. from -0.22% to +0.26% for nitrogen-fixing soybean whole plant (Unkovich, 2015, secondary data); from -0.01 % to +1.2 % in legumes and +0.7% to +1.2 % in non-legumes (Shearer -& Kohl, 1986); from 0.22% to 0.62% in algae (Needoba, 2003).
Bateman & Kelly (2007) and Michalski (2015) indicate that synthetic N fertilisers have $\delta^{15}N$ of "around zero", that is between -0.2% and +0.2% for 80% of samples, and < 0.4% for 98% of samples. A literature review by Choi (2017) concluded that δ15N of synthetic fertilisers can range from -0.8 to +0.6 % with 90% of samples in the range -0.3 to +0.3 % and noted that $\delta^{15}N$ of biologically fixed N is also around zero. This review indicates that reported data for raw manure shows $\delta^{15}N$ of +0.3 to +1.6 %, but that fresh manure can have $\delta^{15}N$ around zero because ^{15}N tends to be enriched in animal protein (so diminished in manure).

Kohl & Scherer (1980) suggest that the isotope effect of biological N fixation in soybeans and clover is 0.1 to 0.2%, so within the $\delta^{15}N$ range for synthetic fertilisers.

de Teves Inácio (2020) concluded that δ15N could not be used to differentiate Organic from conventional agricultural crops. Based on samples from eight farms, this paper concluded that δ15N values of soils, organic and synthetic fertilisers overlapped, that δ15N can vary between different parts of a plant, between ripe and unripe fruit, as a function of climate, and on uptake of N from different sources.

Overall, the $\delta^{15}N$ shows considerable variation in different biomass samples, and although biomass will generally have higher $\delta^{15}N$ than synthetic fertilisers (Bateman and Kelly 2007 suggest 0.06% to 3.7%) **some biomass (and so some io-based fertilisers) will have $\delta^{15}N$ comparable to synthetic fertilisers. $\delta^{15}N$ > 0.4% could be 'proof' that a fertiliser is at least partly bio-based, but that seems to be the limit of the usefulness of nitrogen radio isotope ratios.**

Why radio isotope or other tracers cannot reliably identify or quantify bio-based nutrients

Some authors have suggested that various tracers could identify whether a fertiliser is bio-based or synthetic, e.g. De Bauw (2024) suggested tracers including $\delta^{15}N$, inorganic or organic forms of N, carbon dating. But examples contradict the general trends identified: legumes fixing N from atmosphere ($\delta^{15}N$ close to zero, see above), ammonium sulphate recovered from digestate (100% inorganic N).

As above, no indicator seems to be identified which can reliably distinguish bio-based from synthetic nutrients, or indeed quantify the % bio-based (as can be done for carbon by radio-dating).

This is because carbon radio-dating is not identifying carbon fixed from the atmosphere or taken up from soil, it is identifying carbon from fossil sources and fossil-origin carbon is generally not taken up by biomass. There are however exceptions. If biomass were 'fed' synthetic plastics and decompose these to organic molecules which are assimilated (not only to CO_2) then carbon radio-dating will incorrectly identify their biomass as non-biobased. If shellfish are grown in a bio-reactor fed with CCUS (Carbon Capture Use Storage) CO_2 from an oil refinery (CO_2 + light + nutrients -> algae -> shellfish) the shell calcium carbonate would be identified as NOT bio-based by radio-dating of the carbon (in $CaCO_3$) because the carbon came from oil refining.

If plants (or algae) are fixing N from the atmosphere or are taking up nutrients (N, P, K … other) supplied as mineral fertilisers, then radio isotope ratios and probably other indicators (e.g. trace elements) are likely to be not significantly different from those in mineral fertilisers.

ESPP thus concludes that in general a material balance method (as per EN 16785-2) must be used to identify and quantify biobased or recycled nutrients.

