ESPP technical meeting on regulatory issues relating to the use of recycled phosphates in agriculture
Meeting record summary

The Farmers' Club, London, 24th September 2013

45 stakeholders from European authorities and agencies, the water industries, fertiliser industries, waste management, farming and agronomy and from knowledge institutions/experts met at the Farmers' Club in London, at the invitation of the European Sustainable Phosphorus Platform.

After the welcomes from Chris Dawson, member of the Farmers' Club and Chris Thornton, Secretariat of the European Sustainable Phosphorus Platform, the objectives of the meeting were recalled: **to put together proposals concerning the regulatory context to facilitate phosphorus recycling and sustainable phosphorus management**.

The meeting was organised around questions submitted before the meeting and participants input.

Thanks were expressed to the Farmers' Club for the excellent venue, and to the participants who participated on the panels for the different discussion sessions, with the role of facilitating discussion and clarifying questions and proposals:
- *Laetitia Six, Fertilisers Europe*
- *Jane Salter, UK fertiliser industry (Agricultural Industries Confederation)*
- *Anders Nättorp, FHNW Switzerland and P-REX*
- *Jane Gilbert, European Compost Network*
- *Rachel Green, ReFaC*
- *Alexander Schitkowsky, Berlin Wasserbetriebe*
- *Edmund Beard, DEFRA (UK Environment & Agriculture Ministry*
- *Mat Davis, Environment Agency (England)*
- *Sarah Coe, Natural Resources Wales*
- *Rachael Dils, Environment Agency (England)*
- *David Tompkins, WRAP*
- *Andy Ross, Leeds University and BioRefine*
- *Murray Hart, DEFRA (UK Environment & Agriculture Ministry)*
- *Francesco Presicce, European Commission DG Environment*
- *Chris Dawson, International Fertiliser Society.*

From waste to product

Recovery of phosphorus as a 'mineral' (eg. struvite, sludge incineration ash) is a different situation from recycling of (organic) biosolids to farmland after treatments (eg. digestion, composting, processing), and will be dealt with separately below.

Complexity of regulations

Discussion and examples from different countries emphasised the complexity of regulations concerning biosolids recycling to farmland, with **different specific legislations** covering:
- animal by-products
- waste
- end-of-waste and quality protocols
- possibly in the future: fertiliser regulations
- operating authorisation for processing plants
- land application constraints: Nitrates Directive, Water Framework Directive, Sewage Sludge or Soil Directives and their regional implementation

Mixing wastes can have clear advantages (more stable digester operation, improved overall biogas production, better balance of nutrients in end-product, increased economic viability of processes through economies of scale, …) but leads to complex situations, because several different regulations might then apply.

The consideration of **digestate** in the context of the Nitrates Directive is not uniform across Member States. In principle, inclusion of even a small content of animal manure input to digestion or other treatments leads to the resulting product being classified as "manure", considering that "processed manure" is covered by the obligations of the Directive. However, Member States are adopting different approaches in this regard, Also, in some Member States, inclusion of manure in waste treatment input can result in the resulting product (e.g. digestate) being classified as "waste".

In many cases, regulation is not the same **between different countries** or even between regions (Belgium, Germany). A treated biosolids output can be considered a product in one country and a waste in another. For example, the UK has End-of-Waste criteria for digestates which exclude sewage sludge as a digester input: France has End-of-Waste criteria for composts including those made wholly or partly from sewage sludge. Transfer of recycled products across frontiers is thus complex, because the regulatory status can change.

The status of a material can also depend on its destination, because End-of-Waste status is only valid for specified uses, although this approach also varies between countries.

