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Events

NERM Nutrients in Europe Research Meeting, 16-17 April

NERM Nutrients in Europe Research Meeting (6th Phosphorus in Europe Research Meeting). Nearly 200 registrants to date for the conference and its pre-meetings. Speakers include the European Commission (DG AGRI, DG TRD), EIP-AGRI Support Facility/EU Cap Network, EU-FarmBook, NUTRI-KNOW Thematic Network. Parallel sessions on nutrient recovery technologies, bio-based fertilisers. Organised with Fertimanure, Lex4Bio, Walnut, Sea2Land, Rustica.

NERM, Brussels & online, 16-17 April, including site visits: [programme & registration](#)

5th European Sustainable Phosphorus Conference [ESPC5](#), 8-10 October, Lleida, Spain

ESPP looking for service

To develop a listing of organic & organo-mineral fertiliser producers

We are looking for someone to put together a listing of emails of companies selling, producing or processing, in Europe, organic or organo-mineral fertilisers. This will enable ESPP to communicate on [SOFIE2025](#) and nutrient recycling. Listing could also cover companies providing processing technologies: such as granulation, drying, packaging ... Candidates can be individuals, companies or research institutes, subject to being able to emit an invoice or payable note for fees. Work to be done before end summer 2024. Objective: collate list of companies, contact email(s), general types of organic fertiliser sold/processed, website, covering all EU countries plus UK, Switzerland, Norway, Turkey, Ukraine, North Africa.

Send short description of experience and competence, plus estimated price to info@phosphorusplatform.eu by 15th May 2024

Policy

European greenhouse gas import taxes enter inter force

The EU CBAM (Carbon Border Adjustment Mechanism) has entered into force taxing imports of five industrial products, including nitrogen fertilisers, as a function of greenhouse emissions. The CBAM Regulation 2023/956 and Implementing Regulation 2023/1773, which entered into force on 1st October 2023, covers imports of “nitrogen-containing fertilisers”, iron and steel, cement, aluminium, and electricity. CBAM aims to tax the greenhouse emissions embedded in imported fertilisers (scope 1 and 2: direct emissions in production, emissions related to electricity use in production) and covers CO₂ and NO_x emissions. The objective is to compensate costs for EU manufacturers who have to pay ETS (Emissions Trading Scheme) tariffs for their climate emissions. The EU CBAM Regulations define the methodology for calculating the embedded emissions for the concerned products, based either on real emissions, or in the absence of data, on values for the relevant industry sector in the specific exporting country, or if this is also not available, then based on the average emission intensity of the worst performing EU installations. Fertilizers Europe has [welcomed](#) the EU CBAM, subject to appropriate conditions as ensuring fair competition for EU producers against fertiliser imports. However, Fertilizers Europe expresses concern that CBAM cannot provide a mechanism to address exports of fertilisers from Europe, which risk being replaced by fertilisers with a higher carbon footprint in user countries outside Europe.

EU CBAM Regulation [2023/956](#) “establishing a carbon border adjustment mechanism” and Implementing Regulation [2023/1773](#),

* Regulation 2023/956 – Annex I, Ch. 3105 and Ch. 3102, Implementing Regulation 2023/1773, Annex II – 3.10. Mixed fertilisers – in effect covers all N, NP, NK and NPK fertilisers.

EU Chemical Agency (ECHA) announces next steps towards PFAS restrictions

After over 5 000 comments [were received](#) to the public consultation on PFAS restriction in 2023, ECHA has announced that the EU’s scientific committees will evaluate restriction for uses in different sectors over the coming six months. Uses which will be considered are: consumer products, cosmetics, ski wax, metal plating and processing, upholstery - leather – carpets – clothing, food contact materials and packaging, oil and mining industries. Other sectors, such as machinery and medical, are not yet on the calendar. Following the opinions of the two scientific committees (Risk Assessment RAC and Socio-Economic Analysis SEAC), ECHA will finalise restriction proposal reports, and then the European Commission with the Member States will take decisions.

In the US, legal actions against companies is accelerating, based often on accusations of PFAS contamination of groundwater and drinking water. Litigation is targeting the chemical companies manufacturing PFAS, but also companies using it. Litigation in some cases is being [brought](#) by cities operating water systems. Litigation also concerns PFAS in sludges, both from industry (e.g. [paper industry](#)). In a case reported recently in Europe by [The Guardian, UK](#), farmers in Texas and an environmental NGO are [suing](#) the US Environmental Protection Agency for not adequately regulating PFAS and a company which processes sewage sludge to organic fertilisers. Following litigation, the US courts approved in February a [settlement](#) requiring DuPont to pay nearly 1.2 billion US\$ to public water systems across the US covering payments to water authorities who have already detected PFAS and costs of testing and then compensation to those which have not yet tested.

European Chemical Agency (ECHA) “Next steps for PFAS restriction proposal” [13th March 2024](#).

[The Guardian](#) “Legal action could end use of toxic sewage sludge on US crops as fertilizer” [12th March 2024](#).

