

Estimating potential economic benefits and job creation of P-recycling and P-stewardship

Cover note:

This outline estimate does not claim to be accurate or economically demonstrated because, at present, no coherent data have been collected and no targeted studies are available. Its objective is to solicit further input and comments.

The figures given are estimations only, based on experience of practitioners and comparison to studies carried out on similar environmental employment sectors, and not based on detailed economic or societal analysis.

We suggest that a full study should be commissioned and carried out by professional analysts, including collection and assessment of data including consultation of both industry and scientists / experts, in order to develop reliable figures.

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EU imports of P₂O₅ = 3.4 million tonnes¹

Price per tonne P₂O₅ = approximately 600€/tonne P₂O₅

→ **Cost of EU P imports = 2 billion € per year²**

The market value of recovered phosphate is only a (usually small) part of the economic return from phosphorus stewardship (alongside synergies such as reduced wastewater treatment plant operating cost, reduced landfill costs, improved agronomic management, energy recovery, pollution control ...)³.

We estimate the environmental expenditure on P-stewardship to be c. 5x the market value of the imported P₂O₅ -> 6 billion €/year.

Using the employment ratios derived by the EU Commission ECORYS 2012 study⁴, this indicates:

→ **66 000 jobs non-delocalisable, permanent jobs**

Job losses in 'replaced' industries in the EU are estimated to be small, as in most sectors jobs would be maintained alongside the additional created employment (eg. distribution of recycled P products alongside that of mineral fertilisers, P-recovery as an additional step to existing waste or water treatment⁵ ...

¹ The same figure is estimated by Rosemarin 2010 cited by CIWEM 2012 : <http://www.ciwem.org/knowledge-networks/panels/wastewater-management/phosphorus-wastewater's-role-in-stewardship-of-a-vital-resource.aspx>

² Same figure is given by P-REX 2012

³ Molinos-Senante et al., "Economic Feasibility Study for Phosphorus Recovery Processes", *Ambio* n°40, pages 408-416, 2011 conclude that the market value of recovered phosphate (as struvite) from municipal wastewater is 2000 €/sewage works, compared to 10 000 € operational costs savings and 170 000 € shadow environmental benefits (reduced phosphorus discharges)

⁴ CRI (Copenhagen Resources Institute) analytical paper for the Danish Ministry of the Environment, "Recycling and Sustainable Materials Management", January 2012: "The number of Jobs dependent on the Environment and Resource Efficiency Improvements", ECORYS for EU Commission DG Environment, ENV.G.1/FRA/2006/0073, April 2012, Tables 10 and 11 pages 28-30. Using ECORYS 2012 updated figures for EPE (environmental protection expenditure) and employment in three areas (wastewater, waste, recycling) : EPE = 201 billion €/year, employment = 2 204 000 jobs, ratio = 11 000 jobs / billion €.

⁵ "Implementation of these and other technologies would require new treatment facilities, new logistics systems for collection of waste and manure, new arable practises etc. All these new activities will create new jobs. In some cases these new jobs will substitute existing jobs as current technologies are phased out, and in other cases it will result in a net surplus of jobs. For example, most phosphorus in waste from households currently ends up in landfills. Diverting the waste from landfills to phosphorus recovery facilities will create extra jobs (Friends of the earth 2010). Furthermore, phosphorus is mined outside Europe. Job losses in the phosphorous mining industry will not

This is in synergy with a range of other benefits from P-recycling and P-stewardship:

- **Phosphate and fertiliser industry employment** liable to be lost if phosphate processing moves out of Europe (example of Thermphos, Netherlands, 2012). Approx. 20 fertiliser and phosphate plants in Europe with approx. 30 jobs each x factor of 3 to include indirect jobs
= 18 000 jobs
- **Bioindustry, biofuels and bioresources production.** Phosphorus is a key resource, requiring recycling as an essential requisite for biofuels and biomaterials production. P-recycling technology development and P-management experience is thus essential to bio-industry development.⁶
- **Biogas renewable energy production** from sewage sludge and manures: P-recovery valuable to avoid deposit problems. Deposit avoidance in one sewage works = 300 000 €/year cost savings per works (source Thames Water UK). 1000 sewage works
= 0.3 billion €
- **Thermal energy production** from sewage sludge and manures (drying, incineration or gasification, P-recycling as fertiliser). 500 dewatering plants, 100 energy plants (5% of total EU flows) = 3.8 billion € investment = 9000 job-years. Once operational: approx. 5000 direct jobs, x2 to include indirect jobs
= 10 000 jobs.
- **P-recycling activities:** the specific agronomic properties of recovered phosphate fertilisers (slow-release) and agronomic advisory services to farmers for P-stewardship will improve farm efficiency, reduce soil erosion and provide added-value of foods integrating the circular economy, making local economies more resilient and creating non-delocalisable employment
- **Phosphorus recycling can be developed in synergy to nutrient removal in waste water treatment,** in particular facilitating biological nutrient removal: UK spending on nutrient removal in sewage works = 1.4 billion UK£, total required to reach EU Urban Waste Water Treatment Directive 1991/271 conformity⁷
EU = 150 billion €
- **EP-recovery facilitates eutrophication reduction:** total US economic costs for freshwater eutrophication = c 3 billion US\$/year⁸ Estimate Europe similar:
3 billion €
- **Food waste** = UK£ 12 billion⁹ - estimate
EU = 120 billion €
- **Export of competence and technology:** R&D, stewardship/ policy / collaboration platforms, engineering and recycling installation construction: estimated 500, 500, 1000 jobs in respectively. If the EU becomes international front-runner in P-recycling, these figures could be increased and the jobs will be sustained:
= 2000 jobs

influence the number of jobs in EU. Therefore an increase in phosphorus efficiency and recycling within Europe will have a net effect on the job creation in EU.

⁶ US National Academy of Sciences "Sustainable Development of Algal Biofuels in the United States", 2012

<http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=13437>

⁷ ACHS 2009: <http://archive.defra.gov.uk/environment/quality/chemicals/achs/documents/phosphates-review.pdf>

⁸ "Eutrophication of US freshwaters: analysis of potential economic damages", *Environmental Science & Technology*, 43(1), pages 12-19, 2009

⁹ WRAP, May 2012: <http://www.publications.parliament.uk/pa/cm201012/cmselect/cmenvaud/879/879vw20.htm>