Events

European Sustainable Phosphorus Conference (ESPC4)

Registration is now open (on Eventbrite) for the 4th European Sustainable Phosphorus Conference, Vienna, 15-17 June 2020. This 4th ESPC will centre in plenary on business models, company success stories and city and regional actions towards nutrient circularity. Parallel sessions will mix research with application (see below, call for papers). The third day (17th June) will be the 4th European phosphorus R&D day, showcasing R&D into phosphorus recycling and recycled products and new approaches.

Deadline for submission of presentations, success stories, posters is extended to 31st January 2020 (as several authors requested more time). Fifty presentations are already registered, but some opportunities remain.

Hotels are beginning to fill up in Vienna. Register and book now to get better prices!

Registration: Eventbrite
Full details www.phosphorusplatform.eu/espc4

CRU Phosphates 2020

Registration is now open for the 13th CRU Phosphates Conference, 8-10 March 2020 Paris. This is the world's leading phosphate industry meeting, with over 400 industry participants from 40 countries expected, covering supply, market trends and industry processes and technologies for phosphate rock, fertilisers, animal feed and industrial phosphorus applications. The conference includes outlook presentations by executives of the world's leading phosphates companies; supply, demand and market trends; new phosphate processing technologies and operating experience. See summary of the 12th CRU Phosphates Conference (Florida, 2019) in ESPP eNews n°33. 10% registration fee discount for ESPP members.

CRU Phosphates 2020, 8-10 March Paris - https://events.crugroup.com/phosphates

RAMIRAN 2020

Europe's leading manure and organic resources recycling conference, RAMIRAN, will take place in Cambridge, UK, 14-17 September 2020. The RAMIRAN network was established 25 years ago and the biennial conference attracts some 250 participants. This year's RAMIRAN will look at "Managing Organic Resources in a Changing Environment", including nutrient utilisation, soil quality, air and water, best practices, treatment technologies and policy. Abstract submission until 1st March 2019.

www.ramiran2020.org

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

Calls for papers

Call for texts: phosphorus stewardship and climate change

SCOPE NEWSLETTER

ESPP (European Sustainable Phosphorus Platform) and the Sustainable Phosphorus Alliance (North America) are preparing a special SCOPE Newsletter edition on "Nutrients and Climate Change". This will consist of selected short texts presenting expert perspectives on how climate change will impact nutrient emissions and eutrophication as well as actions to mitigate this. Proposed texts are invited from researchers, companies, stakeholders and any interested party. Around twenty texts will be selected for publication by an editorial committee chaired by Jessica Stubenrauch, Beatrice Garske (FNK Leipzig & University of Rostock), Anders Nättorp (FHNW Switzerland) and Jim Elser (University of Montana). The SCOPE Newsletter is circulated worldwide to 41 000 companies, stakeholders, regulators and media interested in nutrient management, with a detected opening rate of 12-14%, and is published on the ESPP website www.phosphorusplatform.eu **Submit your text to be included!**

Send us your ideas for action for on nutrients and climate change to appear with the world's leading experts.
Maximum 600 words. Deadline 31.01.2020 latest.
Call details and instructions here: https://phosphorusplatform.eu/callfortexts

Public consultations

EU consultation on new Circular Economy policy

The European Commission has opened a public consultation, **to 20th January 2020**, on the Roadmap for a New Circular Economy Action Plan. The proposed Roadmap underlines the economic potential of the Circular Economy, which employs 4 million people with a 6% increase since 2012. Reducing dependency on raw materials, and reducing waste are cited as key objectives, in particular reducing landfill and incineration of municipal waste. Objectives indicated include developing the market for recycled materials, developing skills and investments, improving legal certainty. Actions to be considered include supporting design for recycling and preventing environmentally harmful products, regulating green claims and information on sustainability. The Roadmap cites as priority sectors "opportunities for closing loops for biological materials", textiles, construction, electronics, plastics and packaging.

EU public consultation on the Roadmap for a New Circular Economy Action Plant, open to 20th January 2020
https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2019-7907872

EU consultation on new "Soil Health & Food"

The EU has opened a public survey, **to 19th January 2020**, on the Horizon Europe 'Mission' on "Soil Health and Food". This consultation targets mainly individuals or organisations for a simple opinion (around 15 rapid-to-answer questions) on what are key issues around soil health. ESPP will submit input underlining the importance of nutrients and of soil carbon, and the links between soil quality and nutritional value and safety of food.

