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Events

Nutrients, aquatic methane emissions and climate change

Freshwater emissions of methane are of the same order as methane released by wetlands, and a significant contributor to climate change. Nutrient losses to surface waters and eutrophication will impact methane emissions. ESPP and the US Sustainable Phosphorus Alliance summarised recent knowledge in [SCOPE Newsletter n° 135](#) (July 2020).

[ASLO](#) (Association for the Sciences of Limnology and Oceanography) is organising, as part of the 2021 Aquatic Sciences Meeting (online, 22-27 June 2021), a [Special Session \(SS06\)](#) on **Methane Accumulation in Oxidic Aquatic Environments: Sources, Sinks and Subsequent Fluxes to The Atmosphere**.

Deadline for abstract submission is 12th March (05:59 GMT, 1600 characters)

In partnership with the [Leibniz Institute of Freshwater Ecology and Inland Fisheries](#) (IGB) and ASLO, ESPP and SPA will follow-up the ASLO session with a webinar to exchange between science, water stakeholders and policy makers on implications of aquatic methane emissions for nutrient management. Both the ASLO session and this webinar will be summarised, with an update on recent science, in a further SCOPE Newsletter special edition.

ASLO special session on methane in oxidic aquatic environments: <https://www.aslo.org/2021-virtual-meeting/session-list/>

Contact Mina Bizic mbizic@igb-berlin.de

Abstract submission deadline 12 March 2021 (05:59 GMT)

To contribute to the ESPP- SPA- IGB webinar: contact info@phosphorusplatform.eu

Algae for nutrient removal and recycling: regulatory questions

ESPP is organising a webinar workshop, with participation of the European Commission (DGs ENVI, GROW MARE, JRC) on **Monday 22nd March, 9h-13h** (Paris time, CET). The webinar aims to identify regulatory questions impacting valorisation of algae grown in wastewaters, or “fed” with other waste streams (e.g. CO₂ capture), or for materials left after extracting materials such as biofuels or cosmetics from algae. Algae can be valorised to fertilisers (recycling nutrients and organic carbon to soil), animal feed, bioenergy or to many other applications. Use of nutrients from algae grown using waste inputs raise specific questions under EU fertilisers and animal feed regulations, as well as contaminant and safety questions.

Registration (free): <https://algae2021.eventbrite.co.uk>

Event webpage, updated programme www.phosphorusplatform.eu/algae2021

P-efficiency in poultry farming

A stakeholder webinar will present and discuss the results of the [PeGaSus](#) (ERA-NET) research project (Phosphorus efficiency in the chicken *Gallus gallus* and pig *Sus scrofa*) **22nd April 2021, 15h-17h CEST** Topics will cover feeding strategies, animal physiology and genetics, soil agro-ecosystems, phosphorus re-use and recycling options, measures of farmers' economic performance, legislative aspects on manure management, and governance & policy instruments.

Programme and registration: http://pegasus.fbn-dummerstorf.de/stakeholder_workshop.html

CRU Phosphates 2021: “the” phosphate industry event



Members of ESPP benefit from a 10% reduction for registration to “**Phosphates 2021**”, **online 23-25 March 2021**. This is the only major global event for the phosphate mining, processing, phosphorus chemicals and phosphate fertiliser industries, and brings together over 400 industry participants every year. This year's Phosphates conference is online, with virtual exhibition and networking centre, interactive discussion groups, conference presentations with Q&A. Registration prices are considerably lower than usual.

<https://events.crugroup.com/phosphates/register>

AquaEnviro Wastewater Resource Recovery Conference

One day conference on resource recovery from wastewaters and biosolids: nutrient recovery, hydrogen and other materials: experience from pilot and full scale plants; market pull, user confidence and business models, regulatory framework, links to net zero carbon 2030 agenda for the UK wastewater industry. **Abstract submission deadline: Friday 12th March** (200 words).

“The Art of the Possible: Resource Recovery from Wastewater and Bioresources”, May 13th 2021 online.