European water industry calls for universal PFAS restriction

The water industry (EurEau) is [calling](#) that “all uses of PFAS should be phased out rapidly” because PFAS cannot be effectively removed in sewage treatment, so accumulate in water, soil and foods. EurEau represents European drinking water and wastewater operators serving 500 million Europeans. The federation has sent an open letter to the President of the European Commission, Ursula von der Leyen, calling for universal restriction of PFAS. The federation underlines that PFAS (Perfluoroalkyl and Polyfluoroalkyl Substances) are today found in water, food, air, household products, are remanent and pose health risks. Removal of PFAS from drinking water is technically challenging, expensive, energy and resource consuming, and relies on activated carbon imported from China. PFAS in sewage hinders recovery and recycling of nutrients. EurEau consequently calls for a universal PFAS restriction, in line with the EU Chemicals Strategy for Sustainability and the Green Deal.

The European Environment Agency has published a communication stating that nearly 15% of teenagers in Europe show exposure to PFAS above EFSA Health-Based Guidance Values (HBGV).

EurEau position on PFAS: <https://www.eureau.org/priorites/pfas>

EurEau briefing paper “Sludge and the circular economy - the impact of PFAS”; [July 2022](#)

EurEau input to EU consultation on PFAS restriction, [18th September 2023](#) “Universal PFAS restriction - Consultation on Annex XV report”

EurEau open letter to the European Commission “No Green Deal with PFAS: Call to support the Universal PFAS Restriction proposal”, [4th March 2024](#).

European Environment Agency “Risks of PFAS for human health in Europe (Signal)”, [15th March 2024](#).

Industrial Emissions Directive (IED) revision

The IED revision, agreed by Parliament & Council, making strictest achievable pollution emissions limits mandatory, will improve industry material efficiency requirements, will cover more intensive pig & poultry farms, but not cattle farms. The Directive revision amendments have been provisionally agreed by Parliament, Council and the Commission ([trilogue 29/11/2023](#)), validated by Parliament ([12/3/2024](#)) and are pending Council final validation, before legal publication. The IED fixes mandatory pollution emission limits applicable to all covered factories and installations, currently around 50 000 across Europe. The revision extends coverage to include more intensive pig and poultry farms, down to 280 – 380 LSU “livestock units” (implemented progressively starting in 2030). The Commission [estimates](#) that this will increase the % of total EU pigs and poultry in covered farms from around 35% under the current IED, to around 70 – 80%. Cattle farms are however still not covered by the IED Directive: this will be reviewed by end 2026. Will also be reviewed the possibility to ensure that overseas producers of meat imported into the EU respect the same criteria. The revised Directive will require waste, resource efficiency, energy efficiency and raw material use targets for covered industries. The Directive is also extended to include certain metal mining / extraction activities (phosphate rock not included) and battery manufacture.

European Commission IED Review – Livestock farm data update 2016-2020 [HERE](#).

Trilogue agreed Directive revision text: [HERE](#).

European Parliament press release [12th March 2024](#).

ESPP and EU policy consultations (NERC, Nitrates)

EU input on revision of the NERC Directive asking that this integrate nutrient recycling and not only emissions limitation. ESPP did not input to the EU consultation on evaluation of the Nitrates Directive, as members had differing positions.

ESPP input to the EU consultation on the NERC Directive (National Emissions Reduction Commitments), 14th March 2024, supporting the value of this Directive in limiting transboundary emissions of air pollutants across Europe (the Directive currently limits emissions of sulphur dioxide, nitrogen oxides (NO_x but not N₂O), ammonia, non-methane volatile organics, fine particles PM_{2.5}), noting that limiting these N emissions is coherent with the [EU Farm-to-Fork Strategy](#), EU Biodiversity Strategy and [COP15 Convention on Biological Biodiversity](#) objective to reduce nutrient losses by 50% by 2030 and suggesting that it should integrate recovery and recycling of nitrogen and sulphur from these emissions.

Concerning the Nitrates Directive, ESPP members did not agree on whether the Directive has been effective (since its adoption in 1991), whether to oppose re-opening of this Directive (which could lead to regression in protection of surface and groundwaters from nitrates) or to consider this necessary to address the obstacle posed to manure nutrient recycling (by the 170 kgN/ha limit for manure and “processed” manure), what forms of manure-recycled nutrient might be exempted from this limit (Renure criteria too lax and non-verifiable, but < 1% organic carbon not practically relevant ...). Members also disagreed on whether or not to propose that the Directive should be widened to specifically address phosphorus as well as nitrogen.

ESPP input to NERC Directive (National Emissions Reduction Commitments) www.phosphorusplatform.eu/regulatory

Summary of discussions on Nitrates Directive at ESPP webinar 22nd February 2024 in [ESPP eNews n°84](#).

Inputs received to the EU public consultation on the Nitrates Directive (closed 8th March 2024), 258 contributions published [HERE](#)

Feedback from ESPP members: [EurEau](#), [N2-Applied](#), [Ragn-Sells](#), [SUEZ](#), [TIMAC AGRO](#). This list may not be complete, because some contributions submitted are inexplicably not published as at 30/3/24 (e.g. Fertilizers Europe, [Nutribudget](#), submitted by Proman). ESPP has notified the European Commission of this problem.

