Proposed considerations for the EU's "Integrated Nutrient Management Action Plan" (INMAP)

This document, intended for discussion and comment, aims to prepare input to the European Commission on possible objectives, content and mechanisms for such an 'Integrated Nutrient Management Action Plan'.
Comments are invited to info@phosphorusplatform.eu

Context:

➢ Farm-to-Fork Strategy

The EU Farm-to-Fork Strategy, COM(2020)381, 20th May 2020), states:
"The excess of nutrients (especially nitrogen and phosphorus) in the environment, stemming from excess use and the fact that not all nutrients used in agriculture are effectively absorbed by plants, is another major source of air, soil and water pollution and climate impacts. It has reduced biodiversity in rivers, lakes, wetlands and seas. The Commission will act to reduce nutrient losses by at least 50%, while ensuring that there is no deterioration in soil fertility. This will reduce the use of fertilisers by at least 20% by 2030. This will be achieved by implementing and enforcing the relevant environmental and climate legislation in full, by identifying with Member States the nutrient load reductions needed to achieve these goals, applying balanced fertilisation and sustainable nutrient management and by managing nitrogen and phosphorus better throughout their lifecycle. The Commission will develop with Member States an ***integrated nutrient management action plan*** *to address nutrient pollution at source and increase the sustainability of the livestock sector. The Commission will also work with Member States*

to extend the application of precise fertilisation techniques and sustainable agricultural practices, notably in hotspot areas of intensive livestock farming and of recycling of organic waste into renewable fertilisers. This will be done by means of measures which Member States will include in their CAP Strategic Plans such as the Farm Sustainability Tool for nutrient management, investments, advisory services and of EU space technologies (Copernicus, Galileo)."

➢ Circular Economy Action Plan

The European Commission's EU Circular Economy Action Plan 11th March 2020 includes "Food, water and nutrients" as one of the seven key targeted value chains and specifies as actions to include:

- "*develop an **Integrated Nutrient Management Plan** with a view to ensuring more sustainable application of nutrients and stimulating the markets for recovered nutrients*" including possible "*reviewing directives on wastewater treatment and sewage sludge and will assess natural means of nutrient removal such as algae*".
- reduce food waste (as a key action of the Farm-to-Fork Strategy)
- facilitate water reuse
- continue the Bioeconomy Action Plan
- define a policy framework on compostable, biodegradable and bio-based plastics (ESPP note: important for digestates and composts)
- address microplastics and to better understand their risk and occurrence
- improve monitoring of resource recycling, proposing a "*market observatory for key secondary materials*", a "*Monitoring Framework for the Circular Economy*" and "*Indicators on resource use, including consumption and material footprints*"
- integrate the circular economy into Member States fiscal policies, via the European Semester

➢ Horizon Europe

The Horizon Europe Orientations document states "***A comprehensive EU policy to balance nutrient cycles is not yet well developed. Research and innovation is needed to look at how the EU could move to living within the planetary boundaries, with regards to nutrient flows.***"

Proposals

➢ Integration and implementation

An Integrated Nutrient Management Action Plan should

- address nutrients across all existing areas of EU policy (environment, water, air, industrial emissions, waste legislation, circular economy, agriculture, food and diet, animal feed, fertilisers, raw materials, climate change …)
- cover all nutrients: nitrogen, phosphorus, other nutrients and micro-nutrients and soil organic carbon
- integrate existing policies and implementation structures (e.g. water basin management organisations, agricultural funding and rural development …) in order to be realistically implemented by companies and by local/regional territories

Tools need to be defined and implemented to address the low market price of nutrients and the absence of a monetarised price on nutrient environmental impacts, which combine to generally make nutrient removal and nutrient recycling "not economic". Such tools can include regulatory requirements, nutrient reuse targets, incentives, and fiscal shifts.

