Interreg North-West Europe Phos4You

P-rich biomass

Origin:	Removing P from wastewater effluents with an optimised adsorbent
Recycling pathway:	• Organic soil improver

COMPOUND MATERIAL DESCRIPTION

ORIGIN & AVAILABILITY

Phosphate is recovered from final effluents (i.e., WWTP/septic tank) through a filtration/adsorption process (here, FILTRAFLO™ P) to produce a P-rich biomass. A chitosan-calcite adsorbent (CCM), obtained from fishery and seafood industry waste (crab carapace) is used.

The amount of CCM adsorbent material enriched in PO_4 (P-rich biomass product) which could be produced would range from 10 - 200 tons/year/WWTP (from final effluent), for WWTP's with capacities of 10 PE – 20,000 PE.

This abundant source adsorbent (crab carapace) is locally available in remote, rural and island locations, globally. A first practical implementation in Scotland (trialled at Bo'ness WWTP) showed successful implementation of the CCM adsorbent in pilot-scale.

A low/mid-level degree of variability in product quality can be expected due to variability in adsorbent/process efficiency and final effluent quality (i.e., suspended solids, COD, other contaminants).

QUALITY CONSIDERATIONS

It is essential to check key quality components.

P-content in the P-rich biomass up to ~7% P_2O_5 could be obtained. Further selection aspects: organic matter content, macroelements (e.g., Ca, Mg, K and Na), heavy metals and organic micropollutants.

INTEREST & VALUE

The adsorbent material (CCM) "loaded" with P is also rich in other beneficial components such as $CaCO_3$, $MgCO_3$, K, chitin/chitosan, proteins and lipids.

Further beneficial aspects include: the adsorbent increases soil organic matter content; improves soil physical properties (texture); supplies essential plant nutrients; $CaCO_3$ content buffers against soil acidification caused by nitrogen application; chitin/chitosan has antibacterial properties – so may help rhizobial multiplication by biologically controlling root pathogenic organisms; possible replacement for costly inorganic fertilisers.

TIPS/BE AWARE

To handle and transport P-rich biomass, be aware of potential deformation and breakage of granular structure. Further quality checks are on-going.

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RECYCLING PATHWAYS

As this material can be recycled as a fertilising product, the formulation proposed refers to a possible Product Function Category (PFC) according to the wording in the EU Fertilising Products Regulations ((EU) 2019/1009). The list of animal by-products (ABP) and derived products to be included under Compound Material Category (CMC) n° 10 is currently under definition. Crab carapace, belonging to Category 3 (k) (i) "*shells from shellfish with soft tissue or flesh*" of ABP Regulation (EC) 1069/2009, might be added, provided the ABP end point is achieved. Nevertheless, due to the reaction of the adsorbent with wastewater, the P-rich biomass is expected to be excluded from CMC 10 as a specific assessment is appropriate. In any case, the recycling of a P-rich biomass can occur under existing national legislation, and a CE marking would only make sense if EU marketing is targeted.

ORGANIC SOIL IMPROVER

This P-rich biomass can be applied (without further processing, or, after milling to powder) using common soil application machinery to land. It is an alternative to sewage sludge or manure spreading, and/or, can act as a general soil improver.

Targeted users are local farmers to fertilise agricultural land, but also technical services within municipalities or private enterprises for landscaping works.

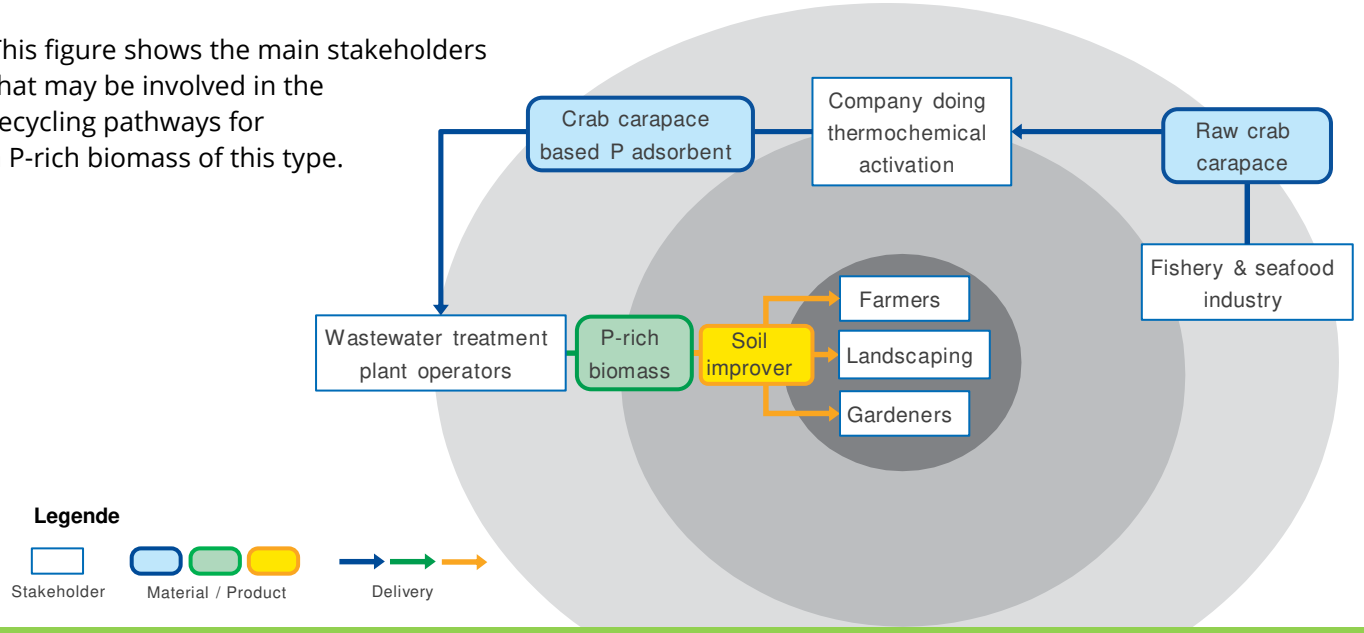
A limiting factor may be that the seasonality of agricultural use may not coincide with the production cycle of the biomass product - and therefore, the product needs to be stored. However, if the P-rich biomass is mixed with other organic fertilisers, the storage units of those products could be used and therefore there would be *a priori* no limiting factor for this use.

Factors in support of this pathway include the direct use of a P-rich biomass with an elevated P and Ca content, and several additional soil improvement properties (adding organic carbon, K and texture). Additionally, waste repurposing is utilised, creating circular links with the fishery and seafood industries.

This approach is highly consistent with the principles of a sustainable 'circular economy', whereby re-use or recycling of waste materials is optimised to extract their maximum value.

STAKEHOLDERS MAPPING

This figure shows the main stakeholders that may be involved in the recycling pathways for a P-rich biomass of this type.



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