## European Sustainable



Phosphorus **Platform** 

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Please register as soon as possible. To date, we have 250 registrants for the Conference. The European Commission DG Environment and DG Research will hold presentations on Monday and Tuesday. The updated programme, including the list of 50 poster presentations, with conference times, can be found at www.phosphorusplatform.eu/espc3



12th European Waste Water Management (EWWM) Conference 17 - 18 July 2018, Manchester, United Kingdom - <u>Website</u> Including a theme on Phosphorus and Nutrient Removal and Recover, follow up of the Big P Conference 2017





## 3rd European Nutrient Event at ECOMONDO 2018 green technology expo

8 - 9 November 2018, Rimini, Italy - Website

Phosphorus and nutrient recycling and management in Italy, the Mediterranean region and in EU research, development and innovation. More information will follow soon.





E2Metrix



<u>E2Metrix</u> has developed an advanced electro-coagulation process for the reduction and recovery of nutrients in wastewater. The ECOTHORTM process uses a unique, magnesium-alloy, sacrificial electrode and advanced power management to remove phosphorus down to <0.01 mg/l and recover struvite, and to also remove suspended solids, FOG (fats, oil and grease) and other microcontaminants. Full-scale installations are already in operation at food processing facilities, landfill leachate sites, mines (ammonia reduction in contaminated groundwater at a Quebec gold mine) and on sanitary wastewater. The technology

has been developed as a modular, Plug 'n Play tertiary filtration solution that may be incorporated easily into any green field or retrofit application, from <20 to >4,000 m3/d. In joining ESPP, which provides a forum for sustainable phosphorus information transfer, E2Metrix is eager to share its experience in the use of electro-coagulation as a mechanism for effective phosphorus removal and recovery, particularly for smaller municipal and industrial applications where alternative processes may not be practically or economically feasible.

More information www.e2metrix.com

#### Yara International



Yara International ASA, a Norwegian company established in 1905, is a globally leading mineral fertiliser manufacturer and provider of environmental solutions. <u>Yara</u> is the only EU-based fertiliser manufacturer owning phosphate mines, in Finland and Brazil. Yara's mining operations and manufacturing processes maximize production efficiency and minimize losses to the environment. Internal recycling of energy, water and raw materials, as well as symbiosis with other industries and sectors, are an integral part of Yara's industrial DNA. Yara's product and nutrient stewardship efforts extend beyond their factory gates. World-wide Yara helps farmers to use theirproducts safely, profitably and sustainably, through on-site training and by developing and promoting precision fertilisation tools and solutions. Yara recognizes that recycled nutrients are an integral and growing

component of future nutrient solutions, and that major fertiliser companies such as Yara can play a meaningful role in better closing nutrient loops. Yara welcomes the concept of circular economy and explores opportunities to advance safe and commercially viable circular nutrient solutions. They actively engage with nutrient platforms such as ESPP to exchange knowledge and develop novel partnerships. Yara foresees that nutrient streams will need to become aggregated and recovered by waste management companies and other intermediaries. Under such conditions, Yara can leverage its production and crop nutrition knowledge, to help build business cases based on transforming recycled nutrients into efficient and marketable fertiliser products.

More information <u>www.yara.com</u> and position on Circular Economy <u>www.yara.com/this-is-yara/sustainability/commitments-and-policies/our-opinions</u>

