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# Mikroplast - var är vi och vart vill vi?

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Jes Vollertsen

Professor i Miljøteknologi

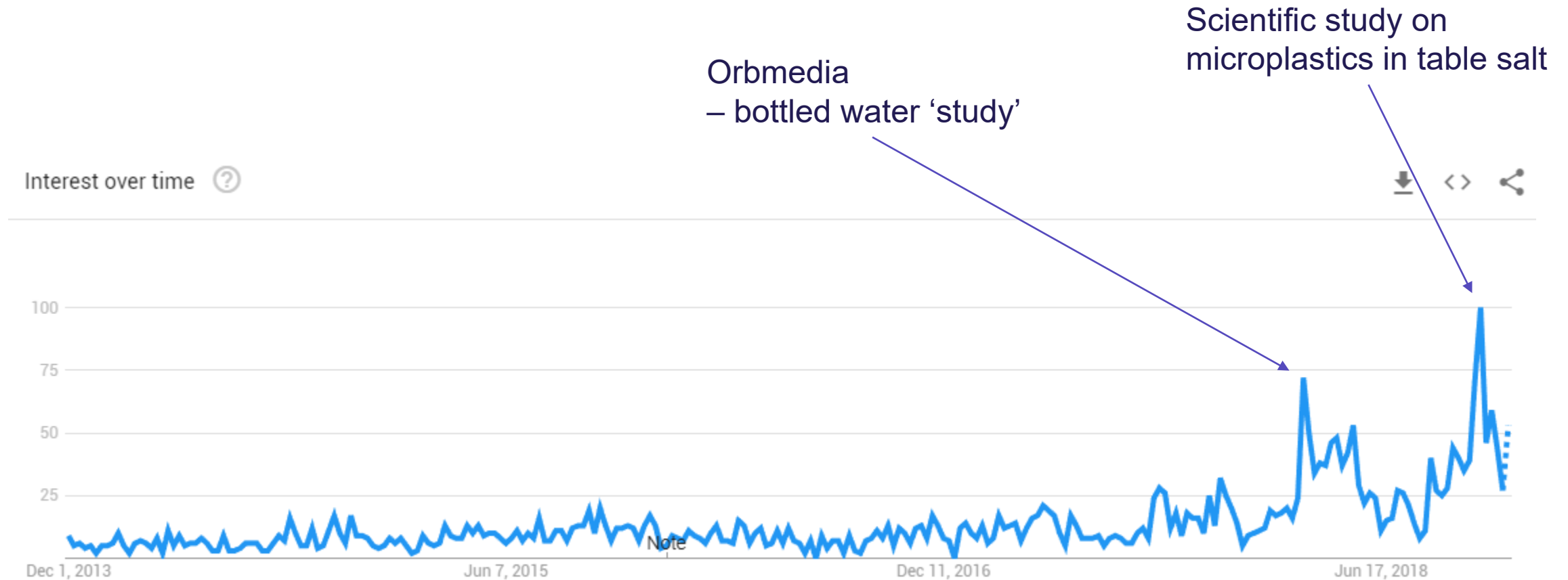
Sektion for Vand og Miljø, Institut for Byggeri og Anlæg

Aalborg Universitet



# The societal awareness: Searches on Google

searches on the term "microplastics"



# Plastic pollution

Impacts on nature and humans

The use of plastics potentially leads to:



Visual nuisances



Physical damages  
on animals



Toxic effects  
on animals and ecosystems



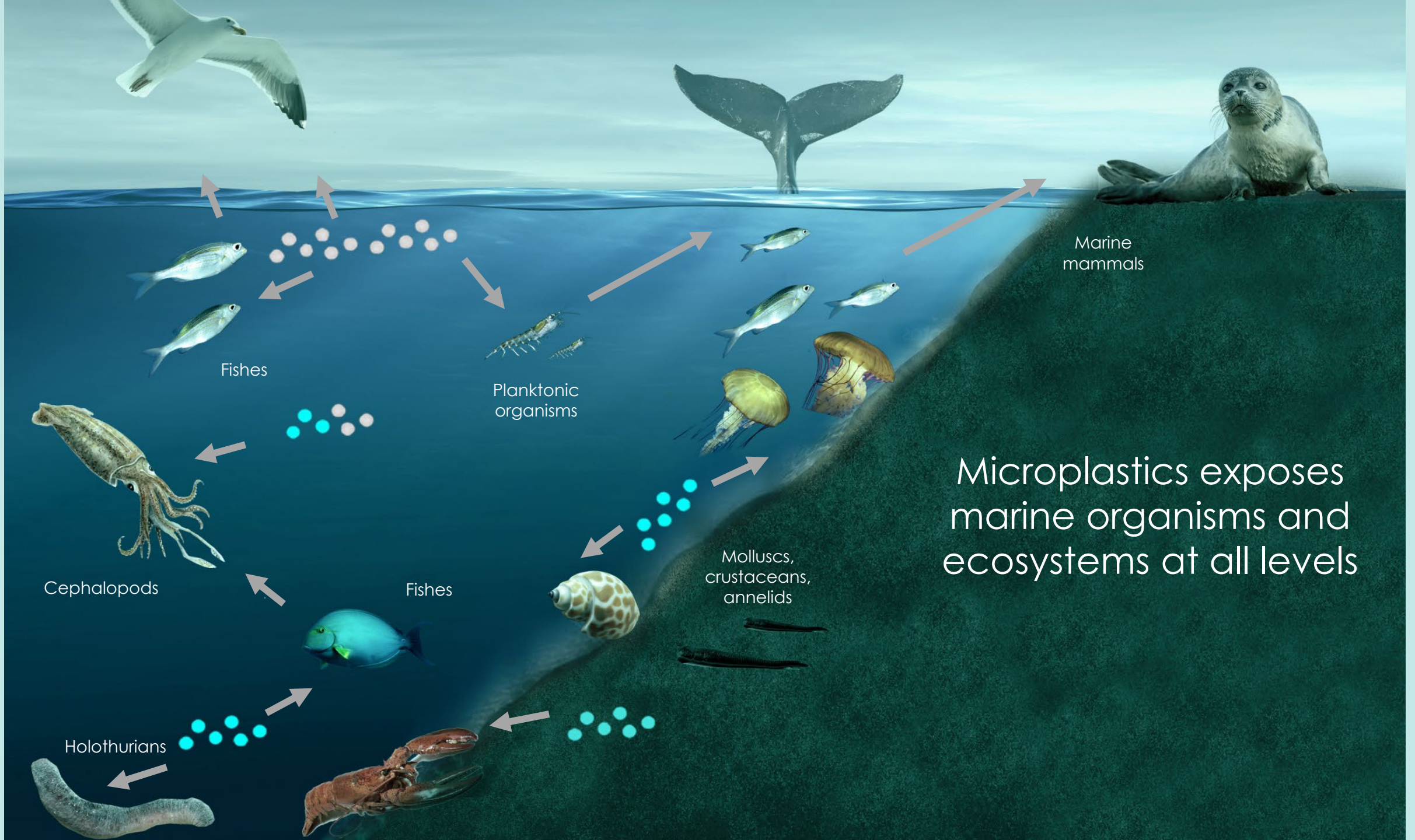
Toxic effects  
on humans?

