

European Sustainable Phosphorus Platform

Regulation and policy

EU Fertiliser Regulation proposal released

The European Commission made public on 18th March the draft text of the revised Fertilisers Regulation, which will cover recycled and organic fertilisers and soil amendments.

International Green Deal: North Sea Resources Roundabout

Green Deal signed by 24 parties to facilitate cross-border resource recycling within the North Sea Region.

EU Court of Justice

Portugal, Spain, Greece condemned for failure to adequately treat sewage. France, UK pending judgement.

BSAG-ESPP: Baltic region nutrient platform

BSAG will act as and be recognised as the regional nutrient platform for the Baltic Sea region.

Consultations

EU Consultation on H2020 R&D programme

Public consultation on the Horizon2020 work programme for environment, resource efficiency and raw materials. Deadline 8th April

WERF call for information on struvite

Call for input from sewage works operators on struvite deposit issues to support research into solutions.

Industrial phosphorus recycling

ICL acquires P4 recycling technology

ICL has acquired the Recophos technology which uses thermal induction to recover white phosphorus (P4) from ashes and other wastes.

Ecophos: recycling phosphorus into animal feed phosphates

Ecophos starts plant construction in Dunkerque, France, and announces September inauguration of industrial pilot, Varna, Bulgaria

SCOPE NEWSLETTER

France's first full-scale struvite installation

Naskeo P-recovery in operation at Castres municipal sewage works, South-West France

Food and farming

Milan manure processing seminar

Research meeting looks at innovative processes for manure treatment for nutrient and energy recovery

Concern about soil degradation

The UK's leading organic farming organisation says soils are in danger and makes proposals for soil restoration

Food chain nutrient footprint tool

Simple N and P footprint for food production and consumption

Circular Economy

Policies to enable the circular economy

POLFREE and DYNAMIX: green tax shift is essential to enable circular economy, specific tools need to be developed for the circular bio-economy and nutrients.

Updated events listing online at:

http://www.phosphorusplatform.eu/events/upcoming-events

To add your event, please contact info@phosphorusplatform.eu



20th April Helsinki

Launch of Finland national nutrient recycling programme and international meeting between companies and Finland regulators, farmers, companies, water industry. Programme and registration, Finland Ministry website http://mmm.fi/en/recyclenutrients



Regulation

EU Fertiliser Regulation proposal released

The draft text of the revised EU Fertilisers Regulation has now been released by the European Commission, defining how recycled nutrient and organic carbon products can be placed on the market across Europe (CE Mark) as fertilisers or soil amendments. This will now be subject to consultation and discussion by Member States (Council) and the European Parliament, with an objective of final adoption in 2017-2018.

This is a major action of the Commission's Circular Economy Package, *published* 2nd December 2015, see SCOPE Newsletter n°118. It is welcomed by European Sustainable Phosphorus Platform (ESPP) as a strong positive step forward for nutrient recycling and the biomaterials circular economy.

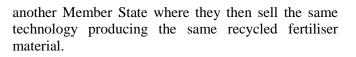
The released text already includes criteria for **composts** and **digestates**. In parallel to this, as proposed by ESPP, the Commission has launched work led by the EC Joint Research Centre (JRC). The goal is to define criteria for **struvite**, **ash-based materials** and **biochars**, with the aim of finalising these in the coming year or so, in order to add them into the new Regulation as soon as it is finally adopted.

Materials conform to the criteria of the new Regulation will be considered "products", will be able to be traded and sold in all EU countries and will automatically cease to be considered as "waste" (End-of-Waste status). The **Waste Framework Directive** and the **Animal By Products Regulation** will be modified to ensure coherence with the product status of fertilisers conform to the new Fertilisers Regulation criteria and validation process.

Stability for investment in recycling

The revised EU Fertilisers Regulation will enable placing on the European market (CEMark) of recovered nutrient products, so enabling inter-state trade of these materials. Additionally, it will offer other advantages.

By defining European criteria, it will **enable** recovered fertiliser products from the same process to be sold as fertilisers in different countries: at present, a technology supplier who obtains authorisation for a recycled material in one country, must start a new fertiliser authorisation procedure in



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Furthermore, the new Regulation will fix stable and recognised specifications and criteria for recovered fertiliser products, and so facilitate investment in nutrient recycling technologies.

Member States will also be able to maintain or implement **national regulations** authorising other types of recycled materials as fertilisers or authorise agricultural use under waste-type controlled spreading regulations.

Comment and input

ESPP will prepare in coming weeks a detailed position and comments on the proposed EU Fertiliser Regulation revision text, including both proposals on core questions such as traceability, proposals on how the different Product Function Category and Component Material Category criteria are defined and comments where appropriate on the proposed contaminant and quality criteria.

For example, currently **traceability** is not considered in the proposed revised Regulation: once a recovered organic product becomes a CE fertiliser product, then it can be placed on the EU market and exported without any trace of which organic materials were used as input, or from which farms or sources these materials came.

> Your input is welcome and can be sent to info@phosphorusplatform.eu

Sewage sludge

In the proposed Regulation text annexes, sewage sludge is excluded as an input material to composts and digestates.

As above, however, sewage sludge can continue to be allowed to be used in fertiliser products in countries with national fertiliser criteria which authorise this. For example, **France has End-of-Waste criteria authorising sewage sludge in compost products**.

Sewage sludge use will also continue under waste-type monitored spreading plans, as at present in the majority of EU Member States where sewage sludge is valorised in agriculture.

Proposed input materials for composts and digestates

The proposed Regulation annex texts specify the following as (proposed) **acceptable input materials for composts and digestates (subject to contaminant and processing specifications**):

• municipal biowaste separately collected at source and similar

- but NOT bio-waste separated mechanically or otherwise from mixed collected municipal solid waste

- animal by-products Cat 2 and 3 - this includes manures
- animal and plant materials
- are specifically EXCLUDED: sewage sludge, industrial and dredging sludges
- •

Recycled fertilisers and soil amendments

The proposed Regulation is structured with **two annexes** defining the types of fertiliser and soil amendment which can be placed on the European market, what types of virgin and recovered input materials are acceptable, and what contaminant and quality criteria apply:

- Annex I = Product Function Categories
- Annex II = Component Material Categories

Annex I – Product Function Categories (PFC)

This specifies that products can be sold (only) as one of the following categories, fixing **contaminant levels and nutrient concentrations and/or carbon content and/or other product criteria** for each of these categories:

• Organic fertiliser

- must have e.g. at least 15% organic carbon (as organic C) for solid fertilisers

• Organo-mineral fertiliser

- co-formulation of an inorganic fertiliser (as defined by the revised Regulation) and an 'organic material'
- must have e.g. at least 7.5% organic carbon (as organic C) for solid fertilisers

• Inorganic fertiliser

any fertiliser "other than an organic or organomineral fertiliser" (as defined above)
subject to minimum nutrient concentration specifications, e.g. for a "Straight solid inorganic macronutrient fertiliser" one or more macronutrients (10% nitrogen as N or 12% phosphorus (P) as P₂O₅)

• Liming material

• Soil improvers

- organic, made of material of exclusively biological origin (not petrochemical)

- inorganic = any other soil improver
- Growing medium
- Agronomic additives:
 - nitrification or urease inhibitor
 - chelating agent
 - complexing agent
- Plant biostimulant: microbial, non-microbial
- Blends of the above

Editor's note: this appears to mean that any fertiliser product (conform to the other criteria) which has <7.5% or <15% (to be clarified) organic carbon (C) (for solids) could be classified as an "inorganic fertiliser".

Annex II – Component Material Categories (CMC)

This specifies the **list of materials which can be used as fertilisers or used to produce fertilisers** (or other Product Function Categories).

This means that, to be sold as (or used in) a European CE Mark product, a recycled material must correspond to both Component Material Category criteria (one such category) and to Product Function Category criteria (for the product type as which it is being sold).

The following material categories are authorised in the proposed revised Regulation text:

• Virgin materials: materials which have never been by-products or wastes

Editor's note: this is in effect minerals such as phosphate rock, mineral nitrogen produced by industry, but presumably also products which are deliberately produced by e.g. extraction from algae or from petrochemicals.

