

The background image shows a close-up of ocean waves crashing against a dark, jagged rock. A clear plastic bag is caught in the water, partially submerged and being tossed by the waves. The water is a deep blue with white foam from the breaking waves. The overall scene conveys a message of environmental impact and pollution in marine ecosystems.

Nutrient Recycling in Municipalities

Kati Berninger
Tyrsky Consulting

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What is nutrient recycling?

- Using the nutrients that are already in circulation as efficiently as possible and avoiding the use of virgin raw materials
- With nutrient recycling we avoid
 - the use of non-renewable and scarce mineral phosphorus
 - the energy used in the production of nitrogen fertilizers





What does nutrient recycling have to do with municipalities?

- Municipalities manage many nutrient flows in
 - waste management
 - waste water treatment
 - energy production
 - food services
 - agriculture
 - forestry





Nutrient Recycling in Agriculture



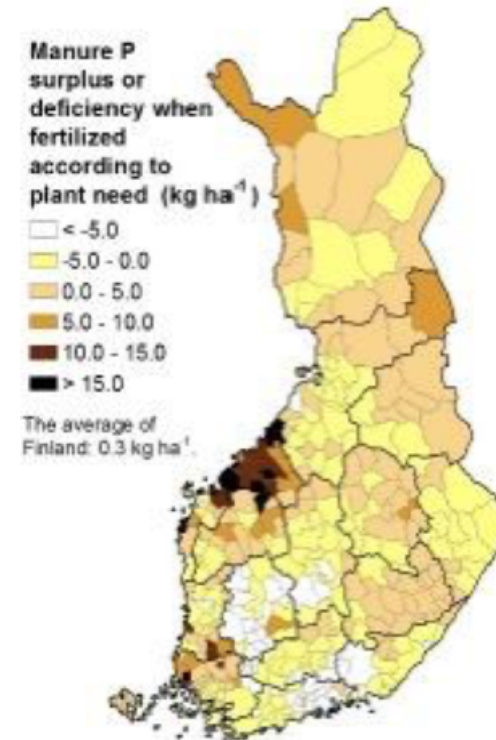
Nutrient recycling in agriculture

- The largest amounts of N and P is used in agriculture
 - Nutrient recycling can replace mineral fertilizers
 - Recycled organic fertilizers increase the organic matter content in the soil
- Manure is most commonly used
 - Manure / compost from own or neighbor's farm is preferred
- Processed recycled nutrients can also be used
 - as raw material manure, biowaste, sewage sludge, etc.



Concentration of nutrients

- In Finland, livestock production and manure are particularly concentrated on the south-west and west coasts
- Concentration of manure phosphorus
- Farm size increased and farm specialization increased
- Manure transport is expensive



Source: Luostarinen, S. et al. 2020. Manure processing as a pathway to enhanced nutrient recycling. Natural Resources Institute, Finland.



By processing more usable

- Processing can change
 - usability and transportability of manure
 - also the relationships between nutrients
- Separation of dry and liquid fractions
 - Most of the nitrogen in the liquid fraction
 - Most of the phosphorus in the dry fraction
 - The liquid can be utilized nearby and the dry fraction transported farther
- Granulation of the dry fraction, can be bagged, transported easily





Nutrient Recycling and Food Services



Managing food waste

- Food waste = edible food that is wasted
- Preventing food waste is an important way to improve the nutrient use efficiency
- Restaurants and food services in schools, hospitals etc.
 - in Finland 75-85 million kg/a food waste
 - mainly left overs of served food, especially from buffet tables



Managing food waste

- In Finland, many municipalities sell affordable meals to elderly people after school lunch time is over
- Also food scrap from plates can be reduced for example by campaigns or smaller plate size
 - The effect of campaigns is short, need to be repeated



Fishing: Removing nutrients from water bodies

- Fishing removes nutrients from water bodies.
- If fish resource is used sustainably, fishing is a sustainable way of using nutrients
 - For example using local fish like Baltic herring or cyprinids removed from the Baltic Sea or lakes