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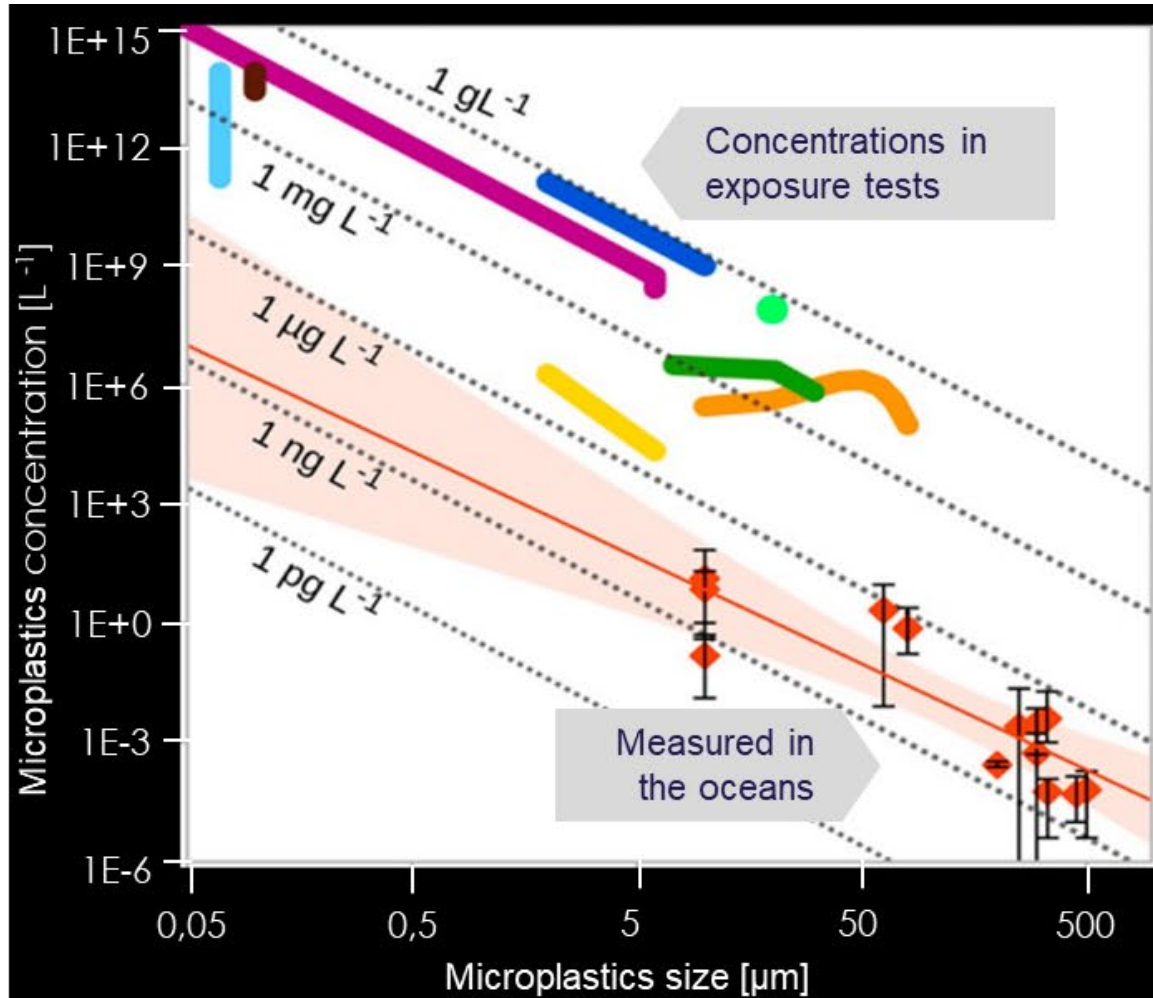
What do we know regarding impacts?

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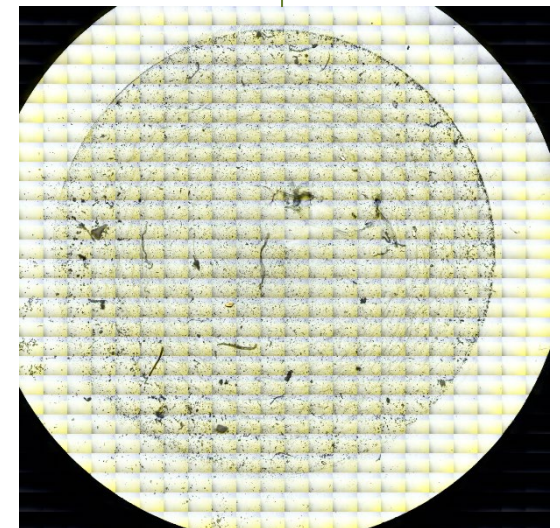
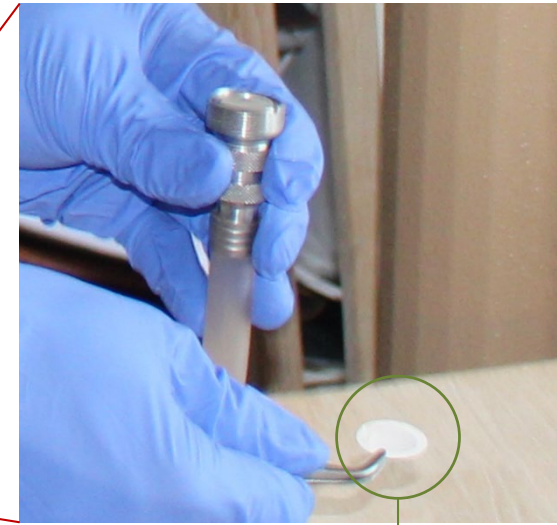


