

## SECTION 4 – REGIONAL FRAMEWORKS AND PUBLISHED RESEARCH

### 1. SUPPORT PROVIDED BY PUBLIC RESEARCH TO REGIONAL FRAMEWORKS AND ACTIONS PLANS

COBSEA RAP MALI is the only regional framework which specifies substantive areas of research needed. These areas of research are therefore focused on as they are also relevant to the other regional frameworks of action. Two of the five research activities identified as key actions in the Appendix 2 to COBSEA RAP MALI refer to upstream research areas which fall outside the scope of the research inventory developed for this study. These are the development of:

- Technology and approaches to prevent marine litter input from land-based sources; and
- Research on effectiveness of market-based instruments.

The other three research areas are downstream pollution concerns:

- Impact of marine litter on the marine and coastal environment and economy (including economic costs and impacts on human health and safety);
- Marine litter trajectory modelling to identify sources and accumulation zones; and
- Analysis of plastic flows into the region and their relative contribution to marine litter generation.

The first research area, which relates to impact of marine litter on the marine and coastal environment and economy, is very wide and includes a number of more specific research areas, including in particular different aspects of ecological and environmental impact (e.g. ingestion of plastic, branchial uptake, entanglement, changes in microbial assemblages, experimental studies of physicochemical impacts and trophic transfer of plastics), economic loss, fragmentation and degradation, survey and monitoring, methodology for the monitoring and assessment of marine litter and impacts of contaminants associated with marine plastic debris.

Research efforts in each of those sub-areas of research differ, with some of these sub-areas being a lot less developed than others. Research areas identified as lagging include:

- Changes in microbial assemblages;
- Trophic transfer of plastics;
- Fragmentation and degradation;
- Impacts of contaminants associated with marine plastic debris; and
- Fouling organisms on plastic debris as a pathway for invasive species.

The second research area, which relates to marine litter trajectory modelling to identify sources and accumulation zones, is still at an early stage with unclear methodology on the criteria for accumulation zones and limited trajectory modelling.

The third research area, which relates to plastic flows into the region and their relative contribution to marine litter generation, has had limited research effort so far. This research area includes contribution from rivers, source differentiation and discharge from offshore installations including aquaculture farms and ALDFGs. Three other known sources of sea-based marine plastic litter which have not been quantified and generally studied in the region are: ALDFGs, port reception facilities, abandoned plastic-reinforced fibreglass vessels and contribution from hull scraping and self-polishing marine coatings.

## 2. RESEARCH GAPS TO SUPPORT IMPLEMENTATION OF REGIONAL FRAMEWORKS AND ACTION PLANS

A research area of particular relevance to Southeast Asia that is needed to support the objectives of COBSEA RAP MALI (though it is not specifically listed in COBSEA RAP MALI section 4.3 on research activities), and was not investigated in the research papers reviewed is:

- Methodology for clean-up.

Another research area of particular relevance to Southeast Asia that is needed to support COBSEA RAP MALI (and is mentioned to that effect in the list of proposed research activities in COBSEA RAP MALI), but not in research papers reviewed is:

- Social and behavioural science.

Methodologies for clean-up and with different technologies and their net ecological benefit do not appear to have been studied except by groups seeking to justify their approach. An example is the indiscriminate removal of all floating matter from rivers. While these include a large quantity of plastic debris, they may also include biological matter, sediments and other alluvions that may be necessary to the ecological functioning of the river system and the estuary. Given the large number of accumulation areas of plastic litter along coastline and the time that is necessary to improve waste management infrastructure, clean-up operations may be necessary to mitigate new input in marine debris. Further research on this could therefore support a national plan of adequate methodologies and technologies in different areas.

Very little research effort could be found on education and outreach to mitigate pollution from marine plastic. The few articles focus on beach clean-up operation and awareness. Research on behavioural change and barriers to these, such as language and cultural traits, is needed. Interestingly, one article published in RO Korea focuses on the public willingness to pay for the removal of marine microplastics. Similar studies would be useful in Southeast Asia.

Additional topics for research that are recommended by the authors on the basis of the review of the scientific research is discussed in [Part 2, Section 6](#) below on the overall findings of the report.

At this stage, a general observation can already be made, which is applicable to all regional frameworks. Findings from recent research articles show that one of the key difficulties encountered in transforming scientific findings into specific policy and measures is the remaining gap in the

understanding of, as well as the persistent scientific uncertainty on, the magnitude of the impacts to ecosystem functions and human health from plastic pollution. Research keeps developing our understanding of exposure to plastic debris of all sizes, but the extent of impacts is unclear.