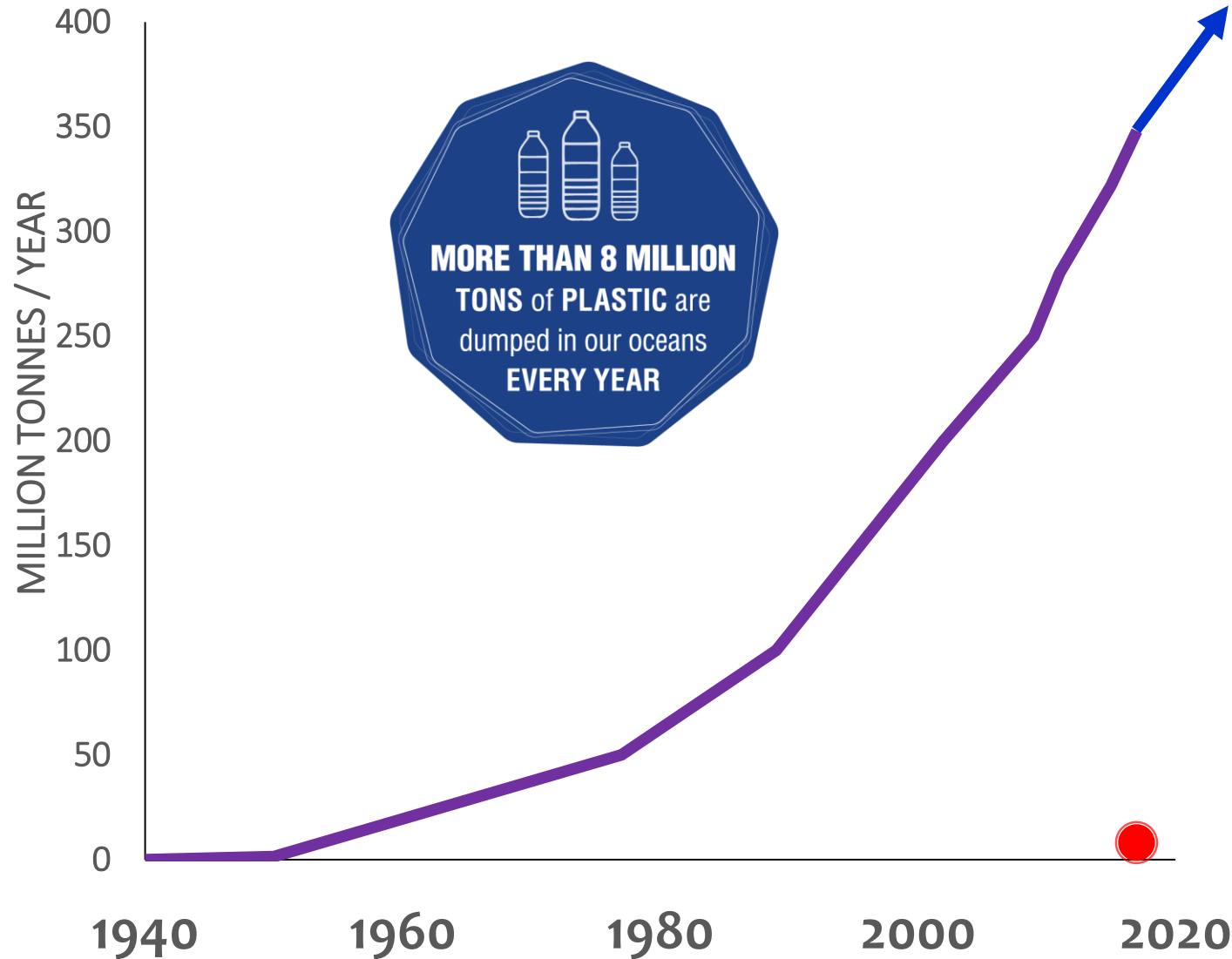


Analysis of micro- and nano-plastics in environmental samples by pyrolysis gas chromatography mass spectrometry

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Global plastics production



Why do we care about plastics?

Air



Wastewater



- Biosolids
- Soil – croplands
- Human tissues

Plastic fibres found in tap water around the world, study reveals

Exclusive: Tests show billions of people globally are drinking water contaminated by plastic particles, with 83% of samples found to be polluted

● We are living on a plastic planet. What does it mean for our health?



▲ The average number of fibres found in each 500ml sample ranged from 4.8 in the US to 1.9 in Europe.