## Secanim



Secanim Ltd is part of the Saria Group, and specialises in the safe treatment and disposal of Category 1 Animal By-Products. The company was established in 1948, as Granox, and today has four operational sites in the UK and provides a full service to farmers and businesses across the country, as well as similar operations in Europe. Secanim uses an innovative incineration process to produce a sustainable, recycled phosphate fertiliser with proven agronomic performance. Category 1 Animal By-Products must be treated to strict standards

laid down by European legislation, and the derived material, Meat and Bone Meal (MBM), produced by this treatment must then be disposed of via incineration. Secanim's plant at Widnes Cheshire, features two incinerators which safely incinerate the Category 1-derived material, producing a waste ash. Since 2014, this ash has benefitted from an End of Waste Position granted by the Environment Agency, and is now marketed as <u>KalFos</u>, a slow release, low cadmium, calcium phosphate and trace element fertiliser. This provides a sustainable alternative to landfilling, and replaces the use of phosphate rock-derived fertilisers. KalFos is sold across the UK and Europe either as a standalone fertiliser, or as a material for blending with other fertilising products to produce multi-nutrient blends. The incineration process also produces renewable electricity (sold to the National Grid) and heat (steam used on site in the rendering process). As part of the incineration process, waste liquids are used to control the calorific value of the MBM and provide a safe recycling route for traditionally "hard to handle" wastes that cannot go to anaerobic digestion or water treatment works.

More information www.kalfos.co.uk





N°22 May 2018

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## EU finds nitrogen pollution only slightly improved since 2008



A European Commission <u>report</u> on agricultural nitrates pollution concludes that nitrate levels in groundwater and surface freshwaters have "slightly improved" since 2008. Nitrates were still above 50 mg/l (drinking water standard) at over 13% of monitoring stations across Europe 2012-2015, compared to 14% during the four preceding years. In coastal waters on the other hand, the number of stations showing >25 mg/l nitrates halved to 0.7%. About 19% of reported river monitoring stations were eutrophic or hypertrophic. The report notes that total EU manure nitrogen use dropped by 2.6% between the two periods, whereas nitrogen fertiliser use increased by +4% (and phosphate by +6%). Perspectives identified by the

Commission to more effectively reduce nitrate pollution include: wider designation of NVZs (Nitrate Vulnerable Zones) in some member states, adapting NVZ Action Plans to better address local and regional nitrate pollution hotspots, better inclusion of sources of nitrogen other than fertilisers and manure (digestate, reclaimed water for irrigation, soil improvers) and nitrogen already present in the soil, innovative manure processing technologies to enable nutrient recycling.

"Implementation of Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources based on Member State reports for the period 2012–2015", European Commission report 4th May 2018, COM(2018)257 <a href="http://ec.europa.eu/environment/water/water-nitrates/pdf/nitrates\_directive\_implementation\_report.pdf">http://ec.europa.eu/environment/water/water-nitrates/pdf/nitrates\_directive\_implementation\_report.pdf</a>

### European Nitrogen Assessment - where next?

Six years after publication of the first European Nitrogen Assessment (ENA), Mark Sutton and other authors, including the European Commission JRC, assess the outcomes and future research challenges. The ENA increased attention to the nitrogen cycle, as a whole, and pioneered similar assessments at the global level and on other continents. Other outcomes include developing a compendium of practical measures to mitigate farm ammonia emissions, endorsed by European farmers organisations and UNECE. Key research challenges identified are the need to emphasise more on reducing agricultural nitrogen losses, as significant progress has been now achieved in reducing nitrogen emissions from electricity production and road vehicles. Europe loses some 22 million tonnes of nitrogen per year, that is around €18 billion value as fertiliser – equivalent to around a quarter of the EU's Common Agricultural Policy budget. The authors note that this shows the need to strongly develop nitrogen recovery and recycling, in particular from organic wastes. Food choice is also an important area for action, because food choices dominate personal nitrogen footprints.

