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Public consultations

EU Industrial Emissions Directive (BAT BREFs)

A public consultation is open to 21st April on the “Inception Impact Assessment” for the EU Industrial Emissions Directive (IED), which defines Best Available Technology (BAT BREFs), which are legally applicable to all installations in concerned industrial sectors across Europe. The roadmap suggests widening the scope of the IED to include cattle farms, “mixed farms” and aquaculture. ESPP supports this, because it is coherent with the inclusion already today of large pig and poultry farms. ESPP welcomes a proposed accent on Circular Economy. ESPP also proposes to streamline the BREF process, which today [generates documents](#) hundreds of pages long. The BAT specifications, which are relatively short and are legally constraining, could continue to be defined by the formal consultation and adoption process, but the examples and innovation texts, which are illustrative, could be more informal and so more frequently updated.

*EU public consultation on the inception impact assessment for the Industrial Emissions Directive. **Deadline = 21st April 2020***
<https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12306-EU-rules-on-industrial-emissions-revision>

EU aquaculture policy

A public consultation is open to 21st April on the Roadmap for “Updated Guidelines” for the EU aquaculture. ESPP welcomes the reference to the [Green Deal](#) and the [Farm to Fork Strategy](#). ESPP will underline the importance of improving the nutrient efficiency of aquaculture feed, including use of local crops or by-products, better uptake of plant forms of phosphorus in fish (especially salmon) and nutrient footprints, making the link to the nutrient strategy proposed in Horizon Europe. ESPP also underlines the need to reduce nutrient losses from both offshore and fresh water aquaculture, and to develop nutrient recycling, including integrating fish manure into the EU Fertilising Products Regulation

*EU public consultation on EU fish farms (aquaculture) – updated guidelines.. **Deadline = 21st April 2020*** <https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12261-Strategic-Guidelines-for-EU-aquaculture-update>

Events

Postponement ESPC4 and PERM → 31st May – 2nd June 2021

Given the development of the international corona virus situation, and after re-discussion with the venue hotel and the Belvedere Palace, Vienna, we have decided to postpone ESPC4 and PERM (4th European Sustainable Phosphorus Conference and European Phosphorus Research Meeting) from June 2020 to **Vienna 31st May – 2nd June 2021**

<https://www.phosphorusplatform.eu/espc4>

Workshop on iron phosphate chemistry applied to phosphorus stewardship

This workshop remains fixed 13-14 July, 2020 either with a physical meeting in Utrecht, the Netherlands, or by webinar (in which case the programme will be organised differently). So: save the date! Themes will cover: Iron phosphorus interactions in sediments, in soils and engineered systems, Strategies for phosphorus release and P-recovery from iron phosphates, Iron - phosphate interactions in agriculture and Markets for recovered iron phosphate materials.

Contact: sara@phosphorusplatform.eu

Registration: [here](#).

RAMIRAN 2020, Systemic, ESNI

The manure and organic resources recycling conference, RAMIRAN, remains fixed 14-17 September 2020, Cambridge, UK. The SYSTEMIC workshop on nutrient recovery from anaerobic digestion and ESNI (European Sustainable Nutrient Initiative) are rescheduled to 26 – 27 October 2020, Brussels

Ramiran: www.ramiran2020.org

ESNI and SYSTEMIC workshop on [Eventbrite](#)

