LIFE SURE

Dredged sediments: A new source of nutrients as a plant-growing substrate

Laura Ferrans - PhD student

laura.ferrans@lnu.se

Co-authors: Frank Schmieder, William Hogland

Havs och Vatten myndigheten

Linnéuniversitetet

Kalmar kommun

Need of dredging

- Guarantee proper water levels for navigation or other aquatic activities
- Preserving the aquatic ecosystem (pollution of sediments)

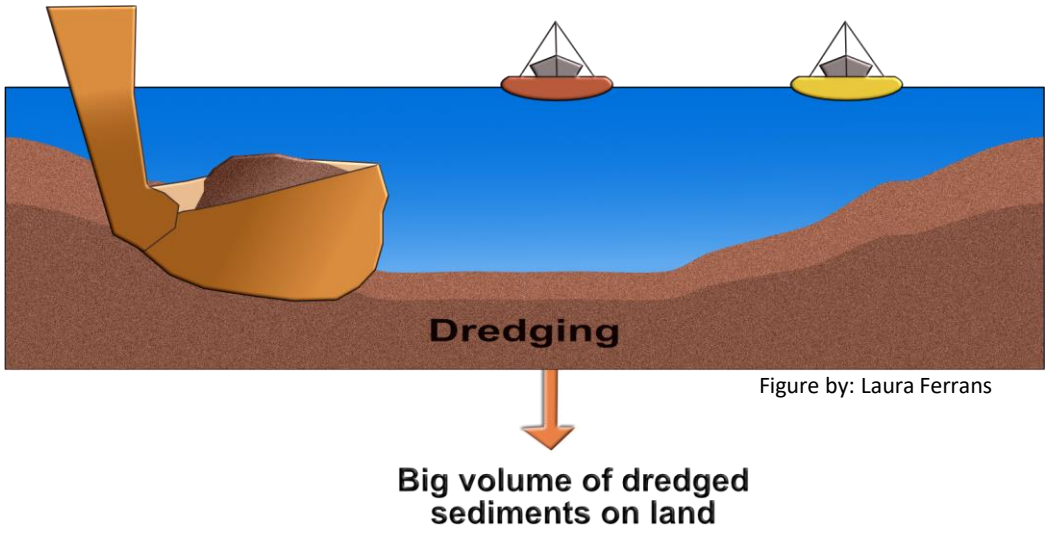


Figure by: Laura Ferrans

LIFE SURE

Dredged sediments are consider as waste and most are disposed of in open oceans or landfills

Photo by Mihail Minkov on Unsplash

Photo by Bakhrom Tursunov on Unsplash

However traditional methods are constricted by environmental and legal reasons

Recycling of sediments is a promising route to avoid traditional disposal methods and reduce depletion of natural resources

Construction

By Jamar Penny on Unsplash

Flood protection

By Niklas Tinner on Unsplash

Agriculture

By Markus Winkler on Unsplash

Habitat creation

By Joshua J. Cotten on Unsplash

→ **Aim:** Use sediment as plant growing substrate

LIFE SURE Project

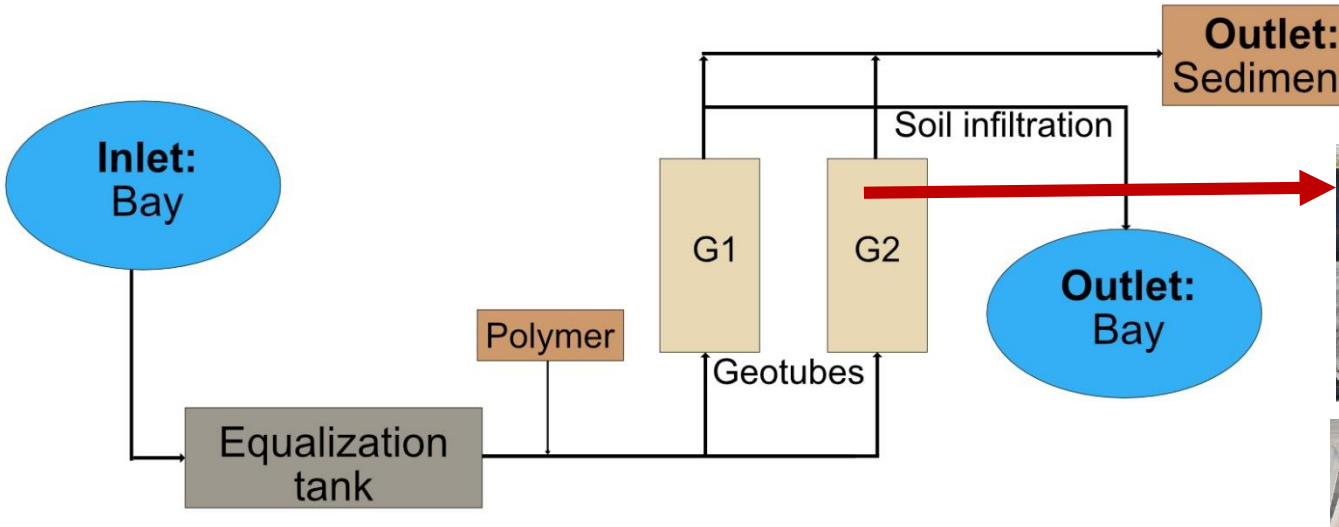
- Malmfjärden bay,
  Kalmar, Sweden
- Shallowness and slight pollution
- Environmental dredging
- Beyond zero-waste
  - Recovery
  - Reuse of sediments

Figure by Laura Ferrans.