"The European Nitrogen Assessment 6 years after: What was the outcome and what are the future research challenges?", M. Sutton et al., Published in: Innovative Solutions for Sustainable Management of Nitrogen. Proceedings of the International Conference, Aarhus, Denmark (25-28 June 2017) www.sustainablesoils.org/s/The-European-Nitrogen-Assessment-Prof-Mark-Sutton-003.pdf

## **Meetings**

#### **Belgian circular chemistry**

The Belgian Federation for Chemistry and Life Sciences industries (Essenscia) held its <u>annual event</u> on 16<sup>th</sup> April 2018, with the theme Circular Economy. Circular chemistry is considered a key pillar of the Belgian economy, and 2017 was a record year in terms of revenues and job creation. Industry success stories were presented, and opportunities and challenges of an accelerated transition towards a circular economy were discussed. Drivers identified include regulatory, environmental and societal pressures. Challenges identified include the lack of EU regulatory uniformity (in particular on End-of-Waste Criteria), contaminant limits, the rapidly-evolving economic, energy and competitive landscape, the need for a "circular mind shift", and the need for a multi-stakeholder, cross-sectorial and value chain approach to make things happen on the ground.

Essencia: "Circular Economy: a 360° view" www.essenscia.be/fr/calendrier/evenement/478 Text thanks to Koen van Keer, Yara.

#### North America: SPA Forum 2018



Sustainable Phosphorus Alliance Speakers at the <u>Sustainable Phosphorus Alliance</u> (SPA) 2018 Forum presented innovative ideas and business success cases in phosphorus management. McGill Compost (Noel Lyons) produces around 140 000 t/y of compost from food waste, plant materials and sewage biosolids. Green Technology (Amir Vashovi) is a Small Business of the Year Award winner start-up, producing fertiliser from sewage biosolids. The Northeast Biosolids and Residuals Association (Ned Beecher) explained how tightening

regulations on phosphorus use has increased reuse of sewage biosolids on land to around 60% nationally in the USA. Mexico National Laboratory of Genomics, Cinvestav (Luis Herrera) proposed to use phosphites as fertilisers with genetically modified crops (GMO) claiming a halving of fertiliser use whilst at the same time the phosphite inhibits weed growth. The Sustainability Consortium (Kevin Dooley) showed the need for better phosphorus use and flow data to enable market incentives to improving





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phosphorus management in agriculture and the food supply chain. Presentations also included: Allison Thomson of Field to Market, Sally Rockey of Foundation for Food and Agriculture Research, Paul Fixen (retired) of IPNI. All presentations are available on SPA's YouTube channel. For information, a new EPA (US Environmental Protection Agency) online tool provides information about the phosphorus and nitrogen balance, nutrient loss mitigation and relevant regulations for each US State.

Summary of SPA Forum, 27 February 2018, Arizona "Sustainable Phosphorus Forum tackles how to feed a future world of 10 billion while protecting water resources" https://asunow.asu.edu/20180328-global-engagement-sustainable-phosphorus-alliance-forumand YouTube (presentations) https://www.youtube.com/channel/UCNFDQTfeT7mGsMY\_YOgMonA

US EPA tool "Working in Partnership with States to Address Phosphorus and Nitrogen Pollution through Use of a Framework for State Nutrient Reductions" www.epa.gov/nutrient-policy-data/nitrogen-and-phosphorus-pollution-data-access-too

Next SPA event: webinar on "Phosphorus Recovery from Water Resource Recovery Facilities", 24th May 2018 11h-12h30 CDT time www.eventbrite.com/e/phosphorus-recovery-from-water-resource-recovery-facilities-registration-

44890164691?mc\_eid=f3b1b65a28&mc\_cid=c1695a96c0

## International Fertiliser Society (IFS) Technical Conference



This conference included a range of presentations on processing nitrogen and phosphate fertilisers by: Elio Strepparola (Casale), Paz Munoz (Stamicarbon), Michal Baji (Lovochemie), Thomas Henry (Prayon Technologies), Branislav Brezny (VUCHT), Jan-Petter Fossum (Yara International), Christian Renk (Thyssenkrupp). The Casale revamping of a methanol plant is a good example of Circular Economy within a processing plant by integrating so-far wasted byproducts into the manufacturing of new products. Also, the Thyssenkrupp presentation showed how granulation of ammonium sulphate by-product from dilute solutions from caprolactam production (about 1.5 million tons in Germany only) can enable a price premium of around 100 €/ton by supplying hard,

durable granules suitable for blending and spreading by conventional disc fertiliser spreaders. This is a fluidized bed granulation process for which a 500 kg/h pilot plant has been tested and which will now be installed at the industrial scale. As well as improving recycling of caprolactam ammonium sulphate byproduct, this process may offer an opportunity for processing recovered ammonium sulphate from other sources.