Editor's note: a bio-sourced molecule such as a mineral phytic acid salt would be an eligible material under this PFC if grain was grown specifically to produce the phytate which was then reacted with mined minerals, but not if the same phytate was extracted from a by-product of food processing of the same grain

• Plants and plant extracts

- water extracted, dried, mechanically processed, etc.

• Compost

- see above regarding limitations on input materialsprocessing and product stability requirements
- (oxygen uptake or self-heating)

- specific product contaminant limits for PAH and macroscopic impurities (these are applicable in addition to the relevant contaminant limits for the Product Function Category under which the compost is sold)

• Energy crop digestate

- including from algae (but not from blue-green algae)

- processing and product stability requirements (oxygen uptake or residual gas potential)

• Other digestate

- see above regarding limitations on input materials (same as for composts)

- processing and product stability requirements (oxygen uptake or residual gas potential)

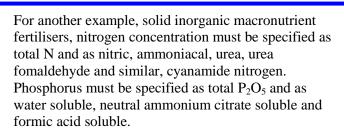
- the same specific product contaminant limits as for composts (PAH, macroscopic impurities)

- **Certain food industry by-products** (the following three by-products only):
 - food lime
 - sugar molasses
 - fermentation vinasse
- Specific micro-organisms
- Agronomic additives
- **Nutrient polymers** made of virgin materials Editor's note: this excludes nutrient polymers produced from bio-sourced materials
- **Polymers** added to fertilisers to control water penetration, water retention - subject to specified biodegradability and toxicity criteria
- Certain animal by-products
 - this table is not yet included in the released draft

Labelling

The Regulation proposal also includes (Annex III) labelling requirements for the different Product Function Categories.

For example, labelling for a CEMark organic fertiliser will have to specify a **list of declared nutrients**, the **concentration of main nutrients** (organic nitrogen and ammoniacal nitrogen, phosphorus as total P_2O_5 , Mg, Ca, S, Na), **organic carbon**, and also copper and zinc if higher than 200 and 600 mg/kg dry matter respectively, dry matter.



Contaminant limits

The proposed Annex I Product Function Category (PFC) specifications set contaminant limits levels for each of the different PFCs.

For example, **for organic fertilisers, the following contaminant limits are proposed** (mg/kg dry matter):

-	Cadmium (Cd)	1.5
-	Chromium (Cr VI)	2
-	Mercury (Hg)	1
-	Nickel (Ni)	50
-	Lead (Pb)	120
-	Biuret (carbamylurea)	12
-	Salmonella:	absent in 25g sample

- E. coli or Enterococcaceae 1000 CFU/g fresh mass

Cadmium limit

For inorganic macronutrient fertilisers (>5% P_2O_5) a cadmium limit of 60 mg/kg P_2O_5 reducing to 40 mg/kg P_2O_5 after three years and to 20 mg/kg P_2O_5 after twelve years (from date of publication of the new Fertilisers Regulation).

Editor's note: it can be expected that these proposed cadmium limits for mineral phosphate fertilisers will be the object of considerable discussion between concerned industry, Member States and the European Parliament. At present, there are no EU cadmium limits in fertilisers.

Struvite, ash, biochars

For struvite, ash-based materials and biochars, the European Commission does not yet have available criteria agreed by stakeholders and ready to include in the new Regulation. Therefore, ESPP proposed to **engage the process of defining these criteria in parallel to the Fertiliser Regulation adoption process.** This adoption process requires Council and European Parliament decision is now launched with the publication of the draft Regulation and is expected to be completed in 2017-2018.



The European Commission commissioned its JRC (Joint Research Centre) to draft criteria for these three materials (struvite, ash-based materials and biochars), to add into the revised Fertiliser Regulation Annex II (as additional Component Material Categories) as soon as the new Regulation is published.

A task description for this work was presented to the EU Fertilisers Working Group (of which ESPP is a member) and was signed by the European Commission (DG GROW) to JRC late 2015. This document is not public but is **available on request**.

The task description given to JRC is to develop "Nutrient recovery rules for waste, biological materials and industrial by-products. Process and product criteria for struvite, biochar and ash-based products for use in fertilising products".

DG GROW is also in the process of defining an impact assessment for the integration of these three types of product into the new Fertiliser Regulation, also to be realised by JRC. JRC and DG GROW are expected soon to release a call for experts to support JRC in these tasks.

ESPP proposed criteria for struvite, ash-based materials and biochars

ESPP's objective is to facilitate and move forward this development of proposed EU fertiliser criteria for struvite, ash-based materials and biochars, as additional Fertiliser Regulation Component Material After consultation of Categories. concerned stakeholders and companies, ESPP has already prepared, proposed criteria outlines for struvite and for ash-based materials. A draft for biochar criteria is also underway.

These available documents are at www.phosphorusplatform.eu/regulation and further **comments and input are welcome** and can be sent to info@phosphorusplatform.eu

EU Commission summary memo of revised Fertilisers Regulation proposals http://europa.eu/rapid/press-release_MEMO-16-826_en.htm and press release 17th March 2016 http://europa.eu/rapid/press-release_IP-16-827_en.htm

Revised EU Fertilisers Regulation proposed text, annexes and impact assessment http://ec.europa.eu/DocsRoom/documents/15949



International Green Deal North Sea Resources Roundabout

Ministers from Flanders, France, the Netherlands, and the UK have signed on March 3rd a North Sea Resources Roundabout (NSRR) Green Deal to facilitate resource recycling, by identifying and addressing regulatory barriers, supporting investments and sharing experience. Metals, compost and PVC are the first materials addressed, and struvite (recycled phosphate) is planned to be added rapidly.

The Deal commits ministries for economy, agriculture. environment and rural affairs as well as national inspectorates, together with 20 companies and other stakeholders, in particular national inspectorates and Green Alliance UK and Acceleratio Netherlands, who were the key initiators of the process.

The Green Deal will address up to ten specific materials, in each case bringing together key industries, both producers of wastes which are a potential resource for recycling, processing companies and market users of secondary products. Together with regulators from the signatory governments and stakeholders, barriers to recycling and to cross-border trade in secondary resources will be identified and solutions proposed.

The objective in particular is to facilitate movement of secondary resources from producing regions, e.g. with waste resources or processing industries, to consumer market regions. Waste regulations, transport and storage regulations and market standards will be assessed to facilitate viable sale of recycled products.

Compost

The Green Deal annex for compost is already signed, targeting compost use as a fertiliser in agriculture and bringing together three companies, ministries of health, consumer affairs, environment and economy from the Netherlands and the UK, with the European Commission as observer.

The signature companies are:

• **Twence** (Netherlands *www.twence.nl*) waste and energy, who produce compost from 120 000 tonnes/year of biowaste, planned to triple by 2017 with extension of waste source separation and sorting.

- **Comgoed** (Netherlands *http://comgoed.nl*), producing 300 000 tonnes/year of compost and organic fertilisers
- President Estate Farming Partnership (Berwick, UK), trader and supplier of fertilisers

The partners identify as barriers the classification of manure-containing compost as waste (animal byproducts Cat. 3) in the Netherlands, which increases obstacles to and costs of transport (need for certification of harbours, storage buildings) - whereas in the UK an End-of-Waste status for compost is in place.

The partners will compare quality, regulatory and enforcement protocols and look for solutions using possibilities and flexibilities in existing legislation.

The other two secondary material value-chains already signed into the Green Deal are rigid PVC and nonferrous metals concentrate extracted from municipal waste incineration bottom ash.

Struvite, digestate

ESPP will coordinate input from struvite producers and potential users in the North Sea Resources Roundabout (NSRR) Green Deal signature territories (Flanders, France, Netherlands, UK) to propose integration of struvite (recycled phosphates) for use as fertiliser as a next case study. This could facilitate placing on the market and cross-border transport of struvite which is currently hindered because some countries have regulation in place authorising use of recovered struvite as fertiliser (Denmark, Netherlands, UK, Germany) whereas others do not (France).