> *Some participants emphasise that regulations do not prevent biosolids recycling to farmland (with the exception of certain specific animal-derived wastes) but will imply **different specific constraints** (permits, documentation, use constraints) and possibly fees.*
>
> *Other participants consider that the **complexity of regulations constitutes a hindrance** to phosphorus recycling and that regulations are designed to 'manage waste safely' not to facilitate recycling, that agronomic benefits are not adequately taken into account. Regulations do not consider the importance of phosphorus recycling. They are often based on today's knowledge, and need to evolve to address future challenges.*
>
> *"Waste" is perceived as negative. There is a **need to recognise biosolids as a resource**.*
>
> ***End-of-Waste and Quality Protocols** can be valuable tools to ensure the quality of recycled products, and so maintain **consumer confidence** in recycling routes.*

Regulation is applied on a **case-by-case basis**, both by defining specific tools (eg. Quality Protocols) for specific biomass inputs and intended applications, and by examining specific processes and products individually.

End of waste

The principle set by the Waste Framework Directive 2008/98/EC is that, to enable recycling, "waste" can be processed to cease to be a waste, according to **specific "End-of-Waste" criteria (EoW)** (defined at either the EU or national level), and so becomes a "product" (no longer subject to waste regulation). The Directive specifies that, for EoW criteria to be defined, "*a market or demand*" must exist and that the produce must be "*commonly used for specific purposes*" and must "*fulfil the technical requirements for the specific purposes*".

End-of-Waste requires that the substance be safe, that is not risk harm to humans and offer "*a high level of environmental protection*" or "*not lead to overall adverse environmental or human health impacts*". This can be summarised as 'recovery without harm'.

> *Several participants consider that the emphasis in End-of-Waste criteria definition is too much on "making a waste safe" rather than on facilitating recycling of valuable resources, and that this emphasis needs to change.*

In End-of-Waste, the producer-responsibility and tracing of wastes is also stopped: the processing plant keeps records of origins of all wastes treated, but the output product can be sold on the market without specific documentation. However, other regulations may impose constraints, e.g. farmland nutrient application planning, animal by-products regulations.

In the UK, "**Quality Protocols**" are published to ensure transparency and established after extensive public and industry consultation. The Quality Protocol covers only designated market sectors, eg. use of poultry manure ash as a PK fertiliser. Where a 'Quality Protocol' has been defined it is considered to define applicable 'End-of-Waste' criteria for the specified materials and applications. End of waste decisions can also be made by the environmental regulators on a case by case basis, but the documentation relating to such discussions is considered to be confidential.
See http://www.doeni.gov.uk/niea/index/about-niea/better_regulation/waste_quality_protocols.htm

It is emphasised that, in the UK, some materials have been unable to achieve Quality Protocol status, and so will remain waste for the foreseeable future (eg. paper sludge ash).

National subsidiarity is currently applicable to End-of-Waste (EoW), e.g. if European EoW criteria are adopted which exclude sewage sludge as an input to EoW compost, a member state could nonetheless maintain national EoW criteria authorising sewage sludge. However, there is no mutual recognition: EoW compost from this member state would be considered 'waste' if exported to a different member state.

> *Several participants emphasise that **continuously developing End-of-Waste Quality Protocols, based on case-by-case experience**, can be the best solution to ensure a stable regulatory context and market recognition for specific biosolids treatment processes (as a function of input materials, process characteristics, and output material agronomic properties).*

In most cases, materials which do not achieve End-of-Waste status (criteria do not yet exist for the type of product, or not conform to criteria), and which are classified as wastes, **can still be used on land**, subject to appropriate constraint (permitting, fees). This is the case for most sewage biosolids in the UK.

> *Opinions varied concerning such agricultural application of sewage biosolids. Some participants consider that such "spreading of waste" is an obstacle to phosphorus recycling. It, gives a negative image by claiming as "recycling" spreading even if it is not useful to crops or soil. Other participants consider that application programmes can be developed to ensure respect of limits concerning contaminants and nutrients, and also to ensure that the nutrients put to land correspond only to crop needs (quantitative) and are available according to crop needs (qualitative). The UK water industry has invested considerable work to build confidence around the benefits and safety of applying biosolids to farmland.*

Current developments in End-of-Waste (EoW) criteria for composts

The EU is currently considering possible European EoW criteria for composts and digestates. The **JRC (EU Commission Joint Research Centre) draft final report (7/2013)*** on "End-of-waste criteria for Biodegradable waste subject to biological treatment" proposes to exclude sewage sludge from acceptable material inputs. This exclusion would apply to the European EoW criteria, Member States would under subsidiarity be able to develop (or maintain existing) national EoW criteria for composts or digestates which DO authorise the input of sewage sludges.

