

Characterization of Plastic Pollution in Rivers: Case of Sapang Baho River, Rizal, Philippines



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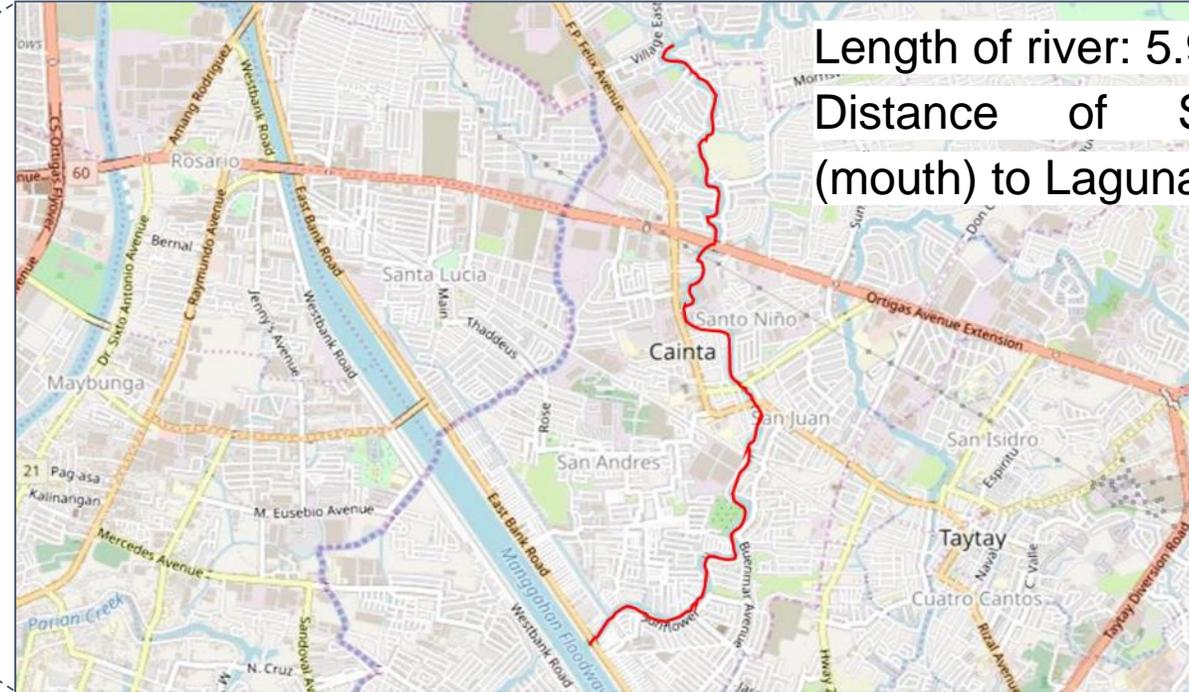


Objectives and Significance

- To identify, characterize and analyze macrowastes and microplastics in Sapang Baho River, Rizal
- The study can provide baseline information about the presence of macro and microplastics in freshwater environments in the Philippines.
- With additional knowledge on macro and microplastics, plastic pollution can be addressed thru policies and awareness can be raised.



