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Plastic pollution research in Indonesia: State of science and future research directions.

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Observational and modeling studies have suggested that Indonesia among the top plastic polluting countries globally. Data on the presence of plastic pollution are crucial to designing effective plastic reduction and mitigation strategies. Research quantifying plastic pollution in Indonesia has increased in recent years. However, most plastic research to date has been done with different goals, methods, and data formats. In this study, we present a meta-analysis of 85 studies published on plastic pollution in Indonesia to uncover gaps and biases in current research, and to use these insights to suggest ways to improve future research to fill these gaps. Research gaps and biases identified include a clear preference for marine research, and a bias towards certain environmental compartments within the marine, riverine, and terrestrial ecosystems, which are compartments that are easier to quantify such as riverbanks and beaches. Moreover, we identify polypropylene (PP) and polyethylene variants (HDPE, LDPE, PE) to be among the most frequently found polymers in both macro- and microplastic pollution, though polymer identification is lacking in most studies. Plastic research is mostly done on Java (57%). We recommend a shift in ecosystem focus of research towards the riverine and terrestrial environments, and a shift of focus of environmental compartments analyzed within these ecosystems. Moreover, we recommend an increase in spatial coverage across Indonesia of research, a larger focus on polymer characterization, and lastly, the harmonization of methods used to quantify plastic. With these changes, we envision future research that can aid with the design of effective reduction and mitigation strategies.

