Invisible Fallout: Global Patterns and Sources of Atmospheric Microplastics

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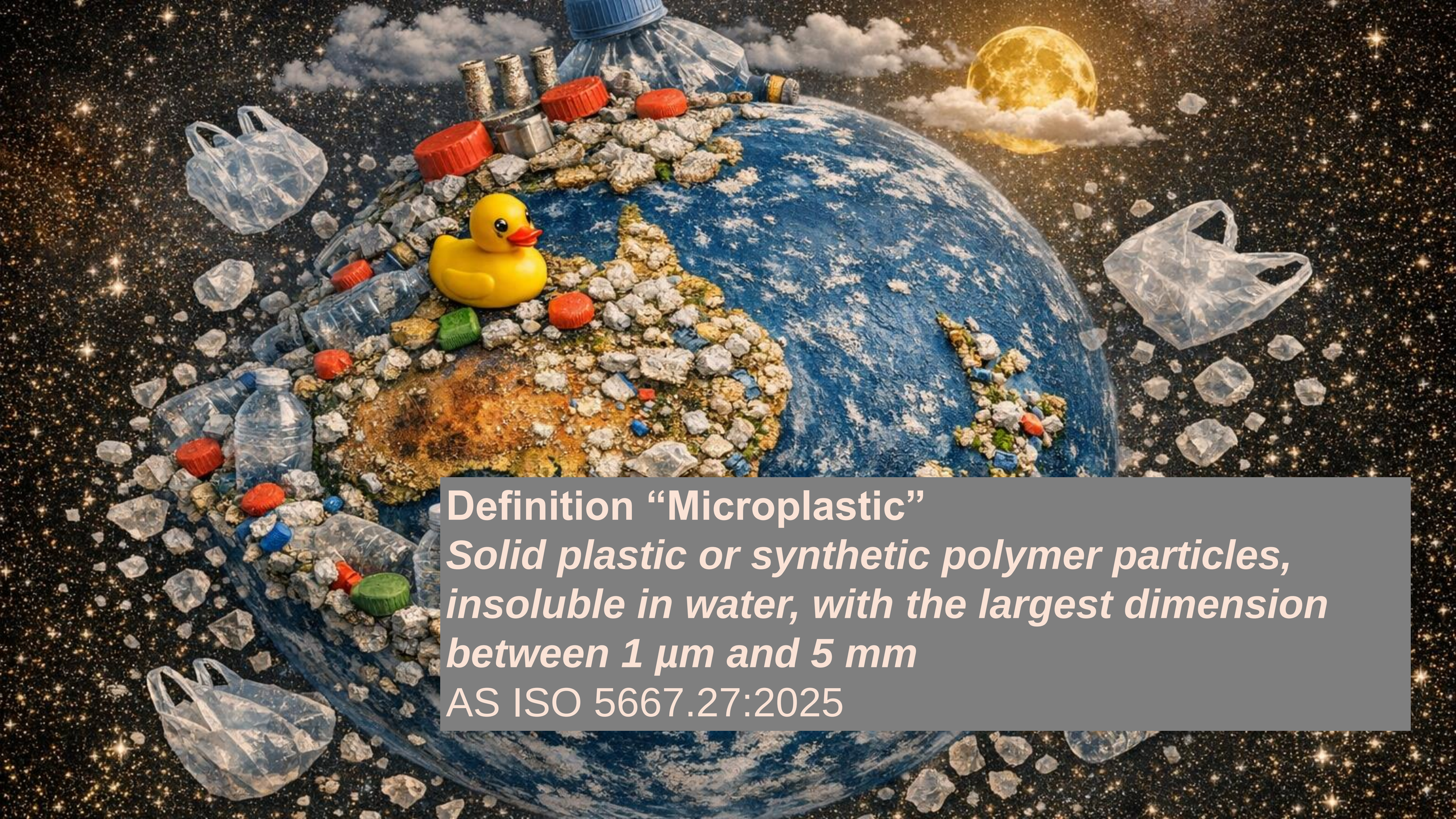


Definition “Microplastic”

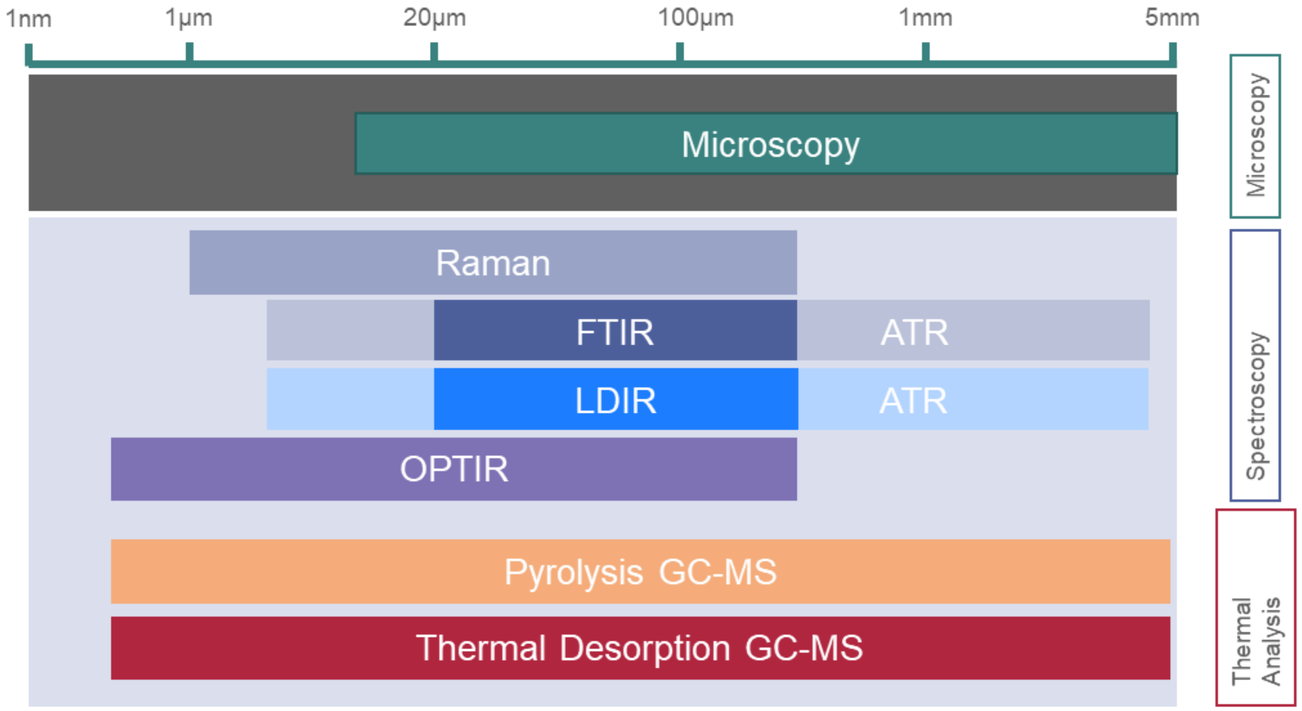
Solid plastic or synthetic polymer particles, insoluble in water, with the largest dimension between 1 µm and 5 mm