Study Site: Sapang Baho River System

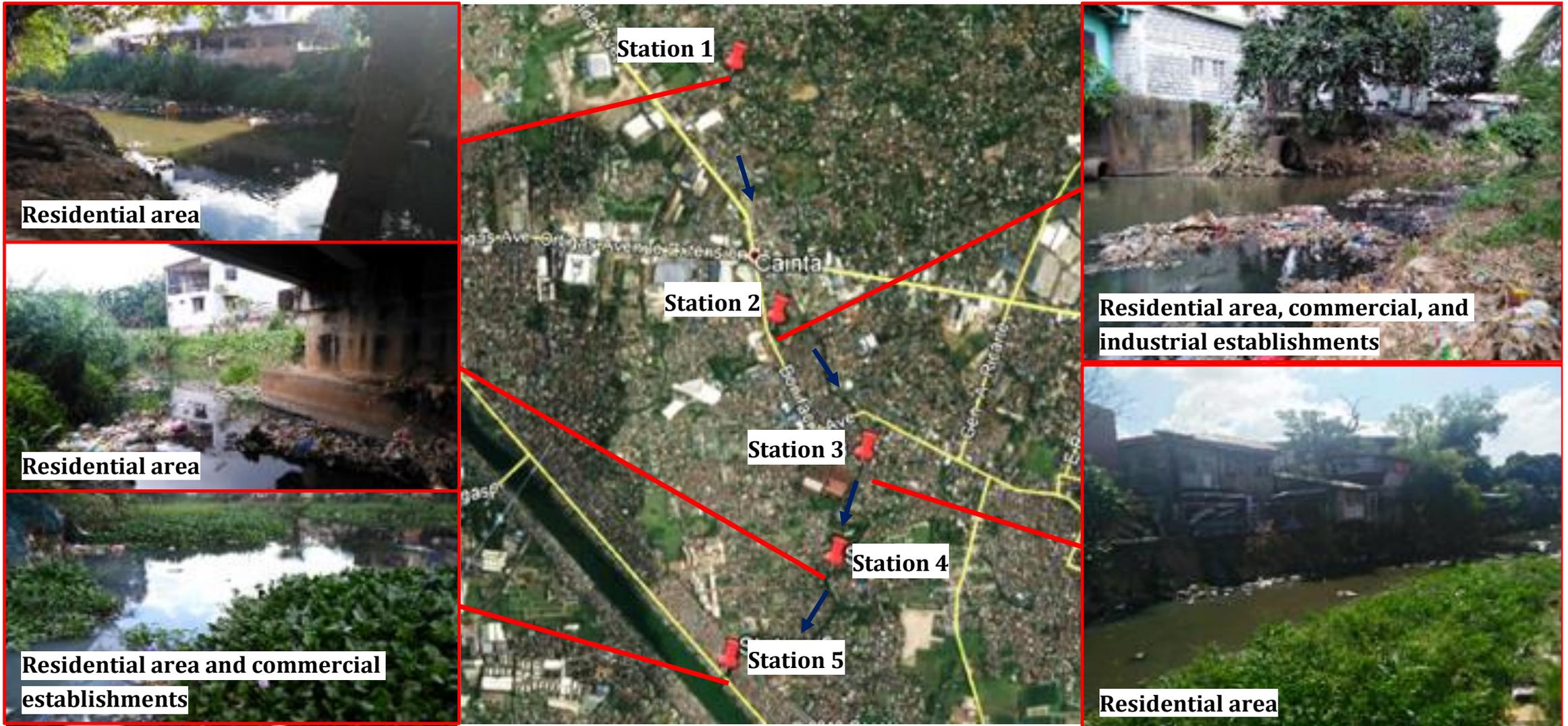


Length of river: 5.95 km
Distance of Sapang Baho (mouth) to Laguna Lake: 7.09 km

- The Sapang Baho River System, which traverses Marikina City, Antipolo, Cainta and Taytay, Rizal, is located near residential and commercial areas.
- The river drains to Laguna Lake, a 900 km² lake, which is one of the largest lake in Asia and one of the primary sources of water in the Philippines (for water supply, agriculture, fish farming, industrial uses, and recreation)