*http://susproc.jrc.ec.europa.eu/activities/waste/documents/IPTS%20EoW%20Biodegradable%20waste%20Draft%20Final%20Report.pdf

> *Several participants consider that the approach is too much orientated to "taking out of waste status", and so to an emphasis on risks and contaminants, with insufficient consideration of the agronomic and nutrient value of composts and digestates. The JRC proposal does not include nutrient contents as quality criteria.*
>
> *Some participants consider that nutrient availability should be specified, but this is difficult to define.*

It is noted that compost can be used in "organic" agriculture under certain conditions: it must be in compliance with Article 16 of Council Regulation (EC) 834/2007, Article 3(1) and Annex I of Commission Regulation (EC) 889/2008 – where there is an agronomic need, from source-separated domestic waste, PAS 100 compliant, and below specified limits for heavy metals.

Application of REACH to recovered phosphate products

REACH obligations

Rachel Green (ReFaC) explains that **REACH registration is generally obligatory** for any company (or organisation) producing a recovered phosphate chemical product, subject to the comments below.

As a general rule, action is legally required **before or immediately on starting production > 1 tonne/year,** although it is not so simple. Action required may be immediate registration (if the substance is already pre-registered (by the legal entity planning to produce it), submission of an inquiry dossier followed by registration or late pre-registration. Action to be taken will depend upon the tonnage produced/ to be produced and whether or not the legal entity had pre-registered in 2008. Each registration will be case-specific and it is recommended to seek appropriate advice on how to proceed.

Compost and biogas certainly do not require registration because they are specifically exempted from registration by Annex V, entry Number 12, of the REACH regulation. This exemption is understood as being applicable to substances consisting of solid particulate material that has been sanitised and stabilised through the action of micro-organisms. **Certain opinions suggest that anaerobic digestates are also exempted from REACH registration** although this is not specified in ECHA guidance on application of this Annex V.

Biochars, however, can be considered to be comparable to charcoal which DOES require REACH registration (if it ceases to be a waste, see below). **Ashes from incineration of biosolids, biomass or wastes and products produced from such ashes also require registration** (again, if they cease to be a waste)

> *The following question has been raised: "**recovered substances" are exempted from REACH registration (under art. 2(7)d of the REACH regulation)** provided that they have already been registered (by some another legal entity, not necessarily in the same supply chain). The ECHA "Guidance on Waste and Recovered Substances" (v2, May 2010, not legally binding) specifies:*
>
> *"For the purpose of REACH, recovered substances should only be understood as substances that, after having been part of waste materials, have ceased to be waste according to the Waste Framework*

Directive. The constituents of the recovered substance may have been present as such in the waste stream or have been obtained from the waste stream through chemical modification during the recovery process."

The definition of "recovery" is also provided by the EU Waste Framework Directive 2008/98/EC (definition n° 15) to include all forms of recycling (definition n° 17) and of "reprocessing … into substances".