Peter Scott, Origin Fertilisers, a blender selling multiple, custom made blends in many European and overseas countries with a total turnover of GBP 1.5 billion, emphasized that granule guality is paramount for blenders that guarantee the same nutrient concentration in every batch and on every plot of fertilised cropland. It is too often neglected that the physical granule quality (diameter, hardness, shape) is one of the main control parameters of blenders due to different granules separating during transportation, handling, storage and use and thus not providing the required nutrient distribution to every corner of the plot. Aida Idrissi Kaitouni, ARGUS Media, presented a reassessment of reserves of phosphate rock, outlining the differences between resources and reserves, the current rock production (about 261,000 tP2O5/y estimation for 2016 by USGS) and industry developments. Most mining projects are on hold because phosphate rock prices are currently low (USD 100/t or below) and because of major capacity expansion projects coming on stream in Morocco and Saudi Arabia. Egypt has become a relevant player in phosphate rock supply, whereas Syria is currently no longer significant. The decreasing quality of traded phosphate rock is confirmed by long-term surveys of phosphorus concentrations in rock processed to fertilisers. Mike McLaughlin, University of Adelaide, presented a screening study on run-off and leaching of different phosphate fertilisers with slow or controlled release properties, including struvite from Ostara (Crystal Green®), reactive phosphate rock and partially acidulated phosphate rock. His conclusion is that "too slow release" can limit plant nutrition performance, without and measurable reductions in phosphorus leaching (except in some sandy). Better phosphorus fixation could not be confirmed by test results.

Antoine Hoxha, Fertilisers Europe, outlined current status and issues regarding the new European Fertiliser Regulation, including guestions around contaminant limits and uncertainties related to the schedule of the new regulation coming into effect. He underlined the need to reach political agreement (Parliament, Council) and finalise the regulation.

IFS Technical Conference, 8-9 May 2018, Prague, hosted by the Crop Research Institute www.fertiliser-society.org

## Struvite

## Plant availability tests of recovered phosphorus materials

Two different fertiliser tests of several recovered phosphorus materials (sewage sludges, sludge ashes, chemically treated ashes ASHDEC, struvite, compost, Mephrec, pyrolysis coal), compared to phosphate rock and to triple super phosphate (TSP), have been carried out within the Denmark IRMAR and the EU IMPROVE-P projects. The Denmark study included short (6 week growth) pot trials with spring barley (Hordeum vulgare) at soil pH 6.9 and soil incubation studies, giving results in which sewage sludge solids showed better phosphorus availability than TSP whereas the other products including struvite (Ostara Crystal Green grain size SGN150) showed lower availability. These results, which differ from many other studies of struvite fertiliser value (including those cited in this paper), may be due to the short experiment duration (12 weeks in Ahmed 2016 and Talboys





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2016 cited), uneven distribution of the fertilisers in the pots (only 6-7 granules) and a lack of nitrogen which impacted some of the test pots. The IMPROVE-P study used 18 month pot trials, with a rotation of red clover (*Trifolium pratense*), maize and ryegrass, at soil pH 7.2. This showed better phosphorus availability for all of the recovered phosphorus materials than for phosphate rock, concluding that the recovered products would be suitable fertilisers for use in organic farming, but that phosphorus availability varies for different recovery technologies.