Sampling Locations



Sample Collection



Macrowastes

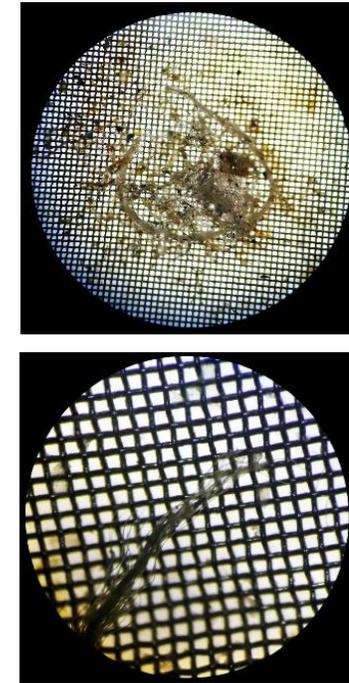
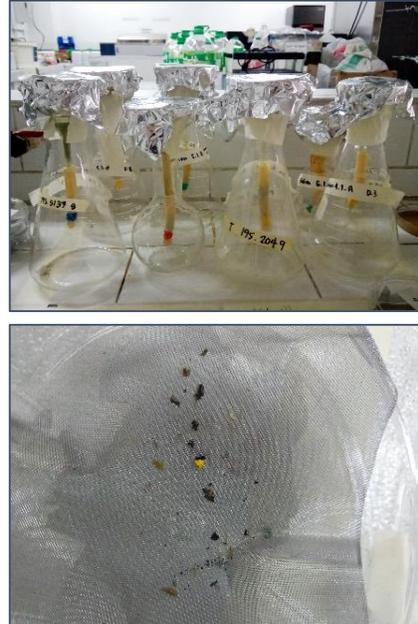
- collected solid waste from the river for 3 sampling days from January to March 2019
- characterized and weighed solid wastes according to different types
- estimated amount of solid waste in area



Microplastics

- collected 400L of surface water from each station
- filtered water using 4.75mm, 0.8mm, and 0.3mm sieves
- transferred retained particles to sample containers