Abstract submission deadline 12th March <https://conferences.aquaenviro.co.uk/events/conferences/resource-recovery-from-wastewater/>

Call for data

Contaminants in mineral and organic fertilisers

The European Commission (DG Environment) has contracted to Arcadis and Arcadia International a study into contaminants in fertilisers (organic and inorganic fertilisers, sold as fertilisers under EU or under national regulations). The declared objective is to identify contaminants, fertiliser additives or fertiliser components or their decomposition products, which pose possible risks for the environment, for crops, for consumers (via crops) or for farmers. ESPP participated in a stakeholder workshop online organised by Arcadis 4th March 2021 (ESPP circulated the invitation to members), with nearly one hundred participants from different concerned companies and sectors. DG ENVI suggested that the study underway could lead to modifications of the EU Fertilising Products Regulation and to “Restrictions” under REACH. A shortlist of substances (mainly contaminants) to be studied has been defined: **pyrazoles, dioxins, PCBs, PFAS (perfluorinated alkyls), pharmaceuticals (e.g. diclofenac), cadmium, chromium, mercury, vanadium and fluoride**. A preliminary risk scoping will be carried out on these substances by mid-2021, including defining fertilisers concerned, risks, possible risk management measures (e.g. restrictions / limit levels in fertilisers). If potential risks are identified, these will be submitted to ECHA (European Chemical Agency) for additional data collection, risk assessment and then public consultation before possible “Restrictions” under REACH. Companies and stakeholders having data, studies on **any of the above listed contaminants in fertilisers are invited to transmit these to Arcadia before end March 2020** (data on levels of these contaminants in fertilisers or in recycled nutrient materials, risk assessments for these contaminants in fertilisers or in soil).

Arcadia study contact daniel.traon@arcadia-international.net

ESPP member news

ESPP new member: HTCycle AG

Based in North-East of Germany, HTCycle AG uses biogenic waste as raw material to produce high quality end products, which are like active carbon and can be used for the 4th cleaning step in wastewater treatment plants, as well as ammonium sulphates and struvite for the agricultural sector.



HTCycle AG was established in 2009 and is part of the IPI group (International Power Invest AG), specialised in renewable energy solutions and environmental technologies. The patented HTCycle process is based on hydrothermal carbonisation technology and uses steam as the reaction medium at around 220°C, 24 bars for 3-5 hours. Focusing on sewage sludge with 25-30% dry matter content as raw material, the activated carbon produced from the sewage sludge can be used in the water cleaning process to remove micro plastic, hormones and pharmaceutical residues. Phosphorus can be leached from the HTCycle coal using sulphuric acid, to produce phosphoric acid. Ammonia stripped from offgases can be either reacted with the phosphorus to produce struvite and/or used to produce ammonium sulphate. The process thus complies with the German phosphorus recovery obligation (Sewage Sludge Ordinance of 2017). To date HTCycle AG has more than 10 years of experience operating pilot plants with 8.000 and 16.000 tons of capacity per year and is currently planning to build several full-scale 24/7 operating industrial-plants in Germany together with a European Infrastructure Fund. The first plant will be built in Wolgast, North East Germany, with a capacity of 16.000 tons per year of sewage sludge wet weight. HTCycle AG joins the ESPP because it aims to bring the economic and environmental benefits of hydrothermal carbonization, combined with efficient phosphorus recycling, to the attention of the general and professional public.

<https://htcycle.ag/>

EasyMining, Lantmännen & SLU to test recovered phosphate as animal feed

EasyMining (Ragn-Sells group), an ESPP member, the Swedish University of Agricultural Services (SLU) and [Lantmännen](#) Research Foundation (Swedish agricultural cooperative of 20 000 farmers) have launched a project to test calcium phosphate recovered from sewage sludge incineration ash as a phosphorus source in animal feed for poultry and pigs.

The PCP (precipitated calcium phosphate) is produced by the [EasyMining](#) Ash2Phos process from sewage sludge incineration ash (see ESPP P-recovery technology [catalogue](#)), 600 kg/day pilot operational in Helsingborg, two full scale plants in permitting. It offers high P content, the same P solubility as commercial MCP (mono calcium phosphate) today used in animal feed (90% in citric acid) and low fluorine. The planned trials, to run for two years, will assess the digestibility of the PCP, in order to enable optimal use in animal feed and to minimise losses to manure.

