

EXECUTIVE SUMMARY

STATUS OF RESEARCH, LEGAL AND POLICY EFFORTS ON MARINE PLASTICS IN ASEAN+3: A GAP ANALYSIS AT THE INTERFACE OF SCIENCE, LAW AND POLICY

Scope and Content

The **scope** of this study is pollution from marine plastic in Southeast Asia and East Asia, with a focus on the 13 member states of ASEAN+3: Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, The Philippines, Singapore, Thailand and Viet Nam (Vietnam), plus The People's Republic of China (China), Japan and The Republic of Korea (RO Korea)

The **objective** is to provide a comprehensive review of the current knowledge and scientific research on pollution from marine plastics in ASEAN+3, as well as the approaches and work streams on this topic by international and regional intergovernmental bodies and initiatives that have a relevant mandate or scope in this sphere. The study is divided into two main parts.

Part 1 focuses first on reviewing the status of scientific research on pollution from marine plastics in ASEAN+3. It includes an overall regional summary of this status and an analysis of the findings. Second, it reviews and discusses the mandates, approaches and status of work by international and regional intergovernmental bodies, as well as relevant regional public-private and fully-private initiatives that seek to combat pollution from marine plastics.

Part 2 is a gap analysis between the scientific research and the information needs for policy-making purposes, with a focus on the Regional Action Plan on Marine Litter (RAP MALI) of the Coordinating Body on the Seas of East Asia (COBSEA) and the ASEAN Framework of Action on Marine Debris (FAMAD). The work of other regional bodies is also considered. This part also discusses regulatory approaches and obstacles to combat pollution from marine plastics based on four previous reviews. - Recommendations on research needed and ways to improve the science-policy-law interface are provided at the end.

Findings in Scientific Research

This study includes a stock-taking inventory of 371 scientific publications on pollution from marine plastics in ASEAN+3 from 2001 to 2019. The inventory is publicly available online at <https://cutt.ly/kstW1Qy>.

Of these publications, 145 are from ASEAN countries and the remaining 226 are from the three East Asian countries. Scientific research in marine plastics is an important and ongoing effort within ASEAN+3, particularly as most of the 145 research papers from the ASEAN countries were published from 2017 onwards. However, an analysis and comparison of the scientific research reveals a more nuanced picture. First, only RO Korea and Japan have published research in the full range of possible research areas. They both have publications in all 10 of the research clusters identified in this report. Second, China, Indonesia and Malaysia follow closely with nine out of 10 research clusters, although China has substantially more publications than the other two states. Finally, over the years, research foci on marine plastics in China,

Country	No. of scientific publications
China	129
RO Korea	67
Indonesia	64
Malaysia	36
Japan	30
Philippines	15
Singapore	9
Thailand	9
Vietnam	4
Cambodia	3
Myanmar	3
Brunei	2

Japan and RO Korea have expanded from examining the distribution and presence of plastic debris in the environment and within organisms, to investigating the impacts of plastics in organisms through experiments and predictive models to improve environmental monitoring.

Of the 10 research clusters reviewed, the **weakest research clusters** relate to:

- ◇ the **interactions of plastics with the marine environment**, such as the impacts of plastic-associated (organic and inorganic) contaminants to the marine environment and organisms;
- ◇ **social perceptions and behaviour** in the context of measures to combat pollution from marine plastics;
- ◇ **fragmentation, degradation patterns, behaviour and transport of plastic particles**; and,
- ◇ **contribution of plastics from marine fisheries** (including ALDFGs) as well as other sea-based sources of pollution (including shipping and offshore installations).

Specific **gaps within research clusters** are:

- ◇ a lack of **baseline on the distribution and abundance of plastic debris** on the seabed and in the subsoil at the regional scale, including a lack of understanding of **sources and pathways**;
- ◇ **plastic polymer-specific research** (e.g. PP, PE, EPS, PET) based on their presence in the marine environment, and potential biological toxicity to marine biota;
- ◇ research on ecological and environmental impacts such as the **physical and physiological impacts of marine debris in biota and marine habitats**, including uptake and accumulation in the organisms' bodies (e.g. respiratory and branchial systems), transfer of plastic particle through the food chain;
- ◇ research on **microbial assemblages** found on plastic debris in biota; as well as
- ◇ research on socio-economic impacts such as **human health, food safety, and economic loss** to quantitatively assess socio-economic costs due to marine plastic pollution in local communities.