Sample Preparation and Characterization



- conducted wet peroxide oxidation
- separated microplastics using density separation
- filtered liquid to obtain microplastics

- microscope exam
- identified type of microplastic based on form
- quantified microplastics by type and color

Estimated Amount of Macrowaste (Volume)

Station 1
0.5 m³



Station 2
19.25 m³



Station 3
2.25 m³



Station 4
10.25 m³



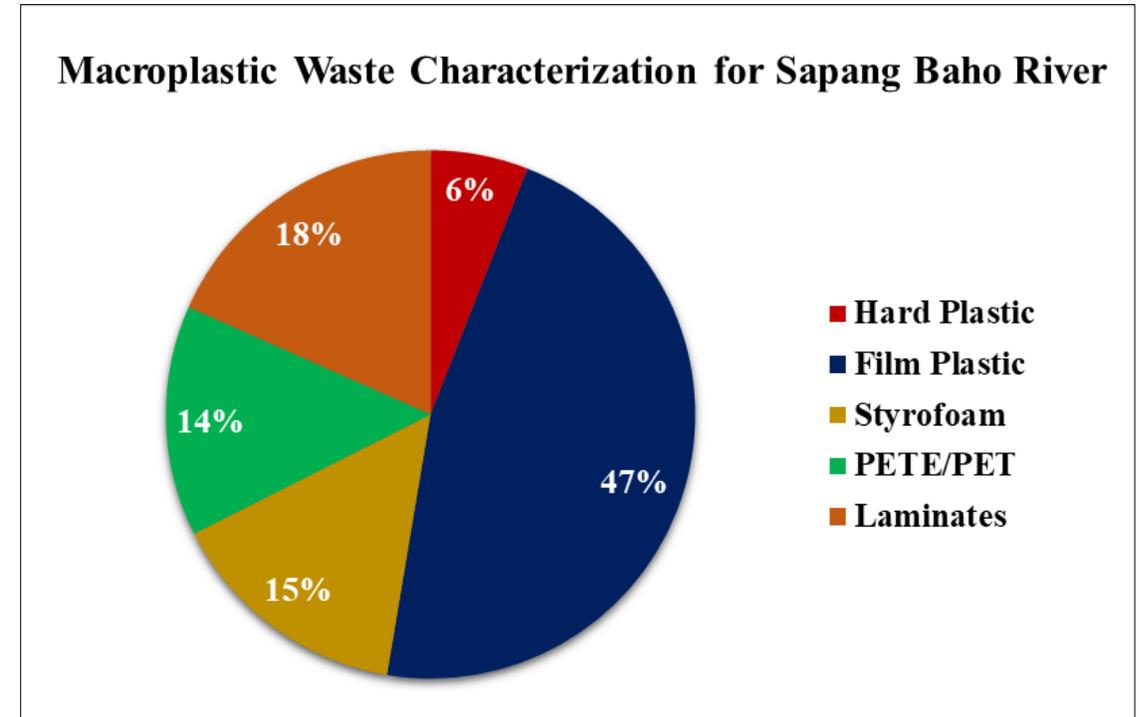
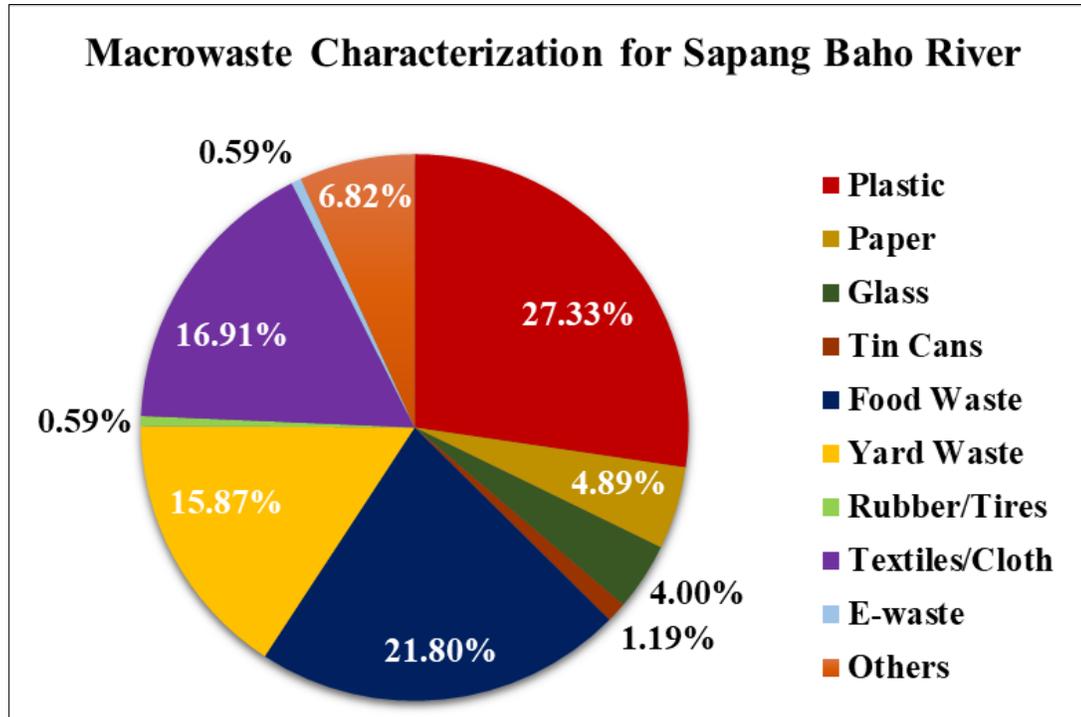
Station 5
-