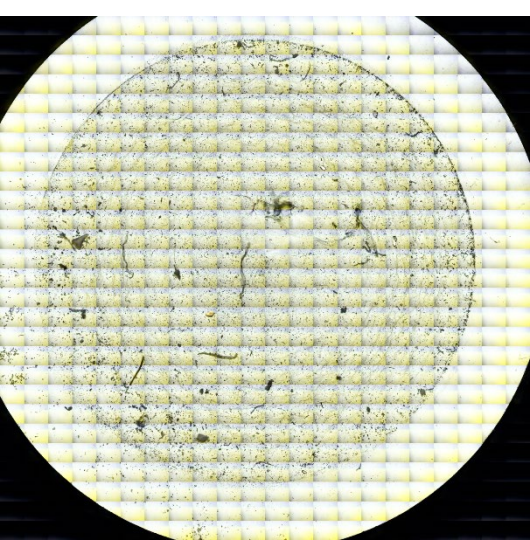
# Are there effects at environmentally realistic concentrations?



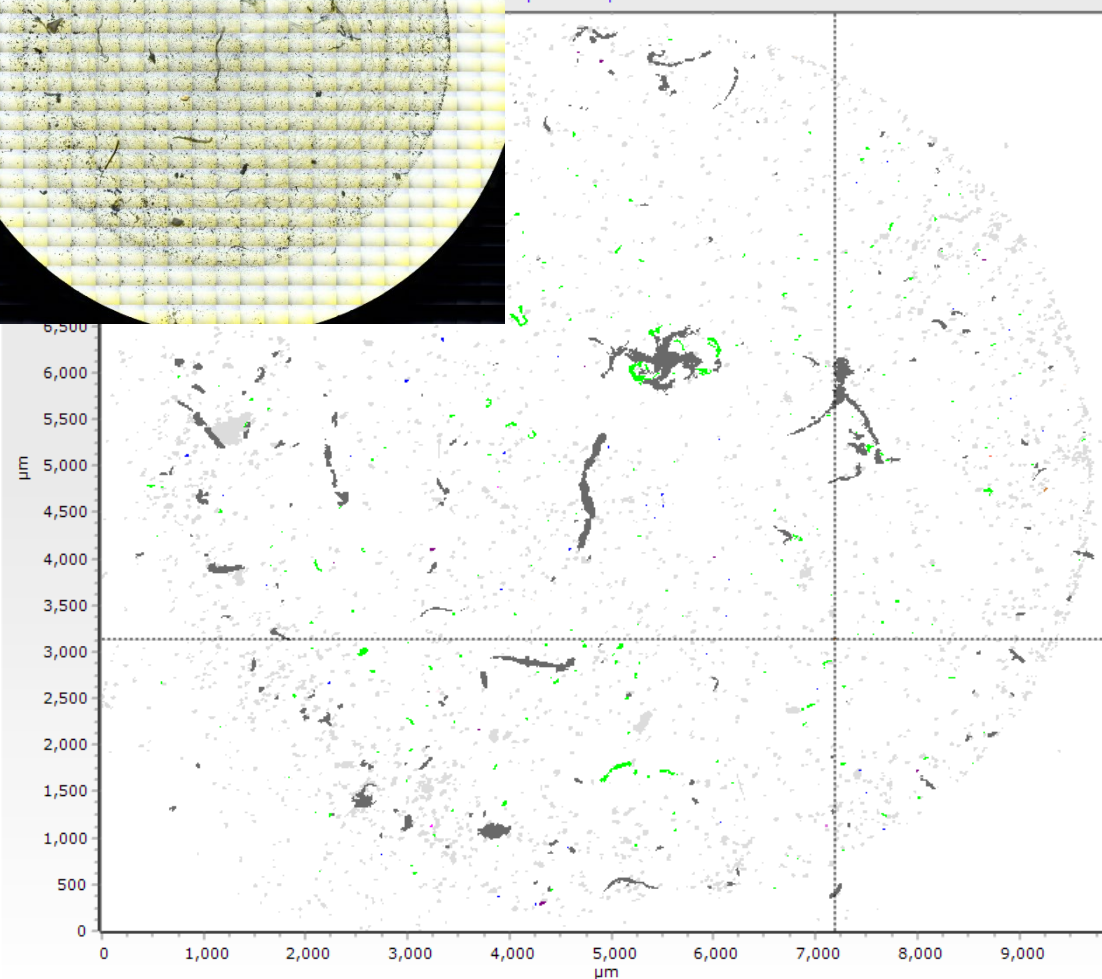
# Human are exposed to microplastics, for example by indoor air

