

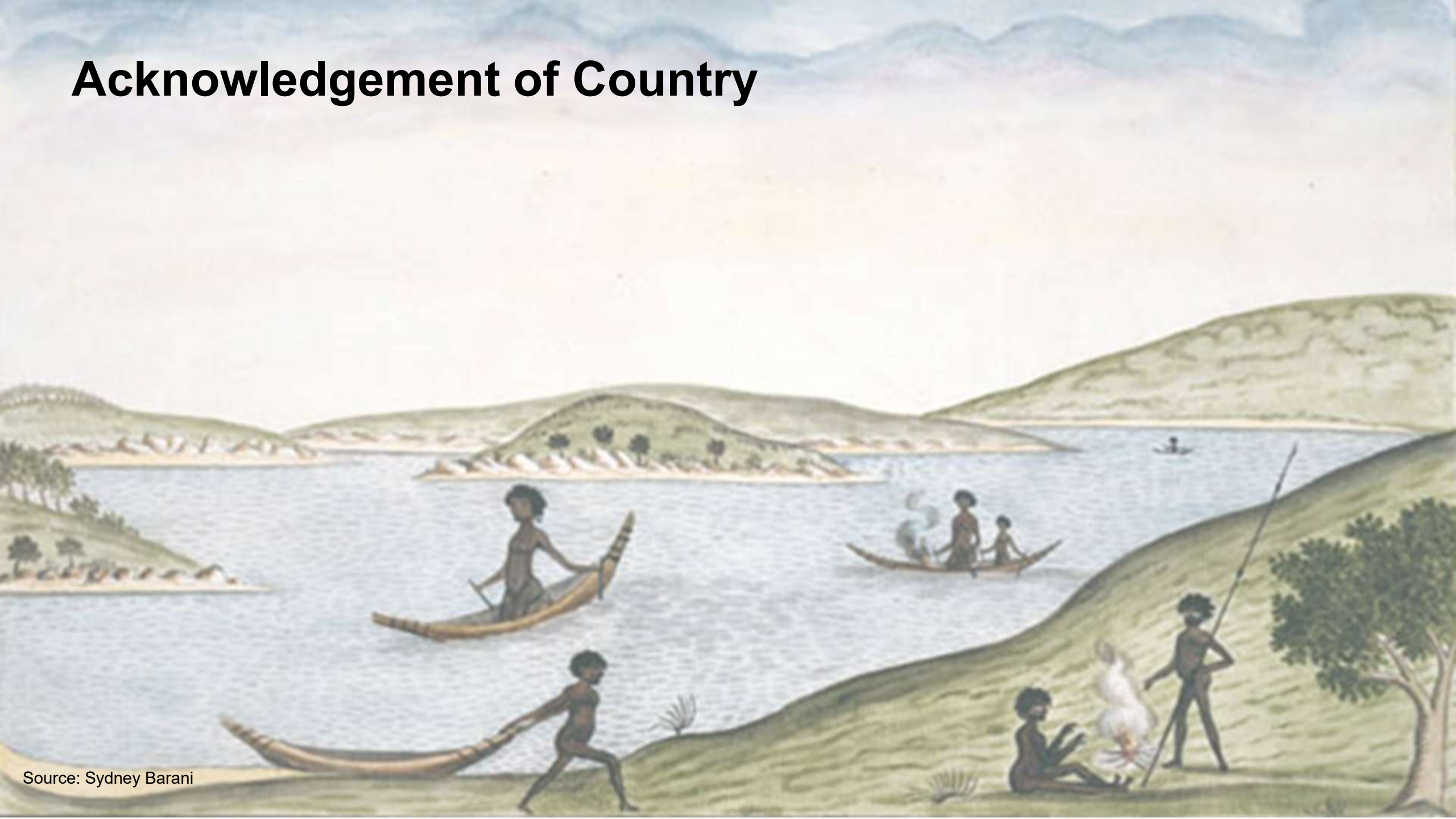


From Factories to Front Yards: Investigating Microplastics in Urban Stormwater

*Sofia Payel, Sanjith Udayakumar,
Asiyeh Kheradmand
SMaRT@UNSW*

*Daniel Rider
Ocean Protect*

Acknowledgement of Country



Source: Sydney Barani

Conflict of Interest



Overview

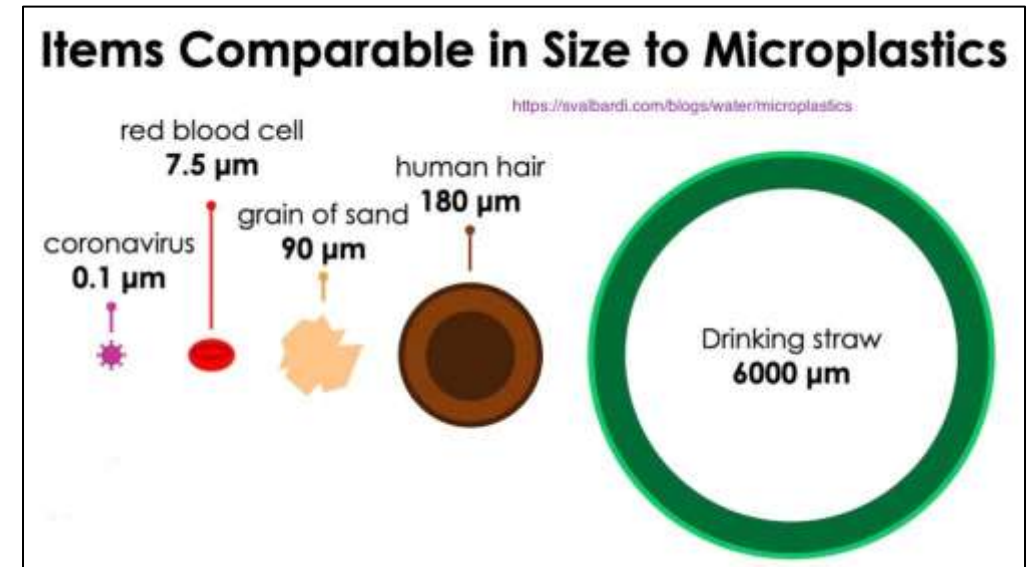


Microplastics

Small plastic fragments = 1 micrometre (μm) to 5mm



Source: Alexander Kung



Source: Eesti Elu (2024)