Seafood

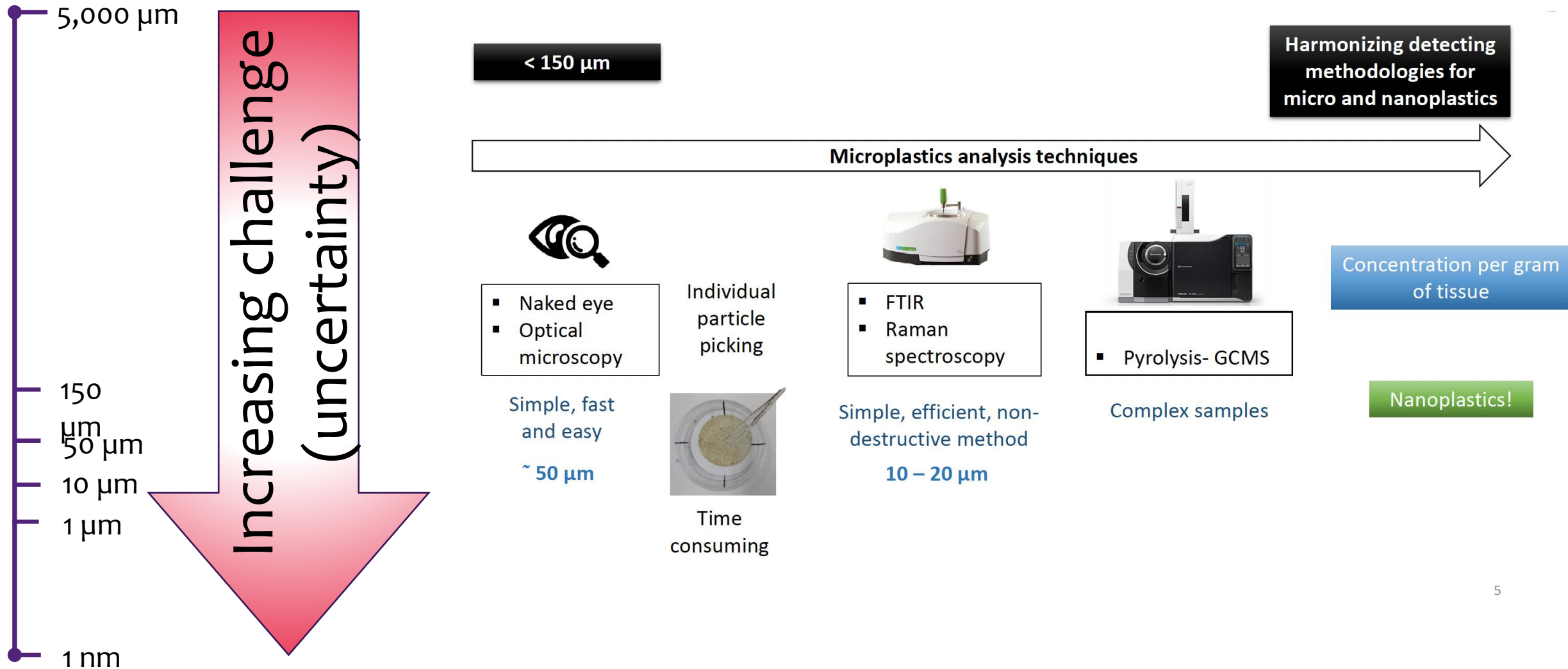


Food

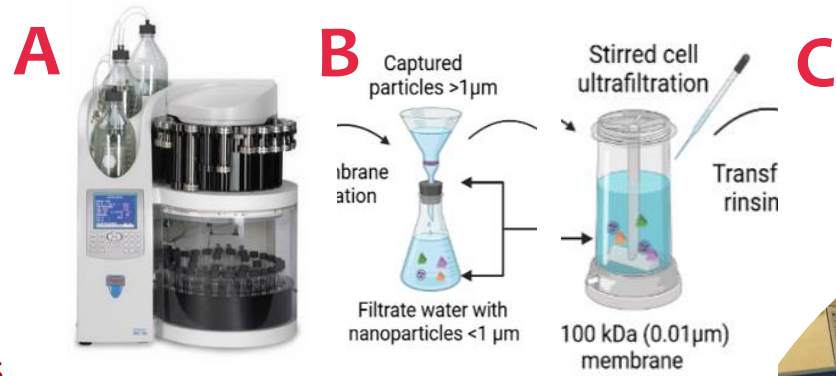
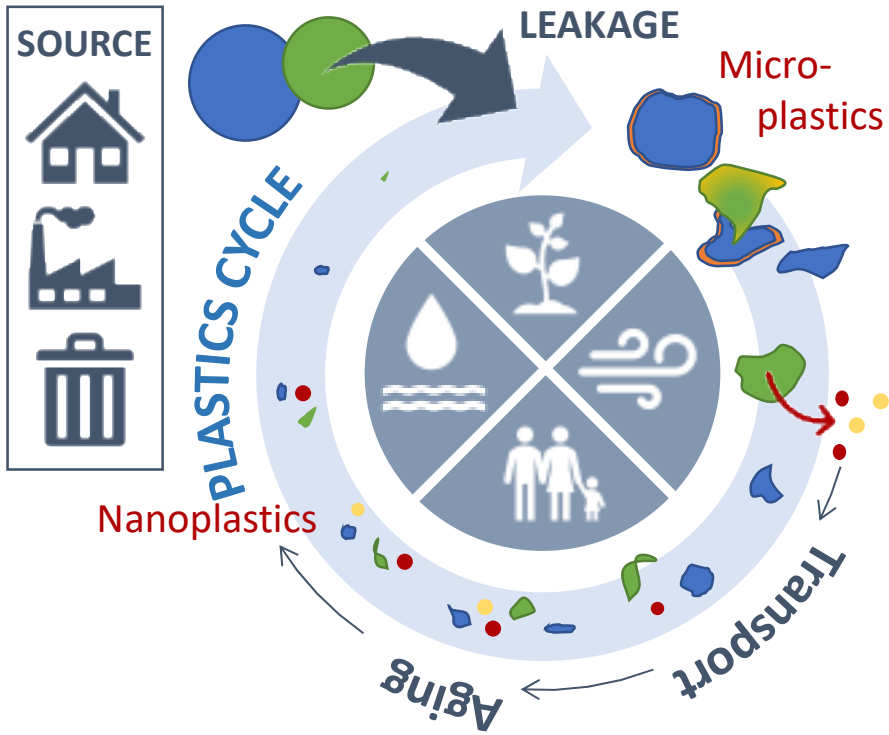