Measured in 3 student flats





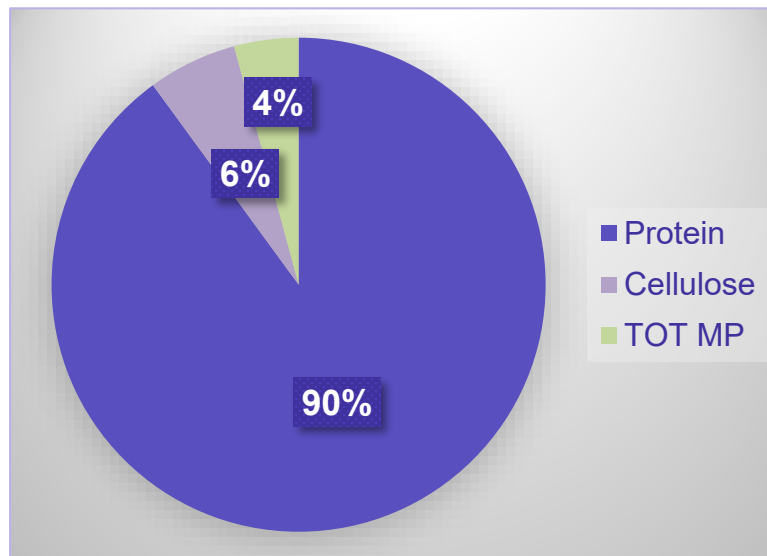
Spectra map



Fouling release	36
Alkyd	35
PU paints	34
Acrylic paints	33
Cellulose	32
Protein	31
Cellulose acetate	30
PEBAX	29
Polyimide	28
Aramid	27
PLA	26
EPDM	25
PTFE	24
PEG	23
POM	22
Diene elastomer	21
Phenoxy resin	20
Epoxy	19
PAN_Acrylic fibre	18
Polycarbonate	17
ABS	16
SBR	15
PS	14
PU	13
PVDC	12
PVAC	11
PVA	10
EVA	9
Vinyl copolymer	8
PVC	7
SAN	6
Acrylic	5
PA	4
Polyester	3
PP	2
PE	1
	0

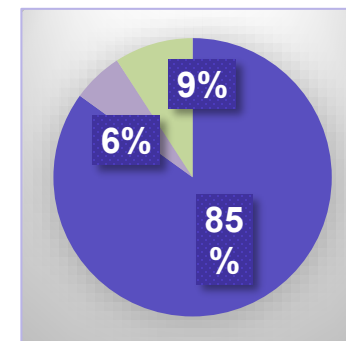
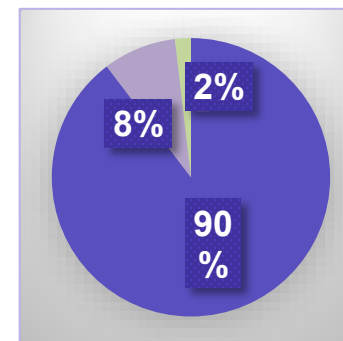
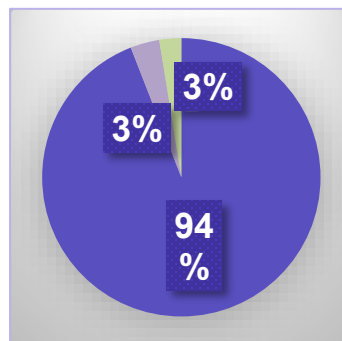
Grey: Natural material  
Colored: Plastics

## Composition of organic material in the breathed air



- Protein is for example skin and hair
- Cellulose is for example cotton
- TOT MP are all types of microplastics

## Differences between the 3 flats





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What do we know regarding fate?

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# Degradation



**Common  
assumption**

Plastic is indestructible

**Reality**



Plastic is degraded



Degradation in the natural and technical environment:

Physical-  
chemical

Biological

**Nanoplastics? Complete mineralization?**

# Degradation in reality

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Degradation depends on  
the environment



25 years in the storage at  
the Danish War Museum

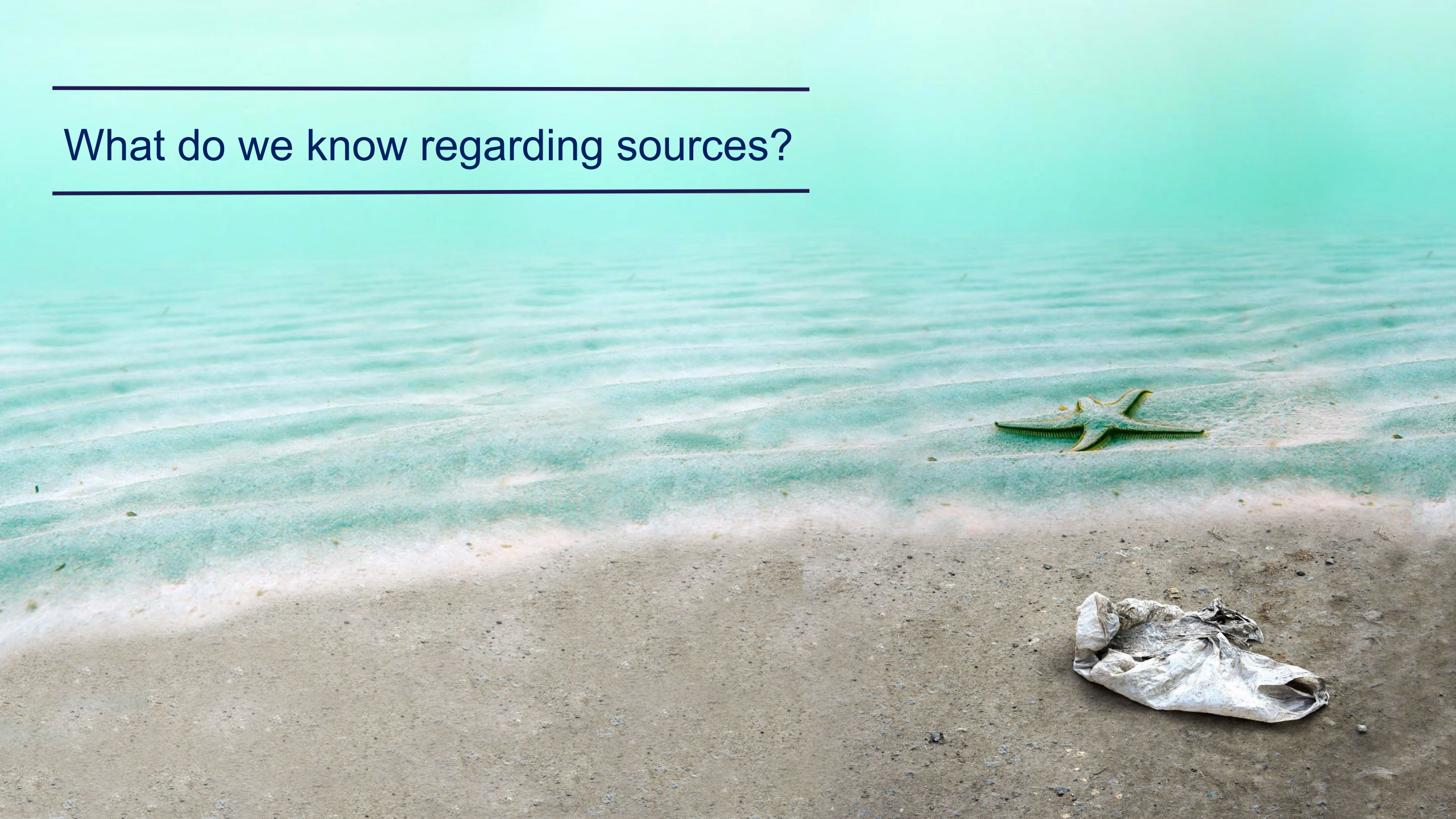


4 months at a  
Danish beach  
(Blåvandshug)

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What do we know regarding sources?