Microplastics in numbers



enter the environment
each year
(Zhang et al. 2020)



of plastic particles
on the ocean
surface are
microplastics
(Coyle et al. 2020)



of microplastics
come from land-
based activities
(Boucher & Friot 2017)

Stakeholders



UNSW
SYDNEY



**Sustainable
Communities
and Waste**

National Environmental Science Program

The Project

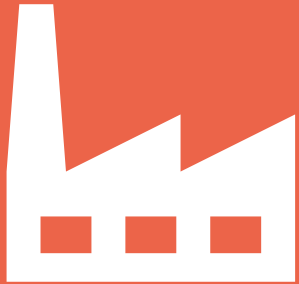
Aim: Establish baseline contamination levels & identify predominant types across different land uses

Timeframe: 12 months

Note: today we are just focusing on February/March



Methodology



Industrial



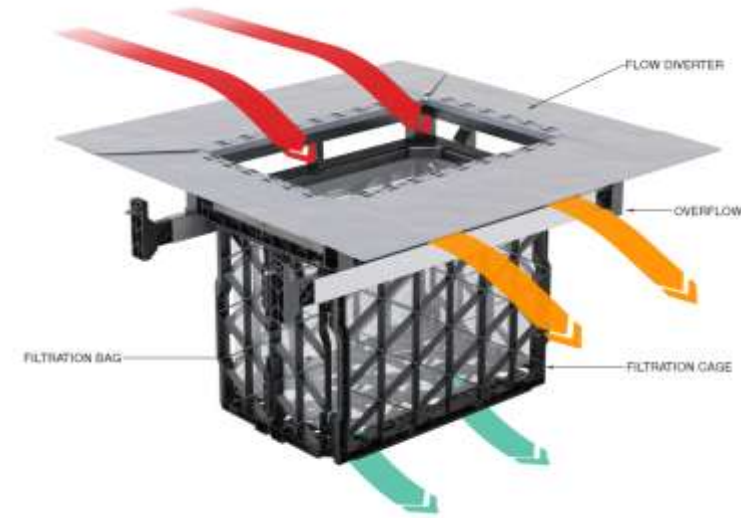
Commercial



Residential

Methodology

- Grouped OceanGuards on these properties
- Visited properties within close timeframe
- Collected 3 samples per property
- Provided samples to UNSW

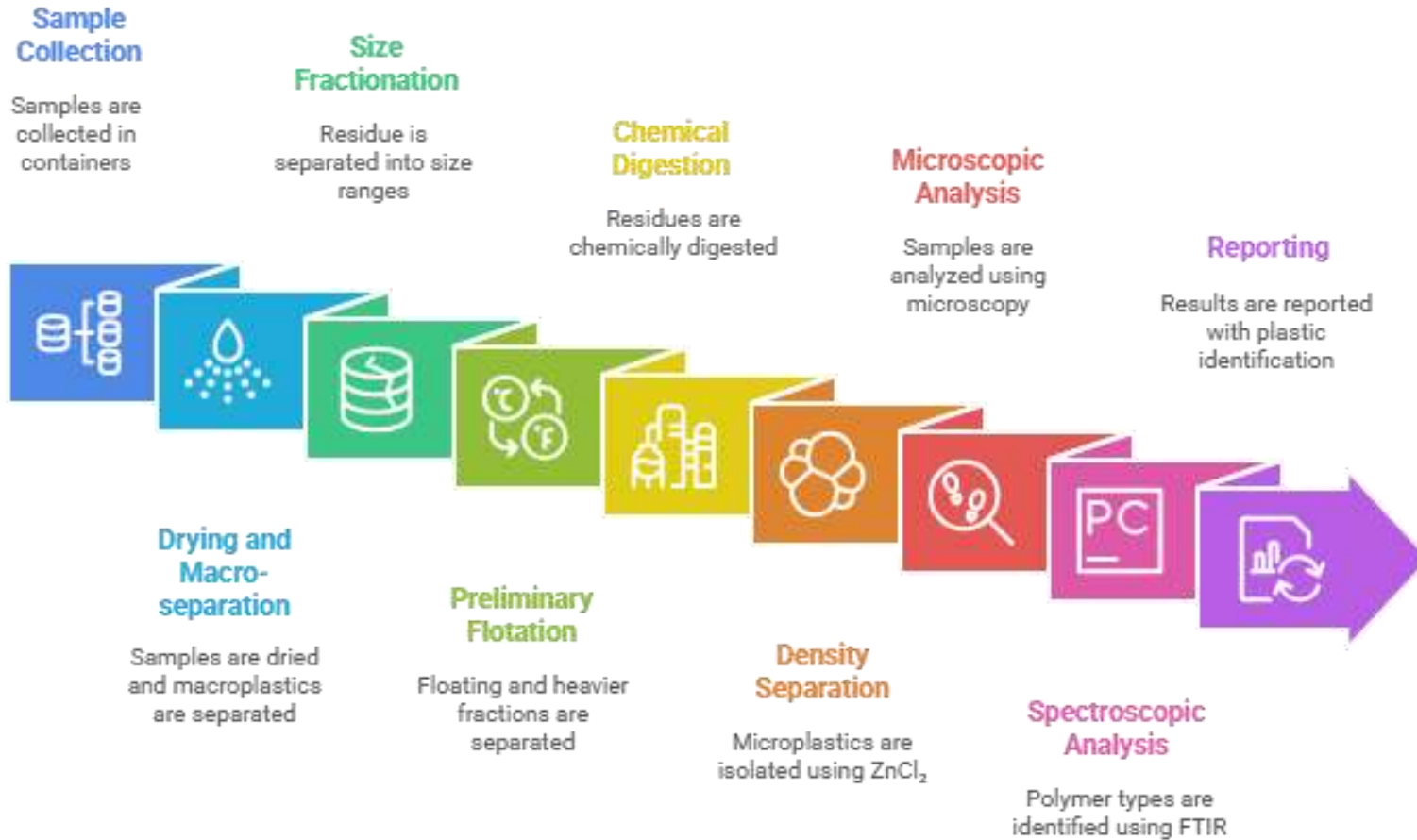


Mesh bag with
200 μm pore size



(a, b) Samples deposited
in the mesh bag inside
the OceanGuard
(c, d) Samples stored in
plastic containers for
transportation

Methodology Overview



Adheres to **AS ISO 24187:2025**

Ensures consistency in:

- Preparing samples
- Separating samples by size
- Identifying microplastic types
- Particle classification, equipment use, and data processing

Macro-separation

(a) Dried samples weighed & ready for next stages of separation

(b, c) Preliminary manual sorting to separate large macro plastics, leaves & other organic materials

(d) Separated macroplastics



Sieving and size fractionation

(a)



(b)



(c)



Preliminary sorted samples are sieved into different size fractions.