EasyMining underlines the need to clarify EU regulation concerning use of products recovered from sewage sludge in animal feeds. ESPP has engaged discussions with the European Commission on this question.

"New project to test recovered phosphorus as feed phosphate" 15/2/2021 <https://www.easymining.se/newsroom/articles-news/feed-project/>

Industry news

DSM and livestock nutrient sustainability

Royal DSM has launched "Reducing emissions from livestock", a sustainability platform addressing climate emissions and nutrient stewardship. DSM is a global science-based company in nutrition, health and sustainable living. DSM solutions for livestock include feed additives which improve nitrogen use efficiency (NUE) in poultry and in pigs, and so reducing N losses, improve phosphorus and amino acid digestibility, reduce methane emissions in ruminants and increase overall animal feed use efficiency. Ivo Lansbergen, President, DSM Animal Nutrition & Health: "*Amidst global climate change, the need to reduce carbon emissions from animal livestock is increasingly important. It is not a question of whether we need to shift to a more sustainable business model, it is more a question of how fast and with what impact. We need to shift to a model where farmers are getting a fair price for the animal proteins produced, where people across the world have access to affordable proteins, and last but not least, where animal farming reduces its impact on the environment (emissions, water quality through manure measurement, bio-diversity) significantly.*"

"Royal DSM N : DSM launches its sustainability platform 'Reducing emissions from livestock' as part of We Make It Possible", 21 January 2021 <http://www.publicnow.com/view/572B40F4251CEEE2628E2D2033D1295A89DF2425>

New network of fertiliser regulatory experts

The **Fertiliser Consultants Network (FCN)** www.fertcon.net is the first European network of regulatory consultancies for the fertiliser sector. The network can provide expertise across Europe as well as North Africa, South America, Russia and China. Members can provide consultancy on both national and European regulation including implementation of the new EU Fertilising Products Regulation 2019/1009 and of the new Regulation on Mutual Recognition 2019/515, biostimulants, fertiliser additives, organic and mineral fertilisers, Organic Farming. Founding [members are](#) Artemisa, Openagri, SILC Fertilizzanti, SUN Chemicals Services, Vox Gaia.

Fertiliser Consultants Network (FCN) www.fertcon.net

Baltic manure management recommendations

SuMaNu (1) report on manure management

The [SuMaNu](#) platform (Sustainable Nutrient and Manure Management for reduction of nutrient loss in the Baltic Sea Region) has published a report (by RISE) bringing together recommendations for manure management from seven Baltic manure projects (list below). These projects addressed different aspects of manure management, and this report aims to develop recommendations covering all aspects of sustainable manure use (nutrient utilisation, ammonia emissions, greenhouse gas emissions, nutrient runoff and leaching, manure nutrient recycling, odours, pathogens and contaminants) over the whole livestock production chain (feed, animal housing, manure storage, manure application and manure processing). Costs of manure management, economic and regulatory instruments are discussed. The report concludes that baseline obligatory standards for manure handling and use should be tightened, information of farmers should be increased and economic incentives implemented to help finance sustainable technologies and practices.

Project recommendations summarised in this report: Manure Standards, Baltic Slurry Acidification, GreenAgri, BONUS PROMISE, Baltic Manure, Baltic Deal, and Baltic Compass. "Technologies and management practices for sustainable manure use in the Baltic Sea Region", E. Sindhöj et al., RISE Report 2020:77, SuMaNu <http://ri.diva-portal.org/smash/get/diva2:1476430/FULLTEXT01.pdf>

SuMaNu (2) report on manure processing

A second report from SuMaNu summarises different manure processing technologies and the resulting recycled nutrient fertiliser products. Regional manure nutrient misbalances in Finland, Sweden, Germany and Poland are assessed. Technologies summarised are: mechanical separation, slurry acidification, composting, anaerobic digestion, thermal drying, pelletising, pyrolysis, HTC, combustion, gasification, ammonia stripping, membrane separation, struvite precipitation and vacuum evaporation. Fate of contaminants and pathogens are discussed. The report concludes that concentration of livestock production in certain regions generates nutrient surpluses: processing and recycling can enable transport of nutrients to crop-growing regions where they are needed, but manure processing is economically challenging. Incentives are needed to support the high investment costs for processing and to develop markets for recycled nutrient products. These often differ from conventional mineral fertilisers and services to facilitate transfer to their use should be supported.