Findings in the Work of Governmental Institutions and Other Initiatives

This study also analysed the work of seven global bodies or regimes that have a particular interest in marine plastic pollution. Three of these international bodies/regimes stood out with their interest in most research topics considered: UNEA and UNEP; the LC/LP, the body in charge of regulating disposal of waste at sea; and GESAMP, a UN research body. The critical work undertaken under the auspices of the Basel Convention to combat marine plastic pollution would therefore benefit from greater cooperation and outreach with these bodies at global and regional levels.

At regional level, five regional bodies that include different combinations of most of the ASEAN+3 countries are engaged in combatting pollution from marine plastics: the ASEAN, ASEAN+3, EAS (the East Asia Summit), COBSEA and APEC (the Asia-Pacific Economic Cooperation). The extent to which on-going research efforts are sufficient to support the work of these bodies as well as approaches to ensure mutually supporting efforts are included in the gap analysis and in the recommendations.

Gap Analysis at Regional Level

Whilst ongoing research is providing critical information to inform the work of intergovernmental bodies, as well as to engage other public or private initiatives involved in addressing pollution from marine plastics, there are several factors that limit the guidance that this research can provide to the identification of specific response measures:

1. Scientific uncertainty and risk assessment

Whilst understanding of exposure and ingestion of plastic has progressed greatly, there remains areas of uncertainty that limit the clarity needed by governments to adopt effective measures. This includes in particular, an understanding with sufficient granularity of:

- (i) The status of plastic pollution in the marine environment with adequate baselines in different environs and at a scale where policy measures can be adopted;
- (ii) The transformation and fate of plastic particles in the marine environment (i.e. degradation, fragmentation, transport, sinking rate, etc);
- (iii) Presence and persistence of different polymers in the marine environment and their toxicity to human health and marine ecosystems, including through associated organic and inorganic contaminants. Areas that need further research include the understanding of uptake by marine organisms through other paths than ingestion, experimental studies of physiochemical impacts, relative exposure of different species and ecosystems to entanglements, composition of microbial assemblages and trophic transfer; and
- (iv) Different sources and pathways of plastic debris into the marine environment which are likely to be specific to activity and geography in order to adopt activity-specific measures and regulations that may be effective in decreasing input of marine plastics.

2. Priority in waste management: Closing the tap

The global discourse on combatting plastic pollution emphasises the development of a circular economy in order to reduce the production of plastic that may reach the natural environment. It is a mid- to long-term goal that all the UN documents emphasise and most agree on, even if as a conceptual goal. Whilst regional instruments also refer to the development of a circular economy, specific actions within these instruments focus instead on waste management, an immediate concern for most countries in SEA. Consistently, this report highlights the general focus of ASEAN+3 countries on waste management and their timid steps towards an Extended Producer Responsibility (EPR) approach which would make producers responsible for the full management of their product's life cycle. The EPR measures adopted to date focus on involving private actors in the management of the post-use of the products distributed by them to consumers. Further elaboration of the components of a circular economy in SEA is necessary before specific measures can be effectively adopted on this path. This should include shared and agreed definitions of the meaning of biodegradability in the context of plastic materials, as well as their recyclability. Research and development in waste management, low cost-low and technology recycling technologies, biodegradability and new plastics are therefore critical. In this context, the clean-up measures highlighted in several regional action plans appear realistic and necessary until waste management measures become effective.

3. Research and protocol fragmentation

COBSEA RAP MALI and ASEAN FAMAD include the development of several guidelines, standards and national reporting with a coordinated approach. Common objectives include the development of regional guidance for the monitoring of marine plastic pollution and for standardised methods. The ASEAN FAMAD also proposes the development of baselines for pollution from marine plastics. As a number of guidelines and protocols are being used in ASEAN+3 that suit different context and available technologies, research on comparable measures and/or bioindicators would be useful for that purpose.