Sieving Process:

- Uses a series of **mesh screens** with decreasing pore sizes.
- Particles are passed through these sieves to collect different **size fractions** (e.g., >5 mm, 1–5 mm, <1 mm).

Benefits:

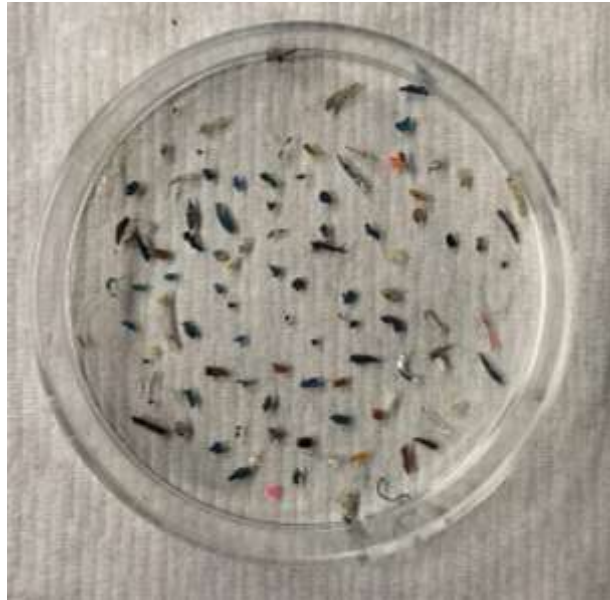
- Improves **comparability** across studies.
- Enables targeted **polymer identification** for specific size ranges.
- Reduces **analytical bias** by ensuring uniform sample processing.