"Manure processing as a pathway to enhanced nutrient recycling", S. Luostarinen et al., 2020, SuMaNu https://jukuri.luke.fi/bitstream/handle/10024/546254/luke_luobio_62_2020.pdf

SuMaNu (3) report: impact gap for manure nutrient projects

A third report from SuMaNu analyses pitfalls between envisaged and realised impacts of manure nutrient projects, that is whether project recommendations were taken up by policy makers or implemented by farmers. The projects analysed are the Baltic manure projects listed in (1) above. The only project recommendation to achieve high policy maker and farmer uptake was the Baltic COMPASS recommendation to develop manure phosphorus management information, such as P-norms and standard P-indices for manures. Slurry acidification achieved medium policy integration and manure-based biogas production achieved medium policy integration and user uptake. Conclusions are that projects should explicitly define recommendations and make efforts to make these clear and accessible, and that project activities should correspond to objectives. Recommendations are more likely to be implemented if they are well communicated, in line with farmers' needs, and if representatives of policy makers and farmers are involved in the project.

"Typical pitfalls leading to gaps between envisaged and realised impacts of manure and nutrient related projects - a gap analysis", H. Lyngsø Foged et al., Organe Institute, June 2020, SuMaNu https://www.organe.dk/docs/SuMaNu_Report_2-3_Gap_analysis_Organe_Report.pdf

SuMaNu (4): draft policy recommendations

SuMaNu has also published six draft policy recommendation sheets, each 2-3 pages. These cover

- Fertilisation planning: in particular recommending obligatory farm gate nutrient balancing for N and P (comparison on nutrient inputs to offtakes, enabling calculation of nutrient efficiency)
- Fertilisation planning measures: development of Baltic region P fertiliser norms, a soil P-index model and tools for manure fertilisation planning, based on manure standards
- Handling and storage of manure: definition of BAT (Best Available Technologies) to reduce ammonia and greenhouse gas emissions, minimum manure storage capacities, spreading in Spring and Summer, application rates based on manure standards
- Regional nutrient reallocation: strategy and measures to support production and use of recycled nutrients from manure, with biofuel production / renewable transport
- Safe manure recycling: reduction of trace elements and pharmaceuticals in feed (then found in manure), improving hygiene of manure processing (avoid recontamination), avoid mixing manure and sewage sludge in processing
- Knowledge transfer between research, regulators and farmers, including via agricultural and environmental advisory services

SuMaNu draft policy recommendations: <https://balticsumanu.eu/national-stakeholders-have-their-say-regarding-sumanu-policy-recommendations/>

Research

Climate change and Circular Economy

A report from the Ellen Macarthur Foundation (EMF) and Institute for European Environmental Policy (IEEP) concludes that moving to circularity for steel, aluminium, plastics, cement and food could reduce by nearly half these sectors' climate emissions, so reducing total world greenhouse gas emissions (GHG) by around 20%. Agriculture and food are estimated to contribute 17% of EU GHG. Over 20% of food is wasted in the EU. Combined with methane emissions from waste, global food waste is estimated to contribute 8% of anthropogenic GHG. EMF suggest that circularity in the agri-food system, including "regenerative agriculture" (~36%), reducing food waste (~12%) and recycling food waste back to soil (~2%) could reduce agri-food system GHG by nearly 50%, but most of this suggested reduction depends on "regenerative agriculture" (defined as "crop and livestock production approaches that enhance the health of the surrounding natural ecosystem").

EMF states that policies needed include a reform of the CAP (EU Common Agricultural Policy), active policies to reduce food waste, separate collection of biowaste (as required by the Waste Framework Directive by 2024) and creating markets for composts and digestates. EMF also notes the need for fiscal reforms to support circularity, including for nutrients.