Low risk of contaminants in EasyMining Ash2Phos recovered phosphates

Report by Aarhus University, for Denmark Food and Veterinary Administration, concludes that Ash2Phos recovered phosphates recovered from sewage sludge incineration ash are compatible with use in animal feed. The report assesses the probabilities of finding undesirable contaminants in the recovered phosphates, including fluorine, heavy metals (cadmium, arsenic, mercury, lead, cobalt, chromium, copper, iron, zinc and nickel) and organic contaminants (PFAS, dioxins, polychlorinated biphenyls (PCB), polyaromatic hydrocarbons (PAH), pharmaceuticals, pesticide residues, residues of biocides and cleaning agents and residues or organic solvents). The report analyses the presence of these different contaminants in sewage sludge and assesses the impacts on each contaminant of the different stages of processing: sewage sludge incineration, Ash2Phos chemical processing of sewage sludge incineration ash (in particular pH), filtration, in order to estimate the probability that the sewage sludge, the ash and the recovered phosphate contain the contaminants, concluding with a risk assessment. The report concludes that heavy metals and trace minerals are expected to be present in the recovered phosphate, but that the Ash2Phos process is very effective at removing these, resulting in "very low" levels in the final product ("low" for fluorine), substantially below legal limits for animal feed (EU Directives 2002/32, 2003/57, 2006/13). For organic contaminants, the report concludes that probability is "very high" of "almost complete elimination" in the sludge incineration and Ash2Phos processing, resulting in a "low" probability of presence in the recovered phosphate, with possible levels "extremely low" for PFAS, pharmaceuticals, etc ("low" for dioxins and PCB) and considerably below the legal limits for animal feeds.

"Assessment of the risk for undesirable substances in phosphorus recovered from sewage sludge ash", Advisory report from DCA – Danish Centre for Food and Agriculture, Aarhus University, T. Skau Nielsen & M. Hald, 2026: https://pure.au.dk/portal/en/publications/assessment-of-the-risk-for-undesirable-substances-in-phosphorus-r/

Phosphorus and health

High diet P in mice impacts bone and kidney health

This study confirms a number of previous studies showing negative health impacts of high diet P in mice. In this case, therapies to correct blood P levels were shown to not prevent these negative impacts. Male and female mice aged 10 weeks were fed low, normal or high P diets for 5 weeks (0.2, 0.6, 1.8 %P, normal calcium 0.6% Ca). Tests were also carried out with low and high calcium and with four therapies aimed at avoiding high blood phosphorus levels: lanthanum carbonate (reduces gut P availability and so uptake), Cincalcet (lowers PTH = parathyroid hormone), vitamin D (increases gut calcium uptake) and Zoledronic Acid (inhibits bone P and Ca metabolism). Bone health (bone volume, density), blood phosphorus and calcium levels, hormones controlling P blood levels (PTH, FGF23, osteopontin, vitamin D) and kidney gene expression were measured. The mice with high diet P showed deteriorated bone and kidney health indicators, and this was not at all or only partially redressed by the different therapies or by increasing diet calcium (to 1:1 P:Ca ratio).

"Correcting serum phosphate homeostasis does not alleviate the health dangers of high phosphate consumption", J. Arnst et al., J. Transl. Med., 2026, https://doi.org/10.1186/s12967-026-08624-x

Research and reading

Long term field trials show safety and soil health benefits of sewage sludge, composts

Copenhagen University CRUCIAL field trials show that over 20 years application of organic wastes to fields at high and extremely high rates improves soi health and microbiology, with no significant negative impacts (see also SCOPE Newsletters 149 and 123). These field trials aimed to address the Organic Farming community's questions on whether recycling today's waste streams to soil is compatible with objectives of safety and holistic soil health. Since 2003, conventional livestock manure, sewage sludge and composted biowaste (source-separated household organic waste) have been applied to test fields at high and extremely high levels (above legal limits, equivalent to 200 years of fertiliser nutrient application). Analysis of physical, chemical and biological aspects of soils show that bacterial communities remain stable and robust, with applications resulting only in temporary changes. Antibiotic resistance increases briefly after applications, but then returns to baseline levels. Soil structure, porosity, water retention and carbon content generally improved over time with repeated applications, as did nematode and earthworm activity, with no indications of toxic impacts. The nutrients applied in the organic wastes considerably improved yields compared to unfertilised plots, albeit with a lower nitrogen fertiliser effect than mineral fertiliser, increased soil nutrient pools and cation exchange capacity (human urine gave results comparable to mineral fertilisers). Although contaminants such as PFAS, microplastics, heavy metals and pharmaceutical residues were widely present in the organic wastes, levels were below risk thresholds and negative impacts were not seen. PFAS levels in groundwater were 500 – 1600 x lower than predicted from soil levels.

"Recycling, Fertility and Resilience in Soil. A report based on the University of Copenhagen's long-term experiments with recycling waste and residues from city to country" (55 pages), J. Magid, Genanvend Biomasse, 2026 https://www.genanvendbiomasse.dk/ *and* https://static1.squarespace.com/static/5dc95521636d7d7acdb69cfa/t/6a296b5e3edfe67e543cd730/1781099358119/Recycling+fertility+and+resilience+in+Soil+may+2026.pdf

US STEPS Centre obtains funding renewal

STEPS (Science and Technologies for Phosphorus Sustainability Center) has been awarded US$ 22.5 million funding for a further five years by the US National Science Foundation. STEPS in an ESPP member (see ESPP eNews n°94). Based as North Carolina State University, STEPS has engaged over 130 students and researchers over the last five years, partnering with a dozen US research institutes. STEPS aims to addresses the complex challenges of phosphorus sustainability by integrating physical, life, social, and economic sciences, including chemistry, materials research, biochemistry and bioengineering, including environmental and agricultural engineering, plant biology, crop and soil sciences.