Corona virus

COVID and sewage

Researchers at [KWR Netherlands](#) have found gene fragments of the Covid-19 virus in wastewater entering a sewage works, with repeated tests confirming the results. The virus gene fragments were not detected in the sewage works effluent (treated water), but only one site was tested, and sewage sludge was not tested. Although the tests do not discriminate between potentially active virus and inactive fragments, **it is underlined that the results do not indicate that Covid-19 infection is possible from sewage**. Workers in contact with wastewater should in any case use protective equipment, because of other health and safety risks in handling wastewater, and the water industry underlines that this should be reinforced. The World Health Organisation briefing on Covid-19 in water and sewage (19th March) can be summarised as follows: there is no proof for the Covid-19 virus, but it has a fragile outer membrane and is likely to be more rapidly inactivated in sewage than other viruses which have been shown to survive for days to weeks in water or sewage (e.g. gastroenteritis, hepatitis). A new paper in Nature (published 1/4/20) found high virus RNA concentrations in faeces of nine Covid-19 patients, but no infectious virus in faeces, in urine nor in blood. The study concludes that there were indications of viral replication in the gut and that the absence of detected viable virus in faeces may be because the nine patients were mild cases, and none had diarrhoea (which occurs in maybe 2% of Covid-19 cases).

KWR press release "What we learn about the Corona virus through waste water research" [24th March 2020](#)

KWR [Webinar](#) "COVID-19: Significance and impact of the pandemic for the water sector"

WHO "Water, sanitation, hygiene, and waste management for the COVID-19 virus, Interim guidance" [19th March 2020](#)

"Virological assessment of hospitalized patients with COVID-2019", R. Wölfel et al., Nature, [1 April 2020](#)

Fertiliser industries working to feed the world

The fertilisers industry is committed to continue to supply farmers, in order to maintain the world food supply. Fertilizers Europe [states](#) its commitment to continuing to deliver nutrients to farmers, in the crucial spring period when fertilisers are needed. The industry thanks the European Commission for [citing](#) agricultural production inputs as goods for which continuation of flow should be ensured in border management. IFA (International Fertilizers Association) [underlines](#) that >40% of fertiliser production is traded internationally, so that continuing movement is essential to enable supply, and that without mineral fertilisers world food production would be cut by around half. Both federations underline the need to ensure safety of workers handling and transporting fertilisers through enhanced hygiene measures and personal protective equipment.

Policy

EU new Circular Economy Action Plan

The revised Circular Economy Action Plan [published](#) by the new Commission on 1st March includes “Food, water and nutrients” as one of the seven key targeted value chains. Actions indicated are to “**develop an Integrated Nutrient Management Plan with a view to ensuring more sustainable application of nutrients and stimulating the markets for recovered nutrients**”, reduce food waste, facilitate water reuse, possible review of the wastewater and sewage sludge directives (including assessing natural nutrient recovery e.g. by algae), continuing the Bioeconomy Action Plan, a policy framework on compostable, biodegradable and bio-based plastics (ESPP note: important for digestates and composts) and a number of actions to address microplastics and to better understand their risk and occurrence. The Plan indicates the need to improve monitoring of resource recycling, proposing a “*market observatory for key secondary materials*”, a “*Monitoring Framework for the Circular Economy*” and “*Indicators on resource use, including consumption and material footprints*”. The Plan also aims to better integrate the circular economy into Member States fiscal policies, via the European Semester and at the global level to define a “*Safe Operating Space*” for natural resource use.

COM(2020)98 “A new Circular Economy Action Plan” [11th March 2020](#)

Global fertiliser industry “committed to reducing P losses”

A 3-minute video from the International Fertilizer Association ([IFA](#)) promotes the need for phosphorus fertilisers to feed the world, stating that 32% of the world’s cropland and 43% of the pastures are phosphorus deficient and that world phosphate rock resources represent 1 000 years of consumption. The video underlines that eutrophication is a major problem, caused by fertiliser losses and other phosphorus releases, and that it is likely to worsen with climate change. The fertiliser industry states that it is promoting better fertiliser management, indicating that fertiliser use efficiency can reach 90% and losses of fertiliser P to surface waters can be reduced to 3%. IFA states that it supports recycling where appropriate, and is “committed to reducing phosphorus losses”.

