

## This brochure aims at explaining why we need circular nutrient practices and how to manage environmental problems

Increasing environmental problems such as algae growth (eutrophication) in lakes, rivers and nitrogen surplus in fjords are depleting life in the fjords and require better nutrient management.

Phosphorus reserves are continuously decreasing, and are placed in occupied areas in West-Sahara, China and USA.

Circular nutrient management contributes to increased self sufficiency in vital plant nutrients, and increased food security.

Extraction of these nutrients is highly energy intensive and requires huge amounts of raw materials making the production of nutrients resource consumptive and have high emissions. To cope with these challenges creating a market for recycled and locally found nutrients will be important



## Circular phosphorous management

**Interreg**  
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CIRCULAR ECONOMY  
**BREC**



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OSLOFJORD



# METHODS AND TECHNOLOGIES FOR RECYCLING PHOSPHOROUS

## Recycle P as calcium phosphate

Sludge or other liquid waste streams are burned to an ash, and added acids and alkaline to capture phosphorus as calcium phosphate.

Similar to struvite extraction it is suitable for industrial waste water treatment plants.

Pollution like heavy metals and mineral are removed and preserved. These metals and minerals can be recycled back to waste water treatment processes.

The downside to this technology is that nitrogen is lost when substrate is burned.



## About phosphorus

Phosphorus is essential for plant growth, and all life. Phosphorus cycles through ecosystems in a process known as the phosphorus cycle. It moves through soil, water, and living organisms, playing a vital role in plant growth and nutrient cycling.

As plants absorb it, the phosphorus content in the soil decreases with each harvest.

To ensure that the next crop is equally good, phosphorus-rich fertilizer must therefore be added to the soil. It is a key ingredient in plant nutrition, and therefore, it is essential for agriculture and food production.

Even though phosphorus is present in large quantities in the Earth's crust, the naturally occurring available forms are limited and not readily accessible to plants. Over decades, human activity has extracted and utilized phosphorus in the form of phosphate fertilizers, leading to an imbalance in the natural phosphorus cycle.



## Struvite extraction

Struvite is a mineral that forms when specific substances come together in a liquid blend. When the liquid fraction (from digestate) contains dissolved phosphate, ammonium and magnesium in the right mutual concentration and where the pH and temperature are optimal, struvite crystals form spontaneously. This causes blockages and problems in pipes and sewage systems.

By extracting the struvite, we solve the blockage problem and it is suitable for organic farming and have a long term fertilizing effect.

Struvite can be spread using existing equipment, or it can be utilized in production of commercial mineral fertilizer and hence decrease the need for virgin phosphorus.

However, we also know that the plant available P in struvite is low, but this depends on pH-level in soil.