Drinking water

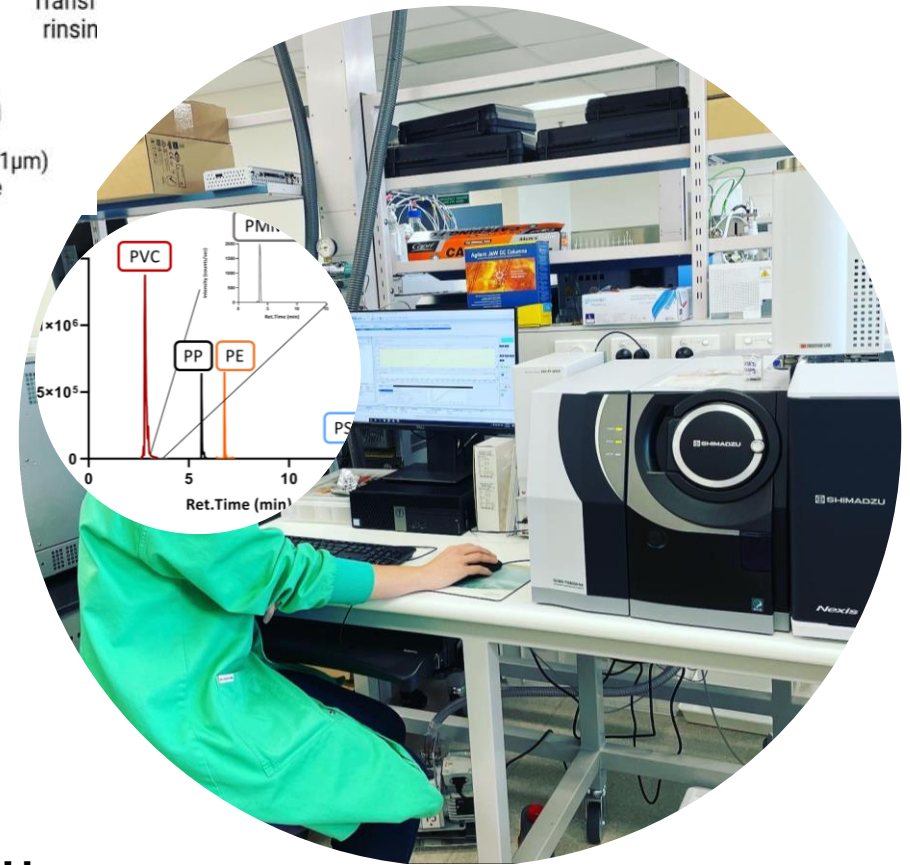
The analytical challenge : Common analytical options



Quantitative analysis for selected plastics using Pyrolysis Gas Chromatography Mass Spectrometry