➢ Integration across EU directorates

An EU Integrated Nutrient Management Action Plan should engage across EU services and policies (for detail of proposals for policies cited, see above):

- DG ENVI: Circular Economy. Industrial Emissions Directive: resource efficiency and recycling in BREFs, horizontal BREF on resource efficiency, resources efficiency and recycling in KEIs, BREF on large cattle and aquaculture units. Site permitting to accept secondary materials. Study into contaminants in fertilisers (currently underway). Strategic Approach to Pharmaceuticals in the Environment. EMAS BEMPs for agricultural nutrient management and nutrient loss mitigation. Water policy and Sewage Sludge Directive. LIFE: funding of nutrient recycling demonstration projects.
- DG GROW: Fertilising Products Regulation. REACH: art. 7(2), restrictions on problematic consumer/industry chemicals. Critical Raw Materials (phosphate rock). Circular Economy.
- DG MARE: Strategic Guidelines for EU Aquaculture
- DG RTD: Horizon Europe objective of "*a comprehensive EU policy to balance nutrient cycles"* and funding of research and recycling demonstration actions in Horizon Europe. Water4All Partnership. Mission Healthy Oceans, Seas, Coastal and Inland Water. Mission Soil Health and Food. Circular Bio-Based Europe Partnership. R&D into risk assessment of contaminants, especially pharmaceuticals, microplastics. R&D into nutrient management and climate change. Follow-up of COST 869: agricultural nutrient BEMP fact sheets. Coordination actions with long-term perspectives.
- DG SANTE: Farm-to-Fork: dietary choices, nutrient footprinting and food product phosphorus-content information, nutrient and nutrition content of food waste (with the food & beverage industry). Animal by-products in the Fertilising Products Regulation. Recycling of phosphorus in Cat1 ABP ash. Recycled nutrients in Animal Feed Regulation.
- DG AGRI: CAP: nutrient management cross-compliance with water policy, FAST tool. Update of 'fact sheets' on nutrient BEMPs. EIP-AGRI: follow-up of EIP-AGRI Focus Group on Nutrient Recycling Horizon Europe R&D on nutrient management and nutrient recycling.
- DG REGIO: nutrient Circular Economy projects in Interreg A, B and C
- SecGen & DG ECFIN: European Semester: fiscal incentives for nutrient recycling, fiscal burden shift from jobs to resource consumption, including in VAT policy.

➢ **Improve knowledge on nutrient flows**

Data is already gathered for nitrogen emissions (because of links to climate change, Emissions Ceilings Directive) but data is lacking concerning phosphorus, concerning nitrogen recycling potential, and concerning integration with organic carbon and other nutrients and micronutrients. Regionalised data on nutrient flows is rarely available, whereas this is important for developing recycling. Data on nutrient content and fat of many nutrient-containing wastes and by-products is largely inadequate. Ongoing Horizon 2020 projects will contribute to increase knowledge.

Integrate existing data (e.g. on wastewater, environmental data, industrial emissions ...) and between nutrients (N, P, K, sulphur and other plant nutrients and micronutrients, and also soil organic carbon), including in particular coordination with data sets of EUROSTAT, EEA,

FADN … Integrate data needs of EU policies: climate policy, Critical Raw Materials, CAP, Water Framework Directive and water policy, Circular Economy and Fertilising Products Regulation, air policy and Emissions Ceilings Directive …

Data should be:
- user (management) orientated, in particular identifying hotspots and flows which can be targeted to reduce impacts, to reduce primary resource consumption and to develop recycling
- recycling requires information on accessibility / usability (e.g. dilution), crop fertiliser value (e.g. of different livestock manures and secondary materials) and contaminants
- feasible to monitor and update to support policy decision making
- transparent and comparable across the EU

It is needed to develop, and agree between different industry sectors and across the EU, robust substance flow analysis methods[i] for nutrients, including calculations of nutrient use efficiencies, losses to water and to air, taking into consideration regional agricultural practices, climate, etc.

This should be integrated into the Action Plan's proposed "*Monitoring Framework for the Circular Economy*", "*Indicators on resource use, including consumption and material footprints*" and "*market observatory for key secondary materials*".

In particular, develop pilot actions at the regional or catchment level to assess or implement integrated nutrient management at this scale, with the aim of transposing respect of Planetary Boundaries[ii] for nutrients to the regional scale, including "imported" nutrient footprints[iii].