Fertilisers & EU Fertilising Products Regulation (FPR)

Survey on animal by-products (ABPs) in EU fertilising products

Request for information, for specific ABPs, on applicable national fertiliser legislation, agronomic effects, nutrient content, processing, heavy metals or other residues, health or environmental risks. The Cat2 and Cat3 ABPs concerned are insect frass, biofuel glycerine, meat and bone meal and derived DCP/TCP, blood products, hydrolysed protein, horn- skin and feather materials (as specified). The survey, open to all companies and stakeholders, is carried out by QLab, under contract from the European Commission, to support preparation of possible criteria or conditions for proposed inclusion of these materials as inputs to CE-Mark fertilising products (FPR CMC 10). This is because art. 42 of the FPR indicates that the Commission can modify the FPR CMCs only if proposed additional materials have the potential to be significantly traded within Europe and if there is evidence of their agronomic efficiency and of safety for health and for the environment.

“Survey to include new materials in CMC 10 to the Fertilising Products Regulation”, QLab for the European Commission [SURVEY HERE](#).

Tenders for laboratories and coordination for Organic and Organo-Mineral Fertilisers

Two CEN tenders open to 15th April to (1) prepare – coordinate, and (2) participate in laboratory ring tests for proposed new European Standards relating to organic and organo-mineral fertilisers for the Fertilising Products Regulation. The

testing will concern the various different standards currently being developed by CEN (European Committee for Standardization) CEN/TC260/WG8 to support implementation of the EU Fertilising Products Regulation, that is verification of the different criteria and limits specified for Organic and for Organo-Mineral Fertilisers in this regulation (as per the [mandate](#) from the European Commission, a list of around 20 proposed test standards is included in the tender documents and draft EU standards (prEN) can be downloaded on the CEN tender web pages)

“Open calls for tender related to the Interlaboratory studies on Organic and organo-mineral fertilizers”, CEN, published 12/3/2024, submission deadline = 15/4/2024 [HERE](#).

EU consultation on fertiliser polymer biodegradability, microplastics, and other

Open to 5th April: consultation on five draft Delegated Acts amending the Fertilising Products Regulation concerning biodegradability of fertiliser and mulch film polymers, microplastic polymers (in CMCs 1 and 11), Enterococcus testing.

The five draft amending regulations are included in one single public consultation, open to 5th April 2024. The biodegradation criteria proposed for polymers are based on 90% ultimate degradation / mineralisation measures as evolved CO₂, in soil and in water, after 2 years for mulch films and after four years for polymers used as fertiliser coatings or for water retention.

“EU fertilising products – Aligning biodegradability criteria for polymers to the REACH restriction on microplastics”. NOTE: the consultation web page title is unclear, this page in fact covers all five proposed Delegated Acts. Public consultation open to the public and all stakeholders. Deadline for response 5th April 2024. Response is free text of up to 4000 characters plus possibility to submit a pdf document. [HERE](#).

Preliminary draft on possible new materials/processes as CE-fertiliser inputs (CMCs)

The draft proposed list of new CMC materials and processes to be studied for possible inclusion into the EU Fertilising Products Regulation (Annex II) is circulated for comment and will be discussed at the Fertilisers Expert Group 15th April (input via members of this Group, inc. ESPP). The study, commissioned by the European Commission (DG GROW) to NMI Netherlands, will run for two years, and will assess which materials/process modifications could be justified to add into the EU Fertilising Products Regulation (based on the art. 42.1 criteria: significant potential for trade on the EU market, agronomic value, environmental and health safety). The study will consider all proposals submitted under the European Commission’s June 2022 stakeholder survey ([ESPP eNews n°69](#)). 207 stakeholders submitted to this survey, with 26 proposals considered out of scope (concerning other FPR annexes not CMCs) but some submissions including more than one relevant proposal. In this first draft report, NMI have regrouped the into proposals for:

- 14 for new CMCs, including separated human urine/faeces, N and K recovered from wastewater liquors, Mn and Zn recovered from battery recycling, ammonium salts recovered from end-of-life fire extinguisher powder, pulp & paper sludge, vivianite, algae grown on wastewaters, industry limes
- 14 for admitting new input materials to existing CMCs, including potassium from municipal waste incineration ash, sewage sludge as input to biochars / pyrolysis / gasification, food & feed industry sludges as input to composts & digestates
- 11 for new materials within existing CMCs
- 6 for new CMC processing methods, including plasma treatment of digestate, tree bark humous (examples cited were included in ESPP proposals).

ESPP proposals which seem to be not included in this draft report (to be clarified) include: fish sludge (stated to be an animal by-product, whereas fish excreta seem to be excluded from the ABP Regulation 1069/2009 art. 2.2(k)), natural biomass collected as waste, digestate from biorefineries wastes, P leached from biochars, pre-processing of inputs to CMCs 13 and 14.