Lack of regulatory clarity and coherence regarding the waste status of recovered struvite poses further obstacles to transport, to sale as fertiliser, but also to use in fertiliser blending or in production of soil improving products (e.g. nutrient enrichment of compost).

These regulatory questions around struvite should be resolved by the proposed inclusion into the future EU Fertiliser Regulation (see above), once the revision process for this Regulation is completed. The EU Commission has contracted its JRC (Joint Research Centre) to prepare criteria for struvite as an EU labelled fertiliser in this process. However, this regulatory revision process will not be before probably 2018. The North Sea Resources Roundabout should be able to achieve rapid, operational solutions to move forward before that date.



The North Sea Resources Roundabout could also usefully address **digestate**, where there are also important obstacles to placing on the market as fertiliser, including questions about waste status, REACH, and the difficulty of obtaining fertiliser authorisation for a product which is by nature variable depending on the substrate, digester operation and post-treatment.

Green Alliance UK "North Sea Resource Roundabout -Developing solutions for trading recycled material across borders" http://www.green-alliance.org.uk/NSRR.php

Acceleratio 3/3/2016 http://www.acceleratio.eu/the-launch-of-thenorth-sea-resources-roundabout/ @AcceleratioEU and video http://www.acceleratio.eu/the-north-sea-resources-roundabout-invideo/

EU Court of Justice

The European Court of Justice has found both Portugal and Spain guilty of failing to adequately treat municipal wastewater, under actions brought by the European Commission under the Urban Waste Water Treatment Directive 1991/271/EEC.

The UK and France are also facing legal actions for Water Treatment Urban Waste Directive implementation. Poland and Greece were condemned last year (see SCOPE Newsletter n° 119), with Greece facing up to 26 million €plus 55 000 €per day fines.

Spain

Spain has been condemned for **failure to adequately** treat sewage in four agglomerations (Berga, Figueres, Banyoles and Pontevedra – Marin – Poio – Bueu). Three of these four cases are the legal responsibility of Galicia and Catalonia, and only one the Spanish federal government.

The case illustrates Spain's progress as much as failure, in that the initial Commission court action concerned 39 agglomerations, of which only four today are still non conform.

Portugal

Portugal has been condemned for failing to treat sewage in 44 small agglomerations, of which five now have sewage works operational.

Again this shows both the failure and success in Portugal, in that the Commission's initial action in 2009 indicated 186 agglomerations.

Eutrophication sensitive areas

A recent report (using 2011/2012 data) by the European Commission indicates that recent EU Member States (EU-13) are having difficulties implementing the Urban Waste Water Treatment.

average EU particular. compliance for In phosphorus removal in eutrophication "Sensitive Areas" is 88%, whereas in the EU-13 it is below 32%. Malta, Latvia and Bulgaria achieve less than 10% compliance. In these areas, tertiary treatment (phosphorus removal) is required in agglomerations of 10 000 person equivalent or higher (generally population around 6 000 taking into account industrial and commercial discharges).



75% of Europe's territory is now classified as a eutrophication "Sensitive Area". 15 Member States have designated their whole territory, whereas 13 have designated only areas specifically identified as showing eutrophication problems.

The new Member States are achieving better however for **sewage collection and secondary treatment**, with compliance rates of 90% and 70%. Compliance was significantly better in urban than rural areas.

The Commission estimates that **92% of Europe's** sewage receives adequate secondary (biological) treatment, up ten percentage points from the last report two years ago.

European Court of Justice judgement 28th January 2016 Case C - 398/14, European Commission vs. Portuguese Republic http://curia.europa.eu/juris/document/document.jsf?text=&docid=1 73916

European Court of Justice judgement 10th March 2016 Case C -38/15, European Commission vs Kingdom of Spain http://curia.europa.eu/juris/document/document.jsf?text=&docid=1 74933

"Eighth Report on the Implementation Status and the Programmes for Implementation (as required by Article 17) of Council Directive 91/271/EEC concerning urban waste water treatment", SWD(2016)45

https://ec.europa.eu/transparency/regdoc/rep/1/2016/EN/1-2016-105-EN-F1-1.PDF



BSAG-ESPP:

Baltic Sea region nutrient platform

The Foundation for a Living Baltic Sea/Baltic Sea Action Group (BSAG) and the European Sustainable Phosphorus Platform (ESPP) have signed a convention to cooperate in joint projects and develop sustainable nutrient management in the Baltic Sea region.

BSAG will act as and be recognised as the **regional "Nutrient Platform" for the Baltic Sea region**, region as defined by HELCOM. BSAG also becomes a legal **member of ESPP** from 2016.



ESPP and BSAG will both

participate in the conference organised by the Finland Government to launch the Finland national pilot programme for nutrient recycling and the international workshop on nutrient recycling, **Helsinki**, **19-20th April** *http://mmm.fi/en/recyclenutrients* and in the Nordic Phosphorus Conference, organised by the Danish Waste and Ressource Network Denmark (DAKOFA), the Norwegian Waste Management and Recycling Association (Avfall Norge) and the Swedish Waste Management Association (Avfall Sverige), **27-28th October 2016 in Copenhagen**.

Baltic Sea Action Group BSAG http://www.bsag.fi/

Consultations

EU Consultation on H2020 R&D programme

The European Commission has opened a public consultation on Horizon 2020 R&D funding, programme "Climate Action, Environment, Resource Efficiency and Raw Materials - Work Programme 2018-2020". Consultation is open until 8th April 2016.

H2020 Societal Challenge 5 aims to: "achieve a resource and water efficient and climate change resilient economy and society, the protection and sustainable management of natural resources and ecosystems, and a sustainable supply and use of raw materials, in order to meet the needs of a growing global population within the sustainable limits of the planet's natural resources and eco-system".

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Based on a five page background document, stakeholders are asked to address the following questions, supported by evidence such as R&D trends or market opportunities:

- What challenges require action in the areas of "Climate action, environment, resource efficiency and raw materials"?
- What impacts and outputs ?
- What are the **gaps** (in science, policy, markets ...) and game changers to take into account?
- Where are **horizontal aspects** important (social sciences, responsibility, gender, international cooperation)?
- In the current socio-economic and policy context, what are **emerging priorities** ?

European Commission, 16th March 2016 "Consultation on 2018-2020 Work Programme of Societal Challenge 5 Climate Action, Environment, Resource Efficiency and Raw Materials" https://ec.europa.eu/programmes/horizon2020/en/news/consultatio n-2018-2020-work-programme-societal-challenge-5-climateaction-environment-resource

Deadline for response: 8th April 2016

WERF call for information on struvite

WERF (the Water Environment Research Foundation) is calling for information from waste water treatment plant operators concerning struvite deposits, to support research the causes of these issues and how to address them.

The declared objective of the project is to use waste carbon dioxide (CO₂) to prevent struvite deposits. Editor's note: Although this seems contradictory to solutions involving struvite recovery as a fertiliser product, for phosphorus and nitrogen recycling, there may be synergies in that the CO_2 may degas in sludge treatment, so concentrating struvite precipitation at a process point where recovery can be implemented.

As a first stage, interested waste water operators encountering struvite deposit issues are invited to contact WERF and send a 2 litre sample for water chemistry analysis.

WERF NTRY9T15 Struvite Control

http://www.werf.org/c/KnowledgeAreas/Resource_Recovery/Links /2016/Opportunity_to_Help_Solve_Struvite_Issues_.aspx



Ecophos P-revcling to animal feed phosphates

Ecophos (Aliphos) has started construction of its 75 million Euros plant to produce animal feed grade calcium phosphates from secondary materials and low-grade phosphate rock, in Mardyck, near Dunkerque France.

also announced Ecophos has the formal inauguration of its industrial demonstration plant in Varna, Bulgaria, in September, with production starting there in June.



These industry developments will open world access to producing quality phosphate products from new resources, by using raw materials which are not currently used in the phosphate and fertiliser industries: secondary phosphates (such as waste incineration ashes) and low grade phosphate rock (rock containing minerals which are incompatible with mainstream phosphoric acid production processes using sulphuric acid).