AS ISO 5667.27:2025

Analysis of Microplastics – Where is the status Quo?

Standards

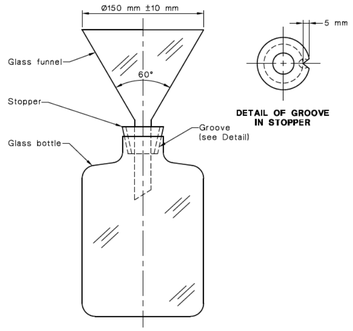
Analysis Tools



Plastic Dust Cloud Project – A Global Study

PLASTICDUSTCLOUD
MICROPLASTICS IN THE AIR ■ ALL AROUND THE WORLD

- Investigate the global presence of **Microplastics in Air**
- Harmonised sampling by **dry-wet Dust Deposition method**
- Sampling at **12 locations, 9 countries** across **3 continents**
- Analysis of samples using state of the art technologies within the **5 Eurofins Microplastic laboratories** using a **harmonised SOP**



Sampling Setup as per AS/NZS 3580.10.1:2016

Site	Urban/Rural	Technique
Aabybro (Denmark)	Urban	–
Alta (Norway)	Rural	–
Barneveld (Netherlands)	Urban	–
Bergen (Norway)	Urban	Pyr-GC-MS (N)
Budapest (Hungary)	Urban	Pyr-GC-MS (H), FTIR
Gijon (Spain)	Urban	TD-GC-MS
Melbourne (Australia)	Urban	LDIR
Northampton (United Kingdom)	Urban	–
Pelkosenniemi (Finland)	Rural	–
Rovaniemi (Finland)	Urban	–
Sacramento (USA)	Urban	Raman
South Bend (USA)	Urban	–

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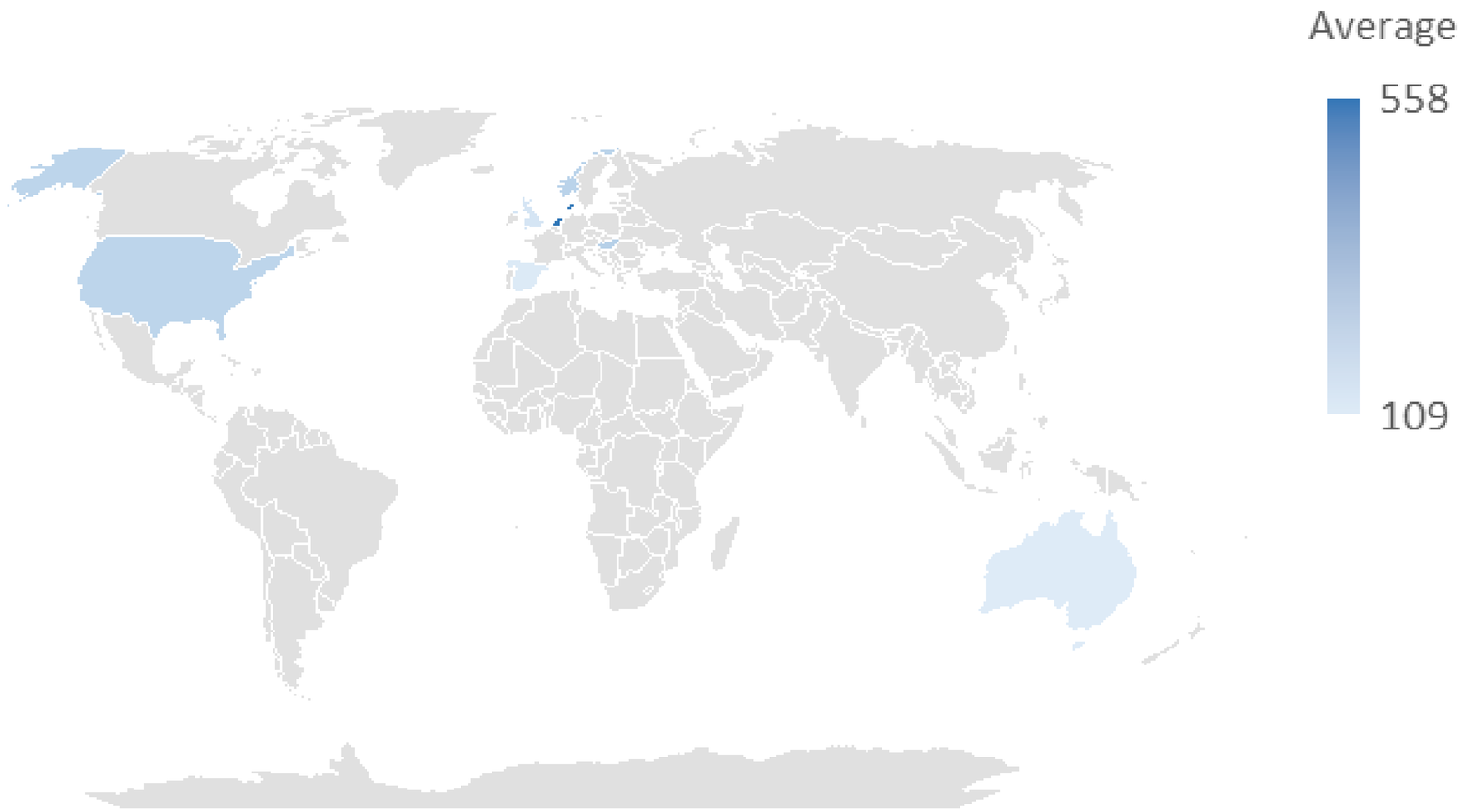
Research questions

1. What levels of contamination are we observing?
2. Is there a difference between rural and urban environments?
3. Which polymers are most dominant?
4. What are the particle size distributions?
5. What are their morphologies and colours?

