European Sustainable Phosphorus Platform
www.phosphorusplatform.eu - Twitter: @phosphorusfacts
c/o European Partners for the Environment (EPE)
av. Tervuren 216, B-1150 Brussels, Belgium
Secretariat: Chris Thornton +33 474 93 07 93 +33 680 72 70 75 info@phosphorusplatform.eu

European Sustainable Phosphorus Platform response to the stakeholder consultation on Horizon 2020 Societal Challenge 5:

http://ec.europa.eu/programmes/horizon2020/en/news/consultation-stakeholders-horizon-2020-societal-challenge-5

Brussels 15th June 2014

Q1: What is the biggest challenge in the field concerned which requires immediate action under the next Work Programme? Which related innovation aspects could reach market deployment within 5-7 years?

- The biggest challenge is to **move from wastewater treatment to resource recovery**: in particular, recovery of energy, carbon compounds, nutrients (phosphorus, nitrogen, potassium, magnesium …) and water.
- This must be approached both by both
  - (1) developing **end-of-pipe systems or plug-in installations** for nutrient reuse or recycling, which can be integrated into existing wastewater infrastructure (which will remain widely in place for the coming 15-30 years),
  - and (2) **forward-looking rethinking of the wastewater management cycle** with innovative system concepts where recovery is an integral part of treatment.
- R&D should address both development of technologies and processes which are already operational at the pilot stage and **implementation and demonstration** of processes where first full-scale installations already exist, but also innovative research into new approaches to resource recovery
- Nutrient recovery and reuse from biosolids treatment steams are a key challenge, in particular **phosphorus reuse and recycling**, in order to ensure sustainability of biosolids management.
- Innovation aspects which could reach significant market deployment within 5-7 years include
  - (1) **P-recovery processes generating high quality, concentrated, phosphate secondary raw materials**
  - and (2) processes to produce reliable quality, consistent, stable, saleable inorganic, organo-mineral or organic **nutrient-rich fertiliser products from biosolids, including composts, digestates** and products produced by processing these
- It is important to ensure synergy and technology transfer (rather than parallel R&D and duplication) between wastewater R&D (in particular biosolids stream treatment technologies and management routes), and **work on other wastes such as livestock manures, food wastes, food industry waste streams, animal / bone by-products**

Q2: What are the key assumptions underpinning the development of these areas (research & innovation, demand side and consumer behaviour, citizens' and civil society's concerns and expectations)?

- Recent recognition of **phosphate rock as an EU Critical Raw Material**, and the need to diversify supply by developing reliable secondary sources of phosphates
- Ongoing **pressures to further reduce eutrophication**, driven inter alia by the **EU Water Framework Directive** water quality status objectives, by tightening phosphorus and nitrogen discharge limits from wastewater treatment plants and from other wastes (manures, agro-industry, anaerobic digestion facilities …)

- The development of energy recovery or other organics recovery processes from biosolids or in sewage works (**anaerobic digestion, polymer, biofuel recovery, pyrolysis …).** This inevitably leads to nutrients in the outflow stream requiring management, in particular phosphorus which is not lost or eliminated, and so generates opportunities for phosphate recovery
- Continuing **concentration of populations** in urban areas leads to an increasing spatial mismatch between sewage biosolids supply and agricultural use opportunities, so that the development of processes which enable the processing, storage and transport of processed biosolids or nutrients over distance to regions with agricultural needs is increasing. The same trend applies to livestock manure, as **animal production is increasingly concentrated in specialised regions**, which face large phosphorus surpluses, and so need to implement recycling processes to make nutrient products which can be transferred to regions needing fertiliser supply.

Q3: What is the output that could be foreseen, what could the impact be, what would success look like, and what are the opportunities for international linkages?