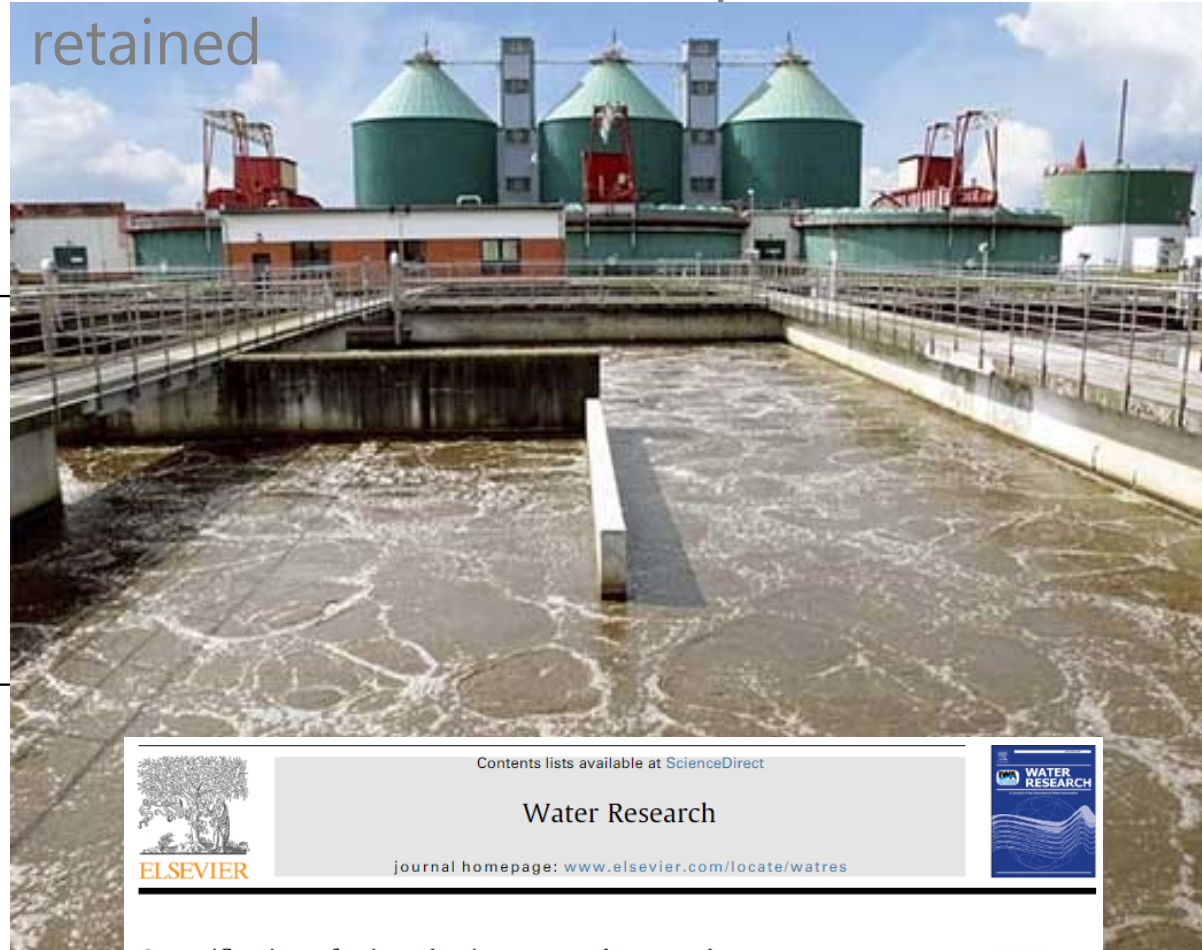
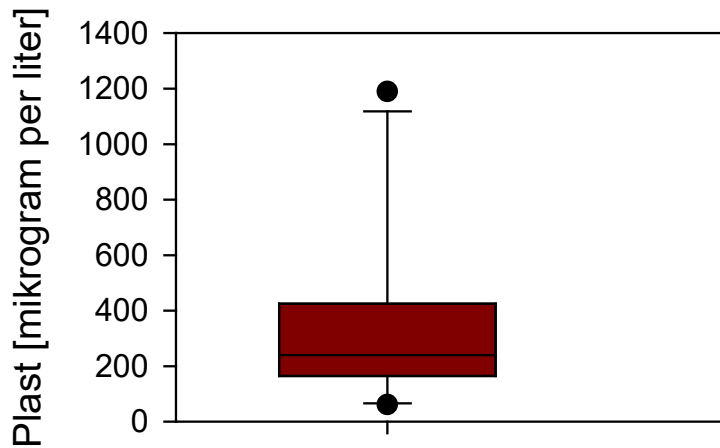
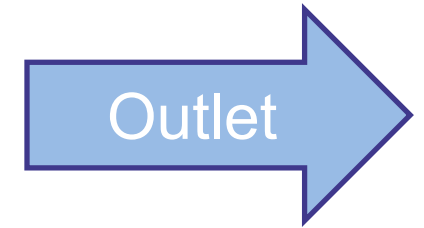
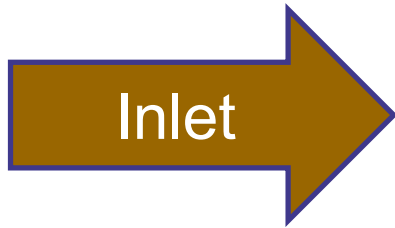
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# How well do wastewater treatment plants remove microplastics?