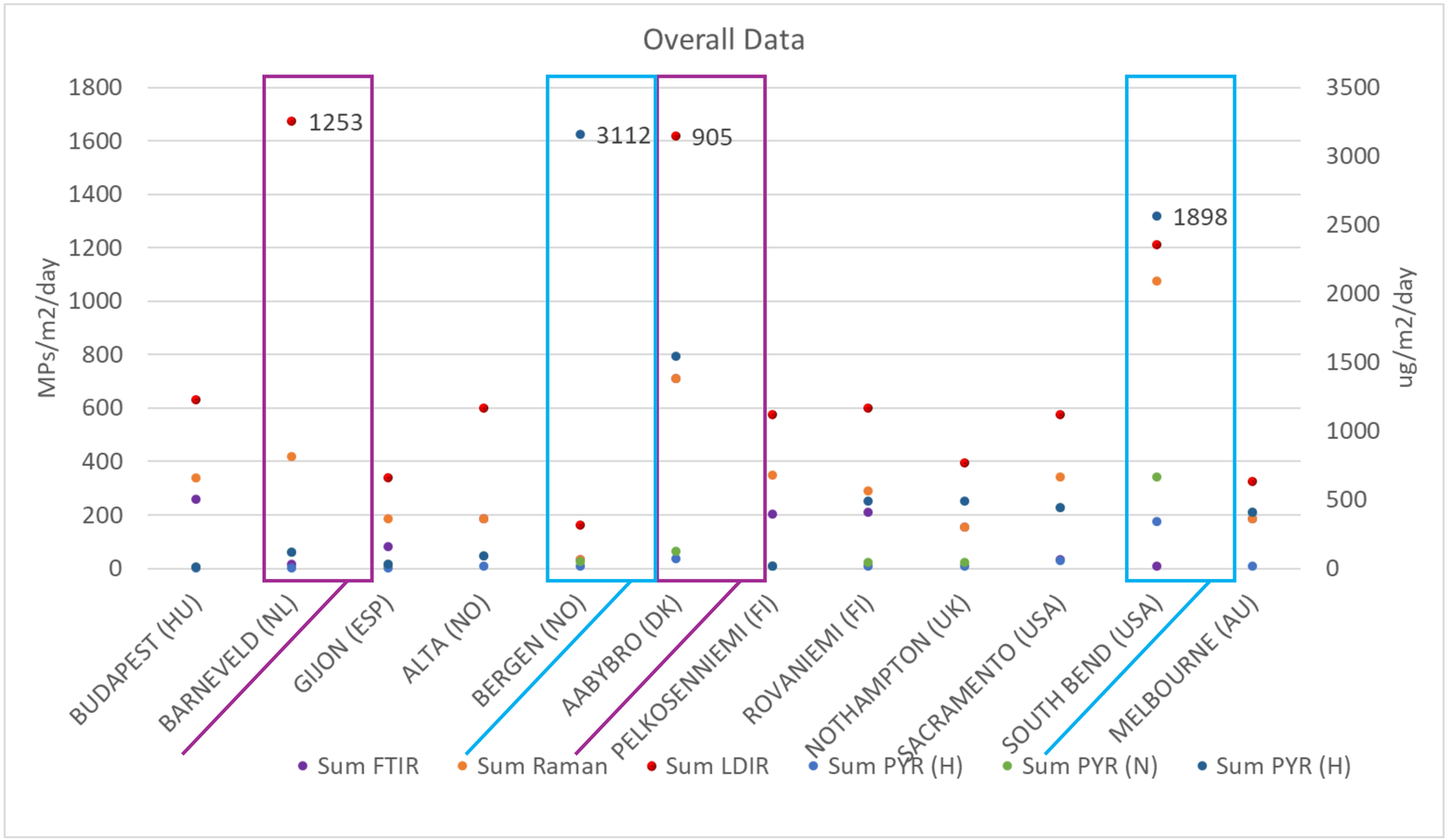
Global Distribution



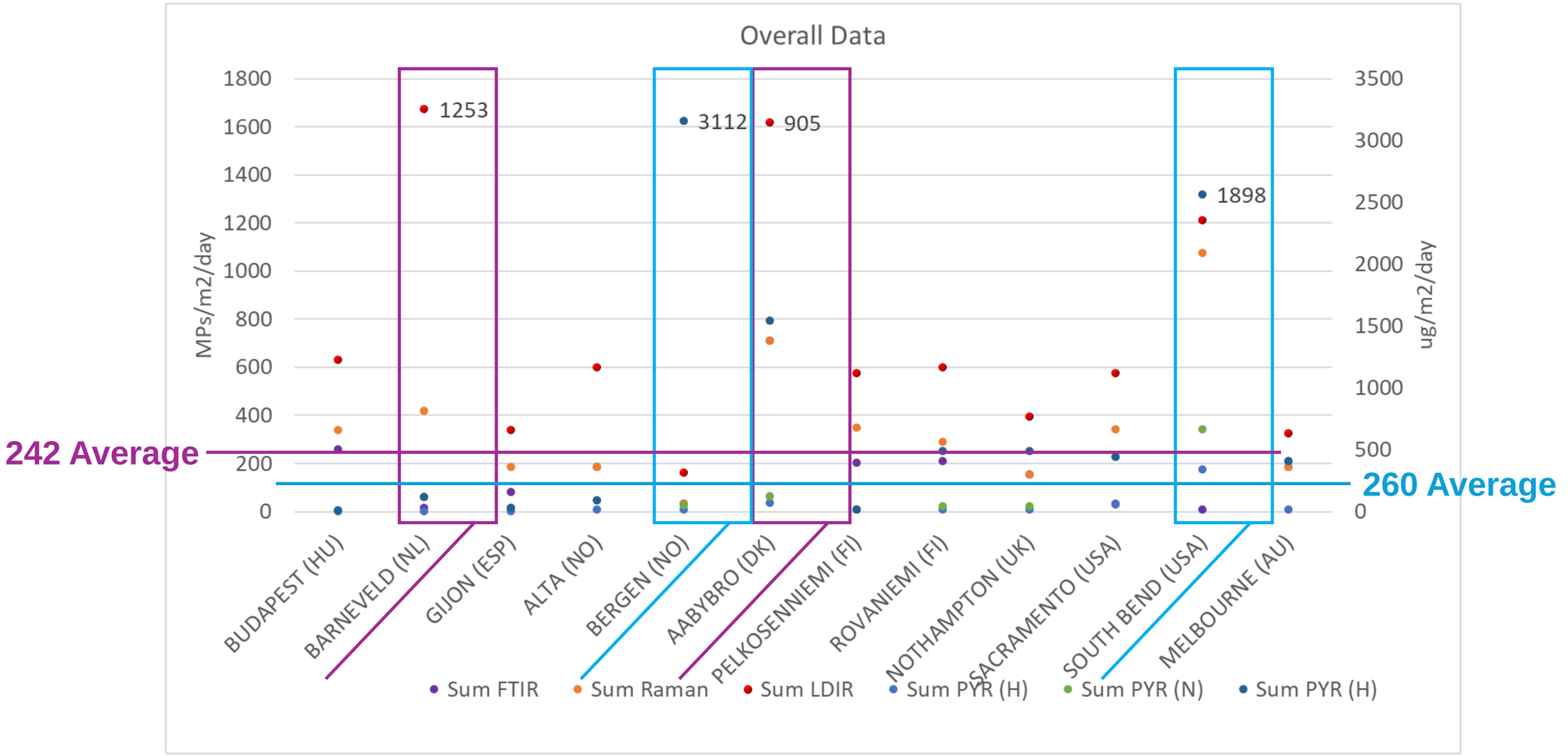
Country	Average Identified MPs (particles/m2/day)
Australia	109
Spain	113
United Kingdom	132
USA	192
Norway	199
Hungary	210
Denmark	539
Netherlands	558