Characterization of macrowastes

Sample size: **33.71 kg**

Total mass of plastic wastes: **9.2 kg**



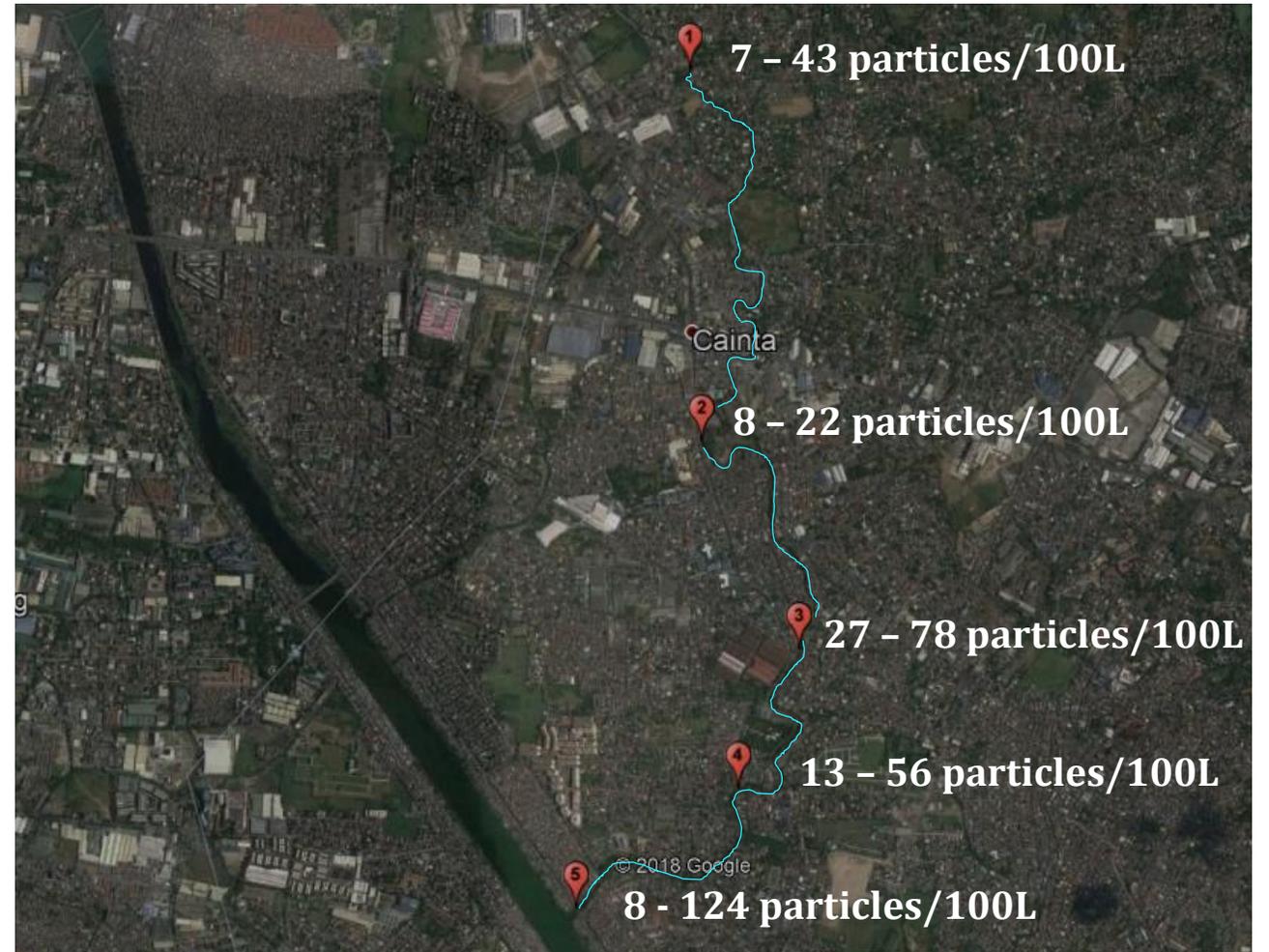
Plastics are most abundant in macrowaste sample and are mainly composed of film plastics.