STEPS has developed "25-in-25: A Roadmap Toward US Phosphorus Sustainability" (May 2023) identifying nine areas of opportunity to reduce both dependence on mined phosphates and losses of phosphorus to the environment by 25% in the next 25 years:

- Improve phosphorus use efficiency in agriculture across new, recycled, and existing (legacy) phosphorus
- Process animal and farm waste more economically for reuse as fertilizers
- Produce valued phosphorus-based products from waste recovery processes
- Reduce mining waste by reprocessing and repurposing it for new phosphorus-based products
- Close food waste loops in the food supply chain to minimize phosphorus loss
- Improve phosphorus monitoring and national coordination to facilitate better environmental management
- Develop and grow markets for proven solutions for phosphorus management
- Accelerate technology adoption through active stakeholder engagement
- Elevate phosphorus sustainability in the public consciousness

"National Science Foundation Renews Support for STEPS Center", 6th August 2026 https://research.ncsu.edu/national-science-foundation-renews-support-for-steps-center/

STEPS Science and Technologies for Phosphorus Sustainability Center https://steps-center.org/

€742 million for 117 new Horizon Europe Cluster 6 projects

Among the new projects, several address topics relevant to ESPP, including nutrient management, biofertilisers, wastewater reuse in agriculture, composting, aquaculture nutrient losses and algae.

The European Commission has funded 117 new Horizon Europe projects under Cluster 6 (Food, Bioeconomy, Natural Resources, Agriculture and Environment), with a total of €742.5 million EU funding. Some projects are already underway and others are due to start in the coming months. The largest number of projects is in circular economy and bioeconomy (27 projects, €198 million), followed by sustainable food systems (24 projects, €139 million), environmental governance and digital solutions (22 projects, €130 million), biodiversity and ecosystems (19 projects, €129 million), zero pollution (10 projects, €56 million), land/ocean/water and climate (9 projects, €53 million) and rural/coastal communities (6 projects, €38 million).

Projects of particular interest for nutrient sustainability include:

- FLEX-IN-BIO: more energy- and resource-efficient bio-based industrial processes, including a biofertiliser production process, alongside lactic acid and bioplastics, with demo sites in Belgium and Spain.
- AYUMI: agricultural reuse of treated wastewater, with nutrients in treated effluents valorised and accounted for, including consideration of avoided fertiliser use.
- AQUALICIOUS: low-trophic and integrated multi-trophic aquaculture systems to reduce environmental impacts including nutrient waste, using fish, shellfish, molluscs and algae.
- COMPERF4EU: co-composting of biowaste and biodegradable and compostable packaging, aiming for full biodegradation, lower emissions and production of sustainable compost.
- FARMORY: digital solutions for small and medium-sized farms, including tools to monitor and sustainably manage nutrients, water and other natural resources.
- MARVELA: monitoring and mitigation approaches for agricultural methane, nitrous oxide and ammonia emissions, including measures addressing manure and soil management.

Other potentially relevant projects include Circular4Farm (safe circular use of reclaimed, grey, desalinated and rain water in agriculture); SUSTAINCrop (environmental impacts of crops supplying bio-based industries); CASI-BIO (sustainable bioeconomy governance, including cascading biomass use and the food-first hierarchy).

"117 new EU-funded projects are ready to spark innovation and research for a greener future" https://rea.ec.europa.eu/news/117-new-eu-funded-projects-are-ready-spark-innovation-and-research-greener-future-2026-07-06_en

ESPP database of nutrient-related R&D projects updated

ESPP has updated its list of ongoing European and national R&D projects relevant to phosphorus and nutrient sustainability, with over 100 projects added.

The updated list brings together ongoing projects addressing phosphorus and nutrient recovery and recycling, recycled and bio-based fertilisers, manure and digestate processing, sewage sludge and wastewater, nitrogen recovery, biochar, algae and seaweed, nutrient management, circular agriculture and bioeconomy. Projects funded under Horizon Europe, LIFE, CBE JU, Interreg, PRIMA, Water4All and other EU programmes are included, as well as relevant national and regional research and demonstration projects. The update has also extended coverage of projects involving leading research and technology organisations across EU Member States

The list currently includes around 200 ongoing projects and will continue to be updated.

