

SECTION 6 – OVERALL FINDINGS FROM THE RESEARCH REVIEW AND THE GAP ANALYSIS

1. RESEARCH GAPS

The research review showed an important and ongoing research effort on pollution from marine plastics in ASEAN+3. Most of the 145 research papers analysed in the ASEAN were published after 2017. However, a more detailed analysis of the subject areas, methodology and findings of the publications (see Inventory in [Appendix VI](#)) provides a more nuanced picture.

Research clusters

Of 10 research clusters reviewed, the weakest research clusters relate to the following research areas:

- Understanding 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 through the leaching of contaminants from either the original plastic particle composition (e.g. additives) or adsorbed onto surfaces of plastic particles from the marine environment;
- Social perceptions and behaviour in the context of measures to combat pollution from marine plastics (e.g. willing-to-pay studies);
- Understanding the fragmentation and degradation patterns of plastic particles (e.g. photodegradation process, rate of breakdown, particle transformation and fate, sinking velocity, etc); and
- Contribution of plastics from marine fisheries (including aquaculture and ALDFGs) and shipping.

Specific gaps within research clusters

Areas of weaker research in ASEAN+3 are in particular:

- Of the marine environs examined, mangrove, seagrass, coral reefs, and seafloor (i.e. surface and subsurface sediments) have been the subject of less studies, with no clear baseline of distribution and abundance of plastic debris on the deep-sea seabed at the regional scale;
- Plastic polymer-specific research (e.g. PP, PE, EPS, PET) based on their presence in the marine environment and their potential environmental or ecological toxicity to marine organisms, with particular focus on the biological interactions with organic and inorganic plastic-associated contaminants;
- Research on ecological and environmental impacts has primarily focused on direct ingestion by biota; research needs to expand into assessing the physical and physiological impacts of marine debris on biota and marine habitats such as mangrove, seagrass and coral reefs, uptake and accumulation through respiratory and branchial systems, transfer of plastic particles through the food chain and impact of microbial assemblages on plastic debris in biota;

- Research on socio-economic impacts (such as human health, food safety, and economic loss) has been mostly based on inferences obtained on marine debris occurrence and distribution, with no specific impacts examined in-depth; research is needed to quantitatively assess socio-economic costs due to marine plastic pollution in local communities.

Research methodology and approach

The review highlights that the following research methods and types of research have been less used so far:

- Modelling and simulation, for example hydrodynamic modelling to assess the transport of plastic particles in order to examine and identify hotspots and accumulations of marine plastic debris as well as backtrack to sources and identification of sources and pathways;
- Sustained monitoring of pollution from marine plastic spatially and temporally, with comparable measurement methodologies;
- Human surveys and social perception research that are necessary for the development of effective policies for managing pollution from marine plastics; and
- Laboratory-based research (e.g. on toxicity of relevant polymers and associated contaminants in marine organisms).

Research gaps in supporting regional response frameworks

The 23 research foci used to categorise the research review (see [Part 1, Section 1](#)) and a high-level review of the findings (see [Part 1, Section 2.14](#)), could suggest that there is sufficient research to address the action plans and areas of interest of intergovernmental policies.

However, several processes are limiting the guidance that this body of research can provide to the identification of specific response measures:

(1) Perception of risk and difference in approach to knowledge in scientific research and in policy making

This difference is one of framing of the issue of pollution from marine plastics. Scientific research typically seeks to gain a clear understanding of scientific processes and reduce uncertainty. In contrast, policy makers need to balance out competing interests and approach issues on a risk assessment basis. This is exemplified by the difference in structure of research categories compared to that of the regional action plans that have been adopted ([Part 1, Section 2.14](#) vs. [Part 2, Table 2.1.2.1](#) and [Table 2.2.2.1](#)). At the science, policy and law interface, robust science is required to provide adequate information for a risk management approach and implementation of international law. Where the severity of a risk is in doubt, a risk-taking approach may not seem unreasonable and is certainly a less costly and therefore more popular path for policy makers, especially in developing states where risk mitigation measures can have adverse impacts on development. Progress in the scientific understanding on pollution from marine plastics is therefore critical, together with an accompanying path of transmission of this knowledge, education and outreach.