10 Danish treatment plants

Around 99% of all microplastic is retained



Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

**Water Research**

journal homepage: [www.elsevier.com/locate/watres](http://www.elsevier.com/locate/watres)



Quantification of microplastic mass and removal rates at wastewater treatment plants applying Focal Plane Array (FPA)-based Fourier Transform Infrared (FT-IR) imaging

Marta Simon\*, Nikki van Alst, Jes Vollertsen

Aalborg University, Department of Civil Engineering, Thomas Manns Vej 23, 9220 Aalborg Øst, Denmark

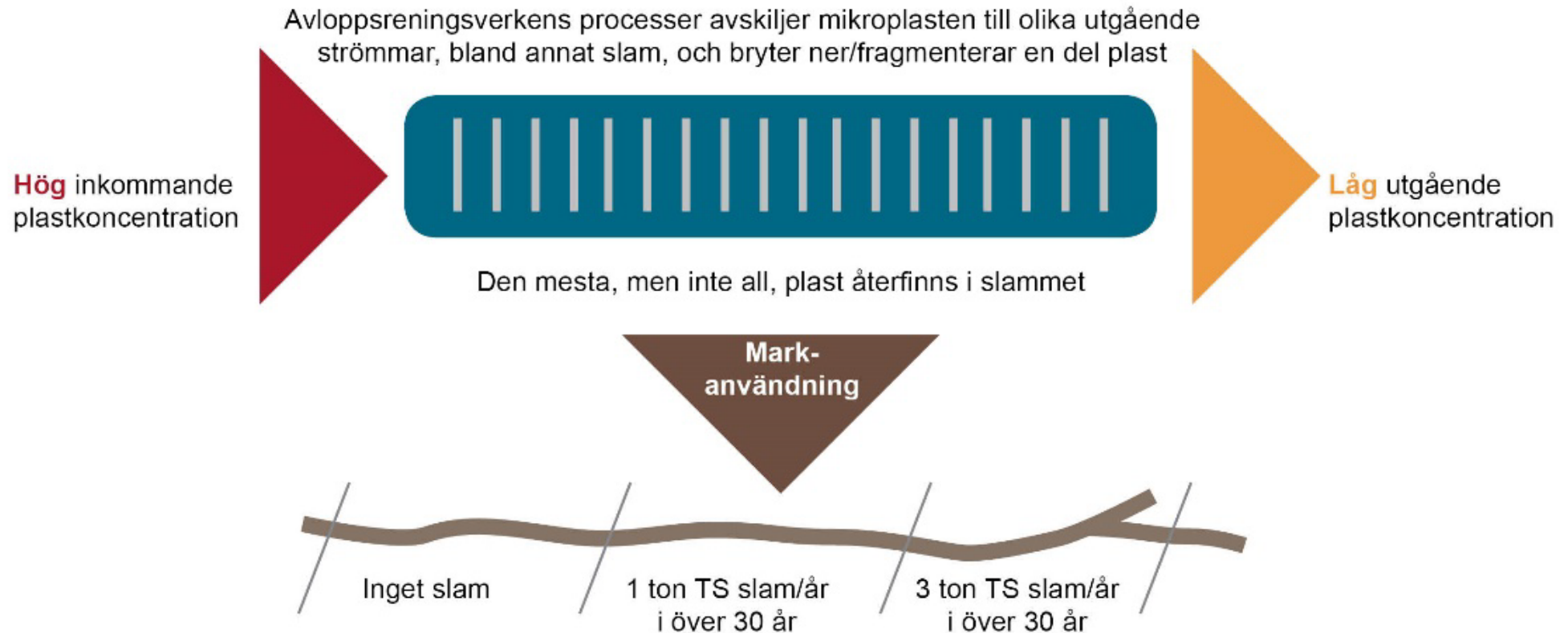


# Where does the microplastics go?

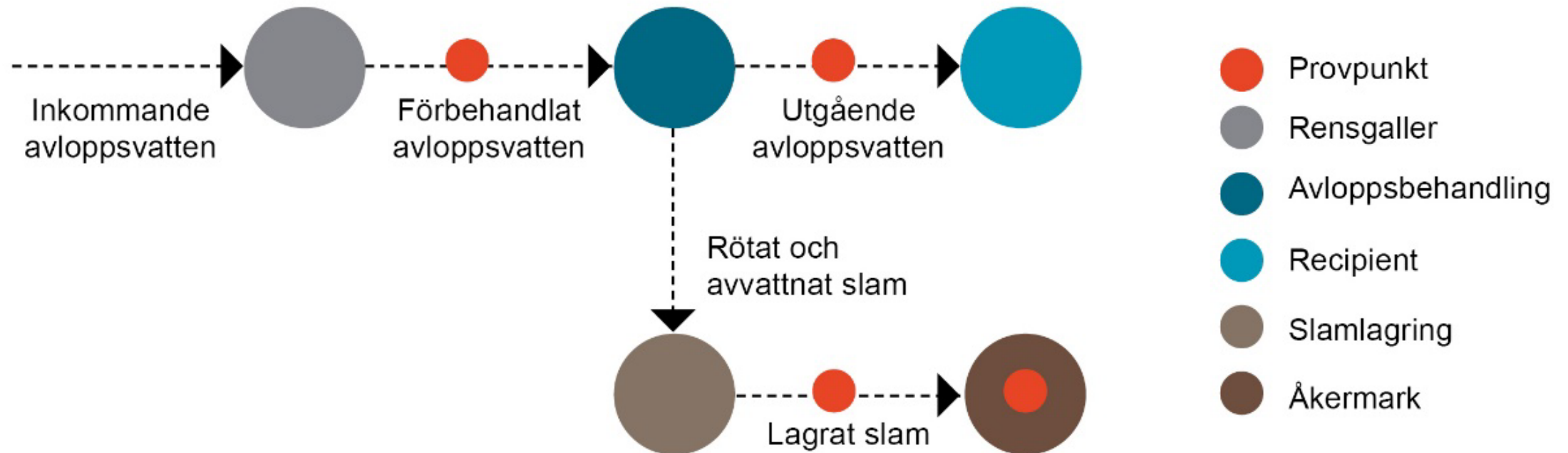


# Mikroplaster i kretsloppet

Små plastpartiklar, så kallad mikroplast, ...