"Plant availability of phosphorus from dewatered sewage sludge, untreated incineration ashes, and other products recovered from a wastewater treatment system", C. Lemming et al., J. Plant Nutr. Soil Sci. vol. 180, issue 6, Dec. 2017, pages 779-787 http://dx.doi.org/10.1002/ipln.201700206

"Phosphorus bioavailability of sewage sludge-based recycled fertilizers", I. Wollmann et al., J. Plant Nutr. Soil Sci. vol. 181, issue 2, April 2018, pages 158-166 <a href="http://dx.doi.org/10.1002/ipln.201700111">http://dx.doi.org/10.1002/ipln.201700111</a>

#### Study suggests recovered struvite may increase antibiotic resistance



A 6-week pot trial study of cabbage (Brassica) in China shows that the use of recovered struvite (from piggery wastewater) dosed at 0.2% w/w to soil showed significant increases in levels of antibiotic resistant genes (ARGs) and mobile genetic elements (MGEs) in both the fertilised soil and in the harvested cabbage (leaf tissue). The numbers of ARGs and MGEs detected were 2-3x higher after struvite fertilisation, compared to lower numbers in control (soil from a vegetable field which had received no fertiliser or soil amendment for three years). Abundance of ARGs was much higher in this struvite than in soil, and was significantly higher in the struvite-fertilised soil (compared to control) and higher (but not statistically significant) in the struvite-fertilised cabbage (compared to control). The authors also suggest that comparison of ARG types detected suggests a link between those found in the recovered struvite and those in the fertilised cabbage. It should be noted that the recovered struvite was only air dried, and not washed, whereas tests in the Netherlands

(see below) have shown that washing considerably reduces impurities (as can be expected). This study shows an increase in levels of ARGs - which are in any case present in soils - without any indication as to possible risks for human health. Also, the struvite was recovered from piggery wastewater (not sewage) and no indications are given concerning levels of antibiotic use in the concerned pig farm. However, it does confirm the need for further monitoring of contaminants in recovered fertiliser products, research into how to avoid and reduce contamination, and analysis of possible risks related to their use.

European Commission "Science for Environment Policy" coverage, 19th April 2018, issue 506 "Antibiotic resistance in struvite fertiliser from waste water could enter the food chain" <u>download link</u>

"Application of Struvite Alters the Antibiotic Resistome in Soil, Rhizosphere, and Phyllosphere", Q-L. Chen et al., Environmental Science & Technology 51(14): 8149-8157 <u>http://dx.doi.org/10.1021/acs.est.7b01420</u>

#### Organic matter impurities impact pharmaceutical contamination in struvites

A <u>study</u> from China assesses tetracyclines (veterinary antibiotics) in struvite precipitated from pig manure anaerobic digestate. Tetracycline levels in the digestate were 668  $\mu$ g/l (mean, total of TC, OTC and CTC). Organic carbon content of the recovered struvite was 15-22%. Total tetracycline content of the recovered struvite was around 500 – 2 100  $\mu$ g/g. Tetracycline transfer to the struvite was significantly higher in the digestate than in synthetic wastewater spiked with similar levels of tetracyclines (no organic carbon). Impacts of different organic carbon compounds in the digestate were assessed by filtering out molecules of different sizes and by destabilisation and aggregation. The authors note that humic and fulvic acid type organic carbon compounds in the digestate, with higher molecular weight, tended to co-precipitate with struvite, but also complex with tetracyclines, so bringing these into the struvite. Overall this study suggests that levels of certain pharmaceuticals in struvite are likely to be related to organic carbon levels. The level of organic carbon in the struvite in this study was much higher than the maximum proposed for EU fertilisers in the draft STRUBIAS report (3% dry matter).

"Influences of dissolved organic matters on tetracyclines transport in the process of struvite recovery from swine wastewater", Y. Lou et al., Water Research 134 (2018) 311e326 <u>https://doi.org/10.1016/j.watres.2018.02.010</u>

## Impurities in struvite influence pathogen contamination



A <u>study</u> by the Foundation for Applied Water Research <u>STOWA</u>, Netherlands, analysed a total of 7 samples (3 unwashed, then 4 washed) of struvite recovered from four different municipal sewage works, using Airprex and NuReSys struvite technologies. This study detected pathogens in all unwashed struvite samples tested, with SSRC (spores of sulphite-reducing Clostridia, an indicator for pathogens) at levels comparable to levels found in manures as spread on farmland (but quantities of struvite applied would be orders of

magnitude lower than for manure). However, levels of SSRC were much lower after struvite was washed, mostly < 1 mg/kgDM.