Following input at the 15th – 16th April EU Fertilisers Expert Group (input via FEG members only, e.g. ESPP), NMI indicate that they will launch a stakeholder consultation on the different regrouped materials / proposals to collect information on current legal status, current use as fertiliser (under national fertiliser regulations or otherwise), producers, potential market. This will enable assessment of the Fertilising Products Regulation (FPR) art. 42.1 criteria that the FPR can be amended if there is “potential to be the subject of significant trade on the internal market”.

For materials/processes where such potential is identified, NMI will further search literature and consult stakeholders on environmental and health safety and risks, and on agronomic effectiveness (an indicator for this being current use today), as also required in FPR art. 42.1

A final selection of relevant materials/processes, respecting art. 42.1, will then be made, and for these NMI will propose to the European Commission draft amendment texts to the FPR Annex II (CMCs) – planned timeline = before end 2025.

“Technical study to support the inclusion of new materials and processes under the Fertilising Products Regulation (FPR); Lot 2: Material and processes under the FPR. Inception report; Screening of proposals, workplan”, L. van Schöll, W.H. Riechelmann, NMI (study performed for the Commission DG GROW F2 under GROW/2022/OP/0046), version March 2024 [HERE](#).

Comments via members of the EU Fertilisers Expert Group (includes ESPP) – send comments ASAP to info@phosphorusplatform.eu

SOFIE summary in Fertilizer Focus

A 2-page summary of ESPP's SOFIE3 conference (3rd Summit of Organic & Organo-Mineral Fertiliser Industries in Europe) is published in Argus Media's March/April 2024 Fertilizer Focus (11 000 readership). A full summary will be published soon in ESPP's SCOPE Newsletter. Questions addressed include distribution costs, industry trend towards combining organic (recycled) nutrients with mineral fertilisers, potential for development of nutrient recycling from digestate and the corresponding need for roll-out of digestate processing (digestate production will increase with EU bio-methane policies), contribution of organic fertilisers to reducing nutrient losses and to soil health, potential for market growth or organic and organo-mineral fertilisers.

Fertilizer Focus, March/April 2024 (Argus Media) [HERE](#).

Mediterranean

Mediterranean coastal lagoon eutrophication correlated to business failure

A statistical study of business failures around Mar Menor, Murcia, South-East Spain, shows correlation of lagoon eutrophication to business failure of companies in some economic sectors. Mar Menor is a shallow saltwater lagoon of 135 km², separated from the Mediterranean Sea by a narrow strip of land. It is a Red Natura and a Ramsar site, with strong tourism and agriculture activities. The lagoon suffered a major algal bloom and anoxia event in 2019. This study compared distance to eutrophied lagoon water (maximum water chlorophyll concentration within a certain radius of the company), distance to coast (of lagoon or of Mediterranean Sea) and rate of business failure (failure at some time in the four year period 2017-2020) for over 3200 businesses in ??? how many ??? municipalities < ??? km from the Mar Menor lagoon (how were these companies and municipalities chosen and why ?). All businesses were < 30 km ??? from the sea or from the lagoon. Overall business failure in this sample of companies was 11.6% (over the four years) compared to 10.6% average across Spain. Business failure was lower for companies situated near the sea or near the lagoon, but higher for companies near lagoon waters with high chlorophyll (algae). Despite the seeming probabilistic benefit of proximity to the coast/lagoon, a 1 gm higher Chl_a concentration within 600m of a company was correlated to +8.4% increase in probability of business failure for accommodation services, +11% for financial and real estate services, +14.4% for industrial and building activities and +9.5% for minor trade. Probability of business failure did not increase with eutrophication for agriculture and transport services. The author concludes that the results show that effective environmental protection to reduce eutrophication would bring benefits for businesses. They also note that agricultural businesses, being not apparently negatively impacted by eutrophication, have no incentive to reduce phosphorus and nitrogen losses.

"The impact of marine pollution on the probability of business failure: A case study of the Mar Menor lagoon", M. Maté-Sánchez-Val & G. Aparicio-Serrano, *J. Env. Management* 332 (2023) 117381, [DOI](#).

Harmful Algal Blooms in the Mediterranean

Review of data suggests that toxic algae events are not frequent in the Mediterranean Sea whereas algal blooms risk impacting tourism, including with mucilage, water discoloration and anoxia events. Of 140 potentially toxic algae species identified worldwide ([UNESCO Moestrup 2009](#)), 84 have been found in the Mediterranean (2 400 records since 1860). Increasing reports of toxic species and harmful algal blooms (HAB) over time are likely related to increasing awareness and monitoring. No trends are shown for increases in toxic algae. Impacts on human health are extremely rare, and on shellfish (toxin accumulation can lead to bans on harvesting) are uncommon except in some local coastal regions of Spain and France. Non-toxic problematic algae blooms, causing mucilage, water discoloration, anoxia (loss of water oxygen, killing fish and other organisms) or other aesthetic deteriorations detrimental to tourism also show no temporal trends for frequency or for bloom algal abundance. Blooms show unpredictable annual changes.