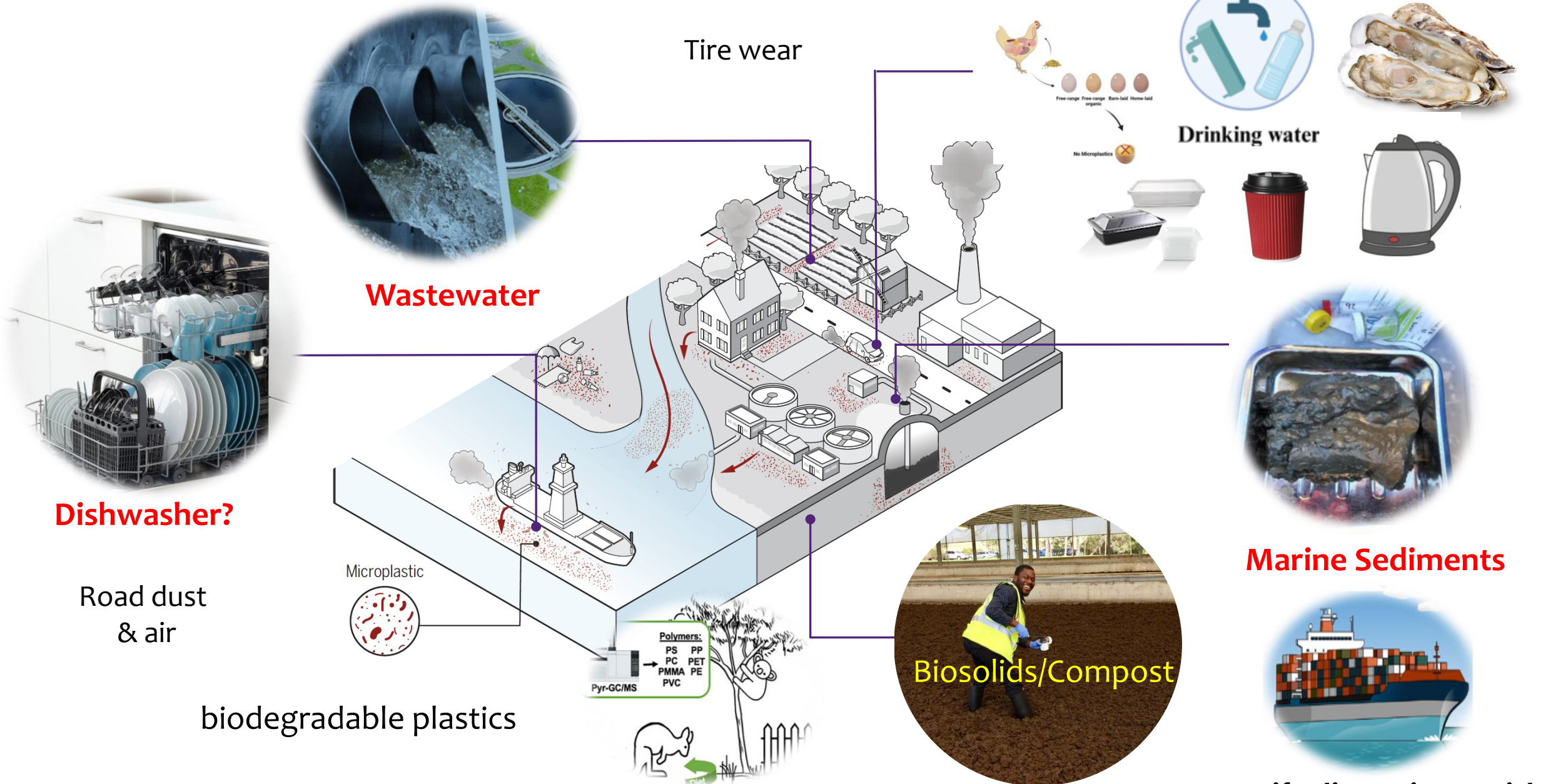
Sampling



PE, PP, PET, Nylon 6, Nylon 66,
PMMA, PC, PS, PVC, ABS, SBR, PU

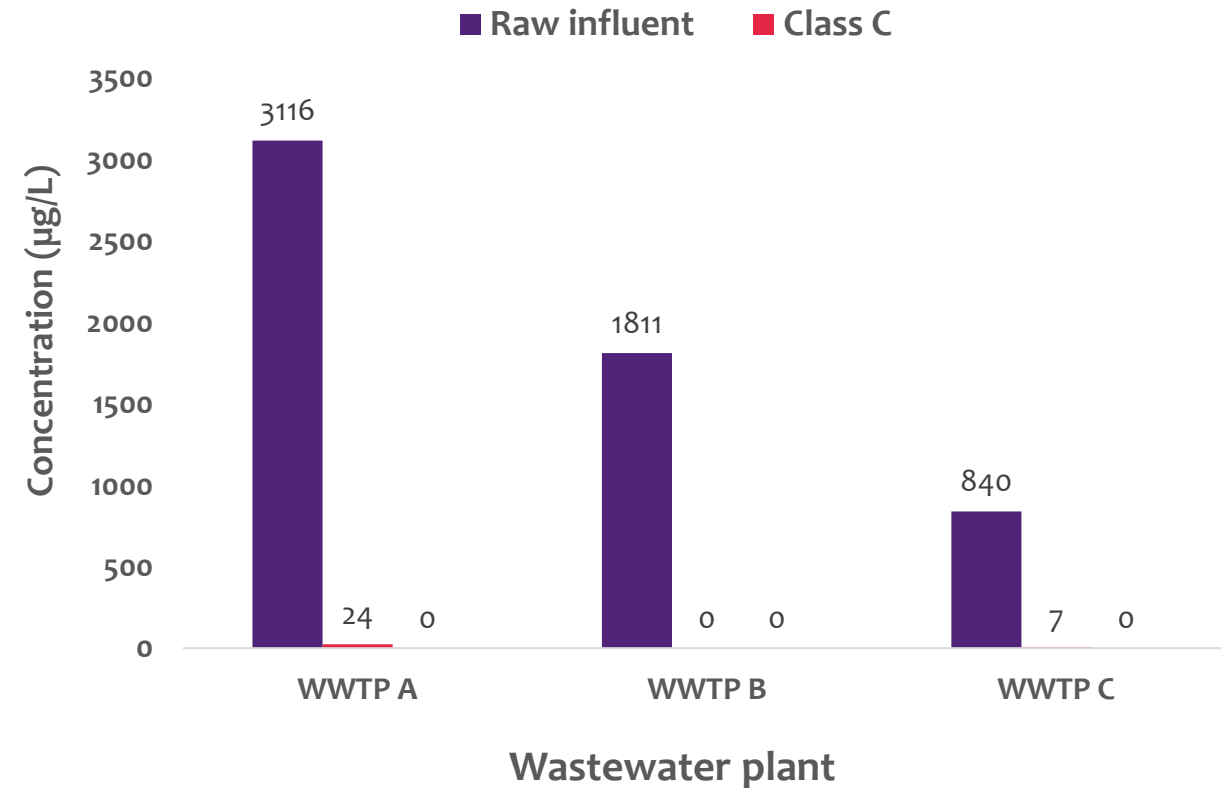
Pyr-GC/MS

Environmental/Human exposure/sources to plastics



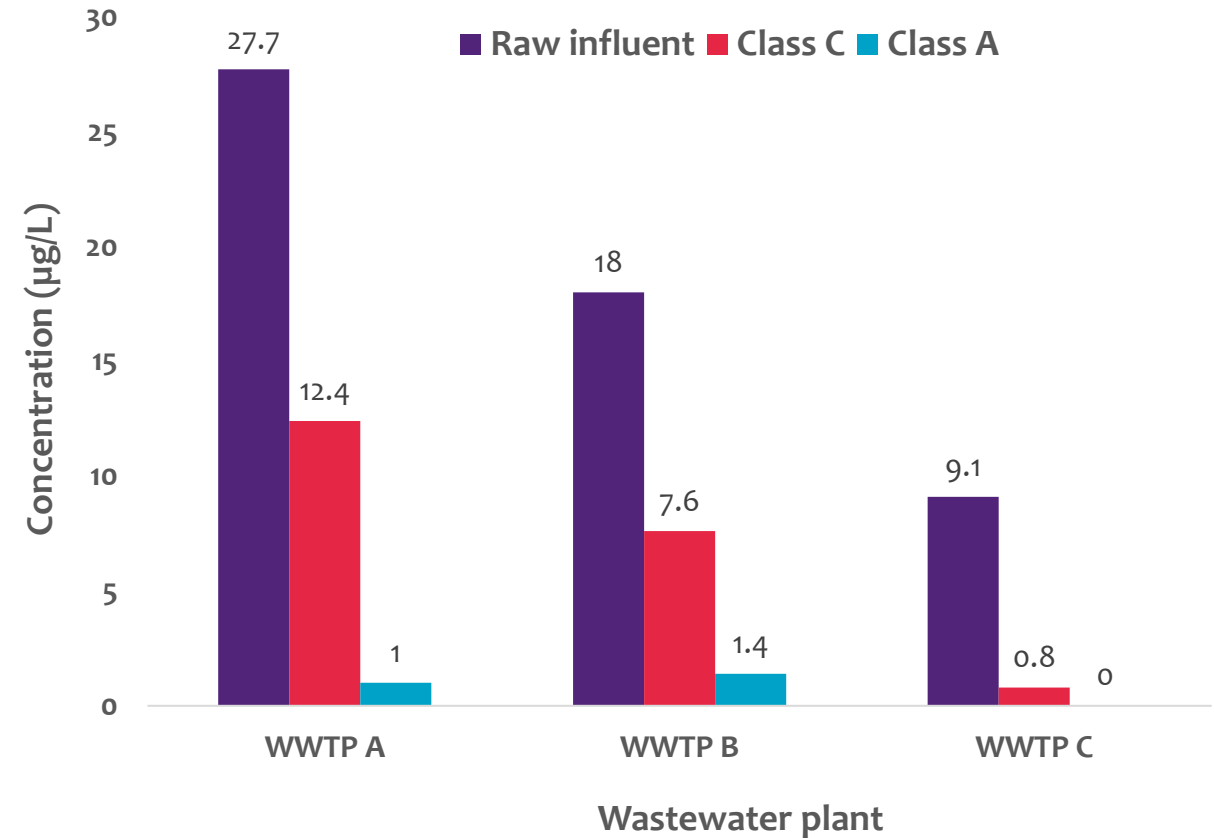
Microplastics and Nanoplastics in Wastewater