- **Integrate nutrient management and climate change policies**

Climate change is likely to accentuate land nutrient losses (increased storm runoff events) and eutrophication (increased temperatures, lower river flows during droughts).

Eutrophication may also contribute to greenhouse gas emissions, e.g. methane, but better understanding is needed as to how nutrient management might address this.

Sustainable manure management and recycling can have significant climate benefits, in terms of reduced GHG emissions both locally and globally as well as SOC (soil organic carbon) build-up and carbon sequestration. In particular, the Circular Economy Action Plan should aim to combine increased efficiency of nutrient recycling in livestock manures recycling adapted to crop uptake) with reduced manure GHG emissions, and reduced ammonia emissions (Emissions Ceilings Directive). A range of approaches and technologies should be further assessed, demonstrated and supported for implementation, including storage and handling, processing to recycling organic fertiliser products, biogas production and digestate processing, manure acidification, injection and improving application, optimisation of application in combination with other fertilising products as a function of crop requirements …

More targeted fertiliser nutrient management can contribute to a higher efficiency of nutrient and especially nitrogen use, and thus contribute to reducing GHG emissions, especially N_2O emissions especially.

Further Life Cycle Analysis studies are needed of different nutrient management routes and nutrient recycling technologies, in order to assess long-term benefits including climate

change impacts, contaminants, nutrient conservation, and to ensure sustainability of long-term investment decisions in manure, food waste and sewage biosolids management.

- **Nutrient recycling and biodiversity**

Preservation of biological diversity is one of the key objectives of the Farm to fork strategy for sustainable food in the European Green Deal (https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en; https://ec.europa.eu/food/farm2fork_en) and should particularly address farmland biodiversity and soil biodiversity, including the microbiological communities underground that guarantee soil health, productivity, carbon sequestration and other, both known and untapped, ecosystem services. Nutrient recycling, from manure and other organic materials, can help restore and maintain soil organic carbon which supports soil microbiological communities.

- **Nutrient recycling and organic carbon in water policy**

Clarify objectives and specify monitoring for resource recovery and recycling in the EU Urban Waste Water Treatment Directive and in the Sewage Sludge Directive.

This should include objectives for nutrient recycling and for valorisation of organic carbon, whilst ensuring safety of contaminants.

- **Farm to Fork**

Dietary choices are probably the biggest driver of nutrient use and of nutrient losses.

The Farm to Fork Strategy should fix the objective to improve Nitrogen Use Efficiency (NUE) in the EU by 10% by 2030 (compared to 2014), to be adapted at national/regional level as farm conditions vary within the EU. This will ensure that nitrogen is more effectively taken up by the plants, while losses to the environment will be decreased and crop and livestock productivity will be maintained/increased. This will contribute to securing a profitable business model for farmers.

Development of nutrient footprinting of diets and of food products should be furthered[iv], engaging the food industry[v] and retailers. Address the nutrient and nutrition content of food waste, rather than just the tonnage.

Work on information on phosphorus content of food products with the food industry: this can vary widely in processed foods[vi] and is extremely important[vii] for kidney disease patients (CKD) - that is maybe around 30 million persons in Europe[viii].

Engage with DG SANTE to facilitate nutrient recycling from animal by-products, including Cat1, without compromising health safety. This must take into account the current Covid media backlash, where recycling of animal by-products and BSE may be presented as representing the same dangers as eating bats.

Nutrient efficiency of animal feed, including in aquaculture and aquaponics (both open water and land-based systems).

- **Healthy Oceans, Seas, Coastal and Inland Water**

Eutrophication, leading to ecosystem unbalances, toxic algal blooms and anoxic zones are an increasing threat to inland waters, coastal ecosystems and oceans. As Commissioner Vella indicated, the Horizon Europe Mission Healthy Oceans, Seas, Coastal and Inland

Water should take eutrophication as one of the key challenges to improve the outlook of aquatic ecosystems.

Promotion of consumption of currently under-valued fish species[ix], in particular those which feed on zooplankton[x], can contribute to limiting eutrophication impacts, provide sustainable protein, generate local jobs, and offer a route to effectively recycle nutrients back from eutrophic lakes, rivers or seas to the food chain.