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This level is such that direct ingestion of the struvite could possibly cause infection. Eight heavy metals and 32 organic contaminants were also analysed. The organic contaminants were often below detection levels. The report concludes that pathogen and other organic contaminant levels are related to impurity levels in the recovered struvite. Furthermore, 21 pharmaceuticals were analysed, and only one (Metropolol, a beta-blocker) was found in one sample. The report also concludes that pathogens, even in the unwashed samples, were at levels at which normal use as a fertiliser would not pose unacceptable risks, on condition that normal operating hygiene was respected to avoid ingestion by users. This first study on a small number of samples was a screening study and further tests are now underway. In a different, recent study in China, struvite from anaerobic digestate of chicken slurry. Coliforms were present in the digestate at  $2.7 \times 10^4$  CFU/ml bur were not detectable in the precipitated struvite. Heavy metals, copper and zinc levels in the struvite were also below US-EPA permissible levels for fertilisers. A third study by De Boer et al. (summary of results in SCOPE Newsletter <u>n°126</u>, and in eNews <u>n°19</u>) shows that very low levels of pharmaceuticals are taken up by struvite and that pharmaceuticals are not found in tomatoes fertilised with recovered struvite.

"Erkenning van de kwaliteit van struviet uit de communale afalwaterketen", STOWA report 2015-34 Onderzoek Waterbeheer ISBN 978-90-5773-711-4, 2015 download link

"Nutrient recovery from anaerobically digested chicken slurry via struvite: Performance optimization and interactions with heavy metals and pathogens", A. Muhmood et al., Science of the Total Environment 635 (2018) 1–9 <u>https://doi.org/10.1016/j.scitotenv.2018.04.129</u>

## Research

### Updated ESPP catalogue nutrients recycling & management research

ESPP is maintaining a list of nutrient related R&D projects focussed on nutrient recycling and management (not only phosphorus), available on the ESPP website (<u>www.phosphorusplatform.eu/R&D</u>). The objective is to facilitate information transfer between projects, and in our network of companies, public bodies and other stakeholders. The R&D project list includes company, national and EU funded research projects, including EU H2020 (FP), LIFE and INTERREG funding. The list has been updated. Please let us know of missing nutrient R&D projects and/or send corrections to Kimo van Dijk (kimovandijk@phosphorusplatform.eu).

ESPP catalogue of nutrient R&D projects www.phosphorusplatform.eu/R&D

## 30% increase proposed for EU R&D "Horizon Europe"



The European Commission's <u>initial proposal</u> for the next budget period 2021-2027 include a 30% increase for research and innovation, despite budgetary challenges posed by Brexit. This will fund the new "Horizon Europe" R&D funding programme, which will follow on from the current "Horizon 2020". The Commission also proposes new revenue sources for the EU, proposing "own resource" taxes including a percentage of the EU Emissions Trading System revenues, a contribution from consolidated corporation taxes and a levy on non-recycled plastic waste. The EU budget now enters political discussion between Member States and the European Parliament. ESPP has proposed to include in HorizonEurope a "mission" on nutrients, and discussion is engaged with DG Research & Innovation, including through their participation at the 3<sup>rd</sup> European Sustainable Phosphorus Conference, Helsinki 11-13 June (<u>ESPC3</u>).