A Removal efficiency (%) of total microplastics



PE, PVC, PET, PP, PMMA

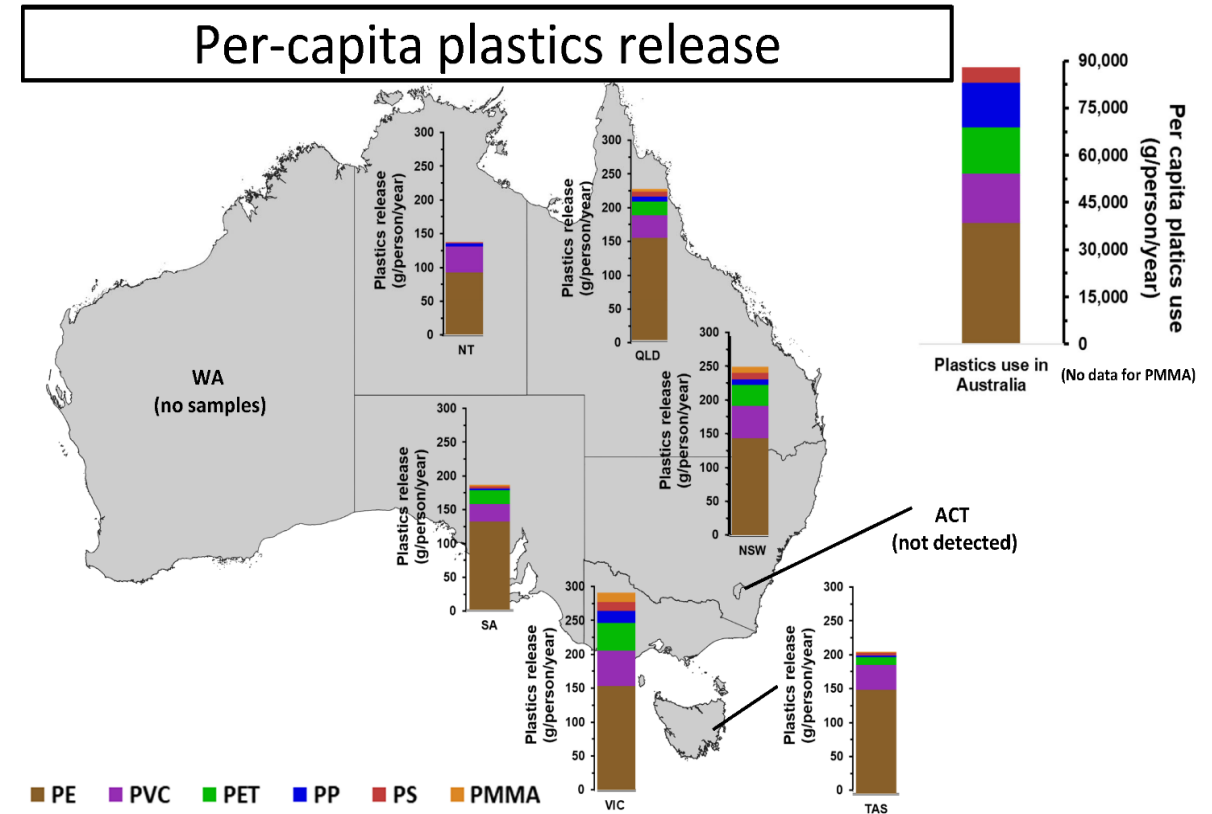
B Removal efficiency (%) of total nanoplastics



Nylon 66, PE, PP, PET, Nylon 6, PMMA, PC, PS

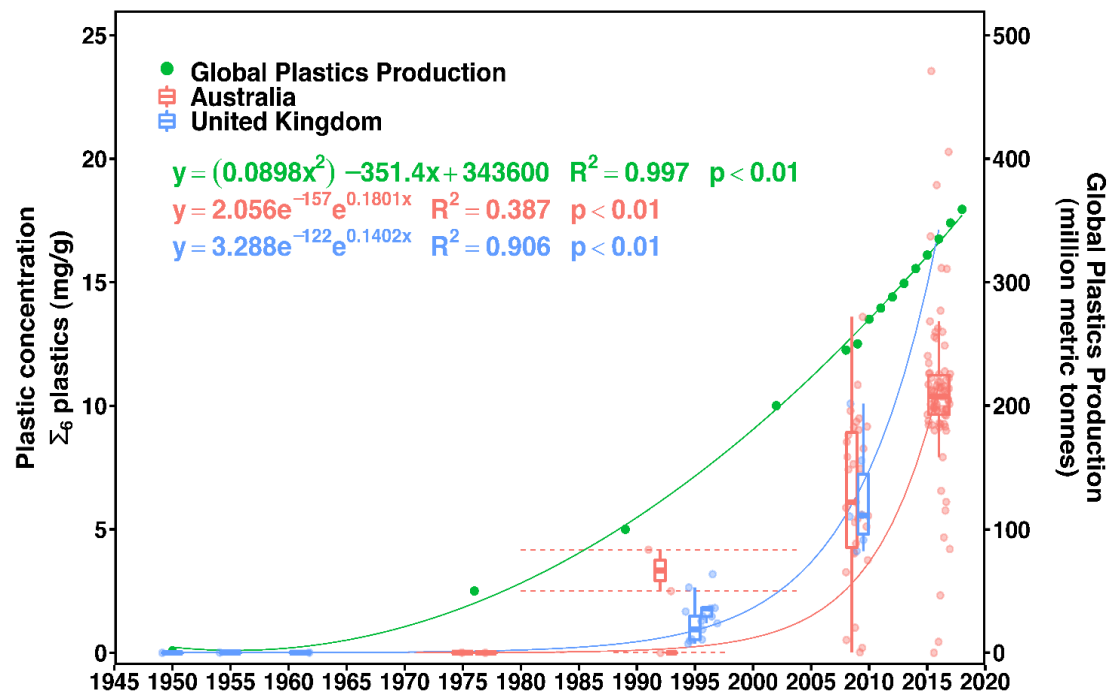
How much plastic do you release through sewage?