- **Agriculture**

Integration of nutrient circularity and recycling with implementation of the proposed CAP FAST tool[xi] (Farm Sustainability Tool for Nutrients) for all farmers across Europe.

Update knowledge on long-term effectiveness, cost and feasibility of nutrient-loss mitigation actions, in different farming systems (e.g. buffer strips, retention ponds, no-till, intercrops …), and updating of online fact sheets and other tools for communicating this information to farmers, agricultural outreach services and to water basin managers (c.f. update from COST Action 869 which terminated in 2011[xii]). This should be coordinated with EMAS BEMPs[xiii] for agricultural nutrient management.

Improved nutrient management should be included in the update of EU aquaculture policy[xiv], including reduction of nutrient footprint of feed materials, improving feed nutrient use efficiency, reducing nutrient losses and developing recovery and recycling of nutrients in discharges.

Follow-up should be ensured of conclusions of the EIP-AGR Focus Group on Nutrient Recycling[xv]: LCA, Nutrient Use Efficiency assessment methods[xvi], organic contaminants (impacts, mitigation), perception and acceptance of recycled nutrients, remote sensing to support precision fertilisation using biobased fertilisers, on-farm techniques for nutrient recovery and for measuring nutrient content in manures, production of recycled nutrient products adapted to specific crops and with reliably consistent composition.

- **Address contaminants**

Contamination of secondary resources of nutrients and of organic carbon flows are obstacles to recycling, because of costs of depollution or consumer rejection. Reduction at source of contaminants should be engaged as an active priority. In particular, contaminants in municipal wastewater are an obstacle to agricultural valorisation of composted or digestated sewage biosolids. Levels of veterinary pharmaceuticals in manures are also a problem.

Pharmaceuticals:
- reduce contamination at source of sewage and manures, improve biodegradability[xvii]
- risk assessment for pharmaceuticals in biosolids used in agriculture
- R&I into removal in composting and in anaerobic digestion

Microplastics:
- addressing this problem is included in the Circular Economy Action Plan
- reduction at source should be implemented where possible
- R&I into whether microplastics in biosolids and other recycled nutrient flows (e.g. food wastes) pose health or environmental risks

Consumer / industrial chemicals:
- where chemicals are identified as posing obstacles to biosolids valorisation, they should be fast-tracked for REACH restriction (cf study currently underway for DG ENVI[xviii])

- priorities to address should be perfluorochemicals (PFCs, in particular PFOS and PFOA and their isomers / derivatives), halogenated flame retardants and other halogenated industrial chemicals (including chlorinated paraffins and naphthalenes)[xix]

➢ Fiscal and market tools

The market for recycled nutrient products is often not "economic", because recycling (relatively small scale processing, contaminants and safety requirements, decentralised logistics) is often more costly than primary fertilisers, because the EU regulatory and fiscal framework does not monetise environmental or social benefits such as pollution abatement, soil preservation, primary resource savings, local job creation ….

Tools to support markets for secondary nutrients should be tested, to avoid market distortion or unintended impacts, and implemented across the EU, in cooperation with Member States (c.f. European Semester):

- Rewarding farmers for carbon storage in soils and for sustainable nutrient balances as part of the CAP, in coherence with FaST
- Market support tools such as modulated VAT, recycled nutrient content objectives
- Transfer of taxes and contributions from jobs (social contributions, VAT) to ecotaxes on resources and on nutrient emissions
- Integration of nutrient recycling into Public Procurement[xx]
- Development of nutrient emissions trading to improve cost-effectiveness of water policy objectives, in particular between waste water treatment and agriculture, including development of nutrient "certificates"
- Communications, via nutrient footprints on food products, in cooperation with the food & beverage industry

A Circular Economy Directive with clear objectives to be achieved by member states (similar to REDII for energy) could provide a consistent and obligatory framework for CE policies.

➢ Support nutrient stewardship and recycling demonstration sites

Under Horizon Europe, Interreg, LIFE, support test and demonstration actions for nutrient footprinting, nutrient stewardship and nutrient recycling.