Microplastic separation



1-5 mm

Plastics are separated from large size fractions manually

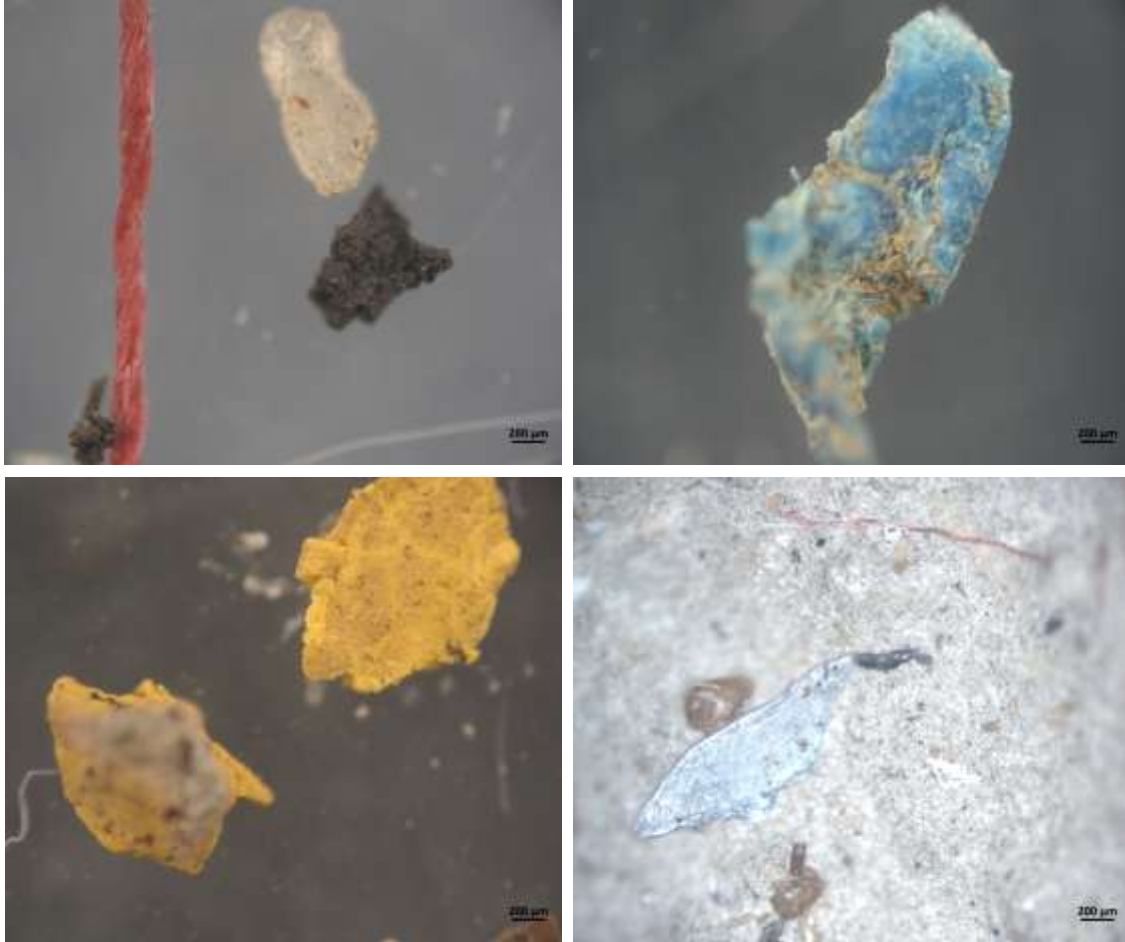


0.5-1 mm

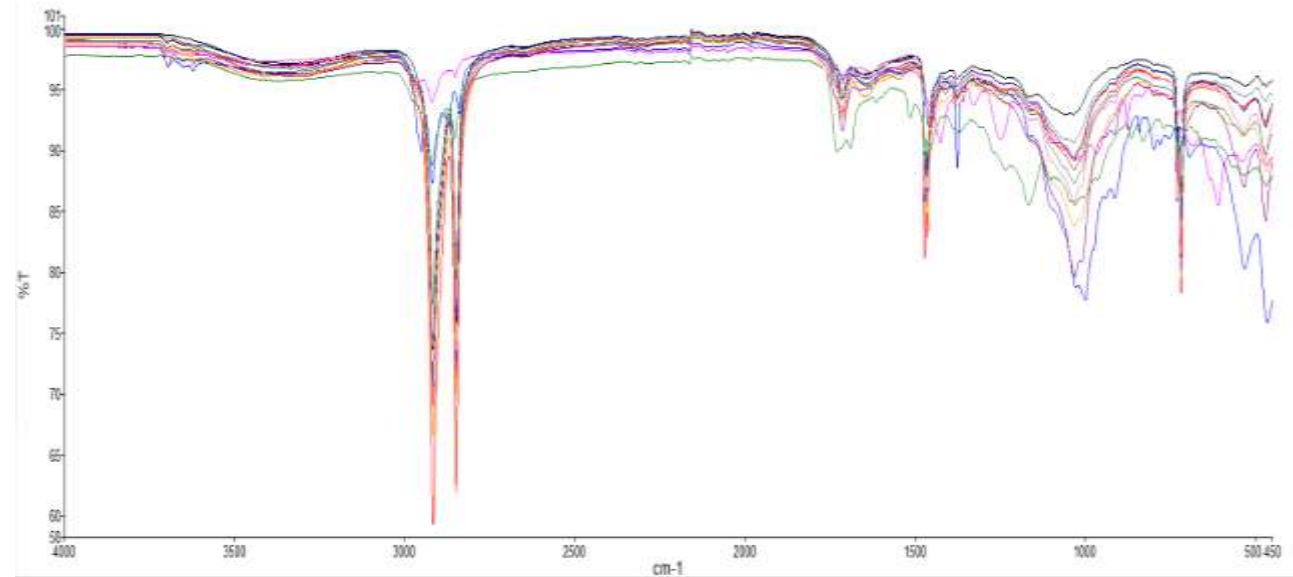


The lower size fractions are separated after water-based density separation & digestion

Microplastic observation & identification



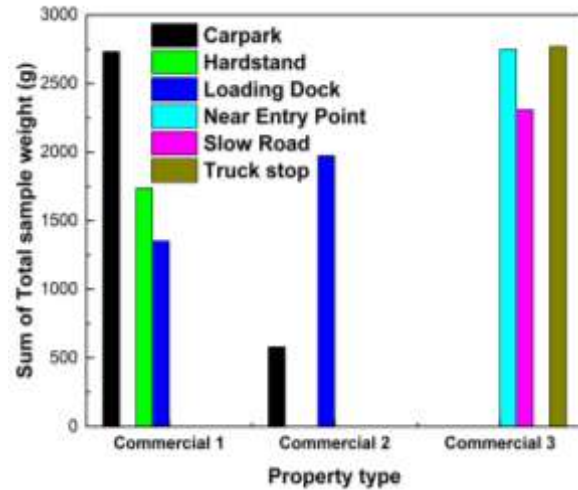
Microplastics are observed under optical microscope



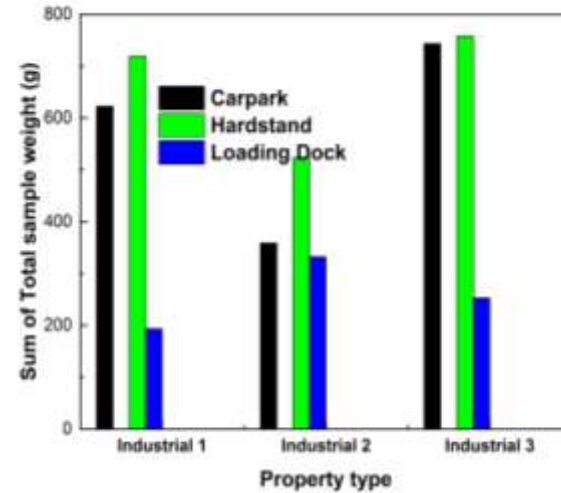
The separated microplastics are identified using FTIR and micro-FTIR and matched with polymers in reference libraries.