<https://www.youtube.com/watch?v=QwOR0PzZENk&t=>

Prosumer cross-KIC meeting on perspectives for P-recovery

The web-meeting “Sustainable strategies towards a phosphorus circular economy: Cross-KIC web-meeting” (26th March, 2020), organized by the Department of Industrial Engineering of the **University of Bologna**, brought together some 40 participants from research, industry and high-education around two projects funded by the **EIT** (the EU’s European Institute of Innovation and Technology) **KIC** (Knowledge & Innovation Communities) ‘**Climate**’ and ‘**Raw Materials**’, respectively **Prosumer** and **InPhos** projects. Other projects relevant to phosphorus funded by these KIC’s include **raPHOsafe** and **Phosforce**. The web-meeting covered different disciplines of phosphorus management. The company **Puccioni**, **fertiliser producer**, indicated that the company is working on the industrial-scale use of recovered struvite from the wastewater of another Italian company, **Pizzoli**, a potato processing plant, as input to triple super phosphate production. Both companies are stakeholders of the Prosumer project. The technological provider, **Outotec**, summarised state of the art of phosphorus recovery. **Marche Polytechnic University** explained the European and Italian legislative framework and the technical features of recovered P for reuse in agriculture.

The webcam discussed **agricultural valorisation of sewage sludge**. In Italy, this can contribute to soil carbon in Southern Italy where this is critical. The proposed new Italy sludge management regulation, currently under consultation, would enable continuing agricultural use limited to high quality sludge (metal and organic contaminant limits, nutrient value) and would fix a priority of P-recovery if sludge could not achieve these criteria and define End-of-Waste for appropriate recovered P products.

The **Italy Phosphorus Platform** (ENEA, under the aegis of the Environment Ministry) presented survey results showing that stakeholders see the three biggest obstacles to nutrient recycling to be End-of-Waste regulatory problems, need for regulatory drivers for recovery and lack of knowledge.

In the Baltic region, the **InPhos** project, coordinated by the **Mineral and Energy Economy Research Institute**, has identified priority recommendations for a common and shared strategy for a more sustainable P management and for the reduction of eutrophication. **Proman** presented results of a quantification of nutrient flows in the Baltic Sea Region, as first step to clearly monitor the situation and define effective solutions.

After the presentation of **University of Bologna**, discussion among all attenders confirmed the value of R&I projects in demonstrating the technical feasibility and assessing the economics and business models for nutrient recovery, as these are essential to facilitate movement by policy makers and industry.

InPhos Prosumer webinar 26th March 2020

See below summaries of Prosumer project, and of Outotec (AshDec update) and Proman (Baltic nutrient management) presentations.

Call for 80% cut in meat eating

Greenpeace says Europe needs to reduce average meat consumption by 80% (by 2050) to achieve the UN +1.5°C limit to hope to prevent climate breakdown. This corresponds to the 300 g of meat per week (the equivalent of two burgers) recommended by [The Lancet](#) for a balanced sustainable diet (see ESPP eNews [n°30](#)). Greenpeace calls on the European Commission to include targets for reductions in meat consumption in its [Farm to Fork Strategy](#), to be presented soon as part of the Green Deal. Mark Driscoll, food consultant at Tasting the Future, [suggests](#) that a massive reduction in meat consumption is indeed necessary (he suggests -50% by 2030) to reduce both environmental and health damage of our diets, but he underlines that locally produced, regeneratively farmed meat can have sustainability advantages.

Greenpeace "EU climate diet: 71% less meat by 2030" [13th March 2020](#)

Science and research

National and global phosphorus footprints

A study estimates the "Phosphorus Exceedance Footprint" (PEF) for different countries, assessing their contribution to the transgression of global planetary boundaries for phosphorus, particularly looking at international trade. Around 30% of planetary boundary exceedance for phosphorus is shown to be linked to international trade flows. Wealthier countries tend to reduce their domestic fertiliser use whilst increasing import of products containing embedded phosphorus footprints. The highest PEF per capita identified is for New Zealand (nearly 19 kgP/capita/year), presumably related to high levels of meat production. The highest absolute PEF is China (3.3 kgP/capita/year, but total 4.5 million tonnes P/year, that is 44% of total world PEF), followed by India, the USA and Brazil. France imports around 100% of its PEF, presumably corresponding mainly to imported animal feed, whereas Brazil and New Zealand export around 100% of their DPE (domestic P exceedance), presumably corresponding to exports of meat products. The authors consider that this work will facilitate devilment of planetary boundary benchmarking for countries, public policies, diets and food products.