Include nutrient recycling, including developing, extended field testing and taking to market of recycled nutrient products in the Circular Bio-Based Partnership[xxi].

Policies and tools developed and implemented by European cities (Helsinki, Amsterdam and many others) should be evaluated for their potential of upgrading to EU policies[xxii].

➢ End-of-Waste and other regulatory obstacles

The new EU Fertilisers Product Regulation 2019/2009 (FPR) will resolve significant regulatory obstacles to nutrient recycling, on condition that the proposed STRUBIAS[xxiii] annexes are adopted, with not only the CE-mark but also End-of-Waste. This will open the market both for secondary nutrient products, and also for nutrient recycling technologies.

- Additional materials need to be assessed for inclusion in annexes, or clarification of their status, in particular: recovered nitrogen and potassium salts from gas cleaning, algae and other biomass grown as wastewater treatment, insect frass[xxiv], fish manure, Cat1 animal by-product incineration ash …

- The annex for animal by-products needs to be prepared (CMC10)
- The annex (CMC11) for by-products needs to be clarified, both for organic and inorganic materials

However, regulatory obstacles (in particular End-of-Waste) need to be clarified for sectors other than fertilising products:

- Use of sewage sludge or animal by-product incineration ash, after chemical processing, to produce animal feed additives[xxv], with removal of contaminants and guaranteeing safety
- Non-fertiliser products recovered from municipal wastewaters
- Non-fertiliser products recovered from flue gas cleaning and ash, including from municipal solid wase incineration

Companies wishing to replace primary raw materials by secondary materials can face permitting problems if the secondary material is "waste"[xxvi]. Coordination of national permitting authorities, and transfer of experience, could facilitate such re-permitting.

The proposed update of the Industrial Emissions Directive[xxvii] should better integrate recycling, as a part of resource efficiency objectives: use of secondary raw materials in production, recovery of materials in processes, and recycling of waste or by-product streams. This should integrate nutrients, and should particularly target the EU Critical Raw Material "phosphate rock". Resource efficiency and recycling, including nutrients, should be integrated into the Key Environmental Indicators (KEIs) for BAT

Cattle farms, other livestock production and aquaculture, above certain size limits, should be integrated into the BREF[xxix] for "intensive rearing of poultry or pigs".

Also, the application of REACH art. 2(7) "recovered" substances needs to be addressed. This article is important to facilitate recycling, which often takes place in small, distributed sites owned be organisations not accustomed to chemical regulations (e.g. local authorities for sewage works) so that REACH Registration of each producer and site would prevent implementation. However, the exoneration from Registration means that there is no obligation to share costs for the REACH dossier preparation, management and updates[xxx].

- **Importance of value-chain stakeholder dialogue**

Facilitate dialogue through value-chains, including farmers (nutrient users), recycling and waste valorisation industries, chemical and fertiliser industries (in particular, organic fertilisers which today lack European industry coordination), regulators, consumers. Commission actions to support such dialogue should ensure cooperation with industry federations and with existing platforms functioning with industry engagement and not undermine these with exogenous or temporary (project lifetime) funding.

In particular, the European Commission should engage with the food and beverage industry on nutrient footprinting, food product phosphorus content information, nutrition and nutrient content of food waste.

[i] http://www.oecd.org/cfe/regional-policy/Ekins-2019-Circular-Economy-What-Why-How-Where.pdf

[ii] https://www.stockholmresilience.org/research/planetary-boundaries/planetary-boundaries/about-the-research/the-nine-planetary-boundaries.html

[iii] https://www.footprintnetwork.org/our-work/ecological-footprint/

[iv] Integrating the work underway at JRC with the Gothenburg TFRN (Task Force on Reactive Nitrogen) and "Footprint Family" project

[v] http://www.fooddrinkeurope.eu/uploads/publications_documents/FoodDrinkEurope_Product_Environmental_Footprinting.pdf

[vi] Dietary Phosphate and the Forgotten Kidney Patient: A Critical Need for FDA Regulatory Action, M. Calvo, R Shermann & J. Uribarri, Am J Kidney Dis. April 2019, vol. 73, Issue 4, pp. 542–551 https://doi.org/10.1053/j.ajkd.2018.11.004

