Mediterranean Institute of Oceanography

Institut de Recherche pour le Développement FRANCE

French National Research Institute for Sustainable Development

BK TP.HCM

Riverine Microplastics Pollution General knowledge

Dr Emilie STRADY

ISAP 2021

International Forum for Sustainable Asia and the Pacific

@Boré IRD Images

What are microplastics?

Size cut-off

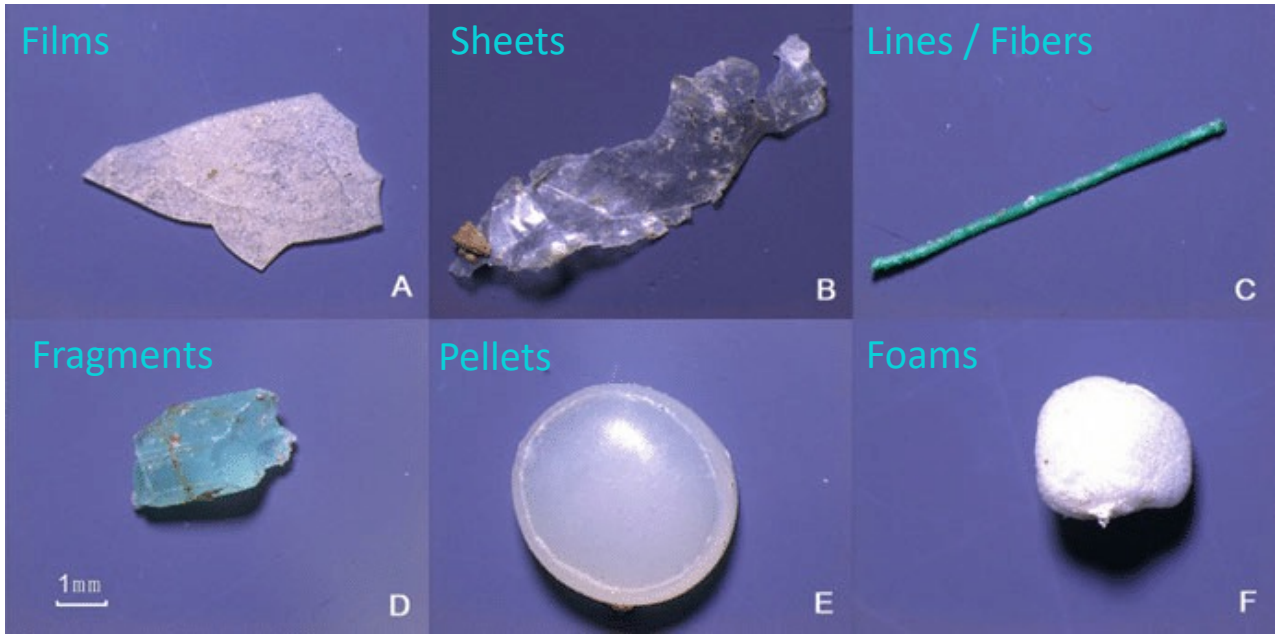
Macroplastic

5 mm

Microplastic

1 µm

Nanoplastic



Shapes of typical microplastics

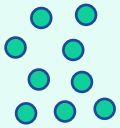
Wu et al 2018; Microplastic Pollution in Inland Waters Focusing on Asia

What are the sources of microplastics?

River

PRIMARY MICROPLASTICS

Plastic pellets



Personal care products

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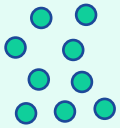

Personal care products

SECONDARY MICROPLASTICS:
Mechanical (e.g. abrasion) and chemical (e.g. UV) degradation of larger plastic items

Daily use plastics

Agriculture

Textile & garment industry

Laundry of synthetic clothes

Transportation

Landfills

Fishery & aquaculture

Adapted from Plastic Leak Project, Quantis 2020

How are microplastics transferred in the riverine environment?