For Spectroscopy only

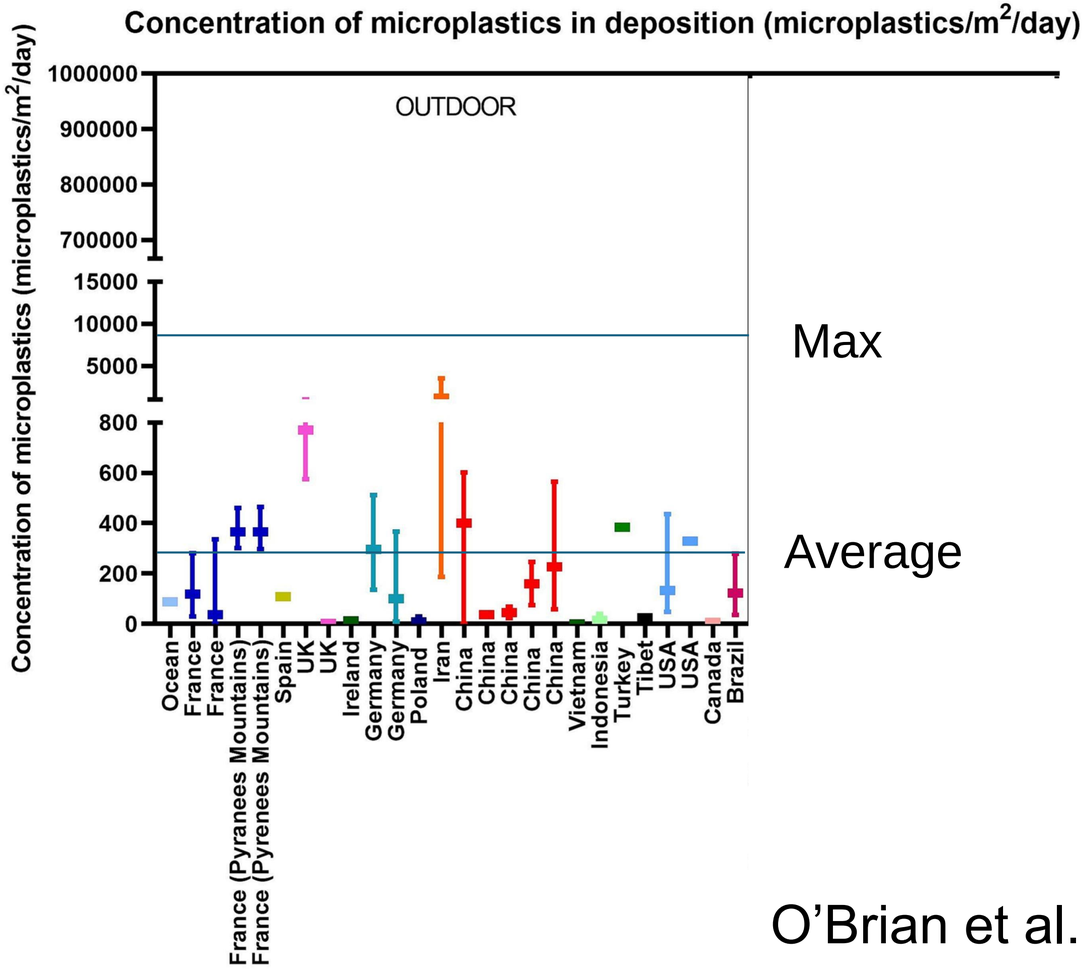
Overall Distribution



Overall Distribution



Comparison to current Literature



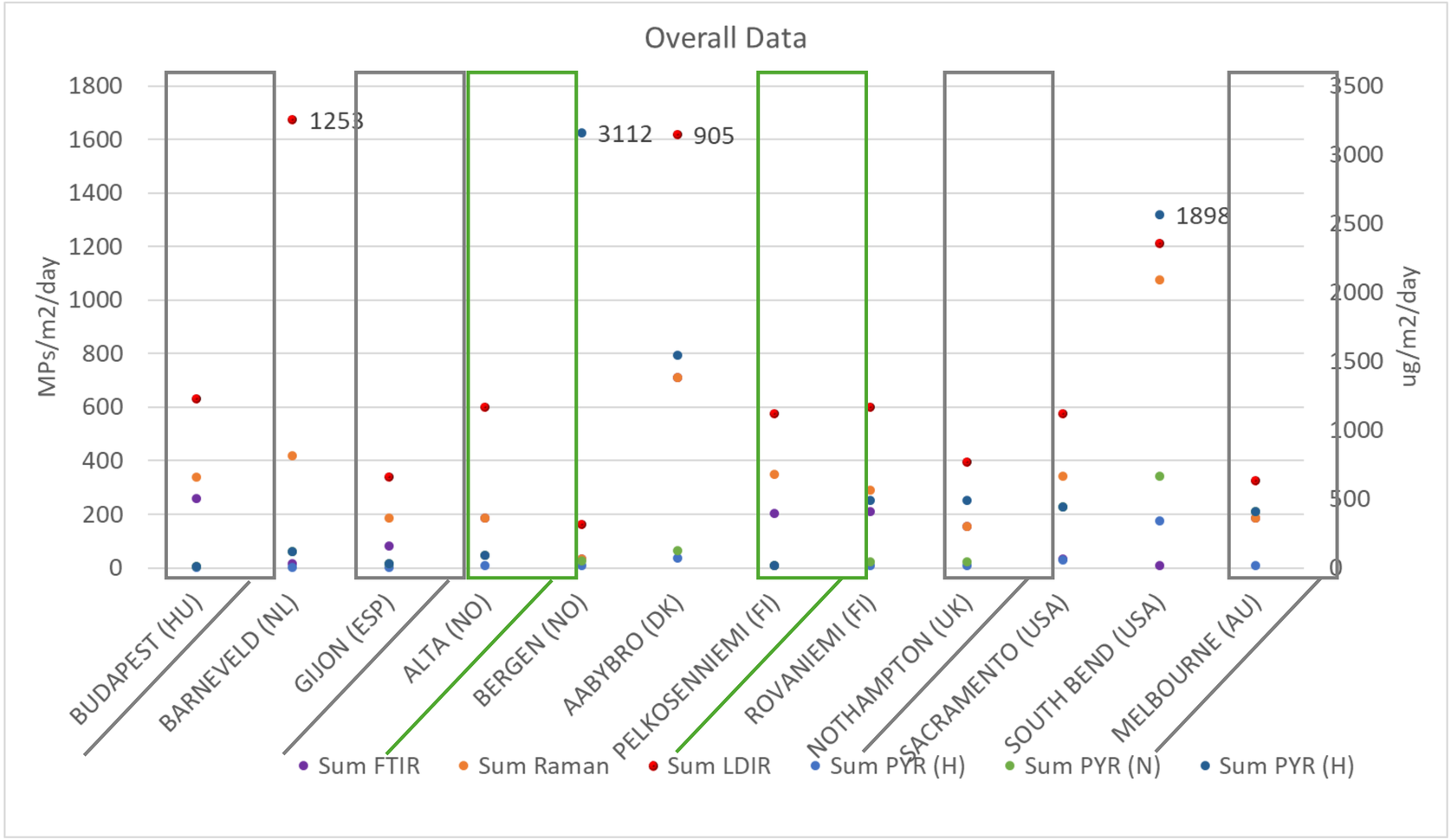
Max