***However, it is currently unclear whether this art. 2(7)d of REACH can exempt producers of recovered phosphate products (for which a first registration has been made, e.g. struvite), because of differing National Authority interpretations**, which in some cases seem to only exempt substances where the recovered substance was already present in the wastestream (such as recycling of solvents or metals).*

*The European Sustainable Phosphorus Forum will submit a **formal Enquiry to the European Chemical Agency ECHA requesting clarification of this question** concerning interpretation of the REACH "exemption" for recycled phosphate products.*

REACH registration formalities

Rachel reminds that to register for REACH requires the following:

- payment (once only, not annually) of the **ECHA registration fee**, which depends on production tonnage band and on size of company registering
- **purchase of 'Letter of Access'** for a substance which is already registered (from the company having registered it, for example from Berlin Wasserbetriebe for struvite). or submission of a new "joint registration" dossier (for a new recycled phosphates substance, not yet registered)
- **preparation and submission of company 'mini-dossier' in the correct IUCLID 5 format** including specific analysis to show that your substance is indeed the substance specified in the registration dossier, and including administrative information about your production site(s)

These procedures can seem complex and daunting to companies not accustomed to chemical legislation and it is recommended to use a consultant to accompany, because small mistakes (wrong box ticked) will result in rejection of the dossier and possible additional costs. ReFaC (REACH Facilitation Company) was established by the UK chemicals industry to provide this service. Other similar support companies exist in other countries.

The levels of standard ECHA registration fees (once only payment) are considerably different depending on the size of the company / organisation submitting the registration and on annual production tonnage, varying from 173€ for a micro enterprise <100 t/year to 24 901 € for a large organisation >1000 t/year example. For details see http://echa.europa.eu/regulations/reach/registration and official fees table in EU Regulation, Annex I, "Joint Submission" fee: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:079:0007:0018:EN:PDF

Fertiliser phosphates and many inorganic phosphate chemicals have already been registered under REACH by the FARM and Inorganic Phosphates Consortiums (see www.reachcentrum.eu)

*It would be helpful to **facilitate access for recycled P producers to appropriate accompanying services for REACH formalities**: identify service providers familiar with the products and issues in question (ReFaC can provide such services as Rachel Green prepared the dossiers for the Inorganic Phosphates Consortium). A standard offer/price (for known product, excluding complications) would be helpful.*

A different registration dossier (and payment of ECHA fees) is required **for each legal entity producing a product** (that is, for each subsidiary) but just one registration can cover any number of production sites of the same legal entity.

> *It could be useful to **investigate whether a legal structure could be feasible** to be the legal 'producer' of struvite or other forms of recovered phosphate for different utilities in order to simplify REACH procedures and have only one registration.*

Rachel reminds that **REACH addresses the main chemical constituent**, not impurities (but see discussion below) but can also cover products which are a mixture of several substances (UVCB = substance of Unknown or Variable composition, Complex reaction products or Biological materials) for which the dossier is generally more complex and for which different producers' products may need to be registered as different substances. This is likely to be the case for incineration ashes and similar products. It is advised to seek expert assistance with determining the substance to be registered and the appropriate route of registration for these materials.

The **same substance produced by different processes** or from different raw materials will have only one (the same) REACH dossier, that is: one 'joint registration' dossier containing the toxicological, ecotoxicological data and studies etc for the substance, submitted by the first registrant (Lead Registrant). All other registrants are 'joint registrants', providing only their own company-specific information in their 'mini dossier', see above). This requires to show that the produced substance is the same (example of bone ash phosphate which has been registered as the same substance as hydroxylapatite = tricalcium phosphate either mined or produced chemically from phosphoric acid.

> *Some participants consider that REACH is an obstacle to phosphorus recycling, because of cost and administrative burden, particularly if every sewage works and every municipality concerned has to submit their own registration. Others indicate that it is a legal obligation for which there is no choice. The objective of REACH is to ensure chemical safety (in use) and provide information to the public: this is important to ensure public confidence in the safety of recovered phosphates.*
>
> *Other participants indicate that enforcement agencies can be expected to come down hard on those companies who they feel have deliberately ignored their legal obligations under REACH.*

A question has been raised concerning how "**recovered substances" are exempted from REACH registration** under certain conditions (art. 2(7)d of the REACH regulation). However, it is currently unclear whether this can exempt producers of recovered phosphate products (e.g. struvite), because of differing National Authority interpretations, and because it is only applicable in certain specific situations. In any case, this exemption does not exonerate from all REACH formalities.