River

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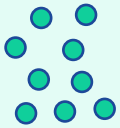

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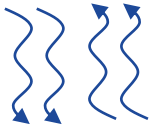
Surface runoff

Wastewater effluent



Atmospheric fallout

In-situ degradation

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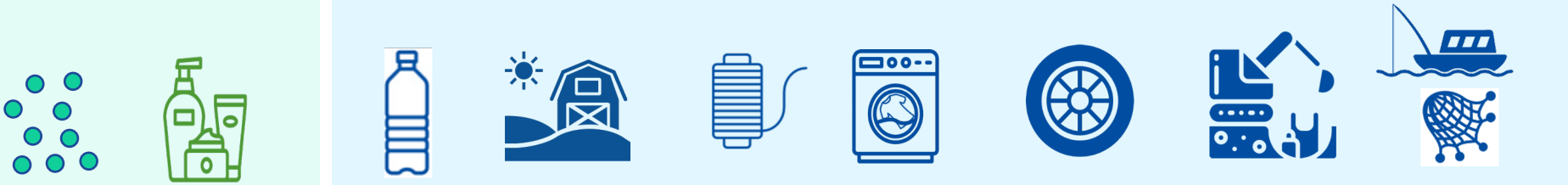

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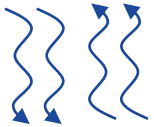

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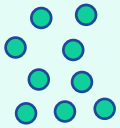

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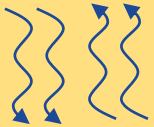

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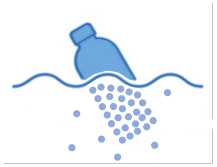

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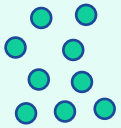

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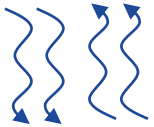

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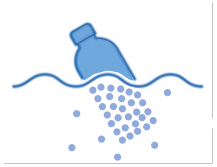

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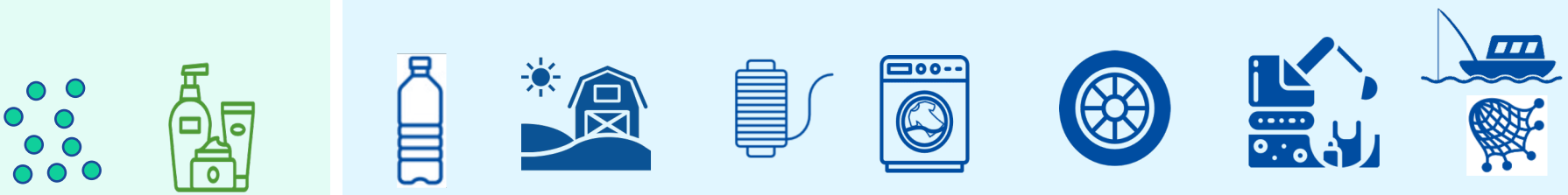

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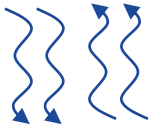