- The EU27 imports 92% of phosphate rock and derivatives for agriculture[1], equivalent to 1'250'000 t of phosphorus per year[2].
- The potential output from phosphate recovery from wastewater can be calculated from the current use of sludge. More than 50% of the phosphorus in the sewage sludge from the wastewater stream is lost in landfills[3], which corresponds to 12% of the phosphorus provided by mineral fertilizers and feed additives in agriculture. The phosphorus lost in the wastewater stream in the EU27 could substitute phosphorus imports for fertilizer and feed worth over 0.2 billion € (in equivalent Triple Super Phosphate fertiliser prices).
- Phosphorus recovery offers opportunities for technology and know-how transfer to other continents facing comparable nutrient management challenges in wastewater treatment and manure treatment :
    - developed regions facing regional nutrient surpluses and the need to implement phosphorus recovery and recycling technologies: North America (cf. establishment underway of North America Phosphorus Partnership), Japan (cf. P-Recycling Council) and China (increasing concentration of livestock, pressure for sustainable water treatment)
    - developing countries, facing the need to use sewage and manure biosolids sustainably and safely in local agriculture (peri-urban, rural), often in situations where wastewater treatment is inadequate

[1] European Commission, 2013 : Consultative Communication on the Sustainable Use of Phosphorus

2 Eurostat, 2011/2012. [Online] Available at: http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Agri-environmental_indicator_-_mineral_fertiliser_consumption

[24 03 2014].

Inorganic Feed Phosphates, CEFIC, 2009, The contribution of Inorganic Feed Phosphates to European soils

3 Environmental, economic and social impacts of the use of sewage sludge on land, part I: Overview report, milieu Ltd, WRc, RPA, 2010.

Q4,: Which are the bottlenecks in addressing these areas, and what are the inherent risks and uncertainties, and how could these be addressed?
and Q5: Which gaps (science and technology, markets, policy) and potential game changers, including the role of the public sector in accelerating changes, need to be taken into account?

- issue of safety of recycled nutrient products, in particular **organic contaminants** (pharmaceuticals, hormones, organic industrial chemicals)
- **farmers' uptake of recycled nutrient products**, including integration into farm supply distribution systems, information and understanding by farmers, agronomic benchmarking, compatibility with existing farmers' equipment and practices
- **societal acceptance**, including consumers, supermarkets, food supply merchants, agro-food industry
- **regulatory complexities** of homologation and placing on the market of recycled nutrient products, mechanisms for encouraging nutrient recycling within the CAP, **norms and product standards** for recovered and recycled products
- lack of **demonstration references on the agronomic efficiency** of recycled nutrient products (both inorganic recycled fertilisers and organic recycled products / processed biosolids) in a range of soil types and for a range of crops, to compare with conventional fertilisers, including assessment of nutrient losses (risk of contribution to eutrophication)

Q6: In which areas is the strongest potential to leverage the EU knowledge base for innovation and, in particular, ensure the participation of industry and SMEs? What is the best balance between bottom-up activities and support to key industrial roadmaps?

- **need for the final stage of RTD, that is full-scale construction and demonstration operation over significant timescales** of currently pilot scale technologies, with assessment of economic and technical performance, industrial reliability, assessment of environmental impact (LCA) and cost assessment. Such full scale plants are needed in different EU countries to ensure demonstration.
- **need to collate existing research information** and test/pilot process data to avoid duplication
- **importance of collaborative platforms** to ensure the links between different actors concerned: wastewater treatment companies and engineering, manure and waste processing operators, regulators, NGOs/society, knowledge institutes, end-users of recovered nutrient products (industry, including innovation SMEs, fertiliser sector, farmers)

Q7: Which areas have the most potential to support integrated activities, in particular across the societal challenges and applying key enabling technologies in the societal challenges and vice versa; and cross-cutting activities such as social sciences and humanities, responsible research and innovation including gender aspects, and climate and sustainable development? Which types of interdisciplinary activities will be supported?

- because of the complexity of nutrient reuse and recycling (different types of recovered/recycled nutrient products, from inorganic to organic; range of application areas including different types of wastewater treatment system, manure treatment, food waste, industrial wastewater streams; agronomic data for use in different regions or on different crops …), it is necessary to **develop tools to collect and organize information, making it accessible and comprehensible to stakeholders and companies in different sectors** who speak different languages and have different modes of functioning (water industry, chemicals, food, fertilisers, …)