"A low-carbon and circular industry for Europe", Ellen Macarthur Foundation and Institute for European Environmental Policy, 2021

<https://think2030.eu/publications/a-low-carbon-and-circular-industry-for-europe/>

"Completing the picture. How the circular economy tackles climate change", Ellen Macarthur Foundation, 2019

<https://www.ellenmacarthurfoundation.org/our-work/activities/climate-change>

Lakes as climate sinks and emitters

In a 20-minute webinar online [here](#), in the US Sustainable Phosphorus Alliance "Science Now" series, Adam Heathcote presents recent work estimating annual carbon capture in freshwater lakes (see paper by Anderson et al. summarised p.16 of [SCOPE Newsletter n° 137](#)). Based on a newly collated data set, covering 500 lakes and reservoirs worldwide, in different biomes, they conclude that lakes are a significant global carbon sink, with increasing nutrient losses increasing carbon sequestration to sediments. However, lakes remain a net carbon emitter, with net carbon releases into the atmosphere around twice burial rates. The largest cause of carbon burial is soil erosion, which takes organic carbon to sediments. Also, increasing carbon sequestration in lakes is maybe 15 to 25 times lower (greenhouse equivalent) than possible expected increases in aquatic methane emissions related to eutrophication (see [SCOPE Newsletter n°135](#)).

US Sustainable Phosphorus Alliance YouTube channel https://www.youtube.com/channel/UCNFDQTfeT7mGsMY_YOqMonA and Science Now "Nutrients Increase Global Freshwater Carbon Sink" https://www.youtube.com/watch?v=L_IIFjlfqE

Organic contaminants eliminated in sewage sludge biochar

Tests with sewage sludge show that pyrolysis at 400°C (2 hours) remove pharmaceuticals to below detection limits. Pyrolysis at 700°C (2 hours) also eliminated 99% of PVBs, PAHs and EDC/Hs*. The sewage sludge was from a 500 000 p.e. municipal sewage works in the Czech Republic operating chemical P-removal, after mesophilic anaerobic digestion, centrifuge dewatering and then dried in a paddle dryer (100°C, 3 hours). Pyrolysis was carried out in the laboratory on 100g samples of dried sludge, particle size 0.5 - 2 mm, in a quartz fixed-bed reactor, and was tested at 400°C, 500°C, 600°C, 700°C and 800°C in oxygen-free conditions (under helium). The sludge H/C-org ratio was 1.75 and this was reduced to H/C-org <0.7 in \geq 500°C biochars, that is conform to the EU Fertilising Products Regulation (draft) STRUBIAS criteria.

Removal of PCBs may not be relevant in that total PCBs in the sewage sludge were < 300 ng/g: levels were reduced to < 30 ng/g in the biochars. Pyrolysis at \geq 500°C reduced levels of PAH from 36 μ g/g in the dried sludge to around 1 μ g/g, that is significantly lower than the 6 μ g/g limit proposed in the EU Fertilising Products Regulation (draft) STRUBIAS criteria. Only three EDC/Hs were found in the sludge: bisphenol A, oestradiol, triclosan. Of these, only bisphenol was detectable in any of the biochars, and was reduced from > 1 000 ng/g in the dried sludge to c. 10 ng/g event with \geq 500°C pyrolysis. Nine of the twenty-seven pharmaceuticals tested were found in the dried sewage sludge (concentrations 0.1 - 50 ng/g) and all were non-detectable in all of the biochars.

The authors suggest that pyrolysis at \geq 400°C for 2 hours is sufficient to ensure complete elimination of the studied pharmaceuticals from sewage sludge biochars. Based on fact that 700°C (2 hours) was sufficient to remove 99.8% of the other organic contaminants tested, the authors suggest the sewage sludge pyrolysis at temperatures higher than 600°C with sufficient residence time (> 30 min) should ensure efficient organic pollution removal. However, this is based on the limited number of different pharmaceuticals found in this sludge and on a limited number of other organic molecules. Also, the study did not assess whether the pyrolysis may have decomposed the pharmaceuticals or other organic contaminants into breakdown products, nor whether microplastics were eliminated. Therefore, further investigations into these questions are recommended.