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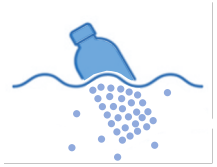
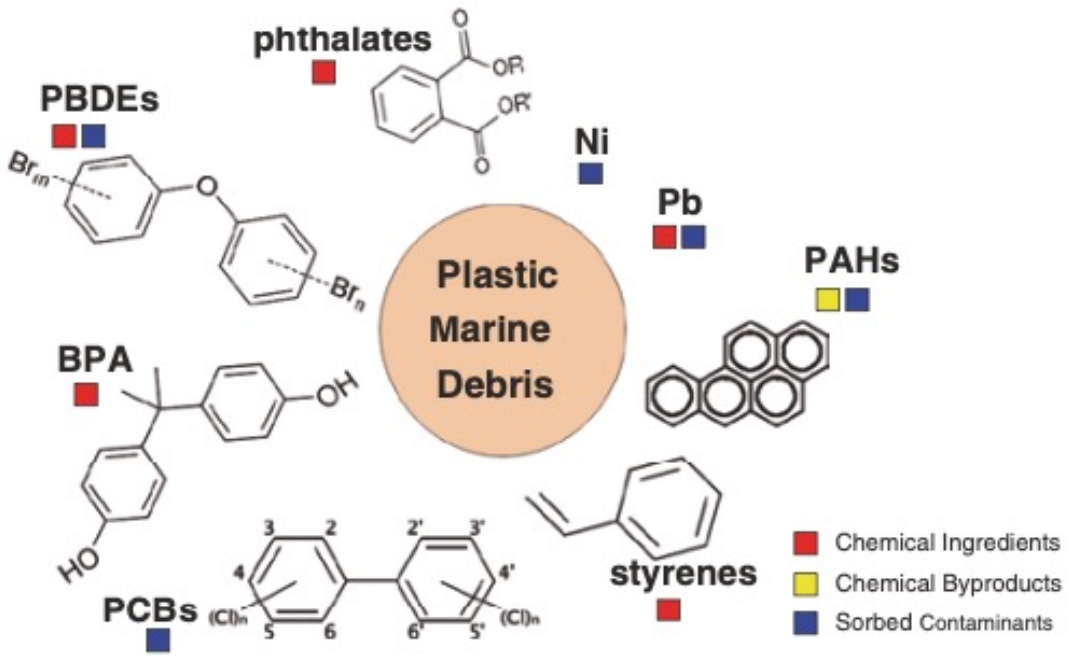


In-situ degradation

Why shall we care of the presence of microplastics in rivers?