> *Further investigation is required to clarify the applicability or not of this exemption to recovered phosphates, and if so in what circumstances.*

Struvite under REACH, Fertiliser and other regulations

The **REACH dossier for struvite was successfully submitted by Berlin Wasserbetriebe** for the 2013 REACH registration deadline (EINECS n° 232-075-2). The dossier concludes that struvite is Not Classified. Organisations and companies producing struvite must therefore contact Berlin Wasserbetriebe to **purchase a 'Letter of Access' to the struvite joint registration dossier before submitting their REACH registration** (REACH legislation requires "one substance – one dossier", except for exceptional and justified opt-out cases), and will have to pay a contribution to dossier costs (studies, preparation).

> ***All companies or utilities producing or planning to produce struvite should contact as soon as possible Berlin Wasserbetriebe** to organise purchase of the Letter of Access to the struvite REACH dossier, obligatory for REACH registration of struvite: Alexander.Schitkowsky@bwb.de*

This dossier covers **struvite produced from any waste stream and any process**, but specifies that the struvite must be at least 80% purity (at least 80% magnesium ammonium phosphate (MAP) or MAP hydrate, water not being considered in this % calculation).

Rachel Green explains that REACH addresses the principal chemical constituent, and accepts (generally) down to **80% purity**, subject to the constraints that:
- all CMR (cancer, mutagen, reprotoxic) impurities are < 0.1%
- all 'Classified' impurities are < 1%
- all impurities are similar compounds to the main substance (eg. for struvite, calcium and magnesium phosphate minerals) and do not significantly modify the chemical (including toxicological and ecotoxicological) properties of the substance.

However, each composition should be evaluated on a case-by-case basis.
The **CLP legislation (GHS Chemical Labelling and Packaging)** also addresses hazardous impurities.
It is the **legal responsibility of each registrant** to demonstrate that their product is conform to these constraints and so can be covered by the struvite registration dossier.

> *A number of registrants indicate that **very variable products are currently being presented as "struvite", with different levels of impurity and different levels of organics**, varying from near-zero organics (trace) to "brown sludges". This organic content could imply a risk of pathogens and an increased risk of organic chemical contaminant content (hormones, pharmaceuticals …). Recovered phosphates with significant organic content also pose problems of handling, stability, smell, and may be not suitable for certain uses or applications.*

Rachel replies that a 'struvite' product with significant organic content would probably not be covered by the struvite REACH dossier and would require a specific and different dossier as a UVCB or a multi-constituent substance (see above) but it would depend on the exact composition as well as other physicochemical criteria which may identify the substance as being different to the substance already registered.

Ostara **struvite has successfully gone through the End-of-Waste process** in the UK, and Ostara and Berlin Wasserbetriebe struvites have been **agreed as inorganic fertilisers under the EU Fertiliser Regulation** and in Germany. Again, however, these conclusions would not necessarily hold for a 'struvite' product with a significant organic content.

It is noted that fertiliser regulations do not require assessment of possible organic chemical contaminants in struvite (eg. pharmaceuticals, hormones, despite that traces may be found: see SCOPE Newsletter n°96) because struvite is considered to be a mineral (inorganic) fertiliser. Struvite was first produced as a mineral fertiliser in the 1950's (see eg. SCOPE Newsletter n°43).

> *Several participants consider that struvite products containing organics should not be accepted as mineral fertilisers, because the **risk of organic chemical contaminants** is not the same and is not wanted by many farmers, and that for all struvites produced from waste streams where organic contaminants might be found, then these should be analysed to confirm their absence or know the level of risk in the struvite.*

On the other hand, the fertiliser value and nutrient availability of struvite-organic combinations may be similar to pure struvite products.