# Sampling at Sjölunda Reningsverk

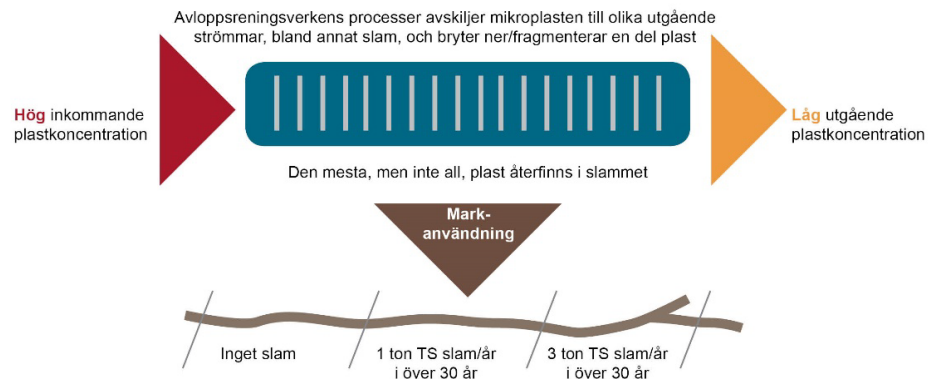




# Results at Sjölunda Reningsverk

More than 99% of the microplastics were removed from the incoming wastewater

Total discharge of microplastics was calculated to 0.15 g/(PE year)

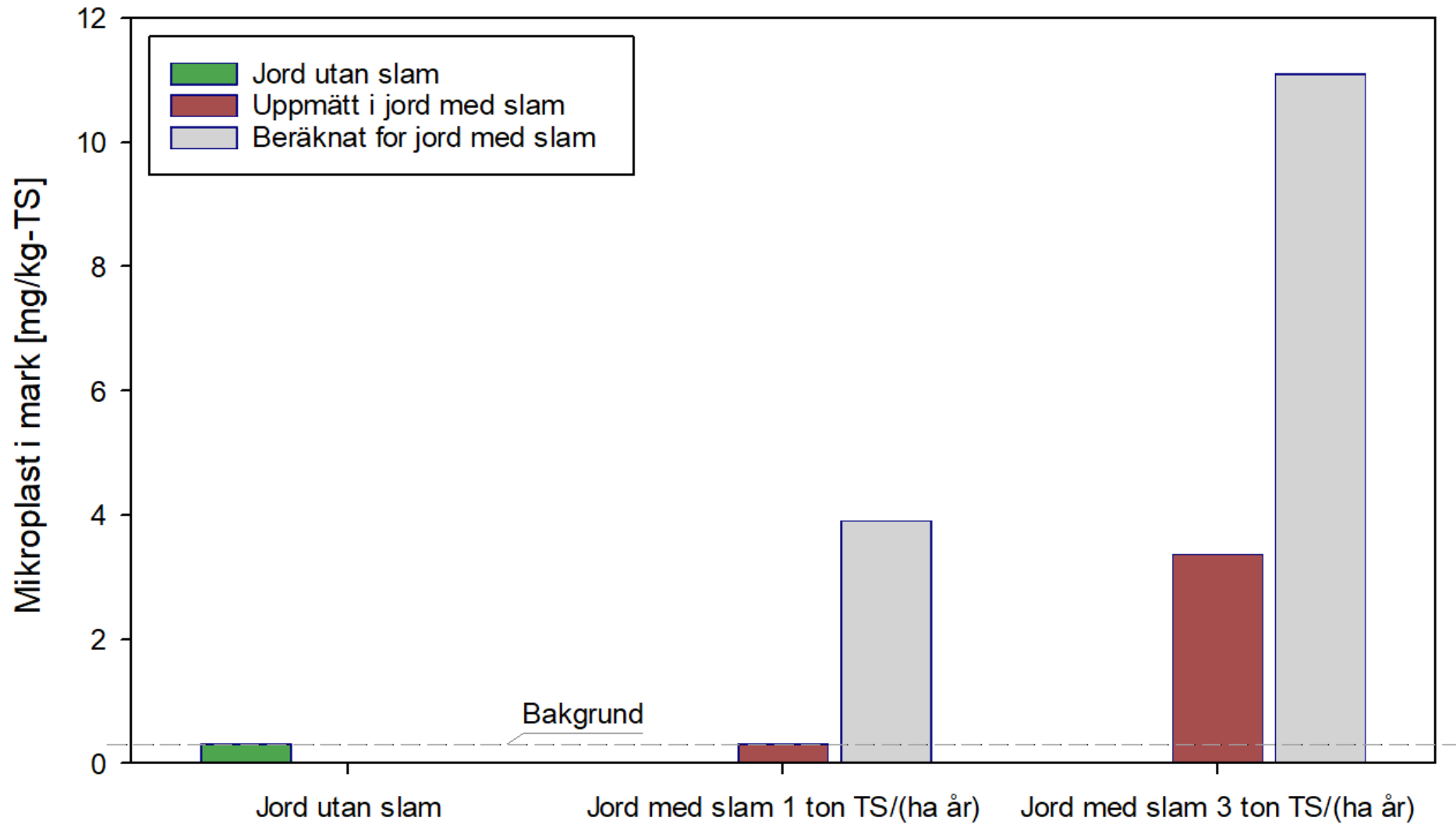


40% of the microplastics in the incoming wastewater was recovered in the anaerobically digested sludge