Total sample & weight analysis

Total sample weight in different property types

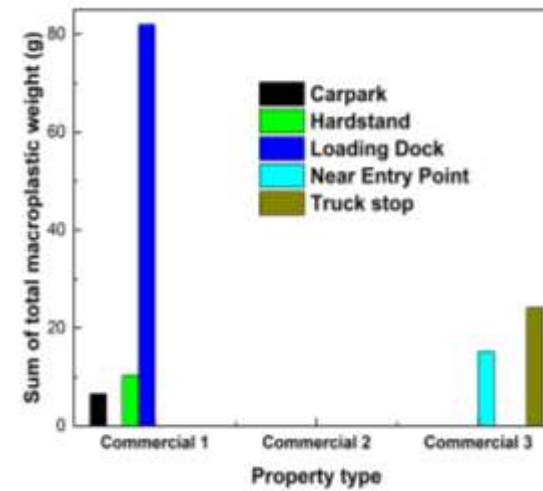


Commercial

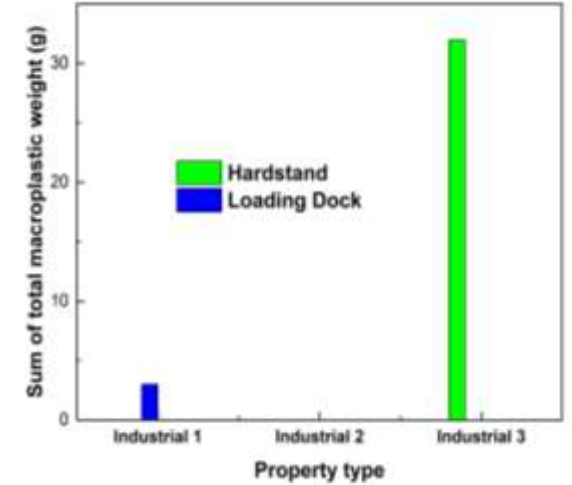


Industrial

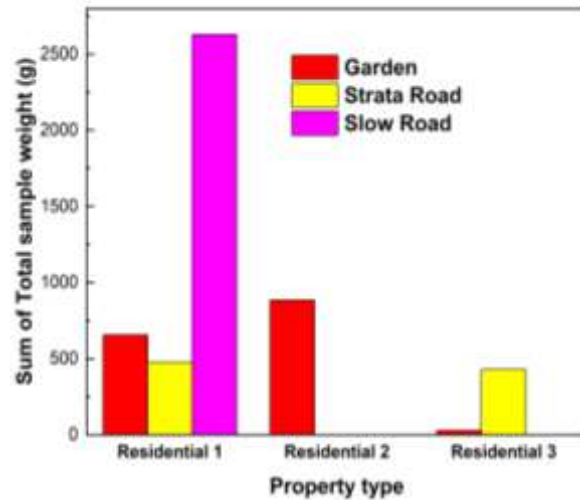
Total macroplastic weight in different property types