Thus a **hierarchy of different regulations must be applied** to cover different outcomes:
- REACH = basic chemical safety for health and the environment, including of workers
- CLP = labelling and packaging, labelling generally derived from the REACH dossier, packing requirements as per CLP Regulation.
- fertiliser regulations = value as a fertiliser, safety for that use
- case-by-case assessment of specific health and environment risks

Risk assessment is the appropriate tool for looking at specific questions such as organic chemical contaminants (hormones, pharmaceuticals): what are the potential "worst case" concentrations of possible contaminants in a product ? Are there environmental or health impacts at the concentrations resulting from

use as a fertiliser ? what are their environmental fate (decomposition ? accumulation ? crop uptake ?). Risk assessments can be engaged voluntarily or within regulatory frameworks.

Recovered P fertilisers and fertiliser standards

The **EU Fertiliser Regulations 2003/2003 are currently undergoing revision**, and are likely to be widened to cover organic soil amendments. Participants envisaged that recycled phosphate products be part of this revision, which should hopefully simplify access to the EU market for those products.

The **importance of but difficulty in defining and testing available P and N in composts** and organic soil amendments is underlined. Both immediate availability and long-term nutrient availability are important, but with different implications for the farmer and for the environment. Composts or digestates made from different raw material inputs will contain different concentrations of nutrients, with different plant availabilities and farmers need accurate information about plant availability. However, requirements must not result in excessive testing costs.

> ***Testing protocols for nutrient availability*** *in composts, digestates and other recycled products exist, but there is a need to agree on their application, ensure harmonisation and communication*

Participants raised the question of plant availability (and so fertiliser value) of phosphates in recycled sewage biosolids-based products where **iron or aluminium is used for chemical P removal** in municipal wastewater treatment.

The FAO Fertilizer and Plant Nutrition Bulletin n° 18 “Efficiency of soil and fertilizer phosphorus use” is referenced (chapter 4) http://www.fao.org/docrep/010/a1595e/a1595e00.htm This shows that the plant efficiency of phosphorus use from fertilisers should be assessed over the long term, showing **80-90% P-use efficiencies** for standard mineral fertilisers. Recycled products should be assessed similarly.

Participants underline that the **Fertiliser Regulations specifications should be different for organic and for mineral fertilisers**, regarding contaminants (not the same contaminants risk to be present) and also regarding nutrient value (eg. composts are generally used principally for the organic carbon content, not as a (nutrient) fertiliser, but will bring some nutrient value also. . Flexible or lower nutrient contents should be authorised for compound fertilisers and organic-based materials.

Material consistency is important for farmers to be able use fertiliser materials reliably, efficiently and with existing equipment: physical, flow, storage and spreading characteristics, dusting.

> ***Opinions diverged on this question of plant availability phosphates in iron or aluminium rich biosolids****. In many cases, a fixed figure is used (e.g. UK Fertiliser Manual (RB209) page 7 estimates the availability of P in sewage sludge at 50% irrespective of the treatment route. The same figure is used by the US EPA). Some participants considered that iron and aluminium render the phosphate permanently not available to crops once the product reaches the soil. Other participants indicated that the P in iron phosphate is plant-available in the long term and that chemical P removal is necessary in sewage works to efficiently achieve discharge consents, particularly in smaller sewage works, and can improve the efficiency of biogas production where sludge goes to anaerobic digestion.*
>
> *One proposal is that demonstrated plant availability should be required for nutrients in “recycled phosphate” products.*

In **Switzerland** there are special laws for recycled fertiliser products which are more stringent for some heavy metals than for fertilizers made from natural resources. Participants consider that contaminant requirements should be the same for different fertilisers and soil amendments (as related to use / exposure), in order to ensure a **level playing field**.

> *Clarification of definitions, clear quality criteria for different types of fertiliser and soil amendment product, and adequate testing are all important to address mis-information and scepticism about recycled products.*

Policy proposals for phosphorus recycling

Regulation or political targets ?

