14.3 Comparison of methodologies used

This comparison has been approached in two ways: first, with a focus on the diversity in use of different methodological approaches in ASEAN+3 employed for research on pollution from marine plastics (Table 1.2.14.3); and second, with a focus on research papers that discuss methodological approaches. (Table 1.2.14.4).

Table 1.2.14.3. Methodologies employed in marine plastics research in ASEAN+3. Legend: Green = methodology employed in marine plastics research; Red = methodology not employed in marine plastics research.

Methodologies	BRN	KHM	IDN	MYS	MMR	PHL	SGP	THA	VNM	CHN	ROK	JPN
Review (literature/social media)	Red	Red	Green	Green	Green	Green	Red	Red	Red	Green	Green	Green
Sampling	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Monitoring	Red	Green	Green	Green	Red	Red	Green	Red	Red	Green	Green	Green
Quantification	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Identification	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Laboratory experimental work	Red	Red	Green	Red	Red	Red	Green	Red	Red	Green	Green	Green
Simulation model	Red	Red	Green	Green	Red	Red	Red	Red	Green	Green	Green	Green
Social perception	Red	Red	Green	Green	Red	Red	Red	Red	Green	Green	Green	Red

Methodological approaches for monitoring and assessing marine litter were explored in six countries. These include: Indonesia (n=2), Malaysia (n=3), Vietnam (n=1), China (n=8), ROK (n=8) and Japan (n=8). In Brunei, Cambodia, Myanmar, the Philippines, Singapore and Thailand, there was no published work on such monitoring methodologies.

In some papers, the comparison of methodologies was the main purpose of the paper. In others, their chosen methodology was discussed in the context of particular field or lab-based experiments. Table 1.2.14.3 also shows a strong emphasis on methodologies for microplastic sampling, and significantly less on methodologies for macroplastic identification, fragmentation, degradation and other processes that drive plastic particle behaviour and transport as well as bacterial assemblages.

In most countries, this type of discussion seems to arise after a number of studies and publications as a sign of progress in this field of research whether prior research is country specific or topic specific. An example of this is researchers from a non-ASEAN country discussing application of different methodologies in the context of an ASEAN country; such publication can happen to be the first publication of this type in the country (e.g. Vietnam).

Table 1.2.14.4. List of papers that analysed the methodologies for monitoring and assessing marine litter.

Country	No.	Relevant papers
IDN	2	• Syakti et al. (2018). Simultaneous grading of microplastic size sampling in the Small Islands of Bintan water, Indonesia. Marine Pollution Bulletin 137: 593-600. • Syakti (2017). Microplastics Monitoring in Marine Environment. Omni-Akuatika 11 (2): 1-6
MYS	3	• Auta et al. (2017a). Screening of Bacillus strains isolated from mangrove systems in Peninsular Malaysia for microplastic degradation. Environmental Pollution 231(2): 1552-1559. • Auta et al. (2017). Screening for Polypropylene Degradation Potential of Bacteria Isolated from Mangrove Ecosystems in Peninsular Malaysia. International Journal of Bioscience, Biochemistry and Bioinformatics 7(4): 245-251. • Karami et al. (2016). A high-performance protocol for extraction of microplastics in fish. Science of The Total Environment 578: 485-494.
VNM	1	• van Emmerik et al. (2018) A methodology to characterize riverine macroplastic emission into the ocean. Frontiers in Marine Science 5: 372.
CHN	8	• Ding et al. (2019) Detection of microplastics in local marine organisms using a multi-technology system. Analytical Methods 11: 78-87 • Fok et al. (2019) A meta-analysis of methodologies adopted by microplastic studies in China. Science of the Total Environment: 135371 • Liu et al. (2019a) A novel method enabling the accurate quantification of microplastics in the water column of deep ocean. Marine Pollution Bulletin 146: 462-465. • Wang et al. (2019) Preliminary study of the source apportionment and diversity of microplastics: Taking floating microplastics in the South China Sea as an example. Environmental Pollution 245: 965-874. • Li et al. (2018) A straightforward method for measuring the range of apparent density of microplastics. Science of the Total Environment 639: 367-373. • Xu et al. (2018). Microplastic risk assessment in surface waters: A case study in the Changjiang Estuary, China. Marine Pollution Bulletin 133: 647-654. • Zhao et al. (2018) Limitations for microplastic quantification in the ocean and recommendations for improvement and standardization. In: Zeng (ed.) Microplastic Contamination in Aquatic Environments: An Emerging Matter of Environmental Urgency, Elsevier, pp. 27-49. • Qiu et al. (2016) Extraction, enumeration and identification methods for monitoring microplastics in the environment. Estuarine, Coastal and Shelf Science 176: 102-109.
ROK	8	• Kim and An (2019) A simple and efficient method for separation of low-density polyethylene films into different micro-sized groups for laboratory investigation. Science of the Total Environment 668: 84-89. • Lee et al. (2019) Rapid assessment of marine debris in coastal areas using a visual scoring indicator. Marine Pollution Bulletin 149: 110552. • Hong et al. (2017) Methods of analysing chemicals associated with microplastics: a review. Analytical Methods 9: 1361 • Shim et al. (2016) Identification and quantification of microplastics using Nile Red staining. Marine Pollution Bulletin 113: 469-476. • Jang et al. (2015) Application of remote monitoring to overcome the temporal and spatial limitations of beach litter survey. Advanced Science and Technology Letters 95: 67-72. • Song et al. (2015) A comparison of microscopic and spectroscopic identification methods for analysis of microplastics in environmental samples. Marine Pollution Bulletin 93: 202-209. • Saido et al. (2014) New analytical method for the determination of styrene oligomers formed from polystyrene decomposition and its application at the coastlines of the North-West Pacific Ocean. Science of the Total Environment 473-474: 490-495.