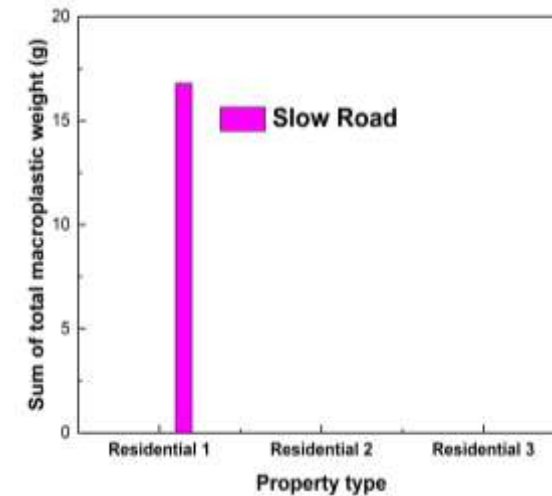
Commercial



Industrial



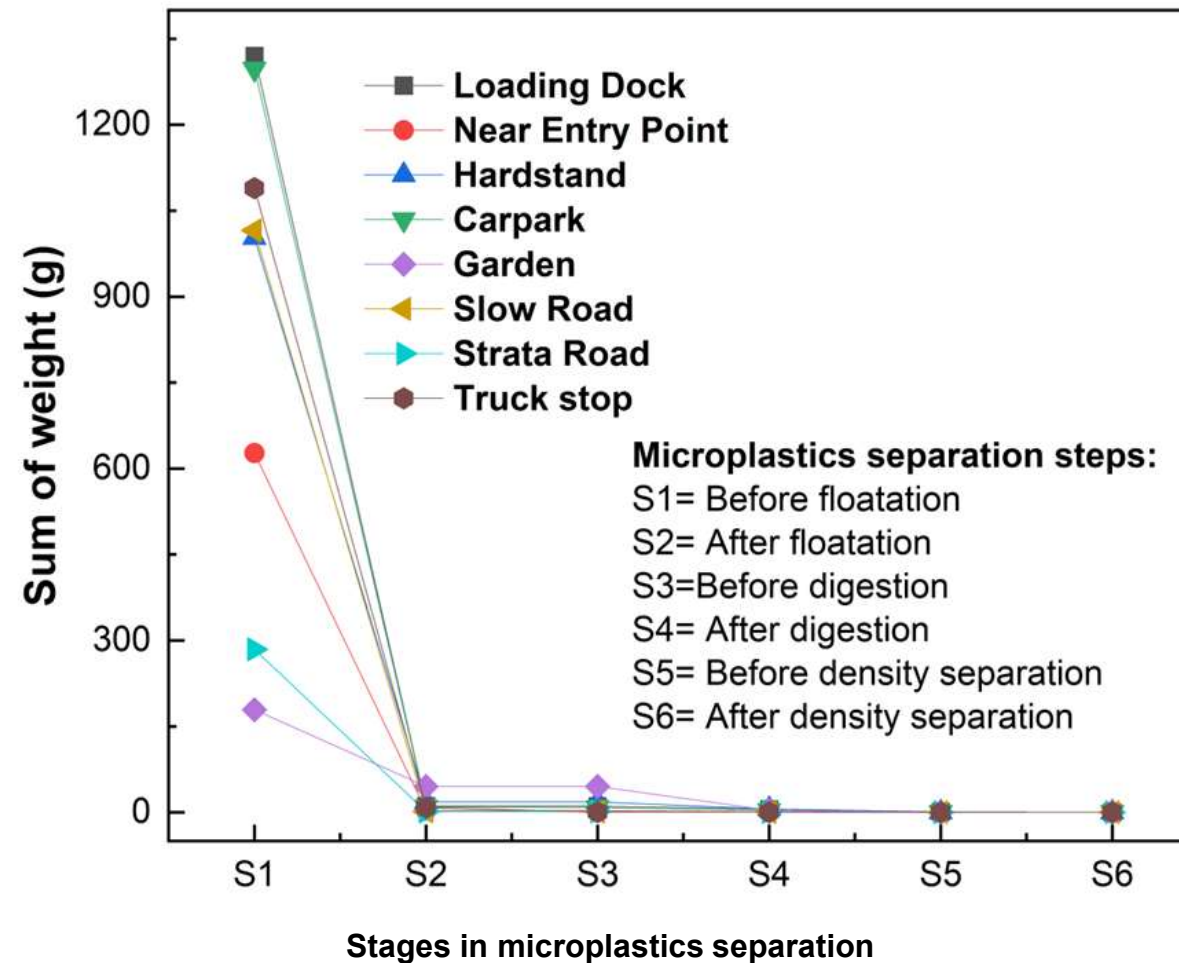
Residential



Residential

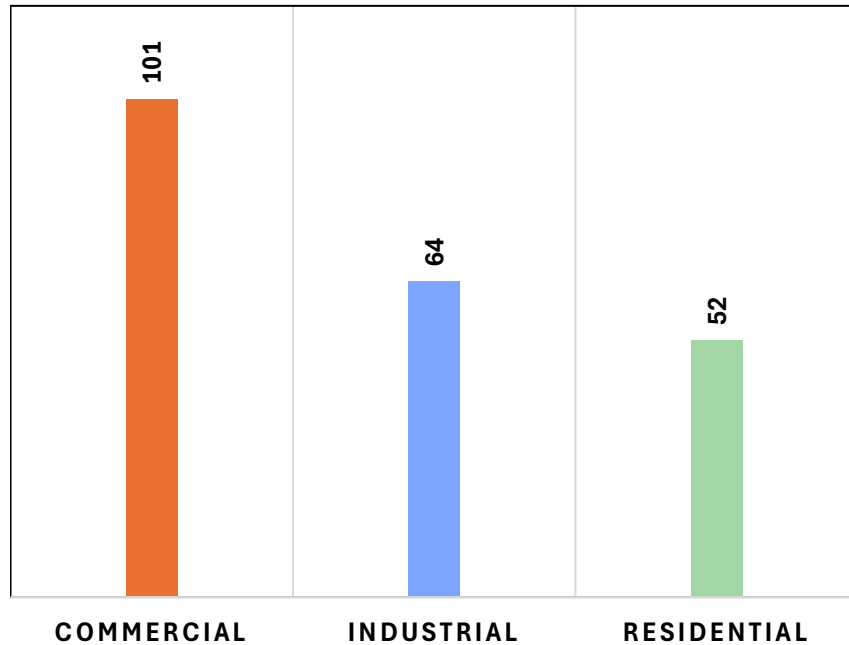
Abundance across different zones