A summary of harmful algal blooms (HABs) in the Adriatic and Ionian regions of the Italian Mediterranean coast, 2012-2019, showed an increasing number of blooms over this period, but with variations. Blooms particularly occurred in coastal zones with multiple human pressures (physical modification of the coast, urban runoff, agricultural runoff) with the strongest link showing to coast modification. No toxic algae events were recorded in this study. See also studies on Adriatic eutrophication in ESPP [eNews n°84](#).

"Toxic marine microalgae and noxious blooms in the Mediterranean Sea: A contribution to the Global HAB Status Report", A. Zingone et al., *Harmful Algae* 102 (2021) 101843, [DOI](#).

"Harmful algae and pressure-impact relationship: Noxious blooms and toxic microalgae occurrence from coastal waters of the Apulia region (Adriatic and Ionian Seas, Mediterranean)", L. Roselli et al., *Marine Environmental Research* 183 (2023) 105791, [DOI](#).

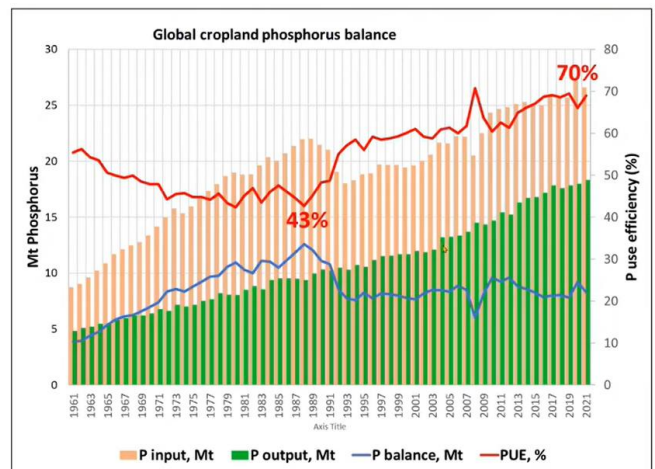
UNEP event summaries

Management of phosphate fertilisers for sustainable food systems

Webinar jointly organised by United Nations Environment Programme (UNEP), Food and Agriculture Organization (FAO) and International Fertilizer Association (IFA), February 2024, with over 260 people attending.

James Lomax, UNEP, opened the webinar underlining the pivotal role of soil health as an ecological foundation of sustainable food systems. Soils are today facing an unprecedented crisis, with over 40% of Earth's surface degraded, and topsoil being lost at a very fast annual rate. Healthy soils can reduce the need for fertiliser, regulate water and nutrient cycles, support plants and soil organisms, and filter, break down and immobilise potential pollutants. Prioritising soil health politically can help bridge ideological divides and galvanise joined up actions to achieve environmental agreements and SDGs. On this, UNEP is committed to create changes at the Country level, to interact with decisionmakers in the field of fertilisers to support the transformation of agribusiness, and to encourage farmer led innovations to tailor practices and incentives to meet needs and to scale and accelerate impact on the ground.

Achim Dobermann, IFA, presented global trends in phosphorus use efficiency, based on FAOSTAT [Global Reference Database for cropland nutrient balances](#), a database of country-level budget estimates for nitrogen, phosphorus and potassium on cropland, covering 205 countries and territories, for the period from 1961 to 2020. Nutrient use efficiency is calculated as the ratio of outputs (nutrient removed by crops) divided by inputs (phosphorus in seed, fertilisers and manure). On a global perspective, both P inputs to cropland and P removal by crop have increased over the last 60 years (see picture). The average PUE is about 70%, (will probably reach 80% by 2040), and there is still a surplus of about 8 Mt P/y (of which 6 Mt P/y in Asia) ending up in soil, fresh water and marine ecosystems. On the regional level, P balances vary widely. China has made great progress in reducing its P surplus (ca 20 kg/ha in 2020, over 35 kg/ha in 2010) and increasing its PUE (around 60%) thanks to changes in policy, but Brazil and India are not. In Brazil, a period of intensification of agriculture resulted in a large and rising P surplus (ca 20 kg/ha in 2020), with a moderate/low PUE (ca 50%), and similarly in India the PUE has not changed over the last 20 years and has remained low (ca 50%), and the surplus is rising (ca 10 kg/ha in 2020). Soil P mining continues in much of sub-Saharan Africa, where P balance has been negative due to soil mining and soil health degenerating for most part of its modern history, requiring large increases in P inputs (fertilisers and recycled P) for greater food security and improving soil health. In the European Union (EU-27), P surpluses declined over the last 40 years benefitting from soil legacy-P and PUE has increased to an average 70%, with room to improve, although the situation is very different among countries and cropping systems. Finally, in the United States, P surpluses have declined over the last 40 years, reaching today a neutral-negative P range (although some local hotspots are present), and P use efficiency is now hovering about 100%.



Source: [FAO-IFA Cropland nutrient budget database](#)

Soil P mining continues in much of sub-Saharan Africa, where P balance has been negative due to soil mining and soil health degenerating for most part of its modern history, requiring large increases in P inputs (fertilisers and recycled P) for greater food security and improving soil health. In the European Union (EU-27), P surpluses declined over the last 40 years benefitting from soil legacy-P and PUE has increased to an average 70%, with room to improve, although the situation is very different among countries and cropping systems. Finally, in the United States, P surpluses have declined over the last 40 years, reaching today a neutral-negative P range (although some local hotspots are present), and P use efficiency is now hovering about 100%.