Participants consider that **existing regulations were not designed with phosphorus recycling as an objective**, and that there are opportunities for taking better account of phosphorus management when regulations are updated or modified, as well as in implementation of existing legislation. In particular in the **EU Common Agricultural Policy (CAP) and Rural Development Programmes (RDP)** (cross compliance)

Some participants see a need to **develop mono-incineration of sewage biosolids** (sewage sludge not mixed with other wastes) in order to enable phosphorus recovery from the ashes. Swiss draft legislation proposes obliging separate landfilling of such ash, so that phosphorus can potentially be 'mined' from it in the future. This will lead to landfill costs which are likely to make phosphorus recycling economically viable today.

Other participants consider that **agricultural use of appropriately treated sewage biosolids** will remain stable or will increase in some countries (UK, France, Sweden …) because it is seen as the ecologically and economically optimal route to valorise organic carbon and nutrient content.

Several participants point to countries which already have or are considering phosphorus recycling policies (Sweden, Germany, Switzerland) and suggest that **European policy or incentive is needed to promote sustainable phosphorus management**. The role of phosphorus in agricultural production and food security is emphasised.

Other participants consider what is needed is a **political target, which would drive modulation of existing regulations**, and are concerned that 'hard' obligations for recycling could have unintended negative impacts, for example artificially favouring one recycling route over others.

> *DEFRA indicates that the UK considers that phosphorus is an issue to be addressed. A business as usual scenario with no change will not happen. Phosphorus is rising on the political agenda and the UK is looking at what actions are possible, at raising awareness, at identifying research gap and at developing guidance for decision makers.*

European consultation – opportunity to move forward

The European Commission consultation on sustainable phosphorus management is open until 1st December 2013 (see SCOPE Newsletter n° 95) at http://ec.europa.eu/environment/consultations/phosphorus_en.htm

Francesco Presicce (European Commission) indicates that this consultation is part of the overall effort to improve resource efficiency and responds to **stakeholder pressure for Europe to move forward on phosphorus stewardship**. The objective is not necessarily to establish new European regulation but to identify actions to facilitate phosphorus recycling and stewardship, Stakeholders are demonstrating significant interest on the questions raised by the Communication, raising issues of adjustment and harmonization of existing regulations and expressing the **need for more legal certainty and further drivers at the European level**, in order to facilitate the sustainable use of phosphorus. ,.

All organisations and individuals are invited to submit comments and proposals. The European Commission emphasises that both concerted responses (eg. from governments, federations …) but also individual responses (from companies, individuals, associations) are important.

Information and research

Several participants indicate the need for better data regarding **phosphorus flows through different systems** (agriculture, households, industry), in order to better identify target areas with high potential for reducing phosphorus losses or recycling.

> *Participants note that household food waste represents only around 2% of total agricultural phosphorus flows, but there may be more in food processing and retail food wastes. Animal bone waste contains significant phosphorus, equivalent to over 10% of fertiliser imports for the EU. Sewage sludge contains, in total, around one quarter of the phosphorus in EU fertiliser imports.*

A number of phosphorus flow analysis studies exist at national, regional or city level from different countries (see eg. SCOPE Newsletter 93 and analysis of 18 such studies in SCOPE Newsletter 95). Conclusions are largely transposable to other countries and areas, so that extensive research is not needed before actions can be engaged. **Applied local or sectoral phosphorus flow studies** can provide further information to define local priorities and to inform local decision makers or water or waste stream operators.