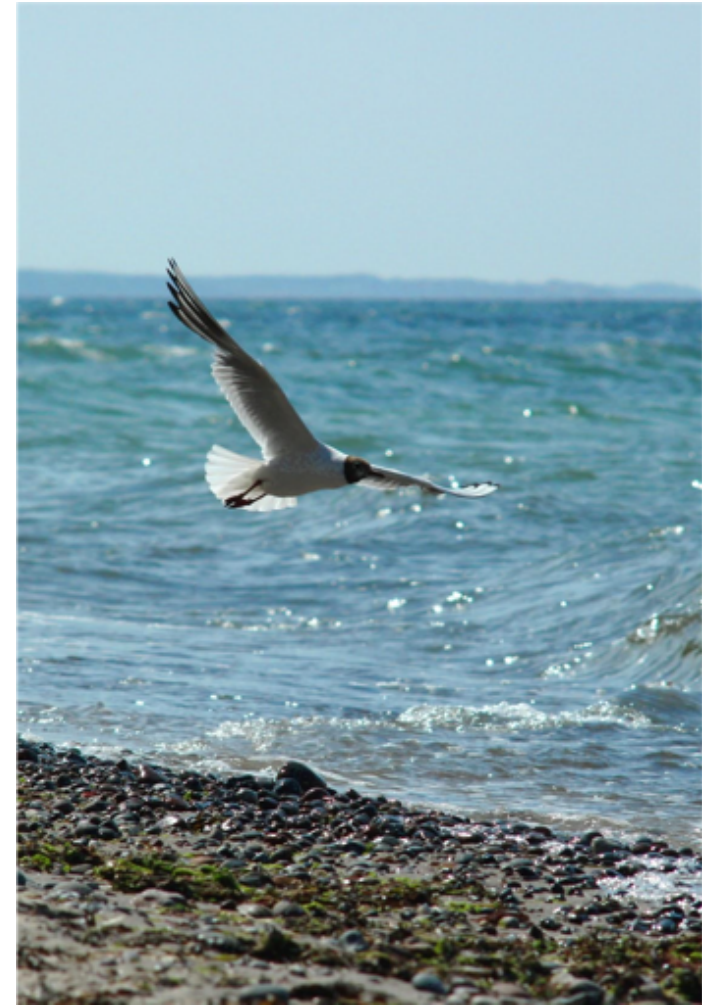


Nutrient Recycling and Waste



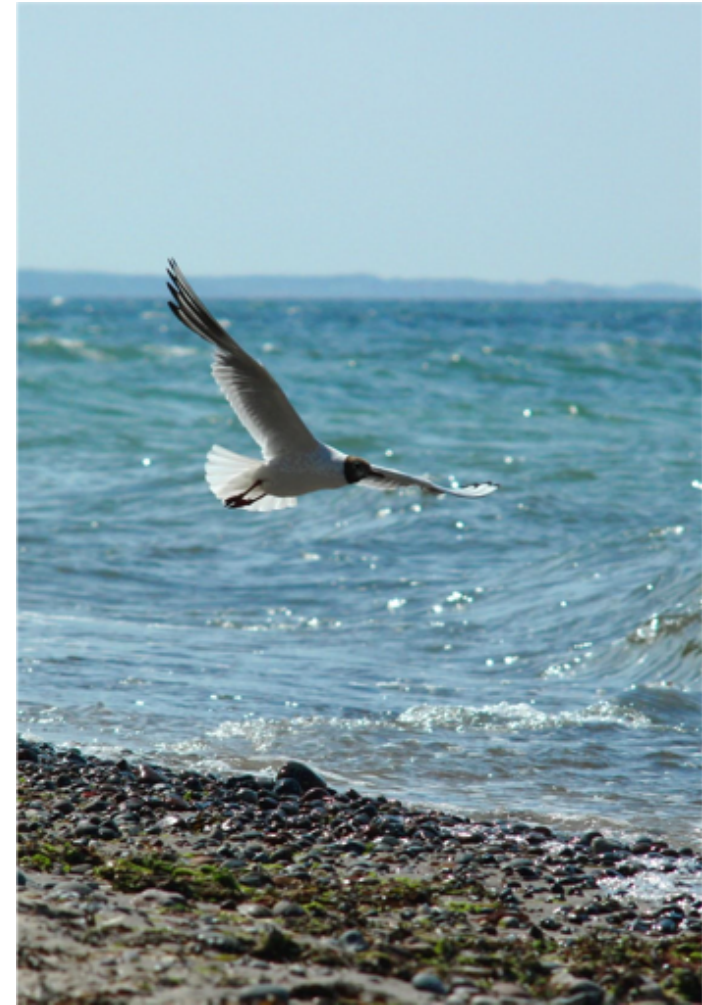
Biowaste

- From municipal waste the nutrient rich part is biowaste
- Only a part of the biowaste is collected separately
- Of mixed waste 1/3 is biowaste
 - Too much moisture, lowers the efficiency of incineration plants



Biowaste

- Biowaste can also be composted in private gardens
- Collected biowaste is
 - composted or
 - biogasified
- Treated biowaste is used as raw material of garden soil



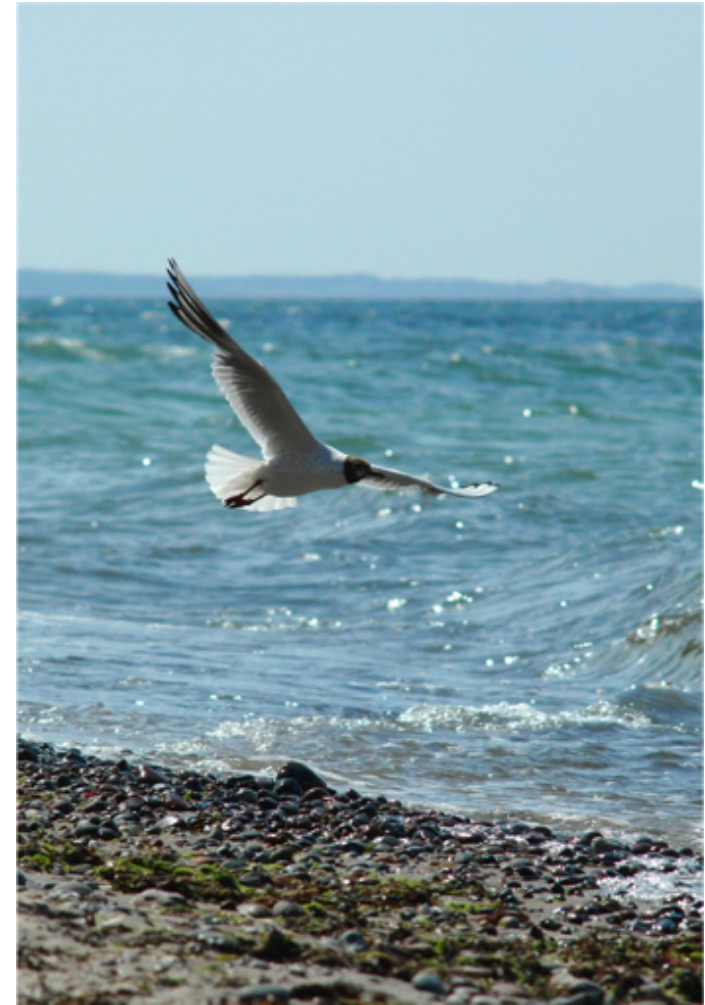


Nutrients in Wastewater Treatment



Nutrients in Wastewater treatment

- Current Finnish waste water treatment methods remove nutrients efficiently
 - not designed for nutrient recycling
- Phosphorus is removed by precipitation into an insoluble form, usually with ferrous sulfate
 - Phosphorus is also in a poorly soluble form in sewage sludge



Nutrients in Wastewater treatment

- Nitrogen is removed from wastewater by a biologically activated sludge method
 - Most of the nitrogen is released into the atmosphere





Sewage sludge and nutrient recycling

- Sewage sludge is interesting from a nutrient recycling perspective
 - The most abundant after manure
 - Concentrated on a few places
- Hygienised sewage sludge can be used in agriculture, but
 - risks posed by contaminants cannot be completely ruled out
 - contaminants cannot be removed from sludges with current technology maintaining the properties of the sludge





Thank you!

Kati Berninger

kati.berninger@tyrskyconsulting.fi

tyrskyconsulting.fi

Twitter: @tyrskyconsult