Veronica Santoro, ESPP, and **Ludwig Herman, ESPP and Proman**, presented successful cases of P recycling technologies in Europe, including biosolids (treated sewage sludge) reuse in agriculture, use of P in wastewater to grow biomass (algae, duckweed), P-recovery from liquor streams (struvite precipitation), pyrolysis and hydrothermal carbonisation, P recovery from incineration ashes (to produce calcium phosphates, phosphoric acid, ...), and other technologies under development (vivianite precipitation, ion exchange, adsorption, ...). Theoretical P recycling potential is however very different from the actual recycling capacity. A [study](#) by the Joint Research Center of the European Commission identified a potential recovery of about 0.3 Mt P/y to mineral fertilisers, and about 0.3 Mt P/y to organic fertilising products, out of the 1.1 billion t of P consumed in Europe. The currently operating struvite plants in Europe are recovering about 3000 t of P, while the global capacity is about 5000 tons of P. The recovery potential from ash is instead about 50000 t of P with the projects that are currently underway in Europe, while the current recovery is of about 16000 t P. These technologies are still in the beginning of their development, making P recycling only regionally competitive and – apart from ash-derived products - hampered by the current low recovery rates and the fluctuating quality of products, but further development will lead to higher efficiencies and lower costs for implementation.

Vinisa Saynes Santillán, FAO, highlighted that nutrient imbalance is one of the major threats to soil health according to the ["Status of the World's Soil Resources"](#) report by FAO (2015). More than 50% of the global P loss in agriculture is attributable to soil erosion, and the P exported in harvest is not replenished by organic or inorganic fertilisers leading to soil fertility loss. General recommendations to ameliorate nutrient deficiencies in soils and in crops include increasing soil organic matter, promoting crop diversification, use fertilisers in a balanced way, choose sustainable soil management practices according to the national and cultural reality. On the other hand, nutrient overuse and misuse also lead to negative effects, including greenhouse gas emissions, nutrient leaching, toxicity for plants and animals and impacts on soil biodiversity. Planetary boundaries research has shown that

both global and regional boundaries for safe operating space of P are exceeded: a paradigm shift is therefore needed to move from current to sustainable agrifood systems, aiming at long-term productivity and minimal environment impact.

A final panel, moderated by **Kim Haekoo, FAO**, underlined the need of getting the political focus onto the importance of maintaining soil health and incentivise good practices, taking into account local differences and conditions. Many initiatives are now converging to this goal, but more needs to be done to implement the measures and develop capacity at local farm scale to increase nutrient use efficiency and soil health. Regarding the economic feasibility of P recycling, in the case of municipal wastes, implementing P recovery in a wastewater treatment plant has a cost but this is minimum in comparison to the whole wastewater treatment cost. In the case of agricultural residues, the integration of P recycling may result in more expensive food prices, and only technical advancements will allow to recycle nutrients at a lower cost.

The meeting was concluded by **Ramesh Ramachandran, GPNM**, who stressed the critical role of P management in enhancing soil health, optimising food production and mitigating nutrient losses, and by **Patrick Heffer, IFA**, who referred to the [updated assessment of world phosphate rock reserves and resources](#), published by IFA in 2023. The study estimated global phosphate rock resources at over 300 billion t (expected to last at least 300 more years), but geologic depletion should not be the only focus: more work must be done on reducing losses during mining and processing of phosphate rock, but increasing recovery and recycling from waste streams and improving P use efficiency at the farm level are pivotal to increase the lifespan and our reliance on these reserves and resources.

“Management of phosphate fertilisers for feeding the world sustainably”, joint UNEP/FAO/IFA webinar 14th February 2024. Recording and materials are available [here](#).

Launch of UNEP global phosphorus project “uPcycle”

2 million US\$ UNEP/GEF* funding for project to bring together global data on phosphorus losses to water and share knowledge on phosphorus (P) management and recycling, with a demonstration study focussed on Lake Villarrica (Mallalafquén), Araucanía Region, Chile. The project is implemented by the United Nations Environment Programmes and executed by the UK Centre for Ecology & Hydrology and the Chilean Ministry of the Environment.

The uPcycle launch webinar, 27th March 2024, introduced by **Will Brownlie and Issy Lewis, UK CEH**, and by **Natalie Alem Zabalaga, UNEP**, with over 60 participants, aimed to present the 2-year project to the global community of phosphorus scientists and stakeholders and to invite them to participate in bringing together databases and information sources on phosphorus and to establish a network for cooperation and exchange. This follows on from the [“Our Phosphorus Future”](#) report (coordinated by UK CEH, funded by the UK Research Council NERC and UNEP) and the [Helsinki Declaration](#) calling worldwide policymakers for more sustainable phosphorus management (launched at the [3rd European Sustainable Phosphorus Conference](#), 500 signatures).