"Towards meaningful consumption-based planetary boundary indicators: The phosphorus exceedance footprint", M. Li et al., *Global Environmental Change* 54 (2019) 227–238 [DOI](#)

Lack of data on global phosphorus cycles

The only relatively recent paper attempting to estimate global phosphorus flows shows the need for a coherent assessment, in order to have reliable data to support policy making. Chen & Graedel 2016 (estimating flows for 2013) suggest that from 69 MtP/year in mined phosphate rock, only 31 Mt end up in beneficiated, marketable rock. This is reasonably close to Steiner et al. 2015 (see ESPP's SCOPE Newsletter [n°128](#)). However, Chen & Graedel suggest that the non processed phosphate rock (tailings) ends up as water pollution, whereas in most mines this will be returned to the mining site with not significantly more loss to water than the rock before mining. This leads the paper to conclude that over half of annual P losses to water worldwide are from mining. The authors also conclude that globally soils are losing nearly 11 MtP/year to water (that is nearly half the annual P used in mineral fertiliser). This contradicts other authors who estimate global soil P accumulation (the reference indicated is incorrect, but may refer to Bouwman 2009, see SCOPE Newsletter [n°88](#)). These differences confirm the need for an up-to-date assessment of global phosphorus flows.

"A half-century of global phosphorus flows, stocks, production, consumption, recycling, and environmental impacts", M. Chen, T. Graedel, *Global Environmental Change* 36 ([2016](#)) 139–152. For other data see ESPP [Phosphorus Fact Sheet](#)

AshDec P-recovery process new test data

Tanja Schaaf presented 26th March 2020, at the InPhos Prosumer workshop (see above) an update on the AshDec process for phosphate recovery from sewage sludge incineration ash and other ashes. A 20-25 kg/h input ash pilot has been operated continuously for 7 days, testing different additives and different temperatures. The choice of additive (sodium carbonate or sulphate) and operation with excess or depleted oxygen impact heavy metal removal and phosphorus solubility (plant availability) in the final product. Sodium carbonate showed to give a product with >80% P-NAC (neutral ammonium citrate) solubility, even down to 850°C. Significant removal of lead, arsenic and cadmium was achieved, improving at higher temperatures (even though cadmium was already very low in the sewage sludge incineration ash used). Copper and zinc were not significantly removed. Pot trials with spinach, soybean and rye grass at Bonn University show fertiliser effectiveness comparable to triple super phosphate.

Summary presented at the InPhos Prosumer webinar 26th March 2020

Baltic region nutrient flows and management perspectives

A study by Proman for HELCOM (the intergovernmental Baltic Marine Environment Protection Commission) has developed substance flow analyses for phosphorus and nitrogen and identifies potentials for reducing losses to the Sea and for developing recycling. To calculate losses, nutrient use efficiency (NUE) is estimated at 90% for mineral fertilisers and at 70% for N and 77% for P in organic fertilisers (based on references below). Nitrogen balance per hectare (input minus estimated offtake, in harvest and in crop residues removed from the field) is highest in Russia (Baltic catchment) and Denmark, and phosphorus balance also highest for Russia. The biggest opportunities for nutrient recovery are in manure (combined with anaerobic digestion) and in sewage (largely in the treatment phase for N and in sludge management for P). Nutrient recycling could represent 500 – 900 KtN/y in the Baltic region, potentially replacing 55 – 69% of mineral N fertiliser use, and 31 – 122 KtP/y, replacing 17 – 50% of mineral P fertiliser use. Improving fertiliser use efficiency remains on the largest opportunities for reducing nutrient losses.