EU survey on "Soil Health and Food" Horizon Europe Mission, open to 19th January 2020
https://ec.europa.eu/eusurvey/runner/mission-soil-health-and-food

Regulatory

EU Green Deal

The new European Commission published its "Green Deal" on 11th December 2019, a 24-page outline of political objectives plus a 4-page "Roadmap" (list of policy actions with dates). The Green Deal is now submitted to the European Parliament and Council (Member States). Key elements are an objective of zero net greenhouse emissions by 2050, implemented by a European Climate Law, a resource-efficient economy and a Sustainable Europe Investment Plan. The Green Deal also aims for "zero pollution", restoring biodiversity, sustainable mobility and "farm to fork: fair, healthy and environmentally friendly food system". A Climate Pact will be launched in March 2020 to engage citizens and give them a voice. A "clean circular economy" is one of the seven themes of the Green Deal, with a new EU "circular economy action plan" for March 2020. This may include "legal requirements to boost the market for secondary raw materials, with mandatory recycled content" and an "EU model for separate waste collection". Nutrients are not, however, in the priority sectors listed (packaging, plastics, batteries, vehicles, construction materials, electronics, textiles). Nutrient management and the circular economy are however cited as an objective of the "farm to fork" objectives, where the roadmap includes "Measures, including legislative, to significantly reduce the use and risk of … fertilisers" (2020-2021). The objective to "reduce pollution from excess nutrients" is also cited under the zero pollution objective (action: zero pollution for water, air and soil: 2021).

European Commission press release, IP/19/6691, 11th December 2019 "The European Green Deal sets out how to make Europe the first climate neutral continent by 2050, boosting the economy, improving people's health and quality of life, caring for nature, and leaving no one behind". European Commission Communication Brussels, COM(2019) 640 final, 11th December 2019 "The European Green Deal" (28 pages)

EU Water Framework Directive objectives confirmed

The European Commission has published (10th December 2019) the "Fitness Check" of the EU Water Framework Directive (with the Environmental Quality Standards, Groundwater and Floods Directives). The Commission's conclusions maintain and confirm the Water Framework Directive's objectives, in particular the 2027 deadline, by when Member States must ensure that all water bodies (lakes, rivers and groundwater) achieve ecological quality standards ("good" status). These conclusions have been welcomed with relief by NGOs and scientists, who had feared that the WFD deadlines might be delayed, and are coherent with the ambitious objectives of the new European Commission's "Green Deal". The public enquiry for this Fitness Check received an exceptionally high 370 000 responses. The Commission underlines that no substantial progress has been made over recent years in water bodies' overall quality status, and that only half of water bodies had achieved good quality by 2015. The Commission notes that achieving quality objectives will requires reducing pressures, restoration (e.g. morphological), full implementation of the Nitrates Directive and of the Urban Waste Water Treatment Directive and better integration of action in agriculture and transport. Diffuse pollution of nutrients (phosphorus, nitrogen) from agriculture are identified as a major challenge: "Around 38% of the EU's surface water bodies are under pressure from diffuse pollution (of which agricultural production is a major source (25%))". Failure to achieve the WFD's objectives is considered to be due to insufficient funding, slow Member State implementation and insufficient integration of environment into other sectoral policies. Actions to address these should include working on best practices for cost-recovery, reduction of pollutants at source and green infrastructure.

SWD(2019) 440 European Commission summary of the Fitness Check of the Water Framework Directive (and other Directives) 10th December 2019 (4 pages). SWD(2019)439 Water Fitness Check, full 10th December 2019 (184 pages)