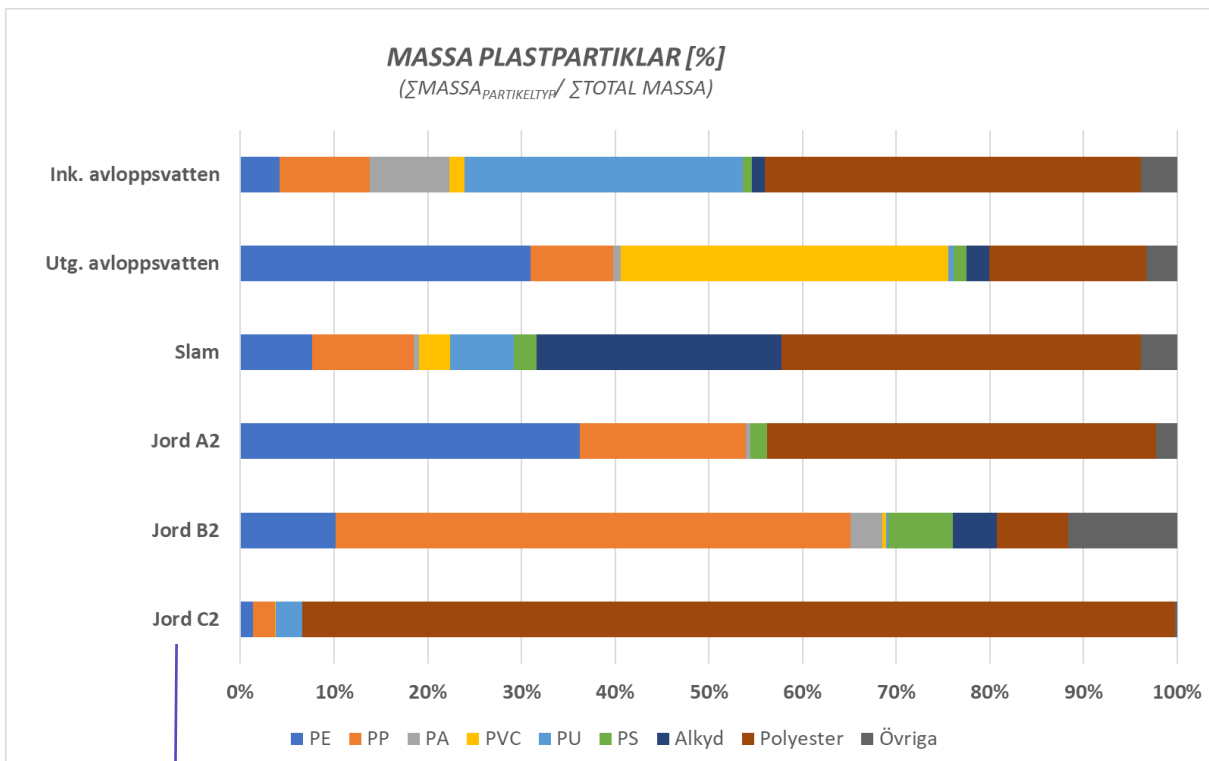




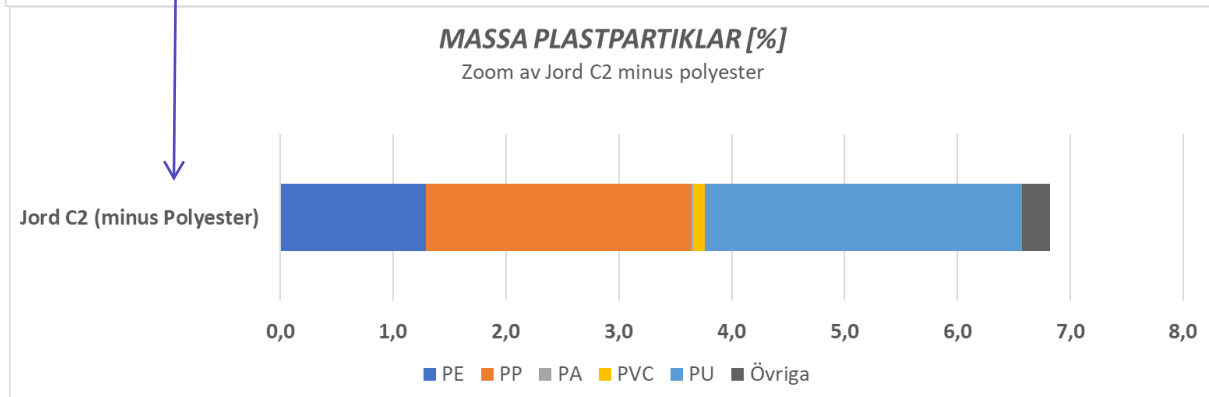
# Fältförsök Petersborg – mass results



# Fältförsök Petersborg – polymer typer



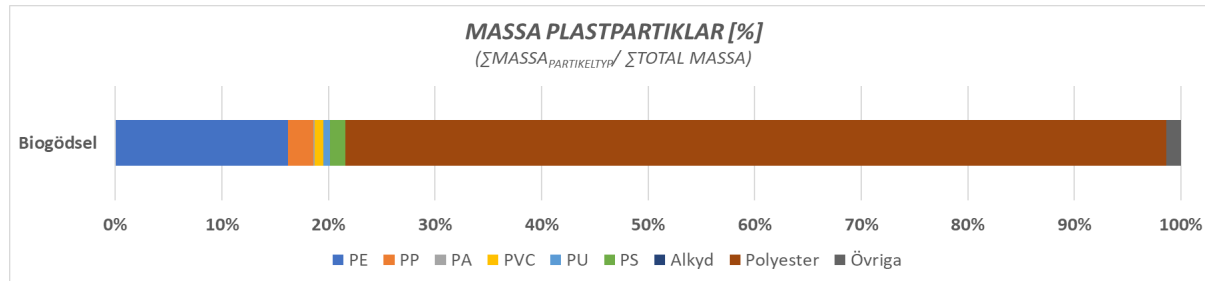
- Alkyd
- Polyester
- Polyetylen (PE)
- Polypropylen (PP)
- Polyamid (PA)
- Polyvinylklorid (PVC)
- Polyuretan (PU)
- Polystyren (PS)



# Biogödsel

(anonymous biogas plant – only one sample from one plant)

6 mg plastic per kg TS



Significantly less than the wastewater treatment plant sludge, however, only one grab sample was analyzed

Alkyd  
Polyester  
Polyetylen (PE)  
Polypropylen (PP)  
Polyamid (PA)  
Polyvinylklorid (PVC)  
Polyuretan (PU)  
Polystyren (PS)



# Main conclusions

- The treatment plant is highly effective in retaining microplastics
- Data indicate that some plastic might 'disappear' during the treatment
- Sludge as fertilizer seems not to cause an elevated microplastic concentration
- Data indicate that some plastic might 'disappear' over time
- Solid waste possibly holds less microplastics compared to sludge



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