Average

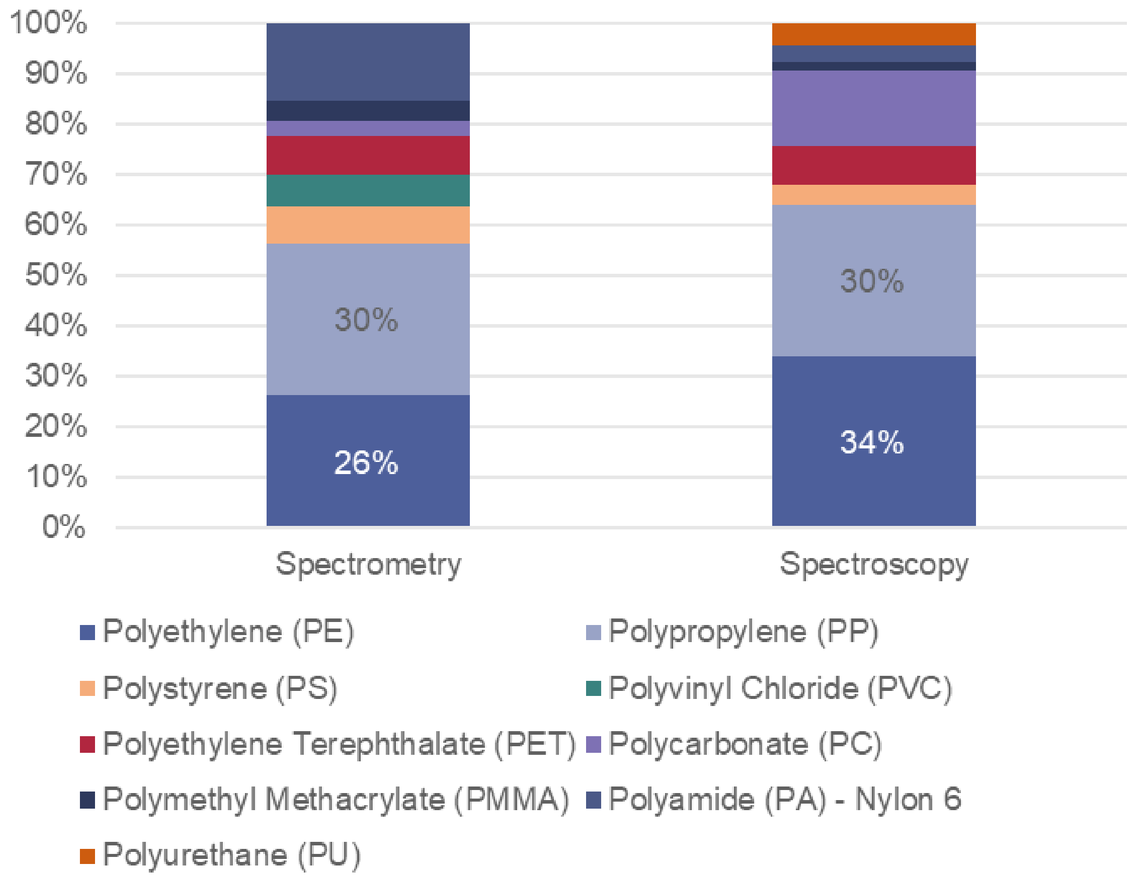
O'Brian et al. 2023

Data only available for Spectroscopy

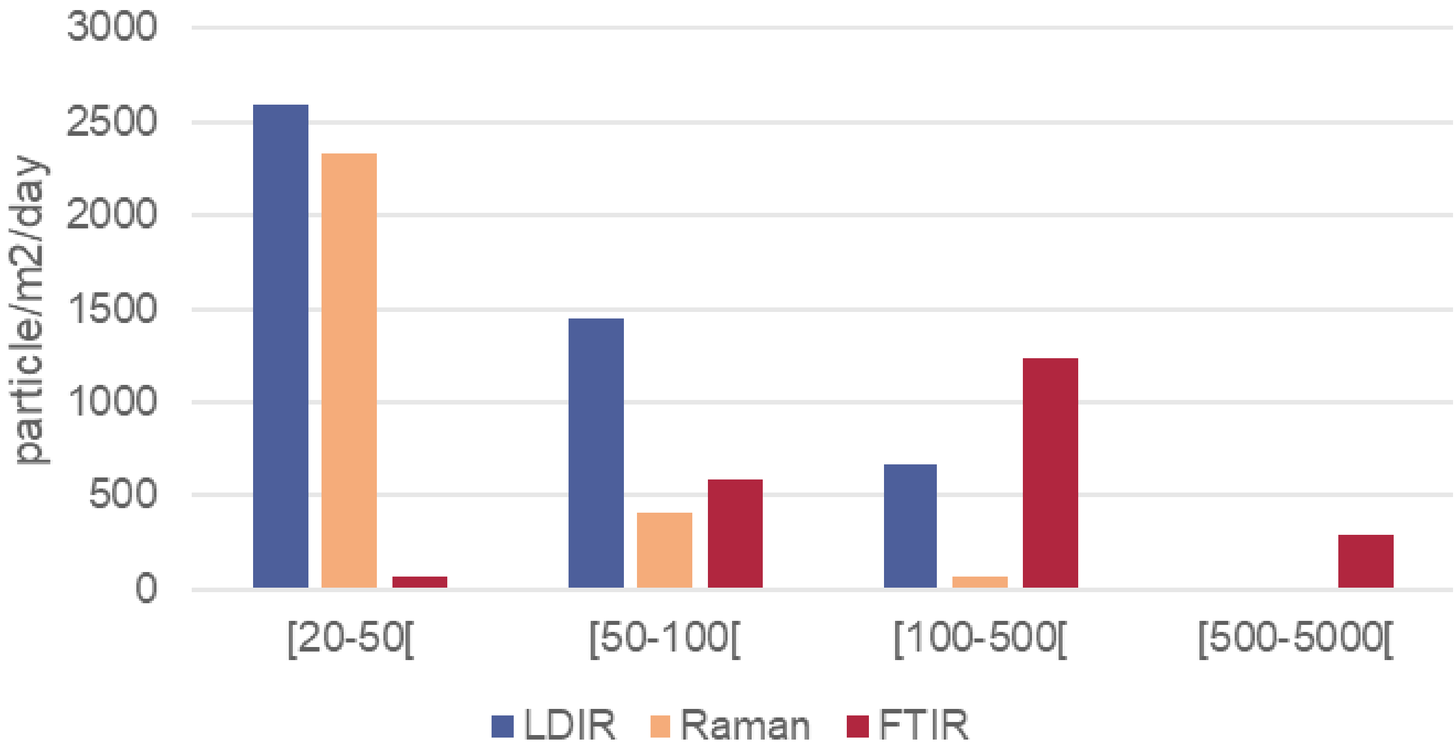
Rural vs Urban distribution