The Mardyck plant will start operation in 2017 and will produce 220 000 tonnes/year of animal feed grade dicalcium phosphate. The new factory is implanted in the industrial port zone, previously the site of a Total oil refinery.

The plant will use as input, secondary raw materials such as sewage sludge incineration ash, meat and bone meal ash and low grade phosphate rock.

A contract has already been signed with SNB (Slibverwerking Noord-Brabant) and HVC Groep, Netherlands, to take **60 000 tonnes/year of sewage sludge incineration ash, so recycling around 4 000 tonnes of phosphorus (P) per year** (see SCOPE Newsletter n° 111).

Varna, Bulgaria

The 'Grand Opening' of the Ecophos (Aliphos) plant in Varna Black Sea port zone, Bulgaria, is announced for September 2016, after production will already start in June. This will ensure that the inauguration will see experience of a fully operational process.

The Varna plant is an **8 000 tonnes/year industrial** scale demonstration plant.

The new plant is situated next to the Aliphos (previously Decaphos) existing Devnya plant, with 100 000 tonnes/year capacity of animal feed phosphates production, in the Agropolychim petrochemical complex which under the Iron Curtain produced 1/20th of the world's phosphates.

The site benefits from accessibility to the Varna Black Sea port and the Danube river, enabling transport of raw materials (including sewage sludge and other incineration ashes) and finished products.

The Ecophos process will produce, in addition to animal feed grade dicalcium phosphate, silicates (to be sold as a soil improver), aluminium and/or iron chloride solution (marketable by-product) and a discharge of clean calcium chloride solution which can safely be released into the sea. The purification process removes heavy metals to a low-volume waste stream.

Ecophos www.ecophos.com

Ecophos Mardyck http://www.deltafm.fr/actu/actu-30358.html *and* http://ecophos-ccicotedopale.fr/09032016-lancement-du-chantier/ (*in French*)

"Bulgaria: the Aliphos factory, Devnya, a passion for phosphates" (in French) http://www.revue-alimentationanimale.fr/ailleurs/bulgarie-a-lusine-aliphos-de-devnya-la-passiondes-phosphates/

Ecophos technology presentation (German UBA website) https://www.umweltbundesamt.de/sites/default/files/medien/378/d okumente/ruiter_ecophos_ecophostechnology.pdf



Industrial phosphorus recycling

ICL acquires P4 recycling technology

ICL (Israel Chemicals Ltd), already a frontrunner in recycling secondary materials into phosphate fertiliser, has acquired the Recophos technology (from SGCL Carbon GmbH). This thermal induction process, already tested at pilot scale, produces white phosphorus (P₄) from waste materials such as ashes, and potentially sludges.

White phosphorus is a vital, high-value, nonsubstitutable raw material used to produce a wide



range of derivatives, with very high purity levels, essential for a number of valueadded industry sectors (see list below).

Europe no longer has a P_4 producer and is **dependent** on imports from, in particular, Kazakhstan (transport across Ukraine), Vietnam (production reliant on cheap electricity from China) and China (China has implemented export obstacles on P4). This poses supply risks relating to transport reliability, distance and economic competition with Asia. The situation for white phosphorus is thus comparable to that of magnesium metal in the EU Critical Raw Materials list.

White phosphorus is usually made in an electric arc furnace by heating phosphate rock, gravel and coke to 1 500 °C (e.g. "Thermphos" process). The Recophos technology uses electro-magnetically induced heating of a reactor bed consisting of coke or graphite, and should enable phosphorus recovery with a better electrical energy efficiency. The process may also allow smaller production units to be potentially viable, although costs of safety, gas cleaning and input material presentation will impact on the economy of scale. Because of its dangerous characteristics, P4 or its derivatives require very specific competence and organisation for production, handling and transport. ICL has such industrial competence.

Phosphorus recovery from sewage sludge

The **Recophos process is adapted to use wastes** such as sewage sludge incineration ash or meat and bone meal ash as input materials, so enabling phosphorus recovery as high-value P_4 . With adaptation, it may also be able to **directly use sewage sludge** as input.

The Recophos process also claims to be able to recover phosphorus from raw materials containing significant levels of **iron** (such as sewage sludge incineration ash where iron salts are used for phosphorus removal to prevent eutrophication).

Kees Langeveld, Vice President Business Development at ICL states:

"We will turn sewage sludge into valuable raw materials. At ICL, we have a history of sustainable innovations and now we will find new ways to recycle waste. The RecoPhos technology will enable ICL to replace the sourcing of thousands of tons of high energy consuming phosphorus into Europe and the US and thus take us one step closer to a Circular Economy"

List of industry sectors and applications dependent on P_4 as a raw material (either P_4 directly or chemical intermediaries produced from P_4 , such as PCl_4).

- Pharmaceuticals:

 directly (phosphorus containing molecules), e.g.
 bone-active agents (bisphosphonates), treatment of arthritis, organophosphorus inhibitors for bacterial diseases
- indirectly, e.g. acid chlorides in synthesis of several families of pharmaceutical.
- Medical diet supplements and similar (e.g. osteoporis treatment, bowel purges ...)
- Vitamin production: triphenyl phosphine, synthesis of Vitamin A
- Toothpastes (fluorophosphates)
- Electronics grade phosphoric acid (currently not produced from MGA phosphoric acid)
- Doped semiconductors, LEDs
- Agrochemicals: pesticides and herbicides (e.g. glyphosate)
- Fumigation chemicals



ICL plans to manufacture several forms of phosphorus derivatives out of waste ashes and has announced the **objective of four full scale units in Europe and in the US**, indicating that the first full scale unit could be operational by 2018.

Recophos process and pilot trials: see SCOPE Newsletter n°112

ICL: http://www.icl-group.com

"ICL - Next Step Towards Sustainable Innovation. ICL acquires breakthrough phosphate recycling technology", 14th March 2016 http://www.prnewswire.com/news-releases/icl---next-step-towardssustainable-innovation-571973381.html

- Lithium ion batteries (cathode materials, electrolytes)
- Lubricants/lubricant additives
- Drilling additives (e.g. for shale gas and mining)
- Water cooling and air conditioning circuits (phosphonates), corrosion inhibitors
- Fire safety (substitution of halogenated flame retardants, protection of steel and wood structures in buildings from heat, fire safety in applications where low smoke emission is essential such as aircraft and transport fittings, public buildings). Some P-based fire safety chemicals are produced from phosphoric acid, but others are produced from P4
- Plastic additives (production of performance polymers for consumer and engineering applications, electronics ...)
- Catalysts and ligands in the chemicals and petrochemical/refining industries ...
- Electroless nickel plating (hypophosphites), e.g. used in IT hard disk drives
- Pyrotechnics (e.g. in transport safety applications), matches

France's first full-scale struvite installation

Naskeo Environnement, French SME specialised in anaerobic digester plants, is now operating the first full-scale struvite P-recovery installation in France, using the company's own design and technology, treating the digestate dewatering centrate of the Castres municipal sewage works. Naskeo is specialised in designing and building anaerobic digestion plants for organic wastes treatment (solid and liquid manure, wine effluents, green waste, agro-industrial wastes...). In order to optimise agricultural recycling of the digestate by lowering the P:N ratio, Naskeo has been working for several years on a **phosphate recovery process** through struvite precipitation (magnesium ammonium phosphate).

©phosphorusfacts





The development of the process has now reached the industrialisation stage. 2014. Naskéo In constructed and is now operating a full-scale struvite recovery plant the municipal in wastewater treatment plant (WWTP) of

Castres, South West France. The Castres works treats sewage for a population of around 130 000 p.e. operating **biological phosphorus removal**. The sewage sludge is anaerobically digested, producing biogas used for electricity and heat cogeneration.

The **digestate will be recycled to local agriculture** (crops include maize, alfalfa, wheat)

The Naskéo struvite installation in Castres treats up to $120 \text{ m}^3/\text{day}$, which represents 100% of the sewage work's digested sludge dewatering centrate flow, and produces around 25 tonnes of struvite a year.

The phosphorus recovered in the process represents c. 13 % of the total phosphorus flow to the sewage works. This allows to **improve biological phosphorus removal performance** and to ensure compliance with phosphorus discharge consents.