ESPP welcomes information on other ongoing projects relevant to phosphorus, nutrient recycling, fertilisers, algae or related areas. If you are involved in a project which should be included, or if you spot information which needs updating, please contact veronica.santoro@phosphorusplatform.eu

Consult the updated ESPP projects list: https://www.phosphorusplatform.eu/activities/r-d-and-projects

An alternative history of human excrements

A fascinating story of how human excrements have come from being a carefully managed valuable resource to an embarrassing and expensive pollution problem, covering literature, agronomy and society worldwide, leading to proposals for separative urine and faeces valorisation. Since humans started permanent settlements and agriculture, we are challenged by the question of nutrient recycling in animal and human excrements versus ensuring sanitary safety. If excrements are removed or buried, nutrients are lost and crop productivity deteriorates, but if they are not there are risks of pathogen transmission.

In 300 pages (in French), Fabien Esculier (OCAPI) explains the nutrient value of human urine and faeces. We excrete around 60g of dry solids per day in our urine (diluted in around 1.2 litres of water) and only around 30g in faeces. We learn why urine is yellow and why and how different animals excrete nitrogen in different forms, from fish to mammals, birds and spiders.

Historical uses and modes of collection and commerce of human excrements are presented. We learn that the phrase “money has no smell” comes from the Roman emperor Vespasian’s (profitable) tax on human urine, which was collected and used for tanning hides. Literary gems praising the value of human excrements as fertilisers include Victor Hugo and a glorious elegy of Flanders’ vegetables fertilised with human excrements collected from Lille (Benjamin Corenwinder), in particular the sweet and delicate baby peas, beans, cauliflowers, and asparagus flowing with luscious juices …

Paris valorised its excrements by collecting from storage ditches tanks and spreading in fields until into the 1960’s, with also factory at Poudrette producing fertilisers and explosive chemicals from collected excrements (closed in 1975). In Lyon, excrements legally had to be stored and collected to ensure nutrient valorisation, until 1961 when sewerage was developed. Consequently, the Paris region was recycling around two thirds of phosphorus in human excrements in the 19th Century, compared to only around 40% today, whereas the recycling rate of nitrogen was and is only around 5% (Esculier & Barnes 2020).

Society’s careful management of human excrements ended with the discovery and exploitation of mined phosphate (guano) and nitrate (Atacama desert) and then of phosphate rock and Haber-Bosch nitrogen. With today phosphorus and nitrogen both massively mobilised and lost into the environment, largely exceeding levels considered as safe planetary boundaries. At the same time, sewerage networks were developed to channel both excrements and other wastewaters away from cities, along with the flush-toilet enabling disposal of excrements with no handling, then sewage treatment works to end-of-pipe reduce resulting pollution.

The author suggests that society should move back to separate collection, sanitisation and valorisation as fertilisers or human excrements and prefer this to installation of centralised sewerage in developing countries, to more efficiently recycle nutrients and reduce contamination with industrial chemicals. Human urine does however today contain pharmaceuticals which require surveillance and the question is then raised of how to manage other wastewaters: household greywater may be appropriate for irrigation or other uses but other wastewaters may still require collection and treatment.

OCAP - Programme de recherche-action sur les systèmes alimentation/excrétion et la gestion des urines et matières fécales humaines (Action-research programme on food/excretion systems and the management of human urine and faeces), Paris, France https://www.leesu.fr/ocapi/

“Une autre histoire des excréments”, 300 pages, in French, Actes Sud 2026 https://actes-sud.fr/catalogue/une-autre-histoire-des-excrements-021558

CiNURGI policy recommendations for nutrient recycling in the Baltic region

EU Interreg funded project publishes 35-page policy document centred on nutrient recycling monitoring and data governance, nutrient recycling standards, closing knowledge gaps, developing awareness and business models.

27 policy recommendations are presented:

Baltic Sea Region (BSR) as a Model Area for Nutrient Recycling:
- Establish a harmonised regional monitoring system for nutrient recycling
- Harmonise regulatory frameworks for the collection, processing, and use of nutrient- rich biomasses
- Strengthen economic incentives and market conditions
- Support technology development and redistribution infrastructure
- Strengthen cross-sector advisory services and knowledge exchange
- Establish clear governance and financing mechanisms at the national level

Reducing Environmental Impacts
- Develop a regional environmental performance framework for recycled fertiliser value chains
- Establish safe and efficient recovery routes for sewage sludge phosphorus
- Create a level regulatory and fiscal playing field for recycled fertilisers versus mineral fertilizers
- Establish a clear regulatory definition distinguishing recycled nutrient fertilizers from soil improvers
- Move toward full farm-gate nutrient balance accountability