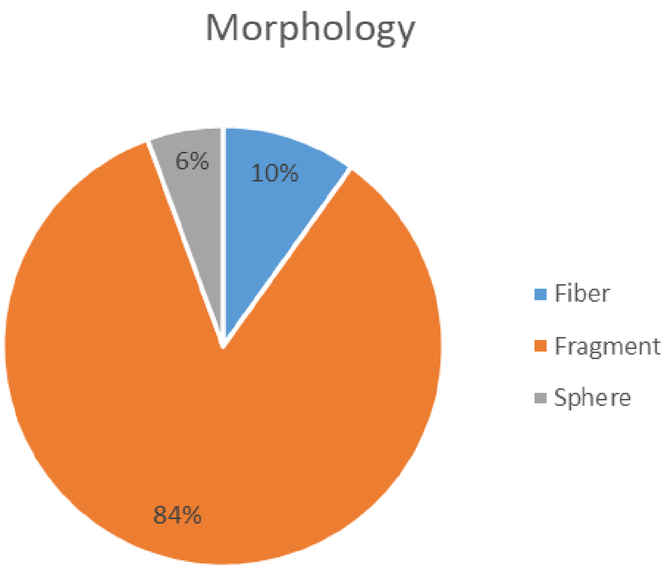
Polymer Distribution

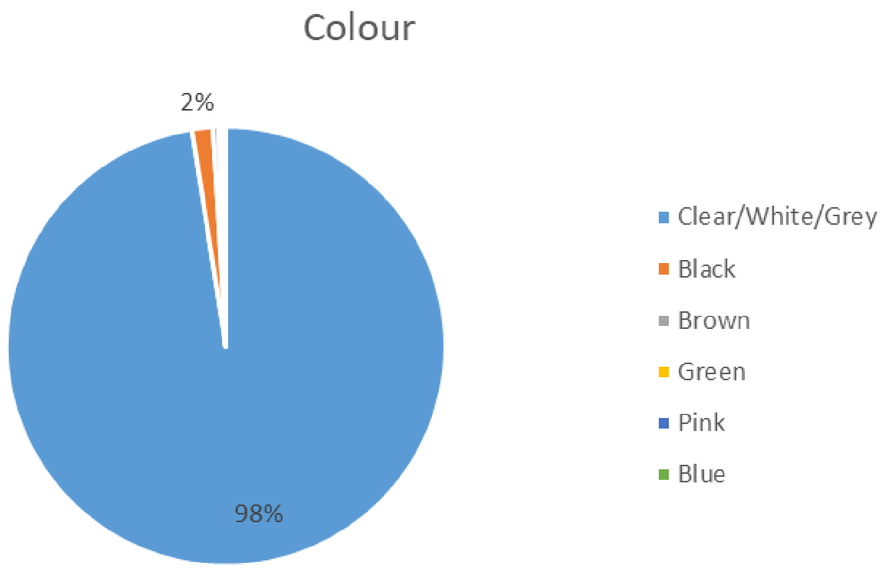


Size Distribution

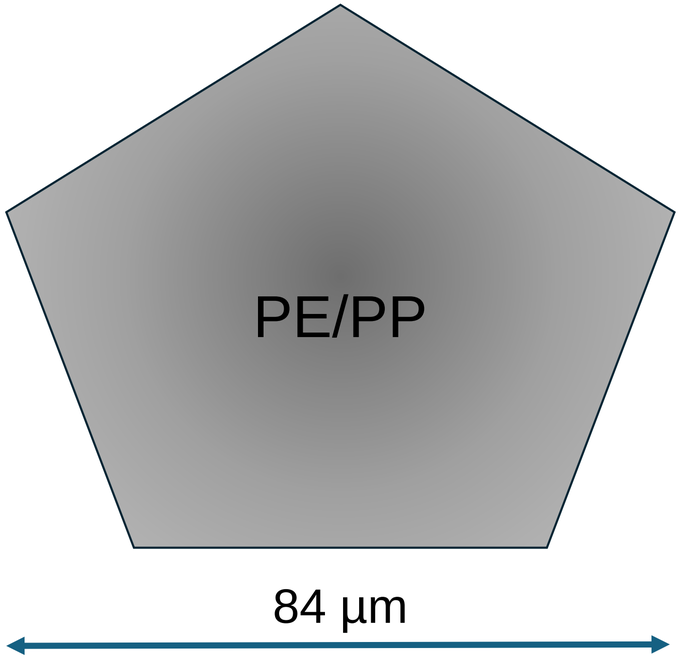


Morphology and Colour



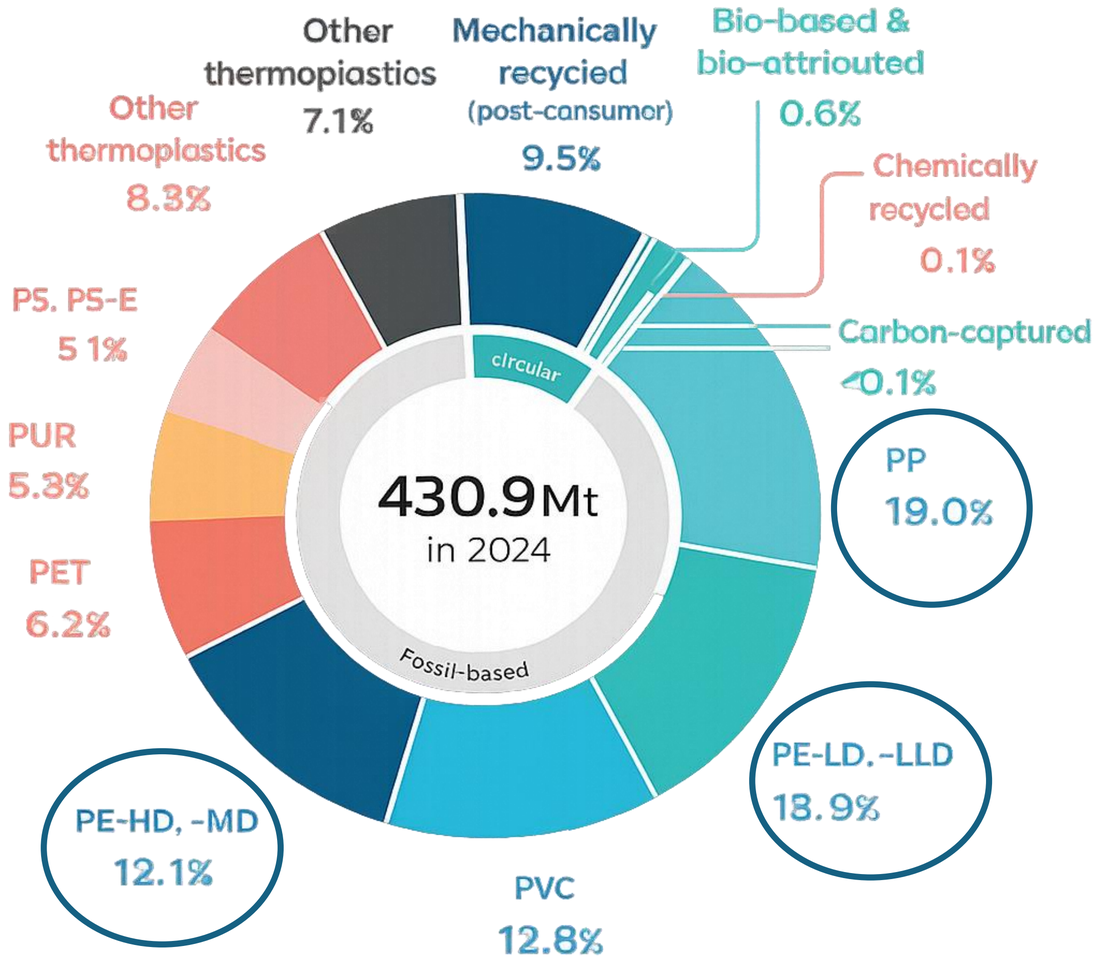


Summary of the results



But where does it come from

Global Plastic Production in 2024



What products are made from PP and PE and how would they end up in the Environment?