European Commission press release 2 May 2018 <u>https://ec.europa.eu/programmes/horizon2020/en/news/commission-proposes-biggest-ever-investment-ri-programme-europe</u>

#### Québec decision support tool for organic waste valorization

Quebec policy on organic waste management implies a ban on the incineration and disposal of organic waste from 2022 onwards, so promoting biomethanisation and composting. However, such projects present difficulties in decision making due to environmental, economic, technical and social aspects which vary with location. Université Laval, with industry and local authority partners, is developing user-friendly decision-support software for the province of Quebec that can accompany municipalities and industries in determining the optimal path to valorize waste. The project includes requirement analysis and data collection, database, decision-support method and interface and validation of the tool with a case study for the municipality of Québec City.

Contact: Céline Vaneeckhaute, Université Laval, celine.vaneeckhaute@gch.ulaval.ca

## **Phosphorus runoff research**

The American Societies of Agrology, Soil and Crop Science have published a <u>special issue of papers on phosphorus</u> site assessment, that is phosphorus losses and runoff from fields and catchments. Twenty papers look at theory and practice of tools to model and assess phosphorus loss vulnerability and to forecast phosphorus losses, in particular looking at phosphorus soil indices (e.g. APEX, APLE, TBET). Conclusions are that concerns remain about accuracy of phosphorus indices (which





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need to be locally adapted) and about reliability of loss assessment tools, showing a need for more data and work to improve accuracy of models. Overall, phosphorus indices and phosphorus loads (inputs to fields) provide good indicators of risk of phosphorus losses. Two of the papers concerned manure application, concluding that phosphorus losses are dependent on specific field characteristics and on precipitation, but that losses are generally lower for spring application compared to autumn or winter application.

Journal of Environmental Quality, vol. 46, issue 6, Nov.-Dec. 2017, Special Section: the evolving science of phosphorus site assessment download link

## Is the universe lacking phosphorus?



Scientists <u>suggest</u> that the universe may be lacking in phosphorus. Earth only received significant supplies of phosphorus because our planet was created near a supernovae which created phosphorus as it exploded at the end of its life, whereas many supernova may not do so. Phosphorus may have arrived on Earth in meteorites from the exploding supernovae, containing phosphorus in a form sufficiently reactive to generate proto-molecules, precursors of life. Planets not situated near a phosphorus-generating supernovae would be phosphorus deprived, and much less likely to develop life. In a different study, scientists estimate that phosphorus cycling was much lower in Earth's early oceans than it

is today, because low oxygen levels prevented decomposition of organic matter, resulting in depositing of phosphorus on the sea bed. They suggest that this limited the development of life. Life may have been able to develop only because volcanic emissions of sulphur enabled the development of sulphate-metabolising bacteria (rather than oxygen metabolising) which ensured phosphorus cycling in the oceans.

"Scientists discover the universe has much less phosphorus than we thought, potentially meaning there are fewer aliens", A. Griffin, The Independent, 5 April 2018 <u>www.independent.co.uk/news/science/alien-life-proof-phosphorus-discovery-planets-worlds-other-discovery-latest-a8288956.html</u>

<sup>#</sup>Biomass recycling and Earth's early phosphorus cycle", M. Kipp, Sci. Adv. 2017; 3(11), eaao4795, November 2017 <u>http://dx.doi.org/10.1126/sciadv.aao4795</u>

## Paris region: nutrient flows and recycling



The <u>OCAPI</u> project, with Paris region local authorities and French government funding, has published an analysis of the megacity's nitrogen and phosphorus flows and policy challenges. Phosphorus and nitrogen inflows in the food supply are estimated at 1.7 gP and 17.8 gN /day/person, of which 1.2 gP/day and 13.4 gN/day are consumed in food. This is around 50% more nitrogen than dietary requirements (WHO 2007). Nearly 60% of phosphorus in food consumed is currently recycled in sewage biosolids back to agriculture, a much lower rate than in the late nineteenth century, but only around 3% of nitrogen is recycled, due to considerable environmental losses. Around 77% of vegetal protein inflow comes from Northern France and around 32% of animal protein inflow from Brittany and North West France. The latter regions depend significantly on imported animal feed from South America, so that Paris's nutrient footprint is in fact significantly externalised. Two thirds of consumed food phosphorus and