EU Urban Waste Water Treatment Directive assessment conclusions

The European Commission has published conclusions of the "Assessment" of the Urban Waste Water Treatment Directive (UWWTD 1991/271), an assessment carried out independently from the water policy REFIT (see above) and based on an in-depth JRC and OECD study and specific public consultations. The UWWTD assessment concludes that the Directive has been effective, largely because of the "clarity and simplicity of its requirements", that benefits outweigh costs, that administrative costs are negligible compared to costs and benefits, that it is coherent with other water policy and that there is widespread recognition that the Directive is still needed and that withdrawing it would have negative impacts. The Directive is estimated to have been successful in reducing pollution, with wastewater BOD (biochemical oxygen demand), nitrogen and phosphorus reduced by 61%, 32% and 44% from 1990 to 2014. However, full compliance is still not achieved in a number of Member States: full compliance for phosphorus would reduce current total emissions to surface waters by over 13.5%. A further 250 billion € needs to spent in the EU to 2030 to maintain and achieve full UWWTD compliance. Nonetheless, the Directive is assessed to be cost effective, with total EU annual capital and operating costs at 18 bn€/y compared to benefits or nearly 30 bn€/y. Challenges which should be assessed are identified as: improving cost-recovery (water tariffs), better collection and treatment of stormwater overflows and urban runoff, emerging contaminants (pharmaceuticals, microplastics), more coherent definition of eutrophication 'Sensitive Areas' by Member States, Circular Economy potentials (control at source of pollutants to facilitate agricultural use of sludge and water reuse) and improving treatment wastewater from smaller agglomerations and non-connected households (these place significant pressure on over 10% of Europe's water bodies). The assessment concludes that the Directive has led to innovation so that today eight of the world's top fifteen water businesses are EU-based.

"Evaluation of the Council Directive 91/271/EEC of 21 May 1991, concerning urban waste-water Treatment", SWD(2019) 700 final, 13th December 2019 (186 pages)

Potential for reducing phosphorus pollution in Europe

The JRC study (Pistocchi et al. 2019) accompanying the European Commission's assessment of the Urban Waste Water Treatment Directive (UWWTD), see above, provides an estimate (fig. 67, p86) of reductions in loads to the environment of phosphorus, nitrogen, BOD and coliforms which would result from full enforcement of the UWWT Directive. For phosphorus, this avoidable load is estimated to be just over 50 million p.e. (person equivalent), broken down as 20 M p.e. from non compliant agglomerations, around 15 M from small agglomerations and scattered dwellings, around 10 M from combined storm overflows (CSOs) and around 5 M p.e. from urban runoff. It is emphasised that the UWWTD only addresses loads from municipal wastewater. Estimates are given (from Vigiak 2019) for total 2019 loads of BOD to EU water bodies, suggesting 34% from livestock, 31% from sewage works and scattered dwellings and 20% from urban runoff (rest: industry, forestry). A comparable estimate is not provided for phosphorus or nitrogen.

"Water quality in Europe. Effects of the urban wastewater treatment directive: a retrospective and scenario analysis of Dir. 91/271/EEC", Pistocchi et al. (JRC), 2019, study
"Predicting biochemical oxygen demand in European freshwater bodies", Vigiak et al. (JRC), Science of The Total Environment, vol. 666, pp. 1089-1105, 2019

Food, Drink & Milk BREF published

The finalised BAT BREF for the "Food, Drink and Milk" industries (FDM) has now been published on the EU JRC website. Under the Industrial Emissions Directive, the BAT specifications in this document now become obligatory for all concerned FDM production sites. During the preparation discussions, ESPP underlined the importance of phosphorus stewardship, see ESPP eNews n°28. Under 17.1.6 (Resource efficiency) BAT 10, it is specified that "*Phosphorus recovery as struvite*" is BAT for "*waste water streams with … high total phosphorus content (e.g. above 50 mg/l) and a significant flow*". Other BAT techniques indicated are anaerobic digestion, appropriate use of residues in animal feed, appropriate use of wastewater in agriculture to valorise nutrients and/or water.

BAT BREF for the "Food, Drink and Milk" industries (FDM) 2019

Nutrient recycling

ICL phosphate recycling to fertiliser

ICL Fertilizers, Amsterdam, has published a video presenting the new installations enabling use of sewage sludge incineration ash and bone meal ash as input materials for phosphate mineral fertiliser production. The phosphate recycling unit includes three new silos and input systems, enabling mixing of the ashes with phosphate rock in the chemical reaction phase with sulfuric and phosphoric acid, in the factory's existing 550 000 t/y phosphate fertiliser production process. As well as reducing dependency on non-renewable phosphate rock resources, recycling of secondary phosphate-containing materials enables reduced transport and so reduced carbon footprint. ICL states as its objectives to be a frontrunner in phosphate recycling, with the ultimate goal of reaching a fully closed phosphorus loop.