The number of articles in ASEAN+3 that discuss methodologies and surveys (66%) suggests that the region is ready to develop its own adequate standardised methodology or a set of methodologies that result in comparable measures of marine plastic pollution. Importantly, such methodologies should have both a scientific and a policy-making aim and build on existing guidelines such as those from GESAMP and IOC WESTPAC. For such standardized methodologies to be commonly used by scientists, they have to be vetted by the specialised research community of the region on this subject area, which means that they would have to be developed in consultation with both the scientific community and governments. Similarly, research could better inform national policy through improved communication channels between both spheres of work (research and governance/policy), whether directly or through regional organisations. Finally, buy-in of other relevant stakeholders is also critical to ensure implementation of policy. This suggests the need for further research cooperation that integrates public, civil society and private efforts. An example of this is the SEA of Solutions held at the UN regional headquarters in Bangkok in October 2019.

Recommendations

A dominating feature of this study is the multi-layered complexity of the issues raised by pollution from marine plastics globally, as well as at regional level, in ASEAN+3. This complexity includes 1) the number of intergovernmental institutions involved and the resulting fragmentation of the governance framework (if not conceptually, at least at human level), 2) the diversity of stakeholder groups, and 3) unresolved scientific questions and risk assessment of the impact of marine plastics on human health and on marine ecosystems. Recommendations are divided into four axes of work:

1. Substantive issues in need of further research

This is a summary of the most pressing research needs according to this study:

- ◇ Risk assessment approach to characterising the **magnitude of the risk**
- ◇ **Standardisation of definitions for plastic products and biodegradability**
- ◇ **Sources and pathways** into the marine environment, including the determination of **criteria or guidelines for the identification of hotspots** where clean-up may be considered and identification of prevalent land-based and sea-based sources of plastics
- ◇ **Persistence, transformation, transport and fate** in the marine environment, including a mapping of the behaviour, transport and fate of plastic particles in the marine environment as well as exposure and vulnerability of marine areas and resources of particular ecological, social or economic value
- ◇ **Regional baseline and monitoring** with standardised or comparable measures that include microplastics in the water-column, seabed and sub-soil and sensitive habitats

- ◇ Progress on the **understanding of impact on marine ecosystems and on human health**, possibly through measures of exposure and magnitude of the risk

2. Research development and coordination aimed at coordinating among stakeholder groups to further develop and consolidate a multi-disciplinary regional expert community, knowledge management and data sharing, as well as stakeholder engagement and consultation.

Research centres from ASEAN+3 that are engaged in supporting the East Asian Seas Regional Node of the GPML regional node could function as an organisational backbone of this network of regional experts. The agenda of this network of exchange would be focusing on addressing concerns and priorities highlighted by COBSEA WGML, taking into account the ASEAN's action plan and priorities in order to ensure consistency and mutual benefits for the region.

The research inventory established through this study for the region and made available online on the website of NUS Centre for International Law will be maintained to be used as a first regional database for knowledge management and transfer. It has been developed to be further enriched and updated over time.

3. Cooperation bridges between relevant intergovernmental institutions and with regional experts to develop guidelines and standardised definitions and procedures that may be used consistently throughout the region. Activities shared across regional bodies and open fora such as those that COBSEA may organise in the context of the GPML may be leveraged for this purpose. In particular, mechanisms of exchange need to be developed between the ASEAN and ASEAN+ and COBSEA. Coordination with the EAS and APEC is also advised in order to synergise efforts and optimise resources.

4. Develop context-specific outreach and education to ensure effective transfer of relevant knowledge and capacity building in local coastal communities, as well as more generally, plastic producers, retailers and users.

Such transfer requires further research on social perception of pollution from marine plastics to improve the understanding of the readiness of relevant communities and stakeholder groups to embrace new measures, the barriers that may be encountered and the threshold of acceptability of different types of measures. Findings from research on these issues would usefully inform realistic and effective policy-making at local and national level. It would also be valuable to inform regional policy-making (in regional bodies) and support the taking into account commonalities and differences.

Authors, sponsors and partners

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