- The webinar was opened by **Maisa Rojas, Chile’s Minister for the Environment**, who announced the aim to go beyond the Biodiversity COP15 global objective to reduce nutrient losses by 50% by 2030 ([ESPP eNews n°74](#)) and work towards “net zero phosphorus” **,
- **Isabelle Vanderbeck** and **Ning Liu, UNEP** (United Nations Environment Programme) and **Mark Sutton, UK CEH**, collectively highlighted the need for action on global sustainable nutrient management. They presented the UNEP’s [Global Partnership on Nutrient Management](#) (GPNM) and its [Global Wastewater Initiative](#) (GWWI). GPNM provides technical support to the UNEP Working Group on Nitrogen, and promotes knowledge sharing and capacity building on phosphorus and other nutrients. She noted that GPNM is considering re-launching a Phosphorus Work Group (previously launched in 2015, see [ESPP SCOPE Newsletter n°115](#), but disappeared).
- **Sergio Sairafi Bazán, Chile Ministry for the Environment**, summarised eutrophication challenges in Lake Villarica (these are widely documented, see e.g. [NASA 2023](#)). The lake is one of the largest in Chile (over 70 km²) and is nearly 170m deep. Its hydrographic basin covers nearly 3 000 km². The lake has important tourism and fishing activities, which are impacted by algal blooms and risk of toxic algae. Water quality standards were fixed in 2013: P_{-total} 10 µg/l, N_{-total} 200 µg/l, chlorophyll_{-a} 3 µg/l, but phosphorus levels can be 10 – 50x higher than this (Rodríguez-López et al. 2023, [DOI](#)). Nearly half of P reaching the lake is considered today to be from natural runoff, c. 10% from agriculture, c. 5% from sewage, and 40% from aquaculture. The aim of reducing P inputs to the lake by 1/3, considered necessary to achieve water quality standards, will only be possible by reducing and capturing aquaculture P losses.
- **Stuart Warner, UNEP**, summarised the results of the SDG indicator 6.3.2 2023 data drive. This indicator is calculated by national agencies and includes basic physico-chemical quality data (phosphorus, nitrogen, electrical conductivity, dissolved oxygen, pH). Information on over 90,000 water bodies was reported in 2023 (including 14 000 lakes). The indicator shows a lack of monitoring in low-income countries. See UNEP’s [SDG Water Quality Hub](#).
- **Ken Irvine, IHE Delft** (Institute for Water Education, UNSECO), presented the UNEP World Water Quality Alliance White Paper Embedding Lakes into the Global Sustainability Agenda (2023 <https://wwqa.info/> -> Ecosystems workstream) and the proposal to develop a global coalition for lakes. He noted that a survey shows that stakeholders consider nutrients/eutrophication the first priority for lake ecosystems restoration. Lakes provide worldwide an estimated 3 trillion

US\$/year ecosystem services, and 20% of this is expected to be lost under a Business As Usual nutrient and pollution scenario.

- **Dana Cordell, University of Technology Sydney:** underlined the inefficiency of the current global phosphorus use chain: P in the food we eat represents only around one fifth of the P in phosphate rock mined (see papers cited [ESPP SCOPE Newsletter n°128](#), 2018)
- **Genevieve Metson, Western University, Ontario,** talked about “towards net zero phosphorus” for cities, with aims to reduce P use (in particular by dietary change), reduce P losses, increase P recycling (back to agricultural lands) and to ensure synergy with climate net zero policies (see Metson et al. 2022, [DOI](#))
- **Linda May, Issy Lewis, Anna Doeser, Philip Taylor, Helen Coskeran and Bryan Spears, CEH,** presented the four components of the uPcycle project: assembling global data on phosphorus losses and impacts on surface water, bringing together existing data sources into a permanent dashboard demonstrating sustainable phosphorus management for Lake Villarrica and Chile, establishing a global community on lake phosphorus management and raising global awareness.

* *ENEP/GEF United Nations Environment Programme / Global Environment Facility* <https://www.unep.org/gef/>

** *ESPP questioned whether “net zero phosphorus” is meaningful: net zero climate emissions is (theoretically achievable) by compensating inevitable emissions by carbon sinks (CO₂ reaction into minerals or burial, trees, soil carbon storage ...). But how can inevitable phosphorus losses be compensated ?*

uPcycle project website: <https://www.upcyclelakes.org/>

“Our Phosphorus Future” report 2022 <https://www.opfglobal.com/>

Research and innovation

Brabantse Delta Water Board launches ViviMag® LIFE project

Phos4EU LIFE project will test vivianite separation using Kemira’s proprietary technology ViviMag® from sewage sludge at demonstration scale (9 m³/h, treating 50% of the wwtp’s 400 000 p.e. capacity) at Nieuwveer wwtp, The Netherlands. In addition, replication projects will take place in Hoensbroek, The Netherlands and Burgos, Spain wwtps operated by Limburg Water Board, and [Acciona](#) respectively.. This follows trials with 1 m³/h pilots at Nieuwveer, at Schönebeck Germany (Veolia) and VCS Sønderød Denmark), see [ESPP eNews n°82](#). The LIFE Phos4EU project (4.1 million € EU funding, 6/2023-5/2028), will further test the magnetic vivianite separation technology at near full scale in Nieuwveer and aims to recover up to 60% of total phosphorus in sewage sludge (with enhanced iron dosing). Aquaminerals and STOWA are also partners of the LIFE project and will look at possibilities to valorise the vivianite. The project is supported by Kemira, the owner of the ViviMag® technology as well as Royal HaskoningDHV, the development partner of ViviMag® in The Netherlands.