Progressive weight reduction of samples during microplastics separation

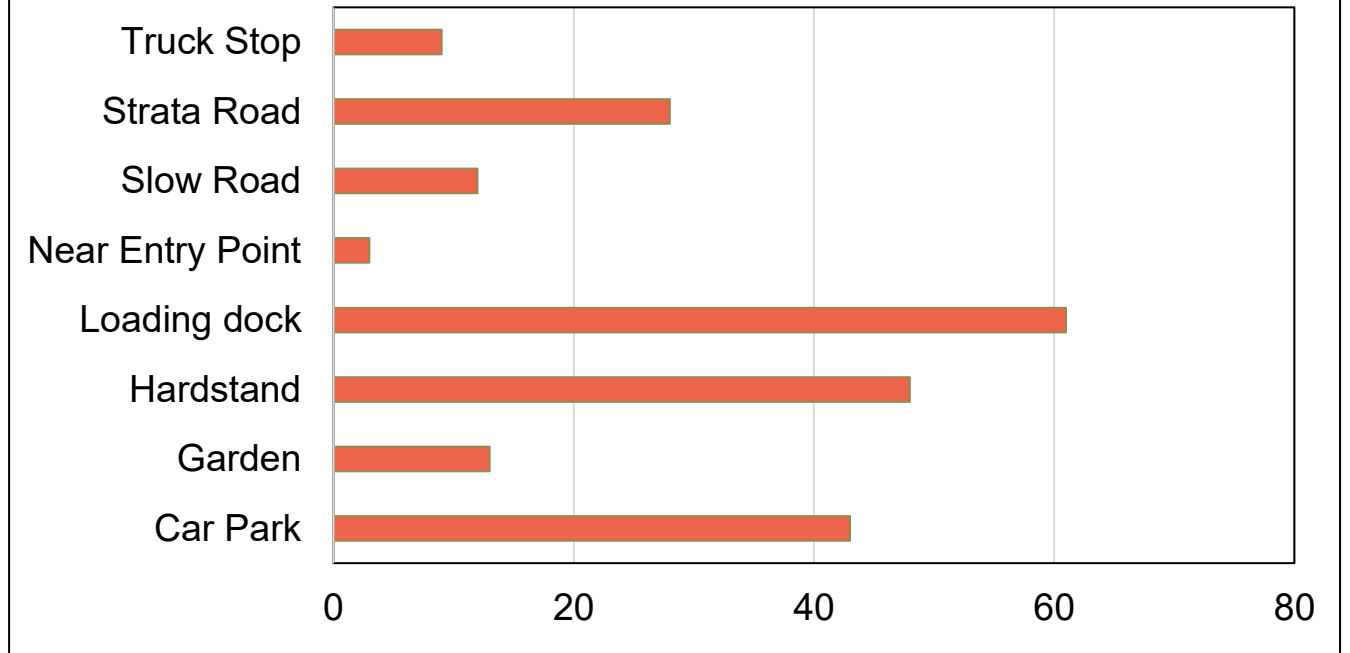


Microplastic count across different zones

COUNT OF POLYMER BY ZONE

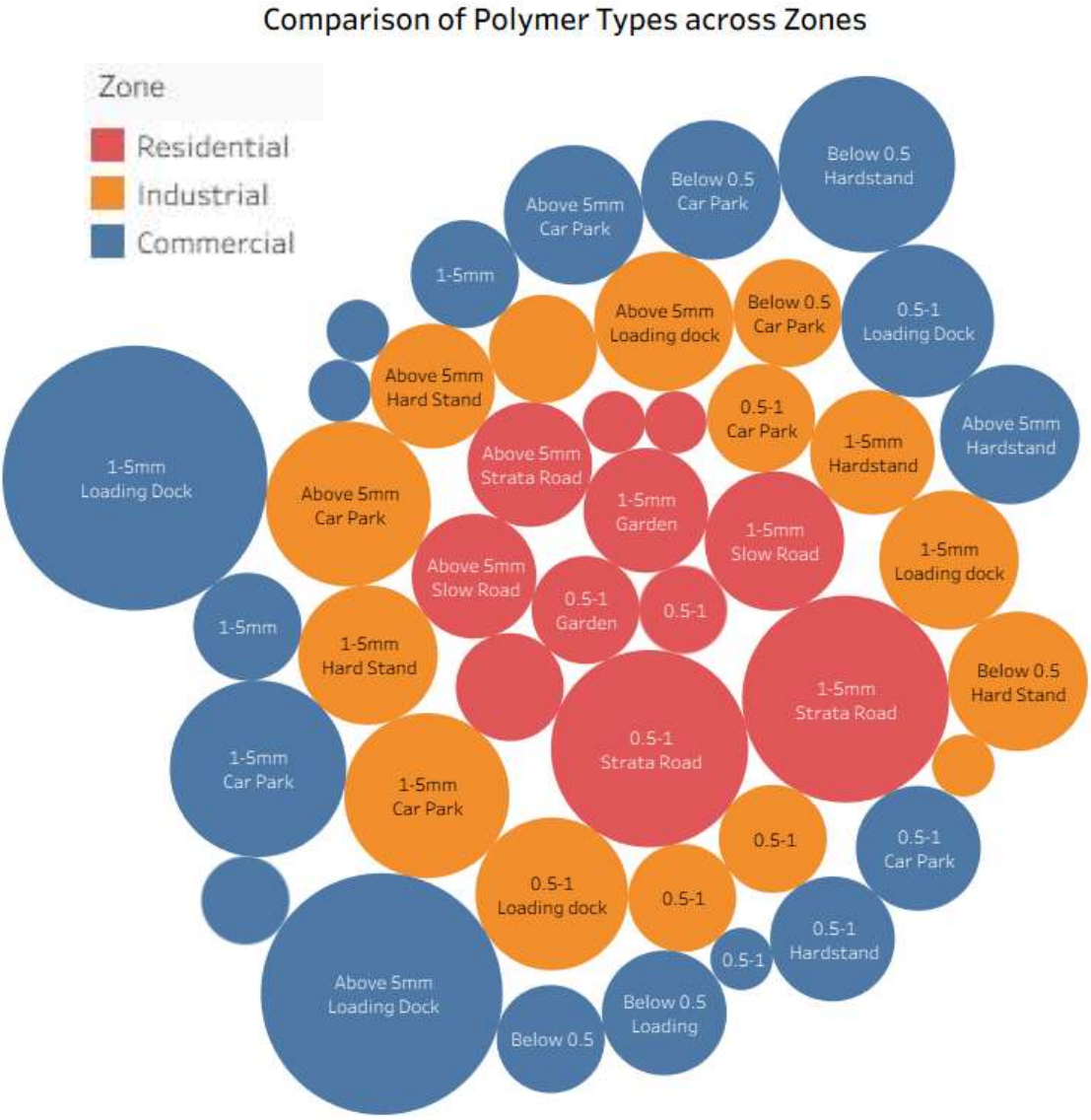
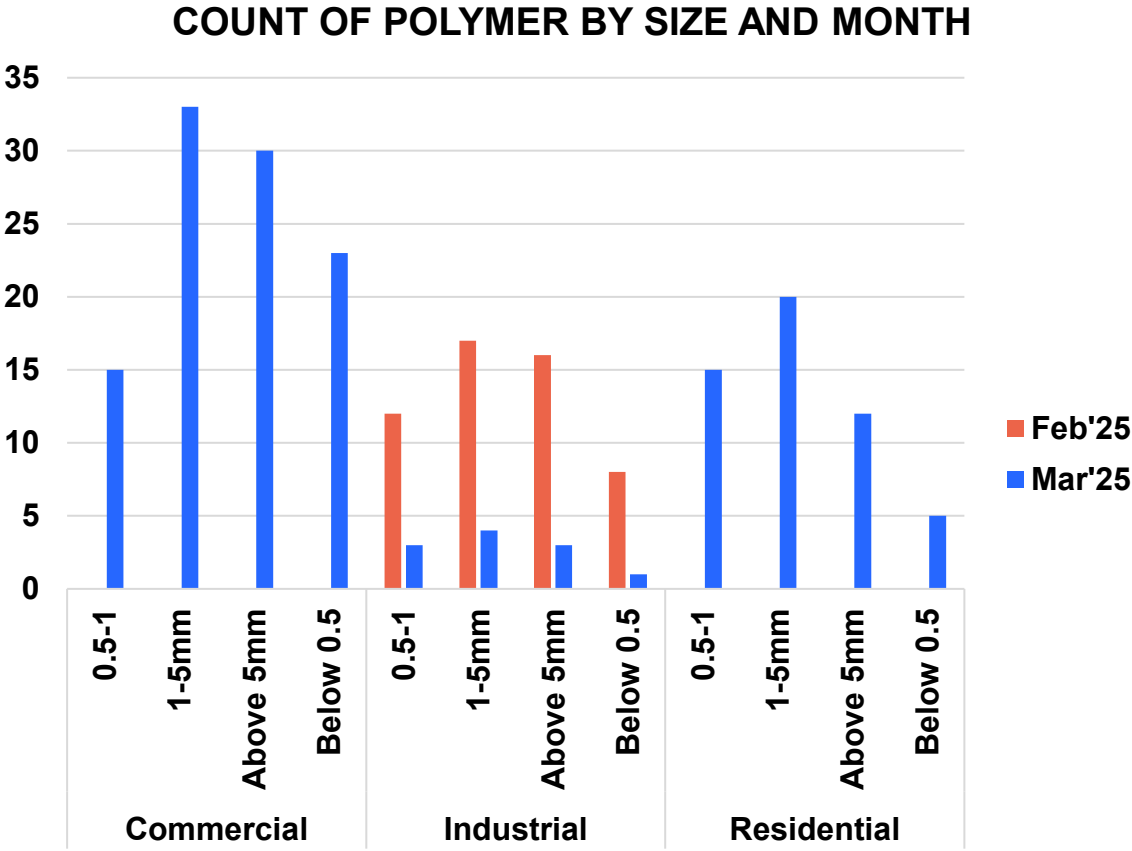