Microplastics Concentration

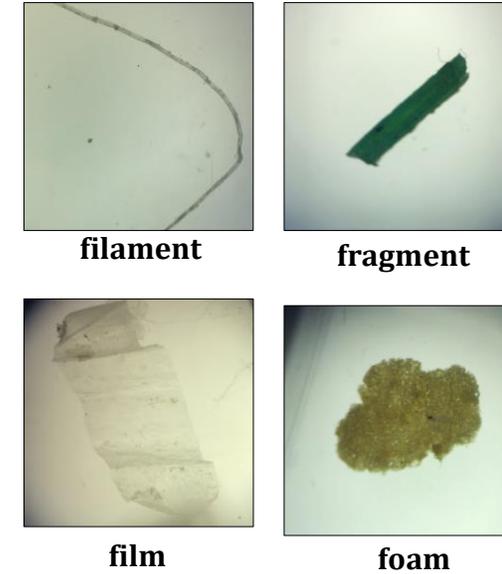
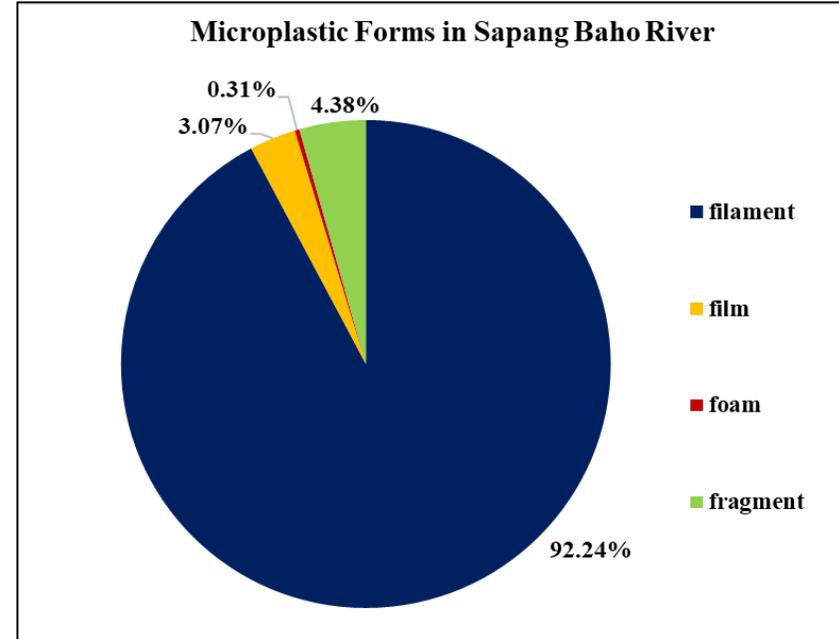
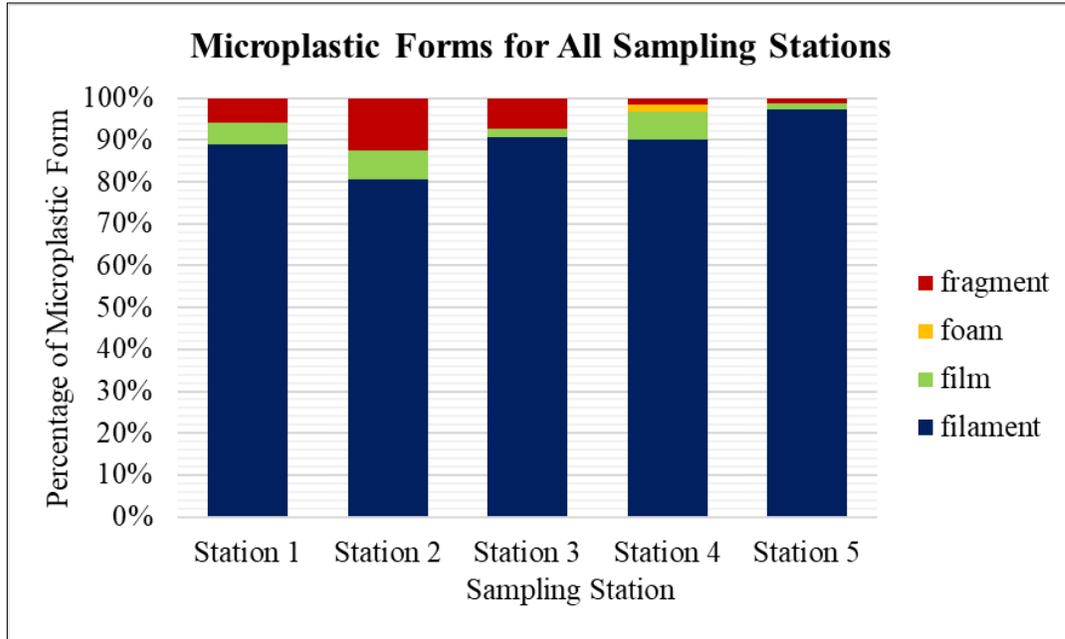
A total of **2,278** microplastic particles were obtained from a sample volume of **6,000 L**. Possible sources of variation in concentration: physical blockage, wastewater discharge, additional point sources

Surface water discharge: **0.29 m³/s**

Microplastic Loading of Sapang Baho River (surface water) to Laguna Lake: **24 – 362 particles/second**