The struvite precipitation is performed in a **Naskeodesigned fluidised-bed reactor** where magnesium is added. In order to reduce the operating costs of the process and the environmental impacts, the magnesium reactant used is a **magnesium oxide** (**MgO**) **containing by-product**, supplied by TIMAB industries by-product of production of magnesium.

The struvite recovery installation has now been in operation for a year, and the main objectives have been reached:

- **Recovery** of 90% of the phosphorus present in the centrate flow treated
- Validation of the environmental safety agronomic performance of the struvite, by RITTMO Environnement, with the objective of preparing a France fertiliser registration dossier

The struvite will be tested this year (2016) in field tests with local partners: four golf courses, Castres city green spaces, full field trials on maize.

http://naskeo.com/



Characteristics of the Naskeo struvite P-recovery installation, Castres WWTP (nominal capacity)		
Ammonium Recovery	5 NH ₃ kg/day	
Phophorus recovery	12 kg P /day	
Struvite Production	90 kg/day dry weight	
Phosphorus removal in the reactor	85 – 90 %	
Part of total sewage works inflow P recovered	13 %	

Food and farming

Milan manure processing seminar

A seminar on manure processing was organised by Gruppo Ricicla (Biomass and Agri-Energy Laboratory) on 21-22 March 2016 at the University of Milan, within the programme "Novel approaches towards a sustainable agroindustry".

The seminar was led by Erik Meers, Ghent

University, Fabrizio Adani, Università Degli Studi di Milano.

The first session addressed "Manure processing and treatment of agricultural effluents Improved".

Natalia Donoso, Ghent University, presented manure processing by means of **constructed wetlands** (CWs) as tertiary treatment and the reuse of the treated effluent for drinking or irrigation water. Implementation throughout small waterways to decrease nitrate concentrations were discussed.

Constructed wetlands to treat manure

The problem of high concentrations of nitrates encountered in waterways throughout Flanders, due to manure surplus and diffuse pollution caused by intensive agricultural activities, was underlined. In-thefield validation has proved the effectiveness of CWs for treating the liquid fraction of livestock or piggery manure after it has gone through physical separation into liquid and solid fractions, and then through a biological treatment. The obtained nutrient removal rates and low concentrations of fecal coliforms are compatible with the reuse of the treated effluent. However, research still has to be done to achieve lower concentrations of salts and sulfide-reducing clostridia in order to achieve the aim of water reuse.

The environmental impact assessment of effluents from constructed wetlands in receiving watercourses concluded that **site-specific standards** based on local environmental conditions would allow more flexibility on the implementation of CWs for treatment of agricultural effluents and avoid oversizing. CWs were presented as interesting perspective to tackle diffuse nitrate pollution as long as there is reliable knowledge of insight flow dynamics and water quality of small watercourses, as well as available land.

Anacleto Rizzo, IRIDRA, Italy, presented pilot research into the use of aerated constructed wetlands to treat swine waste water. Possibilities of treatmeant enhancement and the use of less land area were considered as main objectives. Results showed effectiveness of CWs for nutrients removal, but lower performance for nitrogen removal. To address this, recirculation, incorporation of carbon sources, aeration and stripping have been considered as options to reduce nitrogen concentrations. Stripping techniques could enable nitrogen recovery for the use as fertilizer.

Digestate and bio-based fertilisers

In a session on "Improved Nutrient and Energy



Management through Anaerobic Digestion", Erik Meers, Ghent University, presented the position of anaerobic digestion as the biorefinery of the future, which allows both energy and nutrient recuperation.

Ivona Sigurnjak, Ghent University, presented trials on both laboratory and field scale, where the **agronomic performance of bio-based fertilizers** was compared with the currently used synthetic fertilizers. In these studies, the fertilisers potential utilization of animal manure, digestate, liquid fraction of digestate, mineral concentrate, struvite and effluent from constructed wetland was examined. Results show that tested bio-based fertilizers exhibited similar effects on crop production as currently used mineral fertilizers.

Remigio Berruto, UNITO, presented the **Digesmart** project *www.digesmart.eu* which aims to facilitate the market uptake of innovative solutions for the treatment, recycling and valorization of digestate. One technology is **ammonia stripping/scrubbing where ammonia is recovered by utilizing nitric acid** then used to produce mineral fertilisers. Current results indicate better nitrogen fertilizer value in ammonia nitrate solution (ammonia recovery with nitric acid) as compared to currently used ammonia sulphate solution (ammonia recovery with sulfuric acid).

Manure processing seminars within the programme "Novel approaches towards a sustainable agro-industry" http://users.unimi.it/ricicla/index_en.html

Food and farming

Concern about soil degradation

The UK's leading organic farming organisation, the Soil Association, has published a 20-page report explaining how soils are degrading, why this is important, and proposing seven actions to save soils.

The Soil Association says **UK soils are showing** increasing compaction, resulting in run-off accentuating flood risks, loss of organic matter and of nutrients.

Current UK regulations do not adequately address the issue: the Soil Association cites for example allowing maize stubble to count as providing adequate soil cover when evidence shows soil damage associated with maize cultivation.

Key role of organic matter

The Soil Association indicates that the key to restoring soil is to **increase soil organic matter** and proposes a

target of increasing organic matter in arable and horticultural soils by 20% over 20 years.

Increasing organic matter offers the following benefits:

- Healthy soil rich in organic matter can store up to 3 750 tonnes of water per hectare, so potentially reducing flood risks
- Soil water storage also makes soils more climate resilient and able to resist drought
- Removal or filtration of potential pollutants protects the quality of the underground water supply
- Reduced soil erosion. This is a major issue in the UK which contributes 5% of Europe's soil loss, despite occupying only 1% of Europe's arable land
- Carbon sequestration and reduction of agricultural greenhouse gas emissions. Studies suggest that UK arable and horticultural soils could sequester 1.3 million more tonnes of carbon every year.

Seven proposed actions

The Soil Association proposes the following actions to restore UK farm soil carbon:

• Recycle more plant and animal matter back into soils:

- improve manure recycling and agricultural use of composts

- stop subsidies to soil deteriorating practices, such as growing maize without a cover crop

- farmer information on these practices
- Ensure regular soil analysis
 - implement soil organic carbon testing
 - use Apps such as SOCiT and Farm Crap App
- Invest in soil biology R&D, including better understanding of impacts of agrochemicals
- Ensure cover vegetation using under-sown crops and cover crops, and convert vulnerable soils to permanent grassland
- Restore trees and hedgerows on slopes and to protect soils from erosion
- Limit practices which contribute to soil compaction: use lighter machinery, limit the number of passes, avoid over grazing, avoid traffic on wet land
- Improve crop rotations: longer and more varied rotations, include crops which build soil organic matter, use crops with varying root depths, where possible intersperse temporary leys (grassland) for grazing

"Seven ways to save our soils", The Soil Association UK, 2016, 19 pages and "Living Soils: A Call to Action", 28 pages http://www.soilassociation.org/soils



Food chain nutrient footprint tool

A simple nutrient footprint tool is proposed for food production and consumption and is tested for porridge oat flakes in Finland. The proposed method looks at inputs and losses of nutrients (N, P) at each stage of food production, processing, consumption and waste treatment, taking into account both virgin and recycled nutrients.

Potassium (K) is not considered because mineral reserves are less critical than for phosphorus and production is less energy intensive than for nitrogen fertilisers.

The proposed tool aims to consider both the total amount of nutrients used and the nutrient use efficiency in production of the food product, throughout the life cycle, taking into account virgin nutrients and recycled nutrients used and recycling of nutrients from the production process, whilst remaining easy to use and to understand.

Nutrient losses, waste and efficiencies

To do this, at each stage of production (crop growing, food processing, consumption, waste management), the inputs of virgin and of recycled nutrients are considered (N and P in kg / unit product) and also the outputs in terms of nutrients lost, nutrients wasted, nutrients in side products and nutrients reaching the next stage of the production chain.