1. Microplastics are carriers of organic/inorganic contaminants

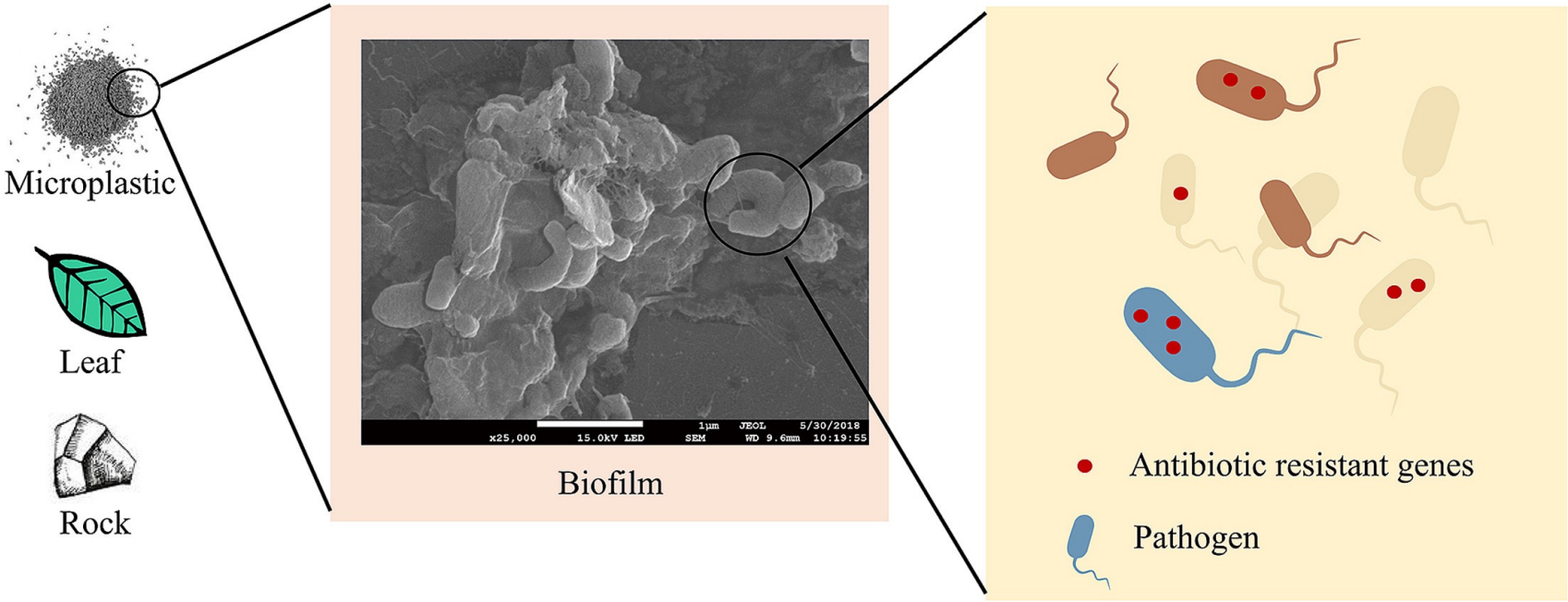


Cocktail of contaminant associated with marine plastics

Rochman 2015; The Complex Mixture, Fate and Toxicity of Chemicals Associated with Plastic Debris in the Marine Environment, Marine Anthropogenic Litter

Why shall we care of the presence of microplastics in rivers?

2. Microplastics are carriers of pathogens and antibiotic resistance gene

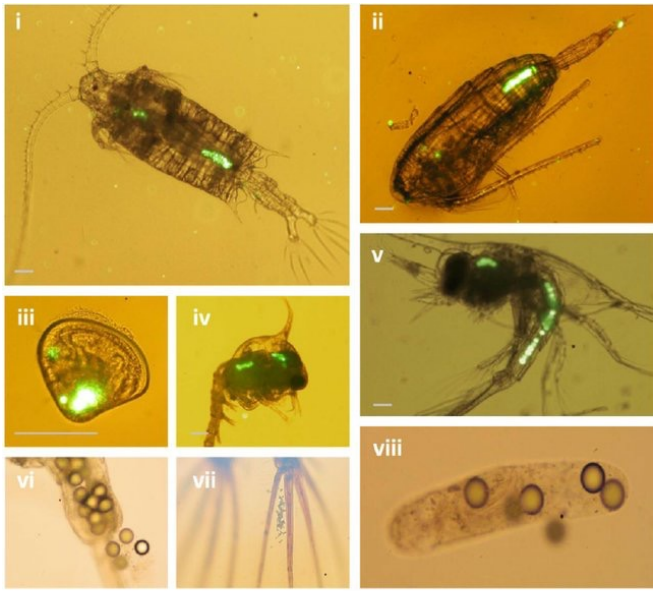


Selective enrichment of bacterial pathogens by microplastic biofilm.

Wu et al, 2019; Selective enrichment of bacterial pathogens by microplastic biofilm

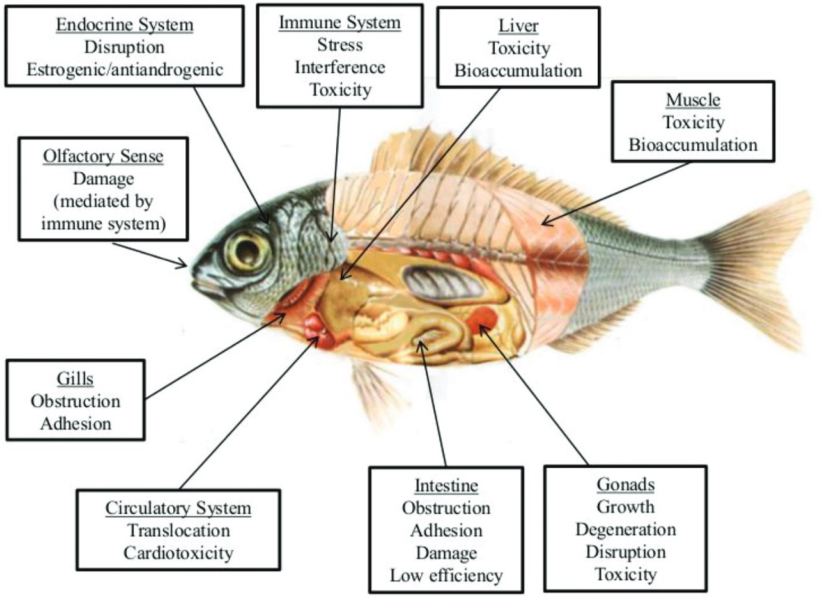
Why shall we care about the presence of microplastics in rivers?