Safe Nutrient Recycling
- Introduce a soil health-based regulatory framework for recycled fertiliser field application
- Harmonise analytical standards and strengthen research on emerging contaminants
- Support long-term studies on soil accumulation and crop uptake
- Strengthen preventive measures to reduce contaminants entering biomass streams
- Establish harmonised quality assurance, labelling, and certification for recycled fertilisers
- Build stakeholder capacity and shared risk understanding

Knowledge Exchange and Awareness Raising
- Mandate transparent data reporting on nutrient turnover in waste and biomass streams
- Enhance the digital fertilizer label with practice-relevant recycled fertiliser information
- Integrate nutrient recycling into formal agricultural education and advisory training
- Prioritise demonstration trials and farmer-to-farmer learning
- Create open-access knowledge infrastructure and multi-stakeholder platforms
- Strengthen cooperation across research projects on recycled fertilisers

Creating Business Opportunities
- Implement harmonised regulatory frameworks to enable cross-border recycled fertiliser trade
- Establish a comprehensive and long-term recycled fertiliser investment support framework
- Develop regional nutrient logistics and processing infrastructure
- Increase dedicated research and innovation funding for recycled fertiliser technologies
- Strengthen cross-sectoral partnerships and regional circular economy clusters
- Integrate recycled fertiliser use into CAP instruments and national farm advisory services

Improving Policy Coherence
- Establish inter-ministerial coordination mechanisms for nutrient recycling policy
- Accelerate national implementation of BSAP nutrient recycling measures
- Strengthen the PA Nutri coordination function and resource base
- Develop a BSR roadmap for nutrient recycling policy convergence

CiNURGI Interreg Baltic Sea Region deliverable D2.3 "Policy Recommendations for Recycled Nutrient Fertilisers in the Baltic Sea Region Advancing Market Development, Policy Coherence, and Safe Use of Recycled Nutrients", April 2026 https://interreg-baltic.eu/project-pilots/cinurgi/policy-recommendations-for-nutrient-recycling-in-the-baltic-sea-region/

Nutrient emission abatement trading and carbon markets

EU Interreg funded project publishes 35-page policy document centred on nutrient recycling monitoring and data governance, nutrient recycling standards, closing knowledge gaps, developing awareness and business models.

Phosphorus and nitrogen emission abatement was modelled for the USA by HUC12 (watershed hydrological unit), comparing estimated costs and carbon emissions for nutrient abatement by improvement of wastewater treatment facilities to achievement of the same abatement by nature-based solutions (such as buffer strips or constructed wetlands) applied to diffuse nutrient emissions (from agriculture). Comparisons were made for different levels defined for US water treatment technologies, from Level 2 (8 mgN/l, 1 mgP/l) to Level 5 (2 mgN/l, 0.02 mgP/l). The study abstract suggests that green infrastructure could save nearly 16 billion US$ and 30 Mt-CO_2-equ. per year plus sequestration of Mt-CO_2-equ., but these numbers are for the extreme Level 5 scenario where water treatment technology costs are increasing exponentially for very low emission levels. Nonetheless, the overall conclusion remains valid: reducing widespread non-point (agriculture) nutrient losses is generally an economically and environmentally preferable solution compared to additional treatment in sewage works which are already

removing nutrients. The paper suggests that nature-based technologies could overall achieve maybe 40% for N and 25% for P of the nutrient emission reductions needed across the USA and that implementation is often hindered by lack of or cost of necessary land space. abatement and 25% of P. Nutrient abatement trading is authorised and has been practiced in the USA for several decades and this paper identifies two review studies which suggest why it has not today been more widely implemented, pointing to regulatory and institutional obstacles, but also economic and environmental difficulties, and in particular the difficulty to measure the real nutrient abatement achieved by nature-based solutions (Bendor et al. 2021, Liu & Brower 2023). The authors suggest that carbon credits could finance nature-based nutrient abatement, because of their carbon emission benefits, but this requires resolving the quantification challenge.

"The potential of carbon markets to accelerate green infrastructure based water quality trading", B. Limb et al., Communications Earth & Environment, 2024, 5:185 https://doi.org/10.1038/s43247-024-01359-x

"What is the future of water quality trading?", H. Liu & R. Brouwer, 2023 https://doi.org/10.1111/coep.12583

"Predicting the existence and prevalence of the us water quality trading markets", T. BenDor et al., 2021 https://doi.org/10.3390/w13020185

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