
Challenges, prospects, and opportunities for plastic remediation technologies

Giulia Leone^{*†1,2,3,4}, Ine Moulaert², Lisa I. Devriese², Matthias Sandra², Ine Pauwels³, Peter Goethals¹, Ana Catarino², and Gert Everaert²

¹Ghent University – Coupure Links 653, geb. F, Belgium

²Flanders Marine Institute (VLIZ) – InnovOcean Site, Jacobsenstraat 1, Ostend, Belgium

³Research Institute for Nature and Forest (INBO) – Brussels, Belgium

⁴Research Foundation - Flanders (FWO) – Egmontstraat 5, 1000 Brussel, Belgium

Abstract

As concerns about plastic pollution are rising, the number of remediation technologies to clean up plastic from the environment or prevent it from dispersing more is also increasing. Therefore, sorting and assessing these technological innovations to combat plastic pollution is fundamental. Our study provides additional insights on the current state of the art of plastic remediation technologies, offers an overview of deployed, tested, and conceptual remediation technologies and their characteristics (e.g., field of application, developmental stage), and assesses possible challenges and opportunities. We have created an overview of plastic remediation technologies by combining information retrieved from a systematic and non-systematic review. The systematic literature review, executed following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and performed on the electronic database Scopus, allowed us to find remediation technologies described in the scientific literature and evaluate the current state of the art. The non-systematic web review was performed using predefined search terms to acquire additional remediation technologies and characteristics. In addition, we investigated the strengths, weaknesses, opportunities, and threats (SWOT) of plastic clean-up technologies for ports and inland waterways. Our overview, listing 124 individual remediation technologies, shows that the majority (60%) of the technologies are suitable to be deployed in inland waterways and, as indicated by the SWOT analysis, despite the challenges, technologies for these fields of application offer extensive opportunities (e.g., new jobs, raising awareness). Although there are still knowledge gaps, such as the potential environmental impact of these technologies, 56% of the studies published on plastic remediation technologies were published in the past three years, indicating a growing interest from the scientific community. Given the increased concern of the public and policymakers on plastic pollution and its consequences, our study provides crucial information on rising technological innovations to tackle this persistent pollutant.

Keywords: remediation technologies, prevention technologies, cleanup technologies

*Speaker

†Corresponding author: giulia.leone@vliz.be