Brabantse Dela Water Board announcement on LinkedIn [12th March 2024](#).

LIFE Phos4EU [link](#).

P-fertilised grassland, Ireland, may release higher CO₂ but lower N₂O

Atmospheric emissions were measured following two applications of N and organic carbon in two temperate grassland long-term field trial areas, after 23 years of zero / low / high phosphate fertilisation. The experiment was conducted on a long term phosphorus field trial site, at Johnstown Castle, Wexford, Ireland, on two contrasting soils both managed as permanent cut grassland. The site plots had received phosphorus rates of 0, 15, 45 kgP/ha/y since 1995. Grass was harvested monthly seven times per year. In Spring 2019, an experiment was conducted to look at the effect of varying phosphorus rates on N₂O emissions under contrasting soil conditions. Plots were fertilised with nitrogen fertiliser (CAN = calcium ammonium nitrate) 40 kgN/ha/application and organic carbon at a rate of 6.3 kg C/day. The organic carbon (glucose, sodium acetate and methanol) was applied to simulate labile carbon in animal excreta. Cumulative carbon dioxide and nitrous oxide emission, soil properties, soil microbial biomass and glomalin related soil protein (GRSP) and plant biomass were measured over three months following the first N and C_{org} application. Cumulative soil N₂O emissions were significantly higher in the zero-P plot (P application of previous two decades) compared to low or high-P in both soils (zero-P = 1.1 vs high P = 0.6 gN₂O/m²) and were higher in the less well drained soil. CO₂ emissions were in some cases higher with higher P-fertilisation, but not systematically. Based on GRSP, the authors suggest that the higher N₂O emissions could result from increased AMF (arbuscular mycorrhizal fungi) development on roots in soils with low P, as these fungi help plants acquire carbon in P-limited soils (GRSP are related to AMF). This research is being expanded in the [EJP Soil Iconica project](#) to investigate the effect of phosphorus on carbon and nitrogen cycling in a number of long term trials across the world.

“Effect of contrasting phosphorus levels on nitrous oxide and carbon dioxide emissions from temperate grassland soils”, A. Gebremichael et al., *Nature Scientific Reports*, 2022, 12:2602, [DOI](#).

See also: "The effect of carbon availability on N₂O emissions is moderated by soil phosphorus", R. O'Neill et al., *Soil Biology and Biochemistry* 142 (2020) 107726 [DOI](#), summarised in ESPP [SCOPE Newsletter n°137](#) special issue: *Climate Change, Nutrients and Catchment Management*.

PFAS could be cause of 0.5 – 4.5% of wastewater treatment GHG emissions

Study of two sewage sludge incinerators reported no targeted PFAS in chimney gas discharged from a fluidised bed furnace, as widely used in Europe, but detectable short-chain fluorine compounds which are greenhouse gases (e.g. CF₄, C₂F₆, C₃F₈). It is assumed that these carbon-fluoride compounds come from decomposition of PFAS* in combustion and not from combination of organic carbon with fluorine present in mineral forms in sewage sludge. The other sludge incinerator, a multiple hearth furnace, showed some chimney gas PFAS emissions (12 µmol). Both incinerators were equipped with wet gas scrubbing, and significant PFAS went to the scrubber water (320 – 340 µmol). No PFAS was reported in bottom ash in the fluidised bed incinerator (the ash in the other incinerator went to the scrubber water). Levels of targeted PFAS in input dewatered sewage sludge were 250 – 1 300 µmol (around 10 -50 ng/gDM), mostly PFOS*, with around half of the 20+ PFAS substances analysed being quantifiably detected. The authors noted that more recent incinerators should have additional flue gas treatment, including activated carbon (to abate mercury emissions), which could reduce PFAS and fluorinated substances in chimney offgas. The authors estimated greenhouse gas emissions (CO₂ equivalent) of the carbon-fluorine compounds in the incinerators' chimney gases at 0.5 – 2.8 % (fluidised bed furnace) or 0.5% - 4.5% (multiple hearth furnace), expressed as a total of GHG emissions from wastewater treatment for the population generating the input sewage sludge (based on the [US EPA greenhouse gas inventory 2023](#)).

* PFAS = perfluoroalkyl and polyfluoroalkyl substances, a wide family of several thousand different chemical substances. PFOS = perfluorooctane sulfonate is one chemical from this family (eight carbon chain = C₈HF₁₅O₂).

"Fate of perfluoroalkyl and polyfluoroalkyl substances (PFAS) through two full-scale wastewater sludge incinerators", L. Winchell et al., *Water Environ Res.* 2024;96:e11009 [DOI](#).

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