Summary presented at the InPhos Prosumer webinar 26th March 2020

References for Nutrient Use Efficiency: Gutser et al., 2005, Short-term and residual availability of nitrogen after long-term application of organic fertilisers on arable land. *J. Plant Nutr. Soil. Sci* 168, 439-446. DOI: 10.1002/jpln.200520510. Hamilton et al., 2017, Recycling potential of secondary phosphorus resources as assessed by integrating substance flow analysis and plant-availability, *Science of the Total Environment* 575, 1546-1555. <http://dx.doi.org/10.1016/j.scitotenv.2016.10.056>. Syers et al., 2010, A new perspective on the efficiency of phosphorus fertiliser use, 19th World Congress of Soil Science, *Soil Solutions for a Changing World*. 01.08.2010 – 06.08.2010, Brisbane, AU. Published on DVD.

Lessons from Asia's nutrient footprints

A study estimates changes in the per capita nitrogen (N) and phosphorus (P) footprints of China, India and Japan from 1961 to 2013, using a comparable framework. Calculations derive nutrient use efficiencies and nutrient recycling ratios, calculated for each nutrient, each country, and each year. The ratios are based on IFA data, FAO data and literatures on inputs in food production, manure use, food losses, etc. The number used for meat vary from, e.g. 28 kgP-released per kgP in food intake for Japan in the 1960's (up to 41 in the 1980's) compared to 7.4 for India in the 1960's (up to 8.4 in the 2010's). For vegetables, the ratios are 6.4 (up to 12) for Japan compared to 0.01 (up to 0.9) for India. China's footprints increased significantly from 1976: from c. 5 to 19 kgN and from 1.2 to 4.8 kgP (per person, per year). There were some cases of near zero new phosphorus use, due to use of P in soil by crops: the accounted P input was either less than or only a little more than the P in the final crop product. India's footprints also increased from 1976, from 8.5 to 11 kgN and from 1 to 1.6 kgP. In Japan, the footprints increased until 1993, from 12 to 28 kgN and from 2.6 to 8 kgP, but then fell to 22 kgN and 6 kgP by 2013. This decrease in Japan, despite increasing meat consumption, is considered to be related to decreasing cereal consumption and improved agricultural nutrient use efficiency. The authors conclude that the N footprint is most sensitive to meat consumption, whereas the phosphorus footprint is most sensitive to consumption of vegetables, whereas improving nutrient use efficiency can significantly reduce the nutrient footprint for all foodstuffs and diets. They note that if footprints of 7.6 billion people in the high and middle income countries in 2030 increase to the 1993 levels of Japan's footprints, even if the footprints of the other 1.0 billion people stay at the 1961 levels of China's footprints, this would result in increases of +20% for the global nitrogen footprint and +90% for the global phosphorus footprint.

"Trends in the food nitrogen and phosphorus footprints for Asia's giants: China, India, and Japan", A. Oita et al., *Resources, Conservation & Recycling* 157 (2020) 104752 [DOI](https://doi.org/10.1016/j.resconrec.2020.104752)

Insect frass showed to be a good fertiliser

13-week pot trials with barley (*Hordeum vulgare*) compared insect frass to mineral NPK fertiliser. Insect frass is the waste generated from insect farming, a mixture of insect faeces and used substrate. In this case, the frass was from a mealworm farm operated by Ynsect, Paris, after hygienisation (60 minutes @ 70°C). At this industrial insect farm, the mealworms are fed with local agriculture by-products (wheat bran). Soil was from a cultivated field, with pH 7.8. Frass or mineral fertiliser was mixed into the soil two weeks before planting the barley seed, at a loading equivalent to 10 tonnes of frass per hectare (dry weight) or equivalent nutrients (as ammonium nitrate, potassium phosphate and potassium chloride) with four treatments: frass, 50% frass / 50% mineral fertiliser, mineral fertiliser, control. Biomass production and plant N, P and K concentrations were not significantly different between the frass and fertiliser treatments, and were significantly higher than the control (one third to one half higher). Soil incubation and Biolog EcoPlate tests showed that the frass has lower water-soluble nutrients than these mineral fertilisers (the authors indicate that this will reduce risk of nutrient leaching) and that the frass stimulates soil microbial activity, especially when combined with mineral fertiliser.