3. Microplastics can be ingested by aquatic biota and induce toxicological effects



Microplastics can be ingested, egested and adhere to zooplankton (fluorescence microscopy)

Cole et al 2013; Microplastic Ingestion by Zooplankton

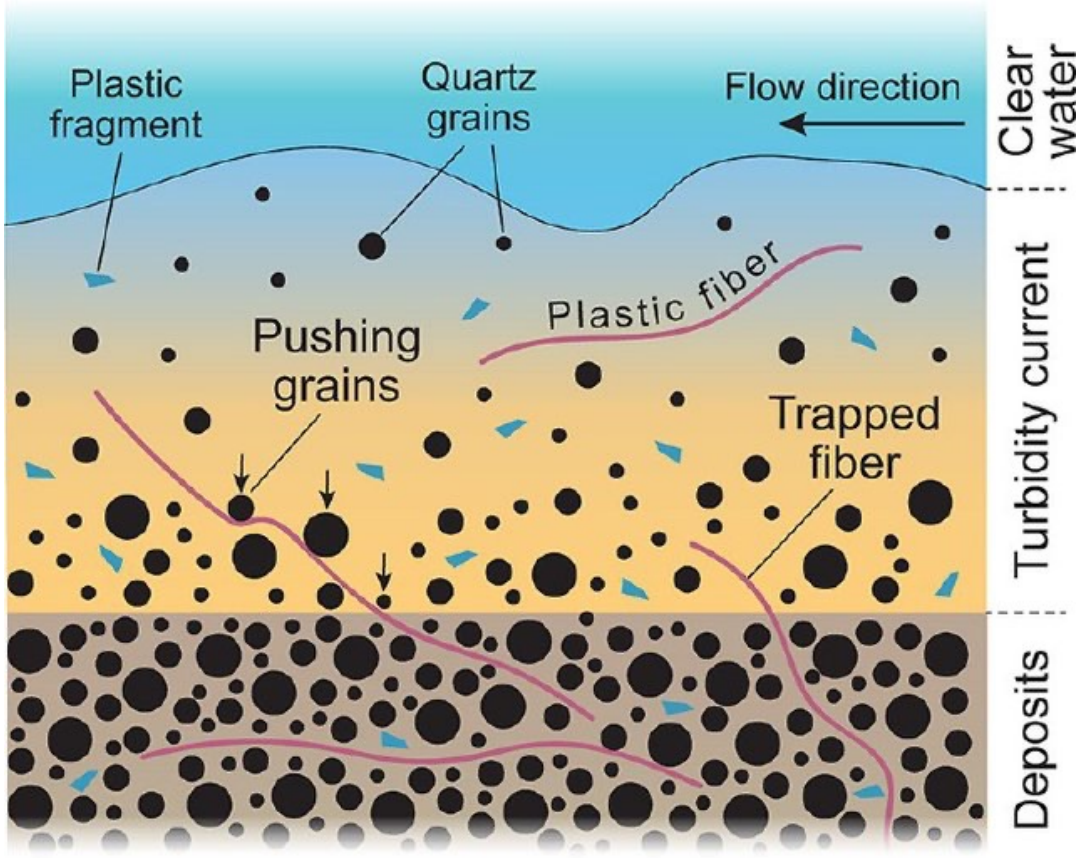


Principal effects of microplastics on fish

Espinoza et al 2016; Microplastics in Aquatic Environments and Their Toxicological Implications for Fish

Why shall we care of the presence of microplastics in rivers?