In the nutrient outflows, "losses" (where nutrients are lost to the environment and are susceptible to cause damage = eutrophication) are distinguished from "waste" (where nutrients are transferred to a form or end-point where they cannot be reused, but do not cause damage, such as N_2 in the atmosphere or phosphorus in landfill of sewage sludge incineration ash).



Nitrogen footprint

This results in an overall conclusion for the product production chain in the form of e.g. "N footprint of 1000 kg of oat flakes is 42 kg N, of which 55 % was utilized by the product and 71 % in the entire production chain, including in side-products. Out of the captured (input) nutrients, 88% represented virgin nutrients and 12% represented recycled nutrients."

The method is demonstrated for the case of farm production of oats in Finland and processing to Raisio porridge oats. Agricultural nutrient use data was based on 350 field sectors, including information on fertiliser and manure use, seeds, pesticides, lime, harvested crops, soils and work operations.





Oat processing data was from the Raisio factory, and covered generated side-products, waste, wastewater, energy. Oat hulls, the largest side-product (25% by weight) are used in animal feeds, as are flours from cutting and flaking processes.

Nitrogen emissions in energy, storage and transport phase were calculated, as were N and P losses in fertiliser production, based on industry data.

For the consumption phase, it was assumed that 5% of porridge is left uneaten (estimated average avoidable food waste in Finnish households, Katajujuuri et al. 2014) and it is assumed that all nutrients taken into the body in food are excreted in urine and faeces.

Average Finland data for N and P fate in waste and wastewater treatment were used. For food waste, this suggests that around half of N and P will be recycled via anaerobic digestion or composting (AD&C). For wastewater, 96% of phosphorus is transferred to sewage sludge and 95% of this will be recycled (via anaerobic digestion and composting, then agricultural application).



For N in wastewater, however, only around 30% is transferred to sewage sludge (44% lost in discharged treated water and 26% lost to air as N₂ and N₂O), then around one third of N in composting of sludge is also lost, so that in total only around 22% of N in sewage is finally recycled.

Phosphorus footprint

Overall, the P footprint of 1000 kg of oat flakes is around 7 kg P, of which 55 % was utilized by the product and 99 % in the entire production chain. Out of the captured (input) nutrients, 88% represented virgin nutrients and 12% represented recycled nutrients.

Compared to the N footprint above, the better recycling level for phosphorus is apparent, related to the higher level of P-recycling in wastewater (use of sewage sludge on fields).

The authors underline that this simple tool does not, upstream, take into account the nutritional value of the product, which should logically be considered for food products.

Downstream, the tool does not take into account the impacts of nutrient losses (eutrophication, acidification, climate change), neither globally, nor locally (the local eutrophication impact of 1 kg N or P loss can vary from zero to highly significant, depending on whether or not receiving waters are eutrophication sensitive and on the connectivity between the use point and these waters.

These aspects should be addressed by LCA approach and by specific local production sustainability stewardship tools.

The tool does however provide a simple indicator of nutrient footprint, taking into account the desirable objective of nutrient recycling, appropriate for support of product chain design.

"Nutrient footprint as a tool to evaluate the nutrient balance of a food chain", Journal of Cleaner Production, vol. 112, part 4, 2429-2440, 2016 http://www.sciencedirect.com/science/article/pii/S0959652615013 694

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Circular Economy

Policies to enable the circular economy

The joint final conference of the EU projects POLFREE and DYNAMIX discussed public policy mixes to enable a "radical" change from a linear to a circular economy, necessary to achieve sustainable development objectives.

The projects confirm that ambitious green tax and incentive policies could create jobs and growth, even in Europe acts alone despite global inaction, and shows that the effectiveness of a tax shift from labour onto raw materials depends strongly on the use made of the tax revenues.

The projects' results and the conference discussions also underlined that specific tools are needed to address nutrients and the circular bio-economy and that these are today lacking.

POLFREE and DYNAMIX are EU-funded FP7 projects, which propose public policy mixes to support development of the circular economy and used models to simulate circular economy policy outcomes in terms of GDP growth, job creation and environmental impacts (climate change, resource consumption, water ...), taking into accounts interactions between Europe and the global economy.

The joint final conference brought together over 160 companies, regulators, stakeholders and researchers to discuss conclusions and policy recommendations.

Paul Ekins, University College London, opened the workshop by summarising key project findings. Markets do not resolve resource efficiency alone, and circular economy business models are not viable in mainstream current markets, because of low raw material prices, so that public policies are essential to ensure a move to the circular economy. However, the policies necessary will require a stepchange in politics.

Markets, if obstacles are removed, can and do lead to increases in materials efficiency, but these improvements are not of the order of magnitude necessary to enable achievement of environmental imperatives, in particular to marry GDP growth with resource consumption reduction.



"God is not creating new land for food production any more"

The resource efficiency objectives taken as the starting point by POLFREE and DYNAMIX are ambitious: dividing raw materials consumption by $\frac{1}{2}$ to $\frac{1}{5}$ and reducing greenhouse gas emissions by 80%. The projects also include specific objectives for land use: zero loss of farmable land in Europe, zero net use of arable land outside Europe to supply EU food consumption.

A key conclusion from the projects is that the "Business As Usual" scenario is unpleasant. Mineral raw materials prices may not increase in the short medium term (workshop participants pointed to the current example of crude oil), but price volatility is likely to increase for materials for which we are dependent on imports, posing important issues for Europe's industry and economy.

However, food prices are expected to significantly increase in all scenarios, because of global population pressures and impacts of climate change and water supply on global food production.

SCOPE Editor's note: this underlines the specific importance of developing the circular economy for bio-materials and nutrients, because food prices will impact EU imports both of food and also of animal feedstuffs (together c. 1/3 of EU phosphorus imports) and also because food prices are often linked to fertiliser prices through positive feedback cycles.

SCOPE Editor's note: In the public consultation on the EU Circular Economy Package (CEP), 2015 (SCOPE Newsletter n° 118): 30% of respondents identified bionutrients as "secondary materials the EU should target first" and, in total, 54% cited bio-nutrients or phosphorus in their response.

Nutrient loss objectives

Martin Hirschnitz-Gabers, Ecologic Institute, Germany, presented a conceptualisation of policy mixes to help achieve the five key environmental targets taken as starting points by the DYNAMIX project: reducing virgin metals consumption by 80%, limiting greenhouse gas emissions to 2 tCO₂equivalent/person/year, zero net arable land demand outside Europe, ensuring that no region is waterstressed and "Reducing nitrogen and phosphorus surpluses in the EU to levels that can be achieved by the best available techniques".

SCOPE Editor's note: it seems indicative of the current difficulties and insufficiencies in bio-nutrient circular economy policy understanding that

- The nutrient objective is the only one of these five DYNAMIX key environmental objectives to not be quantified, being expressed as 'can be achieved by BAT' which remains to be defined
- The DYNAMIX Policy Brief on potential impacts on agricultural production discusses pesticide consumption and biodiversity (a 50% tax on pesticides is estimated to lead to a 10-12% drop in consumption) but **does not address these nutrient objectives** except to state that "no exact level of contribution to this target can be given, the policy mix very likely contributes to this target"

Diet and protein consumption

The DYNAMIX "Physical and environmental assessment" (draft Executive Summary Feb. 2016, deliverable 6.1) underlines the **importance of change in average European diet** in addressing land-use objectives, as well as addressing food waste. Diet changes were assessed for impacts on climate change, land use and water use (but not nutrient impacts).

A reduction in EU average protein intake (by reducing consumption), 102 - 114 g meat from protein/person/day higher (current range of consumption in Europe) to 59-67 g, that is lower range of consumption in Europe according to EFSA, Safety European Food Agency http://www.efsa.europa.eu/de/efsajournal/pub/2557) would reduce greenhouse gas emissions by 40% (but with the agrifood sector still generating 1.5 t eq. CO₂ compared to the 2 t objective indicated above), would reduce land use by 30% (achieving the zero net non-EU arable land use objective) and water use by 20%.

A reduction in food waste would only result in land use reductions if it results in a reduction in food production. However, improved food waste management can provide a source of energy and secondary nutrients.