ICL P-recycling video, 3'20'' YouTube

Atria Baltic Sea Commitment on sustainable livestock

Atria, Finland, is a leading Nordic food company, with nearly 5 000 staff and a range of fresh and processed meat products. The company, with its A-Rehu contract farmers and contract producers, aims to achieve carbon neutrality by 2035. Atria has now also made a five year Commitment with the Baltic Sea Action Group (BSAG) as part of its sustainability and circular economy objectives. The Commitment aims to reduce the environmental impact of livestock production by, e.g. optimisation of feeding, recycling of food industry by-products as feed, nutrient recycling. Cooperation with arable farmers supplying animal feeds will aim to improve manure application and crop rotation and to increase land use efficiency and domestic protein crop production (to reduce the carbon footprint of imported soya). Conservation agriculture and other practices will be developed to improve soil health and carbon sequestration, by training of Atria's own experts, sharing of best practices and communication of research results.

Press release "Atria and BSAG to cooperate", 17 December 2019

Carbon and nitrogen capture

The benefits for soil, plant and soil microbes of an organic fertilising material produced by carbon and nitrogen capture technology were tested. The CCU (carbon capture and utilisation) technology developed by CCm is presented in ESPP's SCOPE Newsletter n°134. Ammonia solution (recycling of nitrogen by stripping from e.g. digesters) is reacted with calcium nitrate, then with CO_2 and a secondary organic (cellulosic substrate), producing calcium carbonate which acts as a binder, (as well as being a plant nutrient) enabling production of pellets containing nitrogen and organic carbon. The resulting product was tested using two different soils (peat compost, mineral soil), measuring soil characteristics, plant growth (30 day pot trials with wheat with CCm product dosed at 0 – 7 g/l soil) and soil microbial development (after soil sterilisation). Results showed that soil water retention was doubled in the peat compost with 25g CCm/l soil and soil matric potential was significantly improved (soil plant water availability: the force with which water is held by the soil matrix, as measured by a tensiometer). Wheat plant biomass showed c. 40% increase at 3 gCCm/l-soil (statistically significant), but with not such a large increase at 6 g/l (but still higher than without CCm): this is probably related to the nitrogen content of the CCm and possibly other nutrients (in the recycled organic substrate) as well as to improved soil properties. The CCm process shows interesting potential to valorize to soil both carbon and nutrients in organic wastes, whilst fixing further atmospheric nitrogen and providing a soil sink for industrial CO_2.

"Sustainable soil improvement and water use in agriculture: CCU enabling technologies afford an innovative approach", J. Lake et al., Journal of CO_2 Utilization 32 (2019) 21–30

Microalgae from wastewater treatment as organic fertiliser

Microalgae biomass of two different origins, after simple drying, was tested as an organic fertiliser for container-grown tomatoes in a greenhouse test (3 months), looking at tomato plant growth, fruit harvest quantity and quality. The microalgae biomass came from (a) flocs harvested from an outdoor raceway pond operated for batch treatment of wastewater from a freshwater fish cultivation aquaculture system and (b) production in outdoor photoreactors using marine water and flue gas CO_2 and residual heat from landfill biogas combustion The dried microalgae biomass contained 0.6 and 1.3 %P (a and b), 2.4 and 8% N, 0.2 and 1.4 %K, 20 and 0.2% calcium and various microelements. Fertiliser effectiveness was compared to a liquid inorganic fertiliser adapted to tomatoes and a blend of two solid organic commercial fertilisers (Frayssinet, France) with potassium, magnesium and sulphate added to ensure comparable macronutrient ratios. The microalgae were applied assuming a 33% N mineralisation rate. The four treatments gave similar plant growth, but a lower fruit yield (wet weight) with the organic fertiliser, and very much lower still (< 50%) with the microalgae. Tomato quality (sugar and carotenoid content) were significantly higher with the organic fertiliser and the microalgae. The authors suggest that the significantly lower tomato productivity may be related to increased salinity with the organic fertilisers and microalgae.

