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COVID-19: Resource recovery from plastic waste against plastic pollution

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Abstract: To combat with the challenge of plastic pollution, a sustainable, systematic, and hierarchical plastic management roadmap that clearly defines the relative roles and socioeconomic and environmental impacts of these measures is needed. It requires plastic waste type-specific and country demand-specific action plans as well as greater support from policymakers and the more general public. Finally, disaster resilience needs to be considered in consistent with the Sendai Framework for Disaster Risk Reduction 2015–2030.

Subjects: SDG; Responsible Consumption and Production; SDG; Affordable and Clean Energy; Environmental Management; Environment & Resources; Chemical Engineering; Waste & Recycling; Pollution

Keywords: plastic pollution; waste management; resource recovery; sustainable development

Plastic pollution is one of the major global environmental challenges calling for effective responses. “Reduce, reuse, and recycle” is regarded as a long-term strategy to reduce plastic pollution towards a circular plastic economy (Geng et al., 2019). The strategy, however, is not enough to curb the fast accumulation and increasing threat of plastic waste to our ecosystems from a short-term perspective considering a global recycling rate as low as 9% (Geyer et al., 2017). The problem is exacerbated during the coronavirus disease 2019 (COVID-19) pandemic.

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Dr. Siming You is a Lecturer in the James Watt School of Engineering of Glasgow University. Before joining the School, he worked as a Research Fellow at NUS (National University of Singapore) Environmental Research Institute. He also served as a Postdoctoral Fellow at Nanyang Technological University and the Massachusetts Institute of Technology in 2014 and 2015, respectively. Dr. You received his Ph.D. in Thermo-fluids from Nanyang Technological University in 2014. He has an area of expertise in the design and analysis of waste management and waste-to-resource generation, and the valorization of waste-derived products like bio-char and hydrogen. Dr. You was awarded the Outstanding Young Researcher Award by the American Institute of Chemical Engineering, SLS in 2018. He also sits in the Editorial Board of a leading journal on waste management – Journal of Hazardous Materials.

PUBLIC INTEREST STATEMENT

The COVID-19 pandemic has disrupted the effort of plastic pollution mitigation to a great extent with the overflow of plastic-based medical waste. This work summarises the dilemma of existing plastic waste management. It highlights that it is important to adopt a sustainable, systematic, and hierarchical plastic management roadmap that clearly defines the relative roles and socioeconomic and environmental impacts of these measures. The roadmap needs to take disaster resilience as a design factor, and relevant action plans need to be plastic waste type-specific and country demand-specific and call for greater support from policymakers and the general public.

The problem is further complicated by China's import ban on nonindustrial plastic waste in 2017. As a leading plastic waste receiving country, China had imported a cumulative 45% of global plastic waste since 1992 (Brooks et al., 2018). The ban incurs an abrupt diversion of a huge amount of plastic waste to other countries like Malaysia, Vietnam, Philippines, and Indonesia. Unfortunately, most countries do not have proper infrastructure and regulation capacities to sustainably manage the over-imported plastic waste (Dauvergne, 2018). This has sparked a series of diplomatic rows between various Asian and Western countries, followed by potential import bans and a global plastic waste trade shuffle (Bengali, 2019). Moreover, over 90% of waste in low-income countries is either openly dumped or burned (Kaza et al., 2018), implying an increased plastic pollution risk to some of the importing countries' ecosystems.

The COVID-19 pandemic has led to a significant upsurge in the use and production of health-care-related plastic products, especially single-use plastics like surgical masks (Klemeš et al., 2020). The plastic waste management during the pandemic has been seriously disrupted in some developing countries due to their rudimentary waste management infrastructure and limited infrastructure and facilities. This has made the sustainable management of plastic waste during the pandemic a big concern, calling for higher resilience for the whole waste management chain (You et al., 2020). This poses an urgent problem: how to deal with the plastic waste that has accumulated in our ecosystems and the new surge in plastics that is expected in the near future?

Advanced resource recovery (e.g., hydrogen, carbon nanotubes, etc.) from plastic waste appears to be an effective solution to alleviate the current dilemma of global plastic waste management (Saleem et al., 2018; Yao et al., 2018). Conventional practices (e.g., landfill) are losing their popularity due to adverse environmental impacts. Recovered resources that precisely match the socioeconomic, energy, and environmental demands of an importing country will accelerate relevant technology uptake and help to alter the public impression of imported plastic waste from a "pain" to a "gain". This will alleviate the plastic waste trade stress and facilitate the shuffle.

The resource recovery from plastic waste needs to go in parallel with the strategy of "reduce, reuse, and recycle" development for tackling the plastic pollution challenge. This calls for a sustainable, systematic, and hierarchical plastic management roadmap that clearly defines the relative roles and socioeconomic and environmental impacts of these measures, which are currently missing. It requires plastic waste type-specific and country demand-specific action plans as well as greater support from policymakers regarding funding and regulations, and the active participation of the general public. Finally, disaster resilience needs to be considered for the design of actions consistent with the Sendai Framework for Disaster Risk Reduction 2015–2030 that guides the global effort of disaster risk management.

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