Polypropylene (PP)


Food Packaging


Automative Parts


Textiles & Fibres


Medical Products


Household Goods

Polyethylene (PE)


Plastic Bags


Bottles, Pipes, Toys


Packaging Films


Agricultural Products

Additional Environmental Sources of Microplastics

Industrial sources

Loss of nurdles (plastic pellets)

Biosolids application

Domestic / Urban sources

Washing machines & Laundries

Stormwater

What can be done to reduce PE & PP in the Environment?

1. **At the Source**
   - **Reduce production** and **use** of single-use PE/PP
   - **Eliminate unnecessary** plastic products
   - **Shift to reuse systems** (refillable, returnable packaging)
2. **Product & Material Design**
   - **Improve product design** to enhance recyclability
   - Increase use of **recycled PE and PP in new products**
3. **Waste Management & Recycling**
   - **Improve collection, sorting, and recycling** infrastructure
   - **Prevent plastic leakage** from land-based waste streams
3. **Regulatory & Economic Measures**
   - **Extended Producer Responsibility (EPR) schemes**
   - Restrictions or bans on selected single-use plastics
   - Market incentives for recycled content and circular design
4. **Environmental Controls**
   - Improve **stormwater**, **wastewater** and **runoff controls**
   - **Target high-loss sectors** (packaging, textiles, tyres, pellets)

What is happening in New Zealand specifically?

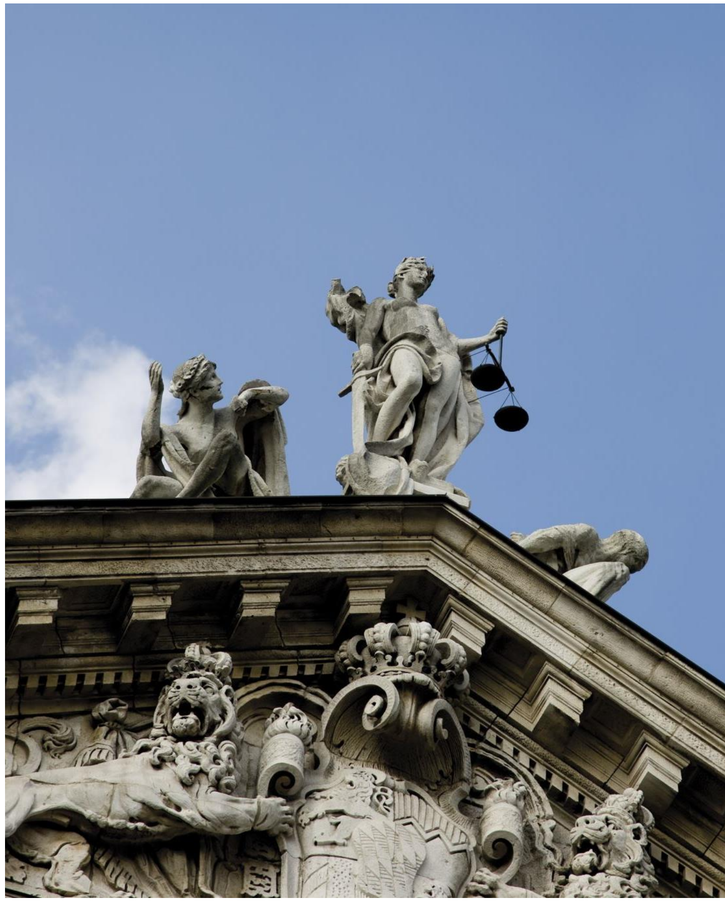
1. **Waste Minimisation Act 2008**
   - **Purpose of this Act**
   - (1) The purpose of this Act is to encourage waste minimisation and a decrease in waste disposal in order to —
     - (a) protect the environment from harm; and
     - (b) provide environmental, social, economic, and cultural benefits.

2. **Waste Minimisation (Microbeads) Regulations 2017**

3. **Waste Minimisation (Plastic and Related Products) Regulations 2022**
   1. **Phasing out single-use and hard-to-recycle plastics**
   2. **Phase out of plastic produce labels**

4. **Waste Minimisation Fund:**
   1. **Supports projects diverting waste from landfills, including recycling infrastructure**
   2. **Kerbside collection policies**

5. **Extended Producer Responsibility (EPR)**
   1. **Tyrewise**



Summary

- Atmospheric microplastics are globally pervasive, with **measurable deposition across all sampled regions**
- **Harmonised sampling and analysis** enabled direct comparison **across 12 sites in 9 countries**
- **Polyethylene (PE)** and **Polypropylene (PP)** were the dominant polymers identified
- **PE and PP make up 50 %** of the manufactured plastics globally
- Typical **particle sizes were below 100 µm**
- Sources are **strongly linked to consumer products**, **packaging, textiles, urban activities, and waste mismanagement**
- **Effective mitigation requires source reduction**, **improved product design, better waste management, and regulatory action**

Acknowledgement and Further Information

Microplastics Peer Group

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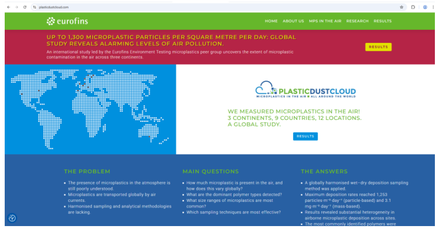
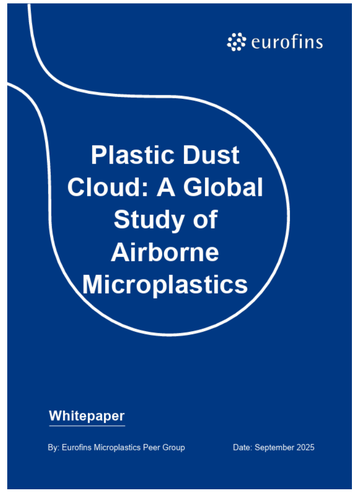
Further Information





PlasticDustCloud.com website

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