"The use of microalgae as a high-value organic slow-release fertilizer results in tomatoes with increased carotenoid and sugar levels", J. Coppens, J Appl Phycol 2015

H2020 water innovation workshop recommendations on nutrient recycling

A workshop on water innovation, organised by four Horizon 2020 projects (SMART-Plant, nextGen, Hydrousa and Project-O) and the European Commission (EASME), see ESPP SCOPE Newsletter n°132, discussed opportunities and challenges for resource recycling from wastewater. The workshop agreed the following recommendations to further nutrient recovery and recycling: promote a positive image for recycling nutrients; need for stable regulatory support; importance of networking of competence, platforms and data benchmarking; difficulties posed by disparate implementation of End-of-Waste in different Member States and regions. The workshop recommended to promote and support nutrient recycling in Horizon Europe, and to develop better coordination of End-of-Waste, Water Policy and Circular Economy policies between Member States.

Report. Post-Conference workshop @IWARR2019. "H2020 Water Innovations for Sustainable Impacts in Industries and Utilities", SMART-Plant website.

Experimental production of P4 (elemental P) from phosphoric acid

A laboratory-scale study in Japan suggests that elemental phosphorus (P4, also known as "white" or "yellow phosphorus") can possibly be produced from phosphoric acid using less energy than production directly from phosphate rock. Existing technologies are estimated to consume around 1 500 kWh electricity per tonne P4 produced, operating at around 1400°C. A 32 mm internal diameter, 1.2 m high quartz reactor furnace, heated electrically, was tested, mixing phosphoric acid with activated carbon as substrate (P-source and reducing agent). The furnace was heated to 1000°C in the activated carbon (reducing) zone, with a second reaction zone at 700°C. The authors suggest that phosphoric acid recovered from secondary materials, for example phosphoric acid recovered from steel slag, for which several experimental studies have been published in Japan (see e.g. Iwama et al. 2019).

"Carbothermic Reduction of Phosphoric Acid Extracted from Dephosphorization Slags to Produce Yellow Phosphorus", R. Yoshida et al., International Journal of Materials and Metallurgical Engineering, Vol:13, No:11, 2019
"Extraction of Phosphorus and Recovery of Phosphate from Steelmaking Slag by Selective Leaching", T. Iwama et al., ISIJ, 2019

Studies and research

European Environment Agency calls for end of growth

The EEA (European Environment Agency) "State of the Environment 2020" report says "*change of direction (is) urgently needed to face climate change challenges, reverse degradation and ensure future prosperity*" and that "*Europe will not achieve its sustainability vision … by continuing to promote economic growth and seeking to manage the environmental and social impacts*". The new European Commission Vice-President, Frans Timmermans, responded that the EU needed an urgent paradigm shift, and the new Environment Commissioner, Virginijus Sinkevicius, indicated that priorities are biodiversity, the circular economy and zero pollution. The EEA report points to phosphorus and nitrogen cycles as both exceeding Planetary Boundaries, underlining that diffuse emissions of both P and N to water remain a problem (62% of EU ecosystems are exposed to levels of nitrogen beyond safe tolerance) and that this requires more coherent policies for agriculture, transport, industry and waste water treatment, including a wider food system perspective

See: ENDS 4/12/2019 and EEA "State of the Environment 2020"

Nutrients, ocean deoxygenation and climate change

A 580 page report by IUCN (International Union for Nature Conservation) assesses evidence for ocean deoxygenation across the world, links to eutrophication, to climate change and ocean warming and to algal blooms, impacts on ecological systems, fisheries and on people, perspectives and actions needed. Water oxygen concentrations are critical to fish and marine life, because it is much more difficult to breath in water than in air (there is much less oxygen in a given volume of water). Global ocean oxygen content is estimated to have fallen 1-2% since the mid twentieth century. The number of low oxygen ocean sites has increased to over 500 over recent decades, and climate warming is expected to exacerbate this. Ocean deoxygenation can be attributed to two causes: climate change and ocean warming, which lead to an overall slowdown in marine circulation and so lower uptake of oxygen to seawater from the atmosphere; and nutrient inputs, from atmospheric nitrogen deposition and land runoff of nitrogen and phosphorus (eutrophication) in coastal areas world-wide, leading to oxygen consumption by algae and then to oxygen deficiencies near the sea bed. Remobilisation of phosphorus and iron from sediment particles in low oxygen conditions can further accelerate the process (feedback loops). Impacts of ocean deoxygenation are regionally very variable, and are highly critical in semi-enclosed seas (e.g. Baltic, Black Sea, Gulf of Mexico) and the EBUS (Eastern boundary upwelling systems – equatorial and coastal regions of the eastern Pacific and Atlantic oceans). The report underlines that ocean deoxygenation and climate change are strongly interlinked, and that the key contributors to both are the same: agriculture and burning of fossil fuels and that a key action is to address nutrient inputs to rivers and oceans from septic systems and wastewater treatment plants, fertiliser run off, livestock manure, and atmospheric deposition of nitrogen from the burning of fossil fuels.