The project proposes **VAT on meat** as a policy tool towards reducing diet protein intake, but concludes that this will not alone achieve the objectives indicated above. A 13% VAT increase on meat is estimated to result in a 10% decrease in consumption.

As underlined at the conference, such policies pose **major issues of political acceptability**.



Circular Economy Package (CEP)

François Wakenhut, DG Environment, presented the (second) EU Circular Economy Package CEP (see SCOPE Newsletter n° 118). The new package has the strength of being widely owned, both across the EU Commission, because it is now a joint initiative of DG Environment and DG GROW with involvement of other services, but also by stakeholders and business through the wide interest and response to the public consultation in 2015 (see editor's note above). The 2015 Circular Economy Package is now an integral part of the new EU Commission's agenda on jobs, growth & investment; climate & energy; democracy and better regulation. The Circular Economy Package aims for both short term actions, which can be engaged before 2019 (e.g. Fertiliser Regulation, waste and by-products legislation) and long-term policy orientations, which will be integrated into the EU 2030 Sustainable **Development Strategy** to be defined and adopted in 2016. At an international level, the Circular Economy Package supports implementation of the **17** Sustainable Development Goals formally adopted by Nations September the United in 2015 (https://sustainabledevelopment.un.org/sdgs). The EU will also push to take forward the G7 Resource Efficiency initiative (http://www.bmub.bund.de/en/topics/economy-productsresources/resource-efficiency/resource-efficiency-in-the-g7/). Monitoring of progress towards the circular economy is an important commitment of the Circular Economy Package, and the Commission intend to put into place Scoreboards for both Resource Efficiency and Raw Materials.

Wanda Gaj, DG Environment, underlined that the circular economy is win-win, for the environment, the economy and for society, by enhancing Europe's resilience. She noted that the Circular Economy Package proposes incremental policy changes, in order to ensure feasibility and acceptability. In particular, tax shifts are outside the EU's area of direct competence.

Gwenole Cozigou, DG GROW, indicated the following priorities of the Circular Economy Package:

- Addressing barriers and regulatory obstacles to facilitate the single market for circular economy products and services, in particular high-quality recycling
- Standards for secondary raw materials
- Measures along the whole product value chain, including product design
- Green Public Procurement (GPP)
- Improve knowledge and data on material flows

Waste and by-product regulation needs to be adapted to facilitate the market for secondary materials, whilst ensuring health and safety and consumer and industry confidence.

The Circular Economy Package Action Plan (http://eur*lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52015DC0614*)

over 50 timetabled actions presents for implementation. Investment Fund, R&D/innovation and regional development funding will support this, with modalities to be defined.

Natalia Matting, DG GROW, underlined that the Circular Economy Package (CEP) aims to be feasible, both by "going as far as is possible" with cross-Commission and Member State engagement, and by ensuring that regulations proposed are enforceable. Policies must ensure that European industry is not penalised. The CEP Action Plan now is being taken forward and is under discussion with Member States, particular Council finance ministers in (see Competitiveness Council brief 15/2/2016 http://data.consilium.europa.eu/doc/document/ST-6008-2016-INIT/en/pdf) and also with other EU Commission services to involve all EU policy areas (e.g. food safety).

Environmental tax reform (ETR) and market instruments

Andreas Versmann, Policy Officer at the European Economic and Social Committee (EESC) indicated that the EESC is currently preparing an opinion on the Circular Economy Package (CEP). Pending adoption of this opinion, he suggests that the Package's Action Plan is wide-reaching and is legitimated because it is the outcome of the public consultation process in 2015. However, the CEP is to date inadequate in terms of policies for market-based instruments, incentives, ETR (environmental tax reform). Targets are missing for waste prevention, repair and reuse, as is an obligation for separate collection of organics.

Mr Versmann underlines the importance of relaunching the EU Semester Greening, led by the EU Commission, supporting, coordinating and assessing Member State progress in environmental tax reform (ETR) and in abolition of environmentally harmful subsidies.

Raimund Bleischwitz, University College London, explained that current low or falling prices for oil and many raw materials do not drive towards circularity. However, price volatility is expected to remain high, resulting in uncertainty for industry.



Also, food prices are expected to trend upwards, increasingly becoming the key international price stress factor rather than oil, and posing strong pressure on land use, in the EU and more particularly for indirect EU land consumption outside the EU (food and animal feed imports). This will result in social and equity issues in the EU. The project modelling results also show that implications will significantly differ between EU member states.

The radical policy changes identified by DYNAMIX as necessary to address materials efficiency, and particularly food price and land use challenges, are not yet in the Circular Economy Package. A key factor is the essential transfer of the fiscal burden from labour to raw materials.

Actions which should already be engaged include economic incentives, improving data on raw materials, large scale testing in example cities. Nutrients and water should be lead markets, because of the link to food and land challenges.

Product footprint information is important, including raw materials transparency initiatives, due diligence and traceability of raw materials. The approaches of the G7 International Resource Efficiency Alliance and **UNEP International Resource Panel** can provide a basis.

A coalition of business and stakeholders is needed to propose and promote policies for the circular economy and to start discussion of targets, which are important to give a stable investment and strategy context for business and decision makers.

Femke Groothuis, Ex'TAX www.ex-tax.com, reminded that currently over 50% of the fiscal burden in the EU is on labour. All studies suggest that transferring this tax burden to pollution and resource consumption is highly positive for both reducing environmental impacts and creating jobs.

Bernd Meyer, GWS (company for economic structural research) with Andrea Bigano and Francesco Bosello, FEEM (Eni Enrico Mattei Foundation), presented in detail the DYNAMIX and POLFREE economic modelling and results. The projects use GINFORS (GWS) and EXIOMOD (TNO), ICES, MEMO, MEWA and ILCD economic models and the LPJmL (PIK) land use model. The results suggest however that the impact of material taxes depends strongly on how the revenues are used. Growth results if revenues from material taxation is invested into technological progress.

Paul Ekins noted that in the Cambridge Econometrics modelling for the original EU Circular Economy Package the main driver for the GDP growth was environmental tax reform (ETR: transfer of the tax burden from labour and income taxes to resource and taxes) rather than increasing resource energy productivity per se. If externalities are costed into materials prices, welfare increases, but not necessarily monetary GDP.

Martin Nestbit, IEEP (Institute for European **Environmental Policy**) explained that green taxation must take into account border issues, in order not to penalise EU industry. Imports must be subjected to the environmental taxes, whereas exported production must be exempted.

Conference participant Wojciech Białożyt (WISE **Poland**) noted that **low income population groups** have a higher environmental impact per unit spending (higher proportion of spending on shelter, food and heat) so that social compensation is needed for taxation on materials and energy.

Arthur ten Wolde. De Groene Zaak and Ecopreneur.eu European Sustainable Business Federation, underlined the necessity to address the demand side of the circular economy. VAT differentiation should be used to modify consumer preferences, alongside Extended Producer **Responsibility (EPR)**, transparency along the value chain and mandatory GPP (green public procurement) targets. To support this, quality standards for secondary materials and data on product raw material content are necessary. The current CEP is missing targets, whereas these are essential to drive policy and industry investment.

Need for data

Carsten Wachholz, European Environment Bureau, also emphasised the need for economic instruments to make the circular economy work for markets and consumers. Impacts on markets need to be measured with monitoring of materials flows, in order to provide feedback to policy makers and companies. He underlined the need for time-series in monitoring data to support policy implementation and evaluation.

René Kemp, Maastricht University, explained that resource efficiency as an environmental objective is not the driving force for change unless it can be made into a source of income. Low raw material prices mean that for this a mechanism such as a carbon tax or carbon prices will be necessary.



Jocelyn Blériot, Ellen MacArthur Foundation, warns of the cost of doing nothing. The Foundation considers policy makers must find routes to price externalities into raw materials costs and to implement materials capital accounting.

The fiscal shift proposed by e.g. Ex'TAX is now politically acceptable. The EU Circular Economy Package should move in this direction, and build on existing tools such as EcoDesign obligations and **Extended Producer Responsibility (EPR).**

Mr. Blériot notes the need to look at the value of nutrients at different points in the agri-food product chain and in nutrient cycles. Organic carbon should also be addressed and the economic impact of soil deterioration taken into account.