- ❖ Per-capita Σ6Plastics across sites were between 8 and 877 g/person/year!
- ❖ Mean 200 g/person/year
- ❖ PMMA & PET release corelates with socio-economic factors.



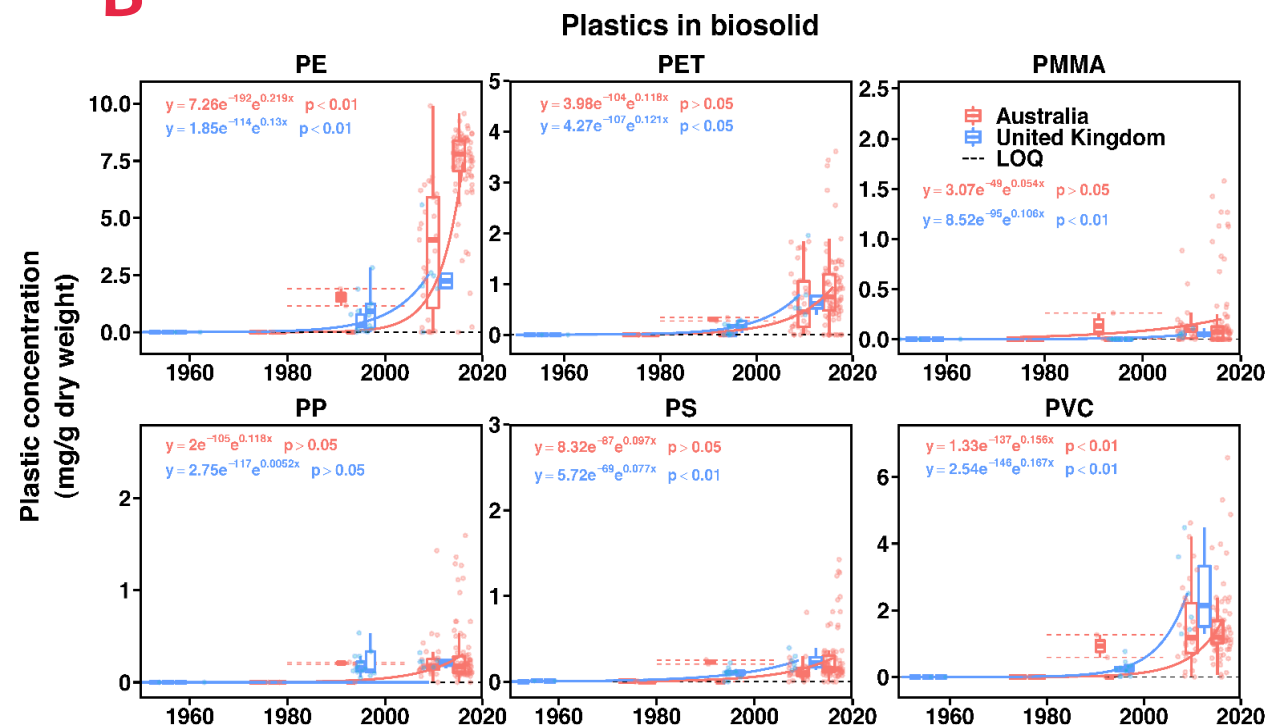
Biosolids: Plastics in archived samples from 1950 to 2016