"Potential use of mealworm frass as a fertilizer: Impact on crop growth and soil properties", D. Houben et al., *Nature Research Scientific Reports*, 2020, 10:4659, [DOI](https://doi.org/10.1038/s41598-020-74659-0)

Nitrification inhibitor improves P uptake and yield

30-day pot trials with maize suggest that the nitrification inhibitor DMPP (3,4-Dimethylpyrazolophosphate) improved yield and phosphorus uptake with both soluble phosphorus fertiliser (TSP) and low plant availability P sources (phosphate rock, recovered phosphate: thermochemically magnesium treated sewage sludge ash SS-Mg). The trials used ammonium sulphate nitrate as N fertiliser. Controls showed that differences were not related to the P content of the DMPP. Analysis showed that the DMPP increased ammonium fixation in detectable hot-spots in the soil. The authors suggest that the slow release of plant available ammonium may decrease rhizosphere pH, due to H⁺ release in plant ammonium uptake, so increasing phosphorus availability. An earlier paper by some of the same authors showed that pyrolysis (400-500°C) of biological P-removal sewage sludge resulted in a product with good plant availability (NAC neutral ammonium citrate P solubility, maize pot trials), whereas pyrolysed chemical P-removal sludge had low plant availability. High temperature treatment of the chemical P-removal sludge with sodium additives resulted in high plant P availability (as calcium sodium phosphate).

"Effects of a nitrification inhibitor on nitrogen species in the soil and the yield and phosphorus uptake of maize", C. Vogel et al., Science of the Total Environment 715 (2020) 136895, DOI 10.1016/j.scitotenv.2020.136895

"Effect of various types of thermochemical processing of sewage sludges on phosphorus speciation, solubility, and fertilization performance", D. Steckenmesser et al., Waste Management 62 (2017) 194–203 DOI 10.1016/j.wasman.2017.02.019

UBA report on pharmaceuticals in recycled phosphates

The German Environment Agency (UBA) has published results of analysis of pharmaceuticals in sewage sludge and in struvite, biochar/HTC and thermal process P-recovery products. 11 pharmaceuticals were analysed in sewage and recovered phosphates at 9 sites: four precipitated phosphate salt processes (AirPrex, Stuttgart, MSE, P-RoC), two thermal processes (AshDec, Mephrec), three pyrolysis/hydrothermal carbonisation processes (Pyreg, TCR, AVA Cleanphos). Results conclude, that the pharmaceuticals were no longer detectable after processing at 400 - 500°C whereas the AVA Cleanphos process at 210°C did reduce but not fully eliminate them. Some pharmaceuticals were detectable in the precipitated phosphate salts (highest: 1.1 mg/kg ciprofloxacin in Air-Prex struvite, precipitated upstream of sludge dewatering). The report concludes that further research is needed as to the possible risks of use as fertilisers of the recycled phosphate products containing traces of pharmaceuticals, as well as actions to reduce levels of pharmaceuticals in sewage.

"Arzneimittelrückstände in Rezyklaten der Phosphorrückgewinnung aus Klärschlämmen" (Pharmaceutical residues in recycled phosphates from sewage works), Umwelt Bundesamt 31/2019 ISSN 1862-4804

Erratum

In the article "Effectiveness of fertiliser and manure in long term field trial", summarising Ning et al. 2020, in our last eNews (n°41), the numbers indicated for application, budget, crop uptake of phosphorus should be read as kg/ha total for the 20 years (and not as kg/ha/year as incorrectly indicated).

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