"Ocean deoxygenation: Everyone's problem. Causes, impacts, consequences and solutions", D. Laffoley, J. Baxter and 67 scientist experts, IUCN, ISBN: 978-2-8317-2013-5, 2019

Scientists' call for action on nitrogen

More than 150 scientists have signed a call for "urgent action on nitrogen pollution", addressed to the United Nations. Currently, 80% of nitrogen used in agriculture is lost, that is more than 200 million tonnes of nitrogen per year, at a cost of 200 US$ billion, adding to nitrogen oxides generated by energy, industry and transport (combustion processes). Actions called for include more efficient use of fertilisers and manures, cutting food waste, reducing meat and dairy consumption and new technologies for nitrogen capture from transport and from fossil fuel burning. The initiative is led by CEH, Edinburgh, Scotland and the INMS (International Nitrogen Management System).

"Global action on nitrogen is essential to tackle the current environmental crisis", INMS 23rd October 2019

Review of possible nutrient recovery technologies

A nineteen page review outlines a wide range of phosphorus and nitrogen recovery technologies for wastewater, providing some 200 references. P-recovery technologies addressed include: ion exchange / adsorption, electrodialysis, magnetic microsorbants, reactive filtration media (e.g. polonite, zeolites), urine separation, struvite precipitation, metal phosphate precipitation, electrochemical (sacrificial anode, dimensionally stable anode DSA), biological phosphorus removal (EBPR) and then land application of biosolids, algae harvesting. Nitrogen recovery technologies addressed include: ion exchange/adsorption of ammonium (e.g. using zeolites or clinoptilolites), electrochemical and microbial fuel cells, struvite precipitation, stripping, gas permeable membranes, conversion to livestock feed or protein by heterotrophic microorganisms. The authors underline that only a few of these processes result in a directly useable product (e.g. struvite, considered a "good fertiliser"), challenges of contaminants in the recovered product, and that all processes work better if nutrients are concentrated (e.g. by urine separation or EBPR). A table summarises 'pros and cons' of the different processes.

"Technologies for Recovering Nutrients from Wastewater: A Critical Review", M. Perera et al., Environmental Engineering ScienceVol. 36, No. 5, 2019

Financing the circular economy

The European Commission has published an Expert Group report on circular economy (CE) financing, concluding that risk, and perception and assessment of risk, are the main challenge to finance of CE projects. The report develops recommendations for financial institutions, for project promoters and for policy makers. These are based on the following general conclusions: level playing field, value chain collaboration and participation of end-users, economic integration of externality costs and product longevity, financing knowledge and innovative first-movers. Recommendations to the financial sector are to define definitions, taxonomy and tools to measure circularity, risk analysis of linear models, financial risk sharing and increasing awareness. Project promoters should identify circular sources of revenues, collaborate with other circular economy communities, disclose environmental and social benefits and develop staff training and knowledge. Recommendations to financial decision makers are to develop reporting standards for risks of linear business models, define definitions and taxonomy of circularity, establish technical and financial advisory services to support circular economy projects and to prioritise circular economy projects within the InvestEU fund. Recommendations to policy makers are to create a framework favorable to and facilitate the circular economy, including: define metrics, develop national and regional circular economy strategies linked to other policies, set CE targets, create collaborative platforms, remove subsidies to linear systems, implement EPR extended producer responsibility, fix sunset dates for landfill, provide fiscal incentives, and create markets via public procurement.

"Accelerating the transition to the circular economy. Improving access to finance for circular economy projects", European Commission, DG Research and Innovation, March 2019 (56 pages) ISBN 978-92-79-99324-4

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