* PCB = polychlorinated biphenyl. PAH = polyaromatic hydrocarbon. EDC/H = endocrine disrupting chemical or hormone.
"Effect of pyrolysis temperature on removal of organic pollutants present in anaerobically stabilized sewage sludge", J. Mosko et al., *Chemosphere* 265 (2021) 129082 <https://doi.org/10.1016/j.chemosphere.2020.129082>

P-fertiliser effectiveness of organic residues

The RAE (Relative Agronomic Efficiency) for phosphorus of nineteen organic secondary nutrient materials was tested in three independent pot trials (each pot with four replicates, total of 152 pots over three years) with barley, for approx. 12 weeks (to maturity and grain harvest) and compared to single superphosphate fertiliser (SSP). Soil used was sandy, low P (13 mg/kg OlsenP), with pH 5.5 or limed to 5.8 or 6.5. Other nutrients (N, K, Mg, Ca, Fe, Zn, Mn, Cu, B, Mo, S) were applied sufficiently. The organic materials tested were manures/slurries from cattle, pig and fur fox, pig slurry mixed with food industry wastes (raw, composted or digested), sewage sludges (from 3 sewage works using iron salts for P-removal to different extents), pyrolysed and HTC sewage sludges.

The RAE (Relative Agronomic Efficiency) was calculated as the amount of P in SSP needed to produce the same yield as for the organic residue, divided by the total P applied in the organic residue.

At low P application rates, pig slurry, cattle slurry and composted cattle manure showed RAE above 100% (up to 189%). These materials were tested at application rates of 40 mgP/kg soil, whereas the sewage sludge derived products were tested at 150 mgP/kg soil, this being the highest P application rate at which SSP was tested. The manures, applied at only 40 mgP/kg, gave barley yields of yields of 47 – 61 g barley grains per pot, compared to the yield of 76 g grain/pot for SSP at 150 mgP/kg soil (3-13 g/pot only for control with no P addition).

On the other hand, digestate of pig slurry + food and enzyme industry wastes tested at a P application rate of 150 mgP/kg soil showed a calculated RAE of only 35% (yield 49 g/pot).

The authors suggest that the RAEs higher than 100% for manures may be because organic molecules may block P adsorption sites in soil so that P remains better available for crops and indicate that this hypothesis is supported by unpublished results of soil incubation experiments testing pig and cattle manures.

All the sewage sludges and sludge pyrolysis/HTC materials showed low RAEs (when tested at 150 gP/kg). Calculated RAEs were 6 – 68% for the sewage sludges, with yields of 17 – 66 g/pot. Calculated RAEs were 1 – 6% for the sludge or manure pyrolysis/HTC materials, with yields of 5 – 17 g/pot at 150 gP/kg.

The authors identify that the combined iron and aluminium content of the organic materials, i.e. molar ratio (Fe+Al):P, is a very good predictor of RAE for organic residues, correlating negatively to barley grain yield in these pot trials. Calcium was not a good predictor, as were also not phosphorus solubility/extraction methods (formic acid, citric acid, NAC, water, NaHCO₃).

"Predicting relative agronomic efficiency of phosphorus-rich organic residues", K. Ylivainio et al., *Science of the Total Environment* 773 (2021) 145618, <https://doi.org/10.1016/j.scitotenv.2021.145618>

Stay informed

ESPP relaunches social media

After a period of dormancy due to organisation changes, ESPP is relaunching our social media channels: [LinkedIn](#) and [Twitter](#). ESPP is now working for communications with ETA – Florence Renewable Energies, a company with over 25 years' experience promoting green innovation, especially for events, platforms and industry associations in the bioenergy sector.

Subscribe ESPP's social media channels [LinkedIn](#) and [Twitter](#) to get up-to-date news on nutrients.

Link us on your own channels. Send us information to disseminate.

SCOPE newsletter: www.phosphorusplatform.eu/SCOPEnewsletter

eNews newsletter: www.phosphorusplatform.eu/eNewshome

If you do not already receive SCOPE and eNews (same emailing list), subscribe at www.phosphorusplatform.eu/subscribe

LinkedIn: <https://www.linkedin.com/company/european-sustainable-phosphorus-platform/>

Twitter: [@phosphorusfacts](https://twitter.com/phosphorusfacts)

Slideshare presentations: www.slideshare.net/NutrientPlatform

ESPP members