[vii] "Re-evaluation of phosphoric acid–phosphates – di-, tri- and polyphosphates (E 338–341, E 343, E 450–452) as food additives and the safety of proposed extension of use", EFSA Panel on Food Additives and Flavourings (FAF), adopted 4th June 2019, EFSA Journal 2019;17(6):5674 www.efsa.europa.eu/en/efsajournal/pub/5674

[viii] Estimate based on the indication of 10% of the population by EFSA 2019 (reference above) or 7% of the population by Ketteler in "Clinical aspects of natural and added phosphorus in foods", Humana Press (Springer), 260 pages, 2017, editors O. Gutiérrez, K. Kalantar-Zadeh and R. Mehrotra www.springer.com/us/book/9781493965649

[ix] See e.g. Järki Särki project, developing valorisation of roach in the Baltic https://www.jarkisarki.fi/#!home/bqldb

[x] zooplankton are the aquatic "grazers" which can naturally control algal blooms, e.g. daphnia

[xi] https://phosphorusplatform.eu/scope-in-print/enews/1826-enews031#_Toc2766002

[xii] EU COST Action 869 "Mitigation options for nutrient reduction in surface water and groundwaters" http://www.cost869.alterra.nl – ended 2011

[xiii] EMAS Commission Decision (EU) 2018/813 of 14 May 2018 "Best environmental management practices, sector environmental performance indicators and benchmarks of excellence for the agriculture sector" https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32018D0813

[xiv] Strategic Guidelines for EU Aquaculture Update (DG MARE – Unit A2), Roadmap open to consultation to 21/4/2020 https://ec.europa.eu/info/law/better-regulation/

[xv] https://ec.europa.eu/eip/agriculture/en/focus-groups/nutrient-recycling

[xvi] c.f. EU Nitrogen Expert Panel www.eunep.com

[xvii] c.f.: EU "Strategic Approach to Pharmaceuticals in the Environment"

[xviii] "Contaminants in fertilisers": Assessment of the Risks from their Presence and of the Socio-economic Impacts of a Possible Restriction under Reach" https://etendering.ted.europa.eu/cft/cft-display.html?cftId=5131

[xix] UK Water Industry Research Report 18/SL/01/9 (2018) ISBN 1 84057 864 5 "Biosolids to market – a strategic proposal to explore the threats to biosolids to land – now and in the future" https://ukwir.org/biosolids-to-market-a-strategic-proposalto-explore-the-threats-to-biosolids-to-land-now-and-in-the-future-sl-850/sl-1072-sl-1060-combined-0

[xx] https://ec.europa.eu/info/policies/public-procurement_en

[xxi] https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2019-4972449/public-consultation_en

[xxii] https://www.oecd.org/cfe/regional-policy/Wijkman-2019-Circular-Economy-Cities-Requires-Systems-Approach.pdf

[xxiii] STRUBIAS : precipitated phosphate salts & derivates, thermal oxidation materials &

derivates and pyrolysis & gasification materials" http://dx.doi.org/10.2760/186684

[xxiv] Insect excreta, exoskeletons, un-eaten feed substrate, from insect production https://en.wikipedia.org/wiki/Frass

[xxv] see: Animal Feed Marketing and Use Regulation 767/2009: art. 6.1 and Annex III 1.1 and 1.5

[xxvi] Example: fertiliser factories wishing to replace phosphate rock as input material by sewage sludge incineration ash

[xxvii] Consultation open to 21/4/2020 https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12306-EU-rules-on-industrial-emissions-revision

[xxviii] http://eippcb.jrc.ec.europa.eu/reference

[xxix] https://ec.europa.eu/jrc/en/news/new-eu-environmental-standards-large-poultry-and-pig-farms

[xxx] Currently the struvite REACH dossier no longer has an active Lead Registrant, is inadequate, and needs updating: read-across is used for acute oral and dermal toxicity and 'in vitro' for eye irritation, whereas this not applicable for these end-points for inorganic phosphates; there are other technical problems with the dossier; newly available data must legally be added to the dossier (since 2013).