James Cooper (University of Birmingham) indicates that a **phosphorus flow analysis for the UK food production and consumption system has been completed** (published in Resources, Conservation and Recycling, Vol. 74, 2013). Regional or local flow studies could be developed using this methodology and basic data. Further work is ongoing to develop this for the water industry by gathering information about the size and treatment methods for all UK wastewater treatment works. Results suggest that over 80% of the UK population (in population equivalent) are served by WWTPs >25,000 p.e.) and over 60% of the population are served by WWTPs >100,000 p.e., implying that targeting only the larger works for P-recovery will capture the majority of wastewater P flows. An issue raised is that most P-removal occurring in the UK is through iron dosing, which could limit P recovery options. Contact: JXC637@bham.ac.uk

Several participants underline the need for **better circulation of existing information**, to avoid "re-inventing the wheel" and losing time carrying out studies when similar data already exists elsewhere and can be transposed. Phosphorus stewardship requires cooperation between different sectors (agronomy, water treatment, social/political, chemical industry, waste operators …) and existing knowledge from one sector is often not readily accessible to other sectors (up-to-date bibliography, summaries accessible to actors who are not experts in the specific sector).

Cost-benefit analysis of phosphorus management strategies and of P-recycling technologies is important. The on-going P-REX project will assess costs for recovering P from the wastewater stream with large scale processes and also develop regional scenarios for 80% phosphorus recovery from the wastewater stream including cost and environmental impact estimation.

Many approaches for phosphorus stewardship and technologies for recovery (as assessed for example by P-REX www.p-rex.eu) are mature. They need no further research efforts but should be implemented now. Through full scale implementation in pilot regions additional knowledge will be gained and momentum for rollout of more widespread P-recovery strategies will be created.

Innovation and water utility funding

A number of drivers will push innovation in water treatment in coming years and can offer opportunities for developing phosphorus recycling:
- **tightening of phosphorus discharge consents** (authorised sewage works outflow P concentration limits), see above
- increasing **co-treatment of different wastes** to optimise logistics, costs, performance
- development of anaerobic digestion (methane production) for **energy recovery**
- **rethinking of sewage works** and other waste streams to optimise energy potential
- increasing use of **biological nutrient removal** in sewage works
- pressure to **reduce contaminants** in agricultural amendments and in foods

Participants cited **anaerobic digestion of biological phosphorus removal sewage sludges**, in which case struvite recovery can be central to operation both by avoiding nuisance deposit problems in digesters or sludge dewatering, and by improving the nutrient removal performance (avoiding phosphorus release – return).

Innovation is also expected in food waste management. Household **sink food waste grinders** can have advantages, by avoiding food waste collection costs, and enriching the domestic sewage flow with organic material which can 'feed' biological nutrient removal processes (after partial fermentation in the sewer pipes) and contribute to energy production in sludge digesters. Other participants consider that there are also advantages in putting food waste directly to the digester.

Co-treatment of different wastes results in larger installations facilitating phosphorus recovery technologies, because of economy of scale and increased operator competence.

UK participants underline the **importance of the mechanisms of investment funding for water utilities**:

- where phosphorus recovery is considered to be part of operating efficiency requirements, then the water companies can only keep the benefits for a limited period. Is this payback time adequate ?
- if phosphorus stewardship objectives are included in objectives set for the industry by government, then relevant investments can be included in costs eligible to be passed on to the water consumer (rather than being carried only by the company)
- the status of income from sale of recycled phosphate products is unclear: does this go to the water company or returned to the consumer ?

Further actions in the UK

Participants confirmed interest to maintain the momentum started by this meeting. A number of proposals were put forward:

- **Establishment of a UK 'group' within the European Sustainable Phosphorus Platform**, to facilitate information exchange, awareness raising, and address specific UK questions (phosphorus flow data, water utility funding)
- Andy Ross (Lees University) indicated that this could combine with activities in the **BioRefine** project (meeting: 19-20 November, Manchester see www.biorefine.org)
- Richard Brindle presented the future meetings on "**Sludge and phosphorus management in Europe, present and future**", organised by the End-o-Sludg project (see SCOPE Newsletter 96) in London 3 December 2013 and Brussels 11 December 2013 www.end-o-sludg.eu
- **Develop a 'catalogue' of competence and actors in the UK**, active in phosphorus management: technology suppliers, operational phosphorus recycling installations, R&D support, scientific/expertise … **Communication on the European Sustainable Phosphorus Platform website** www.phosphorusplatform.org