(2) Scientific uncertainty and risk assessment

While the understanding of exposure and ingestion of plastic has progressed greatly, there remains a number of areas of uncertainty that are impediments to the adoption of effective measures. This includes in particular, an understanding with sufficient granularity of (therefore not only conceptual or modelled at global level with proxy data):

- (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;
- (iv) Various sources and pathways of plastic debris into the marine environment which are likely to be specific to activities, local particularities and geography to adopt activity-specific measures and regulations that may be effective to decrease input of marine plastic; and,
- (v) Understanding of the socio-economic drivers of leakages of land and sea-based sources of plastic debris into the marine environment; this area of uncertainty is a barrier to the identification of adequate measures to combat pollution from marine plastics.

(3) 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 presented as a conceptual goal. Whilst regional instruments also refer to the development of a circular economy, specific actions adopted in the context of these instruments focus primarily on waste management, an immediate concern for most countries in SEA. The reports discussed in [Part 2, Section 5](#), which review measures adopted at the national level, highlight the ASEAN+3 countries' focus on waste management and their timid steps towards an 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 and may not stimulate the design change necessary for the economy to become circular. Further elaboration of the components of a circular economy in ASEAN+3 appears necessary before specific measures can be effectively adopted on this path. This should include shared definitions of the meaning of biodegradability and compostability in the context of plastic materials, as well as recyclability. Research and development in waste management, low-cost recycling technologies, biodegradability and new plastics is 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.

(4) Research and protocol fragmentation

COBSEA RAP MALI and ASEAN FAMAD include the development of several guidelines, standards or national reporting with a coordinated approach. Common objectives include the development of regional guidance for the monitoring of marine plastic pollution and 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 set of methodologies that result in comparable measures of pollution. Importantly, such methodologies would have both a scientific and a policy-making aim. They would also build on existing guidelines such as those from GESAMP and IOC WESTPAC.

Such standardized methodologies have to be vetted by the specialised research community on this subject area so to ensure their use by scientists. In practice, it is therefore recommended that regional standards for survey and monitoring methodologies 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, whether directly or through regional organisations. In addition, the 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. COBSEA's intergovernmental mechanisms and knowledge management efforts, such as the Working Group on Marine Litter (WGML) and the Regional Node of the Global Partnership on Marine Litter (GPML) may be leveraged to strengthen the science-policy dialogue and facilitate cooperative marine litter research that address the regional priorities identified in the RAP MALI. Finally, in order to ensure monitoring of plastic pollution at global level, such regional methodology would need to build on existing guidelines such as those from GESAMP and IOC-WESTPAC.

2. LEGAL AND INSTITUTIONAL BARRIERS OR GAPS

In the absence of regional binding laws and regulations on the protection of the marine environment, including from marine plastics pollution, international law is particularly important. This is especially as most states of ASEAN+3 are a party to relevant treaties, or are a member of bodies that have adopted guidelines applicable to the issue of marine plastic litter.

[Part 1, Section 3](#) identifies more than 20 bodies with an intergovernmental mandate that includes at least all or some aspects of pollution from marine plastic litter. Many have adopted binding regulations and guidelines that are intended to prevent marine plastic debris from reaching the sea. Whilst there are some grey areas under international law (where additional rules appear necessary), it seems that the ongoing release of plastic debris in the marine environment is more a matter of systemic failure and weak implementation at the regional and at national levels, than one of clear gaps in international law.