A



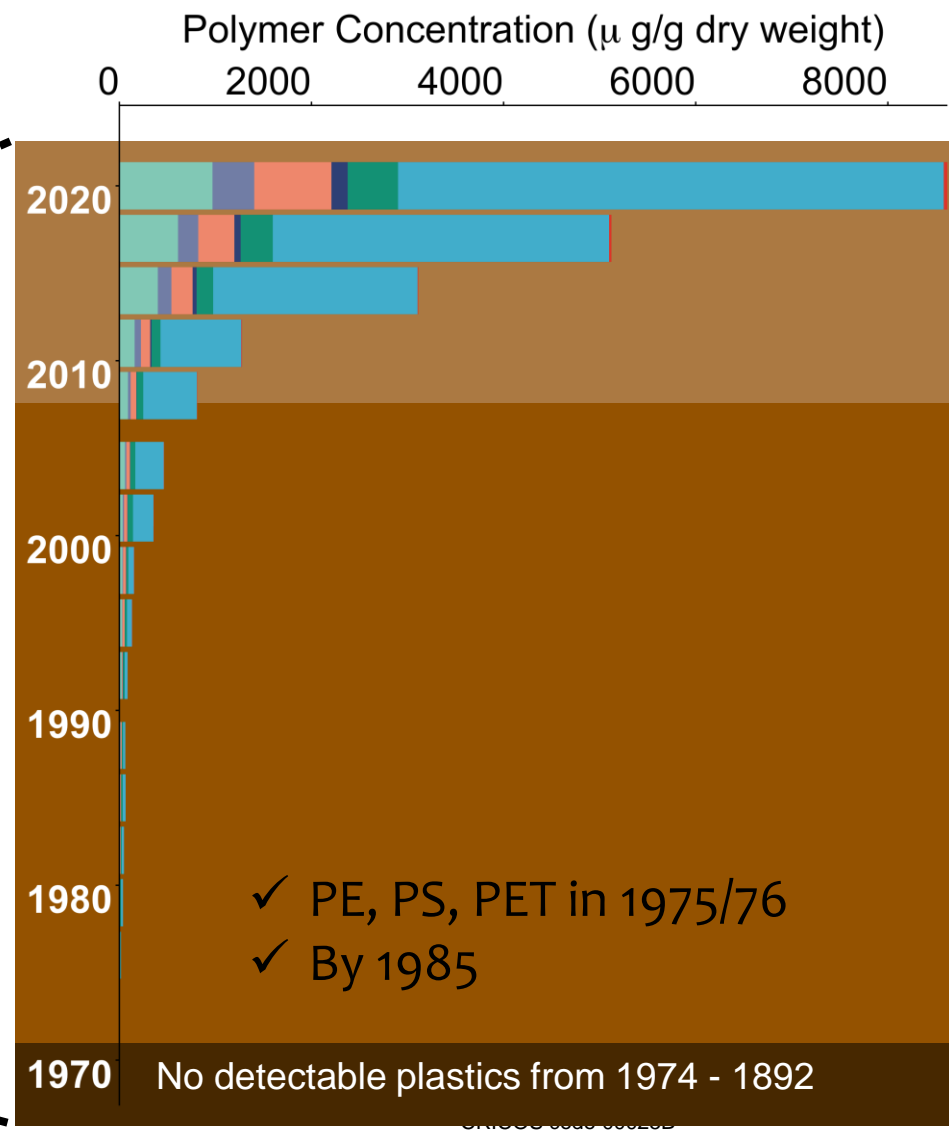
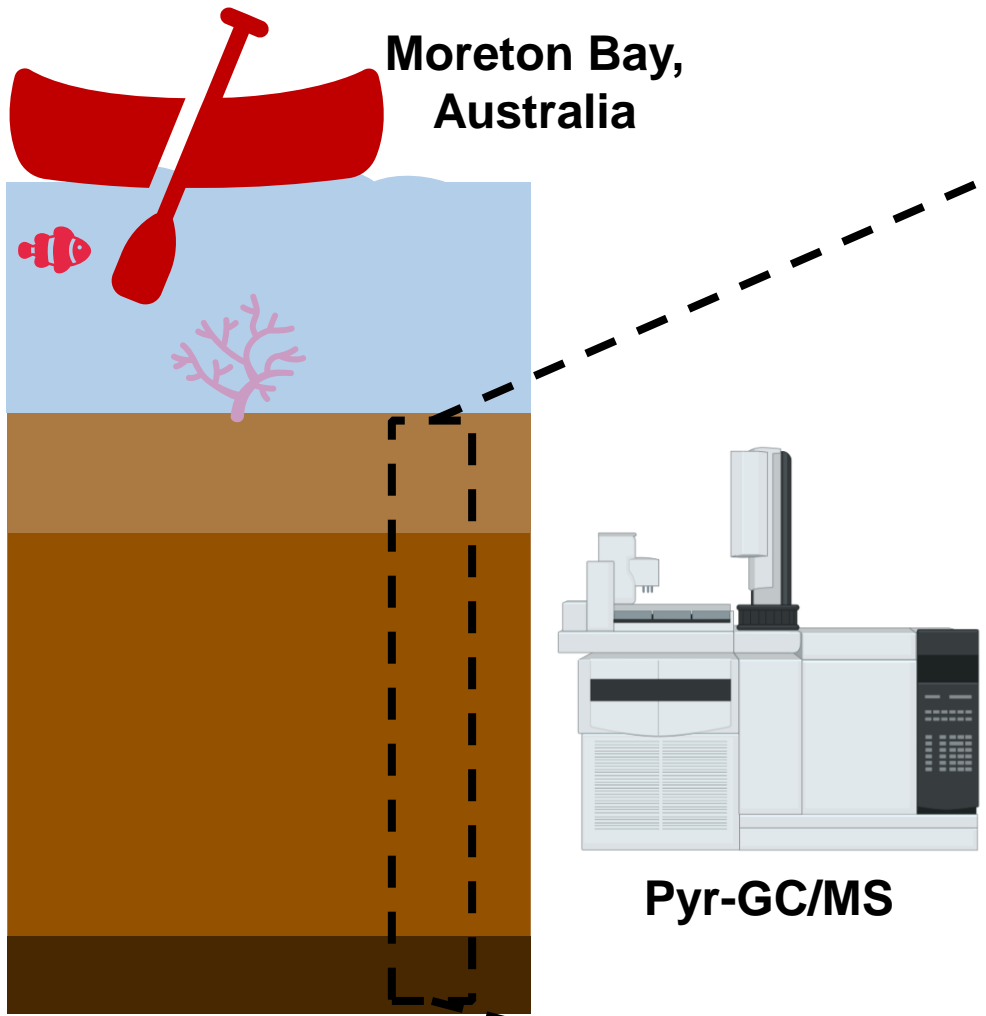
- ✓ Concentrations of plastics closely correlate with production and consumption