Microplastics: Forms

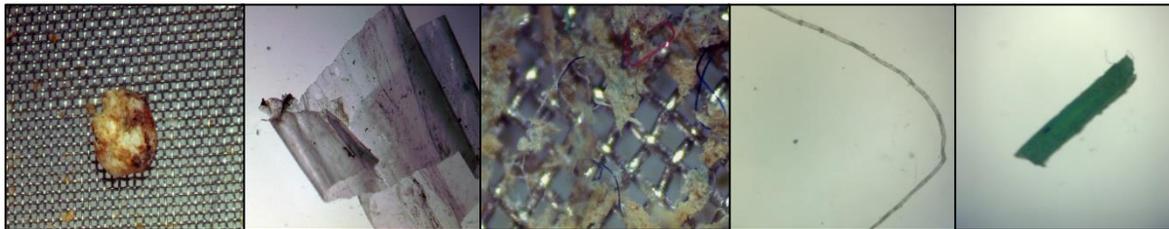
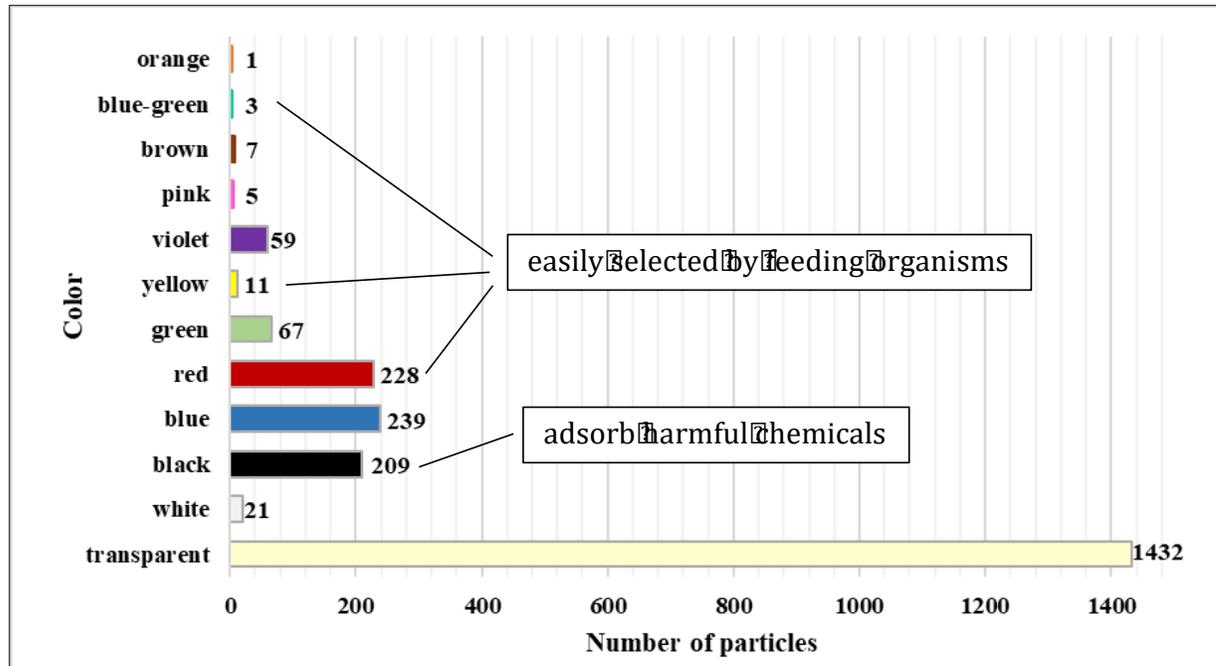


- Filament is the most abundant microplastic form, while pellet was not present in any of the samples.
- Abundance of filament can be attributed to textile macrowaste, cloth washing and wastewater discharge.