4. Microplastics can be transferred to the coastal zone and the oceans



Deposition mechanism of microplastic fragments and fibers in a turbidity current

Pohl et al 2020; Transport and Burial of Microplastics in Deep-Marine Sediments by Turbidity Currents

Why riverine microplastics are an environmental issue in ASEAN?

- Important sources of microplastic
  - 650 millions inhabitants
  - Aquaculture and fisheries are key economic sectors
  - 11% of global exports of clothing (2016)
  - Important waste mismanagement

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- Important sources of microplastic
  - 650 millions inhabitants
  - Aquaculture and fisheries are key economic sectors
  - 11% of global exports of clothing (2016)
  - Important waste mismanagement
- Specific pathways to the environment
  - Tropical moonson climate
  - Insufficient wastewater treatment plant capacity

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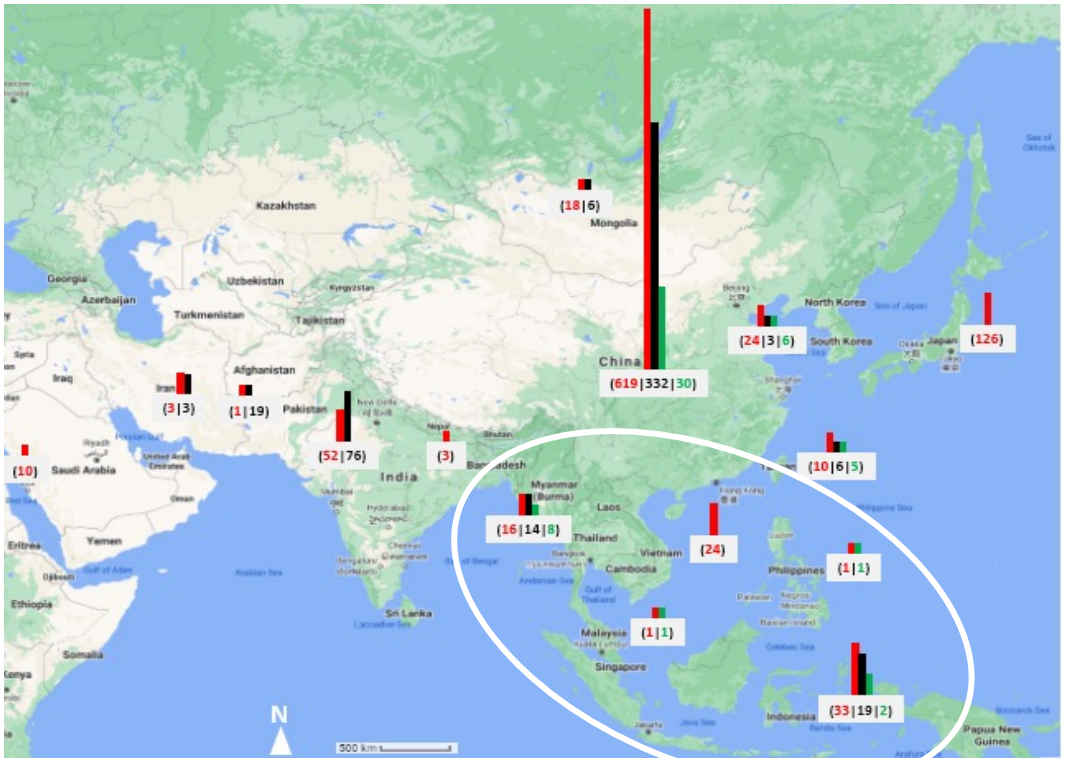

Review of number of studies on MP in freshwater ecosystems in Asia between January 2014 and May 2021

Phuong et al, 2021; Microplastics in Asian freshwater ecosystems: current knowledge and perspectives

Few data in ASEAN

↓

Poor understanding of
- Abundance
- Sources
- Transfer
- Impacts

↓

Difficulties to develop adapted policies to tackle the pollution

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Thank you for your attention

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