		• Heo et al. (2013) Distribution of small plastic debris in cross-section and high strandline on Heungnam beach, South Korea. Ocean Science Journal 48(2): 225-233.
JPN	6	• Iwasaki et al. (2017) Fate of microplastics and mesoplastics carried by surface currents and wind waves: A numerical model approach in the Sea of Japan. Marine Pollution Bulletin 121(1-2): 85-96. • Matsuguma et al. (2017) Microplastics in sediment cores from Asia and Africa as indicators of temporal trends in plastic pollution. Archives of Environmental Contamination and Toxicology 73(2): 230-239. • Kataoka and Hinata (2015) Evaluation of beach cleanup effects using linear system analysis. Marine Pollution Bulletin 91(1): 73-81. • Isobe et al. (2014) Selective transport of microplastics and mesoplastics by drifting in coastal waters. Marine Pollution Bulletin 89: 324-330. • Kataoka et al. (2012) A new technique for detecting colored macro plastic debris on beaches using webcam images and CIELUV. Marine Pollution Bulletin 64: 1829-1836. • Kako et al. (2011) Establishment of numerical beach-litter hindcast/forecast models: An application to Goto Islands, Japan. Marine Pollution Bulletin 62(2): 293-302.

In conclusion, these methodological discussions should be taken into account in the context of the development of regional guidelines on monitoring and surveying of pollution from marine plastics, bearing in mind that further methodological discussions are still needed on research aspects that have not been discussed.

14.4 Comparison of types of plastics research

Macroplastics and microplastics

There is a very dominant interest in microplastics from the scientific literature examined (Figure 1.2.14.5). Although quantification of marine plastic debris or macroplastics is also reported in grey literature, it is often without the same rigour and level of details. There is also a clear lack of research on examining both macro- and micro-plastics or primary and secondary plastic particles in general to understand the process of transformation from the former to the latter.

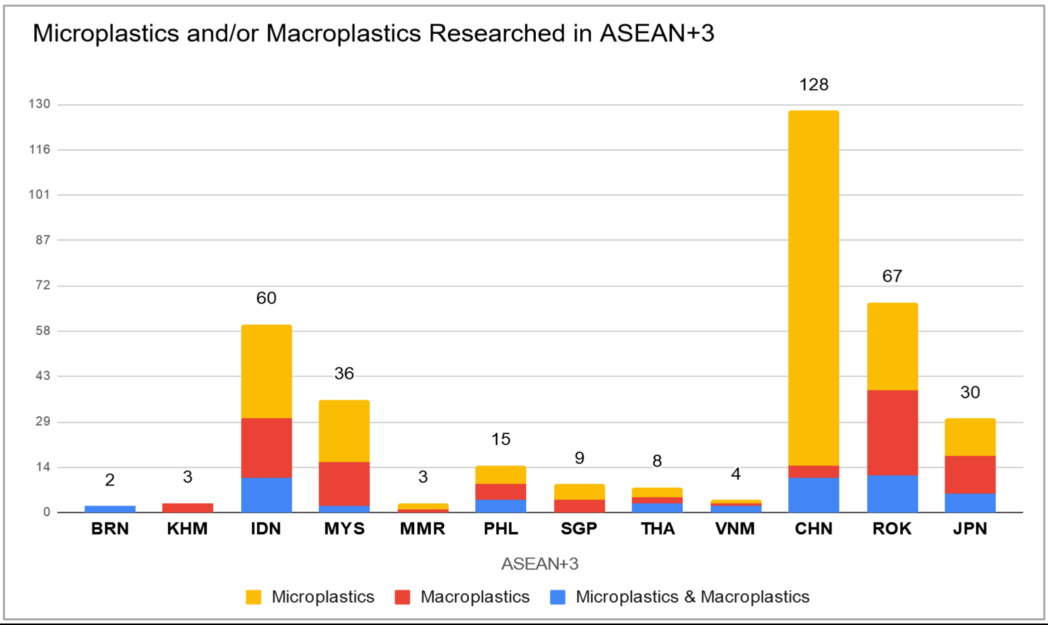

Figure 1.2.14.5. Research efforts on micro-/macro- plastics in the ASEAN+3.