Microplastics

By color



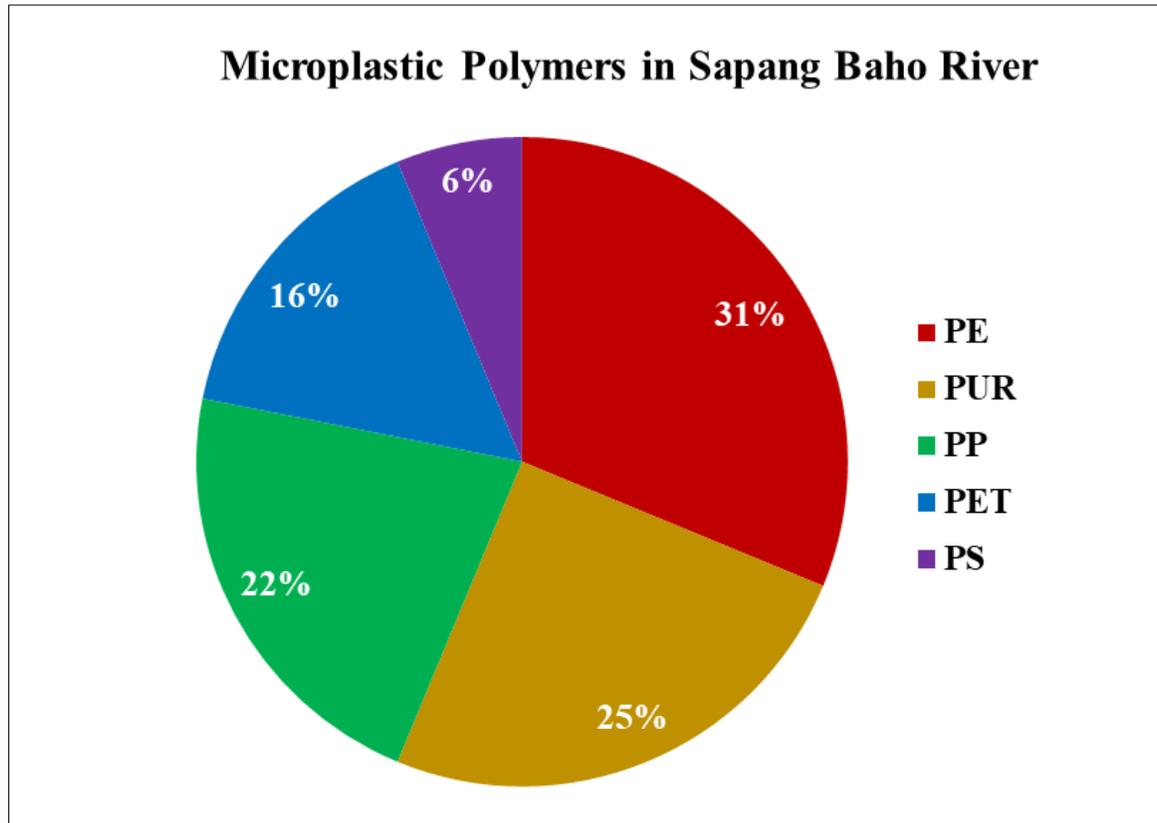
By Size

| Microplastic Type | Percent | |
|-------------------|-----------------|---------------|
| | 0.3mm - < 0.8mm | 0.8mm - < 5mm |
| filament | 74.06 | 25.94 |
| film | 75.71 | 24.29 |
| foam | 14.29 | 85.71 |
| fragment | 80.00 | 20.00 |
| pellet | 0.00 | 0.00 |
| Total | 74.19 | 25.81 |

For fragments, smaller sizes may have been due to photodegradation and biodegradation and other environmental conditions.

It suggests that the microplastics in the river are mostly composed of smaller sizes of particles and may easily be transported to waterways.

Microplastics: Polymer Type



via Raman Spectroscopy Test

Possible Sources:

Polyethylene (PE)

grocery bags, food packaging

Polyurethane (PUR)

furniture cushioning, footwear

Polypropylene (PP)

bottle caps, food containers

Polyethylene terephthalate (PET)

plastic bottles, textile

Polystyrene (PS)

food service products, protective packaging

Summary

- Sapang Baho River serves as a receptacle for mismanaged wastes and transports a significant amount of microplastics to Laguna Lake.
- Plastics were dominant in macrowaste sample.
- Filament is most abundant in terms of type, while transparent microplastics are most abundant in terms of color
- Domestic wastewater is assumed to be directly discharged as evidenced by the abundance of filaments.
- Physical obstruction and additional sources may have caused varying concentrations across stations
- Approximately 24 - 362 microplastic particles/second are contributed by Sapang Baho River to Laguna Lake





THANK YOU!

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