nitrogen come from animal products, but these account for >90% of required agricultural inputs of these elements and more than 95% of required land surface for producing the food consumed. Key policy recommendations are to optimise agricultural phosphorus use efficiency and minimise soil accumulation and soil erosion, and to avoid losses to landfilled sewage sludge incineration ash. Nitrogen shows a much higher potential for improving recycling and reducing losses to surface water and to the atmosphere, particularly because the overall nitrogen imprint is nearly 4x higher than the amount of nitrogen actually consumed in food.

OCAPI (Optimisation of Carbon, nitrogen and Phosphorus cycles In the city), funded by the Paris region sewage treatment syndicate, the Seine – Normandy Water Agency, Ecole des Ponts ParisTech and the French environment ministry. Website <u>www.leesu.fr/OCAPI-presentation</u> and "The biogeochemical imprint of human metabolism in Paris Megacity: A regionalized analysis of a water-agro-food system", F. Escullier et al., J Hydrology in press <u>https://doi.org/10.1016/j.jhydrol.2018.02.043</u>

## AMBIO phosphorus special issue

A 160-page <u>special issue</u> of AMBIO Journal presents 14 papers, based on presentations from the 8<sup>th</sup> International Phosphorus Workshop (IPW8), Rostock, September 2016 (see SCOPE Newsletter n°122). This initiative is <u>led by</u> the Leibniz ScienceCampus Phosphorus Research, Rostock (LWC Rostock), President Mathias Kleiner. A <u>forward</u> by Susanna Kaasinen of HELCOM (Baltic Marine Environment Protection Commission) notes that HELCOM is starting work on a "regional nutrient recycling strategy". The papers cover a wide range of themes including phosphorus (P) in pig diets, fertiliser yield response and interactions with soil organisms, biochar P plant availability (see article summarised in ESPP eNews <u>n°19</u>), use of calcium silicate by-products for phosphorusrecovery, phosphorus loss mitigation, phosphorus removal from wastewaters and eutrophication restoration. A 12-page keynote article by Peter Leinweber (Leibniz ScienceCampus Phosphorus Research



Rostock) et al. summarises the "paradox of phosphorus ... scarcity, necessity and burden", looking at phosphorus flows, recycling routes and governance.

AMBIO Journal, Volume 47, Issue 1 Supplement, January 2018, Special Issue: "Handling the phosphorus paradox in agriculture and natural ecosystems: Scarcity, necessity, and burden of P", I. Krämer et al., open access <a href="https://ink.springer.com/journal/13280/47/1/suppl/page/1">https://ink.springer.com/journal/13280/47/1/suppl/page/1</a>

## Agenda

CEN stakeholders workshop on standards needs for sustainable chemicals in the circular economy (Invitation only) 24 May 2018, Brussels, Belgium - Email

Organized by the European Committee for Standardization



## CENELEC

3rd European Sustainable Phosphorus Conference (ESPC3) 11 - 13 June 2018, Helsinki, Finland - Website - Email



12th European Waste Water Management (EWWM) Conference 17 - 18 July 2018, Manchester, United Kingdom - <u>Website</u> Including a theme on Phosphorus and Nutrient Removal and Recover, follow up of the Big P Conference 2017



6th Sustainable Phosphorus Summit (SPS2018)
20 - 22 August 2018, Brasilia, Brazil - Website
For the first time, the Summit will be held in Latin America, enabling a spotlight on the Tropics, where phosphorus sustainability is a big concern



3rd European Nutrient Event at ECOMONDO 2018 green technology expo 8 - 9 November 2018, Rimini, Italy - <u>Website</u> Phosphorus and nutrient recycling and management in Italy, the Mediterranean region and in EU research, development



See more events at www.phosphorusplatform.eu/upcoming-events



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