No single solution

As indicated by Natalia Matting, DG GROW, there is no "one magic box" single solution which fits all sectors and all regions. Jean-Pierre Hannequart, ACR+ (Association of Cities and Regions for **Recycling**) and other participants emphasised the importance of local actions in developing the circular economy, including policies engaged by regions, industrial symbiosis platforms, regional green public procurement (GPP) and company or citizen-led local circular economy business cases.

Christoph Scharff, CEC4 Europe and Vienna **University of Technology**, noted that currently widely varving recycling rates in different member states cause market distortions, leading to problems such as intra-EU waste shipments to countries where it is illegally or inadequately treated and different waste management costs for companies in different member states. These current differences must also be taken into account in assessing the feasibility of EU 'average' recycling targets.

Prof. Scharff notes that the Circular Economy Package Action Plan is the result of more than a year of consultation by the European Commission, which should ensure support to take it forward. However, there is a need to develop data on future demand for secondary materials and on anthropogenic stocks (as well as flows) of nutrients, for example materials in buildings and phosphorus in agricultural soils.

International action

Peter Börkey, OECD, underlined the need for more robust data on the co-benefits of the circular economy: job creation, economic growth, impacts on government and regional public deficits, climate change.

The OECD is working to strengthen their macroeconomic modelling tools to better represent resource efficiency/the circular economy and assess the economic implications. Mr Börkey also stressed that despite the challenges, economic instruments should remain a crucial element in the policy mix to support the transition towards the circular economy. While there are significant challenges in implementing environmental taxes at the national or international level, there are other economic instruments and scales at which these can be implemented.

Overall, there are a lot of positive examples of successful implementation. An example is "pay as you throw" for household refuse, which the OECD survey of household behaviour shows to lead to a reduction of 20-30% in non-recycling domestic waste disposal, subject to attention to possible side impacts (fly-dumping, less effective sorting).

Christophe Yvetot, UNIDO (United Nations Industrial Development Organisation), indicated that the circular economy should be understood in a global context since value chains are working beyond boarders and because 80% of future growth will come from emerging and developing countries.

The seventeen Sustainable Development Goals (SDGs) adopted by all countries of the world at the UN Summit in New York in September 2015 offer a unique opportunity for implementing the circular economy on a global scale. And reciprocally, the circular economy is a powerful engine for the implementation of many of the SDGs for which each country will have to report on progress made. For example, the SDG No 9 that focuses on sustainable industrialization, resilient infrastructure and innovation offers new directions for industries that can become more competitive and innovative while being more resource efficient and sustainable.

Standardization will be particularly important to facilitate the establishment of a global level playing field for the private sector in many areas including for recycled materials.

The circular economy is an opportunity to move beyond usual silos and **generalize the multistakeholder approach**. The dialogue between governments, industry, civil society and academia is essential to find practical solutions and transform our past economic models into new opportunities.



Business taking the lead

Gary Crawford, Véolia, explained that the company considers the circular economy as it central strategy "Resourcing the world" and is already active, for example producing organic fertilisers and producing and using renewable energies.

Véolia considers that "pull" measures are essential to develop demand for recycled materials, for example **quotas for incorporation of secondary raw materials or reduced VAT on recovered materials**. Better data is needed on non-domestic wastes, in order for policy makers to fix binding targets.

Patricia Vangheluwe, PlasticsEurope, noted the importance of **Life Cycle Analysis (LCA)** and **risk management** (for both primary and secondary raw materials) as key success factors for resource efficiency and circular economy. Plastics are both a material and an energy source. The European plastics industry wants "**zero plastic to landfill**" to become part of the long term goal in a resource efficient circular economy.

Annick Carpentier, Eurometaux, underlined the need to set quality requirements both for secondary raw materials and for the recycling process chain (efficiency of the % recovery, EHS process), including for some waste streams (e.g. WEEE and batteries) through the certification of recycling facilities. Waste transport legislation needs to be implemented in a harmonised manner across all Member States and the shipment of waste for recycling needs to be facilitated, while ensuring adequate control.

Christian Hagelüken, UMICORE, considered that **EPR (Extended Producer Responsibility)** should be really implemented, ensuring that costs are passed on to consumers. The additional cost on products is not an obstacle, on condition that it is shared by all producers, including imports. **Certification and standards** are necessary to support this. Implementation of EPR would modify market cost structure, and so enable new circular economy business cases.

Christiaan Prins, Unilever, presented the companies approach to integrating circularity into its product design and operations. Waste is reduced both by **rethinking products** (e.g. more compact products mean less packing and lower transport impacts) and factory waste streams. Recycled content of packaging is increased. He underlined the importance of fixing **clear company objectives, in order to support decision making at all levels**.

Unilever's objectives include reducing waste, reducing environmental impact and sustainable sourcing.

The discussion with business participants led to consensus around several priorities:

- **need for economic instruments** to develop market demand and compensate for low prices of raw materials
- importance of effective **implementation of legislation** and **harmonisation** between member states, essential to ensure that circular economy frontrunner companies are not penalised
- **standards** for secondary materials and certification for recycling systems, to promote and validate quality and develop consumer confidence
- importance of an active **business stakeholder for dialogue** and cooperation and as a "coalition of the willing" to promote circular economy policies

Discussion and conclusions

Working tables in the conference were led by Martha Bicket, PSI, Tom Bastein, TNO and Francesca Montevecchi, Vienna University of Economics and Business, concluding the following priorities to develop circular economy policies in Europe:

- **engage stakeholders** to develop an active coalition to support circular economy policies
- potential for **job creation**
- promote the "**political courage**" necessary for major policy changes
- improve understanding and monitoring of materials flows
- develop viable business cases
- ensure long-term **policy stability** (necessary for investments)
- build **local resilience**
- develop the **different messages**: environment, convenience, employment
- inform consumers

DYNAMIX – POLFREE Joint Final Conference "Policy mixes promoting resource efficiency for a circular economy" Brussels, 15-16 February 2016

DYNAMIX, Decoupling Economic Growth from Resource Use and its Environmental Impacts, EU FP7 http://dynamix-project.eu/

POLFREE, Policy Options for a Resource Efficient Economy, EU FP7 http://www.polfree.eu/ @POLFREEC



Nutrient Platforms

Europe: www.phosphorusplatform.eu

Netherlands: www.nutrientplatform.org

Flanders (Belgium):

http://www.vlakwa.be/nutrientenplatform/

Germany: www.deutsche-phosphor-plattform.de

North America Partnership on Phosphorus Sustainability NAPPS *https://sustainablep.asu.edu*

Calls for abstracts

- 16-20 Aug, Kunming, Yunnan, China, 6th world Sustainable Phosphorus Summit http://sps.ythic.com/
- 12-16 Sept, Rostock, Germany, 8th International Phosphorus Workshop (IPW8), Phosphorus 2020
 Challenge for synthesis agriculture & ecosystems http://www.wissenschaftscampus-rostock.de/

Agenda

- 6 April, Brussels, Yunnan, European Biogas Association (EBA) Circular Economy Workshop http://european-biogas.eu/events/eba-circular-economy-workshop/
- 20 April, Helsinki, Finland national nutrient recycling programme launch and international meeting http://mmm.fi/en/recyclenutrients
- 3 May, Brussels, Fertilizers Europe conference on EU Nutrient Legislation (Fertilisers Regulation revision) jana.graso@fertilizerseurope.com
- 10-13 July, Denver, Colorado, WEF/IWA Nutrient Removal and Recovery conference http://www.wef.org/Nutrient-WEFIWA
- 16-20 Aug, Kunming, Yunnan, China, 6th Sustainable Phosphorus Summit http://sps.ythic.com/
- 5-9 Sep, Lake District, UK, Germany, International Organic Phosphorus Workshop http://www.soilpforum.com
- 12-16 Sept, Rostock, Germany, 8th International Phosphorus Workshop (IPW8) http://www.wissenschaftscampus-rostock.de/
- 27-28 October, Copenhagen, Nordic Phosphorus Conference iw@dakofa.dk

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