Figure: Kalmar Municipality

Methods - Sampling

Sediments from dredging system. Samples without polymer.



Photos: Laura Ferrans

Methods – Substrate preparation

Manually mix the proportion of each substrate

Substrate 1:
100% Compost

Substrate 2:
50% Sediments
50% Compost

Compost to improve particle size distribution and nutrients

Photo: Laura Ferrans

Methods – Greenhouse

Time: 1.5 months

Light/darkness: 16:8 hours

T^{o}: 25 $\pm$ 3 ^{o}C

Watering: Manually keep 50% moisture content

Photos: Laura Ferrans

Methods – Characterisation

- **Compounds:** Sediment, Compost
- **Initial and final substrate:** 100Comp + 50Sed-50Comp

Nutrients	Elements	Organic compounds	Others
• Total P • Total N • Ammonium • Nitrate	• As, Cd, Pb, Cr, Ni, Cu, Zn • K, Ca, Mg, Fe	• PAH • BTEX • PCB • Aliphatic, aromatics	• Particle size • Organic content • pH

Figure by Laura Ferrans

- **Lettuces:** Elements

Characterisation of substrates

Particle size:

- Silt: 70%
- Clay: 20%
- Sand: 10 %

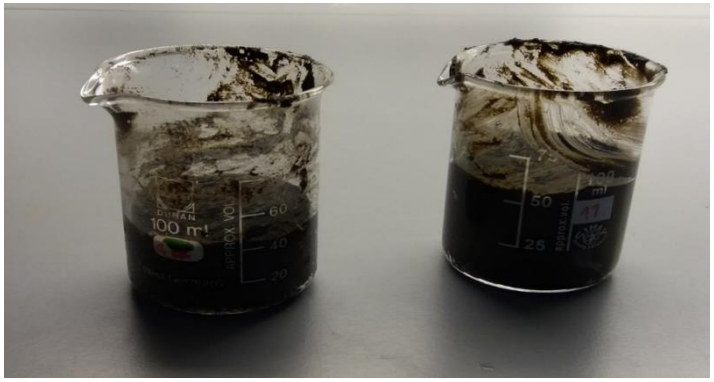


Photo: Laura Ferrans

Nutrients (g/km DM):

- **N**: 12 ± 1 - Compost
  11 ± 1 - 50Sed-50Com
- **P**: 2 ± 0.5 - Compost
  1.7 ± 0.1 - 50Sed-50Com

Metals (mg/kg DM):

- **Cd:** <0.8 - Compost
  1.2 ± 0.3 - 50Sed-50Com
- **Pb:** 11 ± 1 - Compost
  53 ± 7 - 50Sed-50Com

Results – Plant development

Lettuces grew, but not achieved full size

Plants at greenhouse

Mean length: <10 cm
Weight: <20 g

Not enough growth:
Nutrients and availability

Metals on lettuce

Main concern: As, Pb and Cd

- **Cd:** Health risk >1,

  Concentration overpassing legislation

Alternatives: Compost, biochar, ornamental or bio-energy plants

Photo: Laura Ferrans

Take home messages

- **Nutrients and organic matter** are common components of dredged sediments that could be beneficially employed as plant-growing substrate.

- Dredged sediments could be employed as a **resource** of materials and contribute to implement more circular economies.

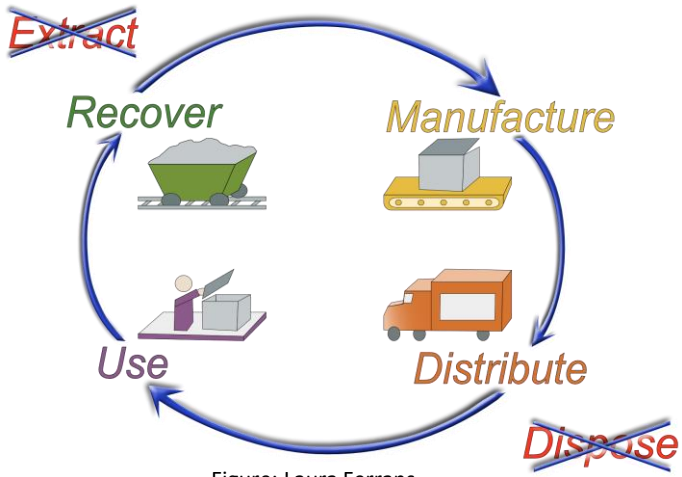


Figure: Laura Ferrans

LIFE SURE

Thanks, any questions??

Havs och Vatten myndigheten

Linnéuniversitetet

Kalmar kommun