Count of Polymer by Subzone

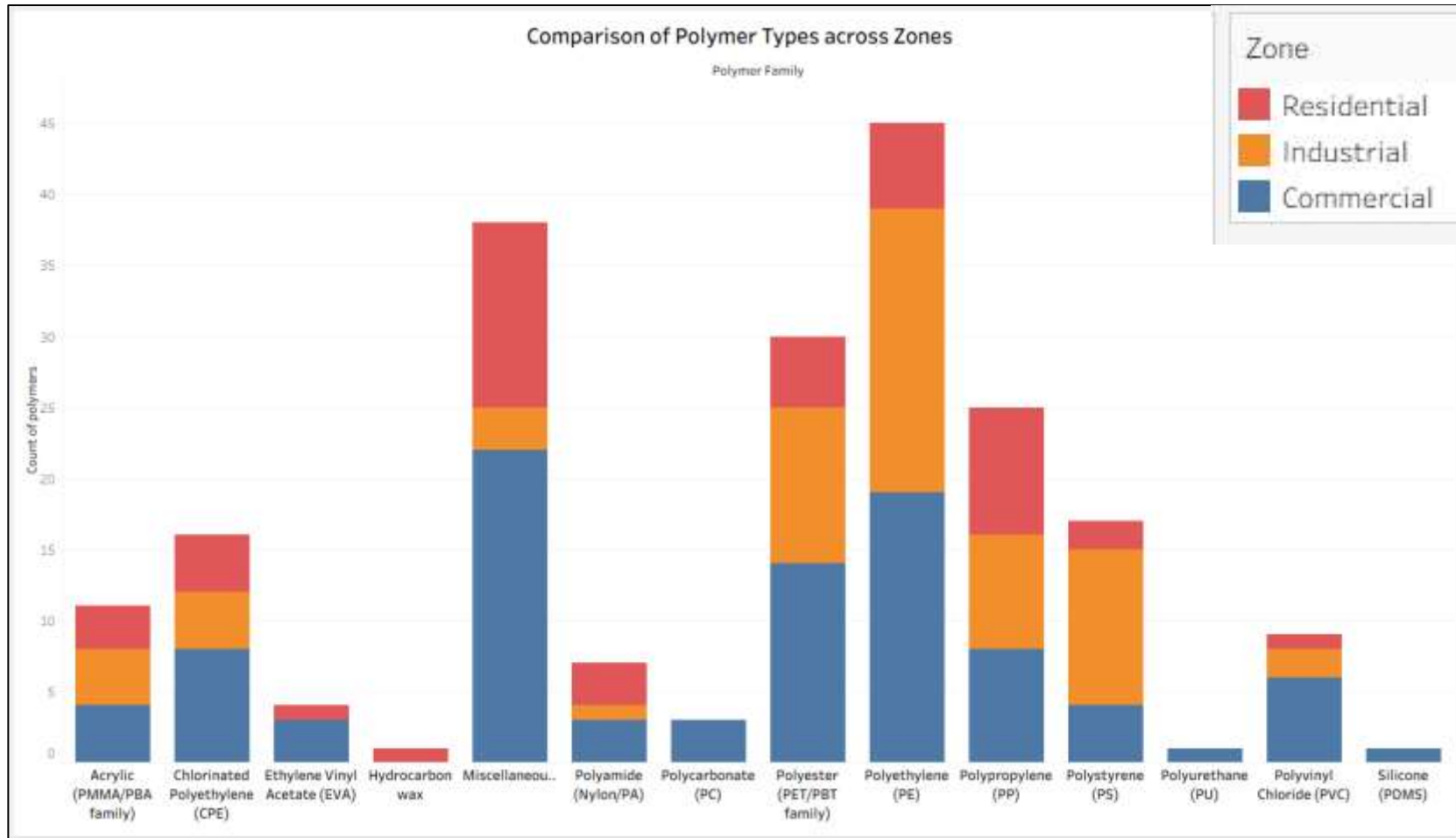


- Macroplastics were found in loading dock, hardstand & slow road.
- Car Park, Loading Dock, Truck Stop, Roads were also found with black rubber dust.

Microplastics count across different zones & sizes



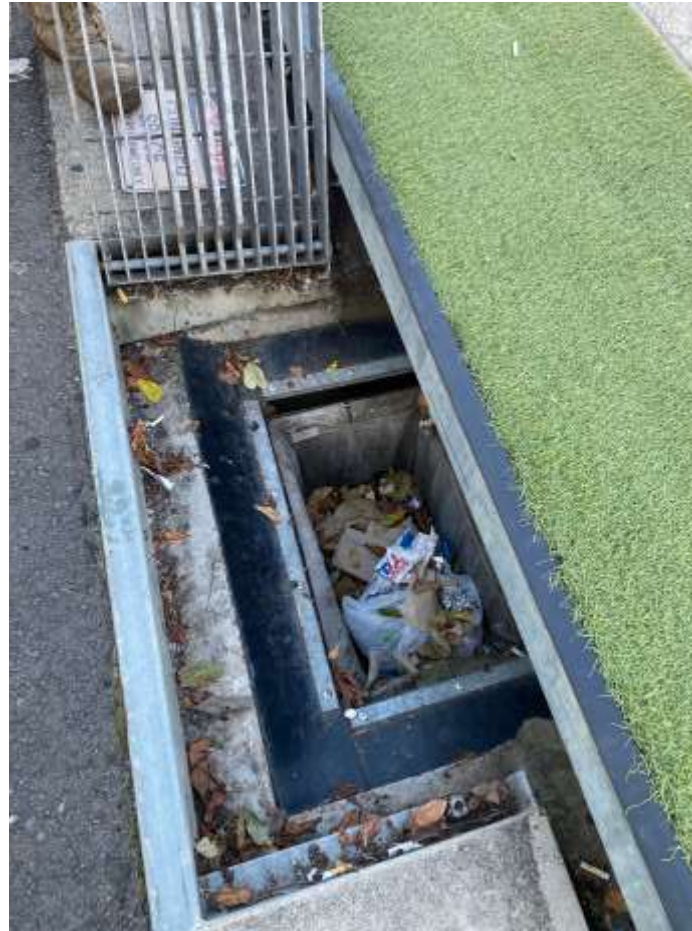
Diversity of microplastics across different zones



- **Most Prevalent:** Polyethylene (e.g. plastic bags) and Miscellaneous.
- **Significant Presence:** Polypropylene, Polystyrene & Polyester (e.g. bottle caps, disposable cutlery, plastic bottles)
- **Least Detected:** Hydrocarbon wax & silicone (e.g. car wax & tyre shine sprays)

Key takeaways

- Microplastics are present in urban stormwater
- Varies between land use:
 - Commercial = most microplastics & macroplastics
 - Industrial = least microplastics by weight
 - Residential = least microplastics by count
- Most common:
 - Size = 1-5mm
 - Type = Polyethylene (e.g. plastic bags)
- Next steps for industry?



Thank you



Sanjith Udayakumar

Researcher, SMaRT@UNSW

s.udayakumar@unsw.edu.au



Daniel Rider

Water Sensitive Urban Design Specialist

danielr@oceanprotect.com.au

1300 354 722