B



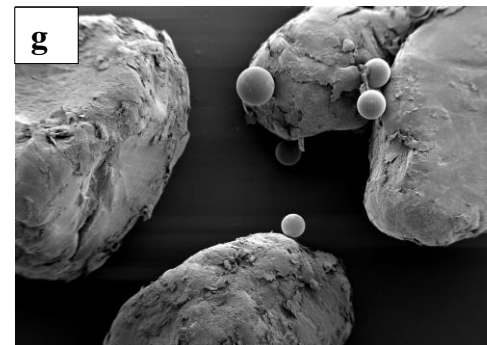
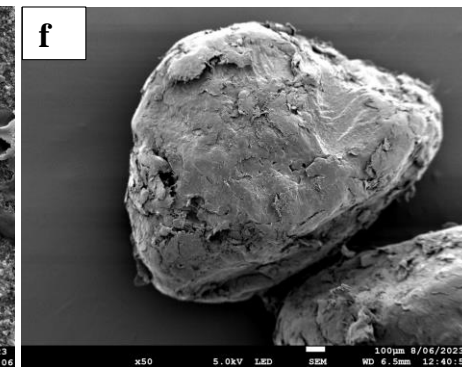
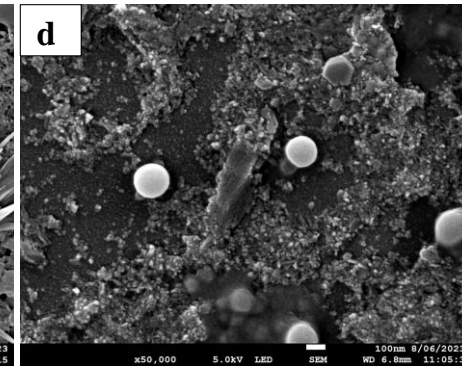
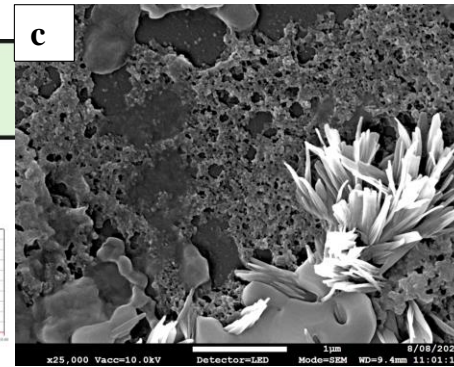
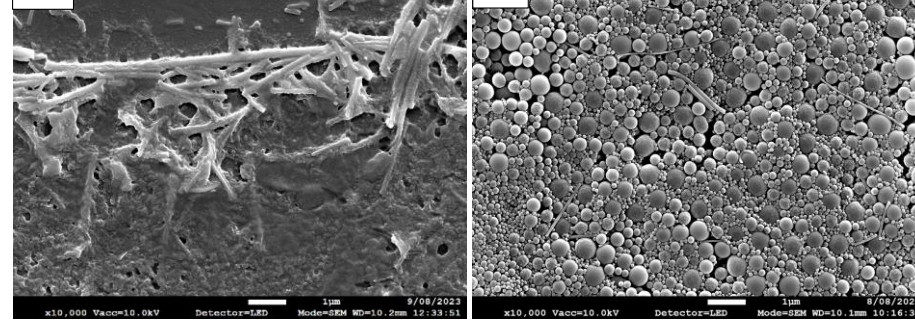
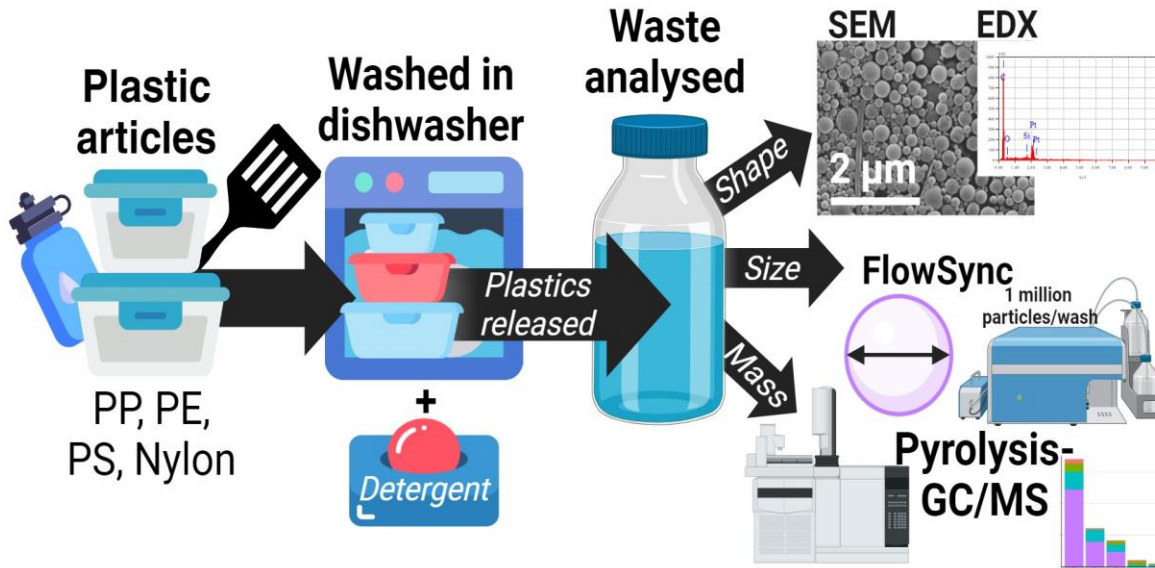
- ✓ Prior to the 1990s, leakage of plastics into biosolids was limited except for PS.
- ✓ Leakage from 1990s driven by increased production and consumption of PE, PET, PVC.

Historical plastic deposition in dated cores



Dishwasher?

Plastics in dishwasher waste



- ❖ 920,000 particles per cycle
- ❖ 170 million particles per household per year

Take home

- Tiny pieces of plastic are ubiquitous in the environment and are part of a 'plastics cycle'
- Little is known about the effects of micro/nano plastic exposure on human health
- Uncertainties and knowledge gaps prevent the full evaluation of health impacts
- Studies of the effects of micro/nano plastic consumption by humans are starting
- Reducing exposure to plastic requires a variety of solutions

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Government**

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