Potential gaps are under international scrutiny and include the loss of containers from container vessels, release of wastewater from ships that are expected to include plastic fibres, as well as the long-term toxicity of micro- and nano-plastics to the marine environment and human health. These potential gaps would need reflecting in a number of treaties such as the London Convention and its Protocol on disposal of waste at sea, and the Stockholm and Basel Conventions that limit the trade of toxic products and waste. The creation of specific rules (including through the potential negotiation of a new treaty) to prevent discharges or leakages of marine plastic debris from land-based sources and to elaborate on UNCLOS Article 207, is now in the hands of UNEA. Furthermore, a global or regional approach to land-based sources of plastic pollution would be of use to prioritise and guide national implementation.

In the meantime, should existing provisions of international law be adequately implemented, marine plastic pollution would improve (and the current state of marine plastic pollution would not have been reached). Provisions of international law themselves refer to the importance of regional mechanisms. International instruments with the most general mandate to combat all aspects of pollution from marine plastics (e.g. UNCLOS and UNEA Resolutions) include such provisions on cooperation through regional mechanisms. Furthermore, In the context of ASEAN+3, declarations, policy documents and recommendations adopted by regional bodies refer specifically to UNCLOS and other relevant international instruments. One of the key mechanisms available to remedy the situation today is therefore a better use of existing regional bodies to implement international law.

However, at regional level, the ASEAN+3 region is characterised by a number of intergovernmental regional institutions which work on the protection of the marine environment while having different membership configurations. [Figure 1.4.1.1](#) (in Part 1, Section 4) shows more than 20 regional bodies. Some have a general mandate, others are specialised (e.g. on fisheries, waste and chemicals, marine turtles, etc.). Some have a policy mandate, whereas others are more dialogue meetings. Some are ministerial-level meetings, others are at technical working group levels. Analysis of the mandate, membership and work of these bodies with respect to pollution from marine plastics (in [Part 1, Section 4](#)) shows that they all approach the issue from a different angle and, from this perspective, their differences can actually serve a complementary purpose. This complementarity can relate to geographic, politics, substantive aspects of the issue or the fact that governments are represented by different parts of governments or agencies in different bodies (focal points). However, the difference in membership can be a barrier to work from the different bodies being joined.

Avoiding duplication of efforts across bodies, as well as optimising consistency in their efforts and recommendations, are commonly proposed. In this context, bodies with a general policy mandate such as the COBSEA and ASEAN have a critical role to play. Systemic fragmentation in governance, as a result of overlapping mandates or narrow mandates that deal with a subset of issues (such as plastic pollution from vessels or from fisheries activities), can result in systemic failures when issues 'fall' in-between sub-regimes or bodies. Another systemic failure is one where weakness of implementation at international level leads to the same weakness at regional and local levels. Research on such gaps or failures, and monitoring of measures of pollution, are critical in bringing these difficulties back to the relevant bodies to be addressed.

In order to improve the flow of information and consistency between international and regional bodies and to avoid systemic failures, mechanisms to link regional institutions to relevant international bodies

and work are needed both vertically (i.e. international to regional to national to local and vice versa) and horizontally (at regional level in particular, for the purpose of this study).

Of note, such vertical institutional cooperation is a key action under COBSEA RAP MALI (KA 4.1.2), as well as the ASEAN FAMAD (Actions 1.C.1 and 2 on the incorporation of international law into regional platforms, and 1.C.3 on a regular dialogue with the Basel Convention Regional Centre). Both organisations also focus on horizontal coordination in a number of other actions (e.g. COBSEA RAP MALI KA 3 and 4; ASEAN FAMAD Actions 1.A.1, 2.C.1-2, 2.C.5, 3.C.1-2).

Whilst differences in organisation and mandate may be a challenge that cannot be resolved institutionally, other paths for coordination can be envisaged. For example, the model of the triple COP may be relevant in this context as it brings several intergovernmental meetings to take place in the same location and in back-to-back timings. This thereby provides a conduit for the improved flow of information, and an approach that limits the risk of different bodies engaging on different and especially inconsistent paths. Knowledge transfer and network development can also be tackled through virtual tools. These are further developed in the recommendations below.