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EDITED AND REVIEWED BY
Sylvia Lorek,
Sustainable Europe Research
Institute, Germany

*CORRESPONDENCE
Takuro Uehara
✉ takuro@fc.ritsumeikai.ac.jp

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Editorial: The sustainability series: the plastics problem - investigating socio-economic dimensions of plastic pollution

Takuro Uehara^{1*}, Mateo Cordier², Juan Baztan² and
Bethany Jorgensen³

¹College of Policy Science, Ritsumeikan University, Ibaraki, Japan, ²CEARC, Université de
Versailles-Saint-Quentin-En-Yvelines, Guyancourt, France, ³Civic Ecology Lab, Department of Natural
Resources, Cornell University, Ithaca, NY, United States

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Editorial on the Research Topic

[The sustainability series: the plastics problem - investigating
socio-economic dimensions of plastic pollution](#)

There is agreed scientific evidence that the plastic problem must be solved. Cumulative production of plastic since the inception of mass production after the second world war is estimated to be 9,544 million metric tons (Mt), produced between 1950 and 2019, and more than 7,000 Mt of plastic waste has been generated over that period (Geyer et al., 2017; Geyer, 2020; OECD, 2023; Our World in Data, 2023). Primarily because of river discharge and mismanaged waste, plastic waste enters the ocean, leading to marine plastic pollution (Jambeck et al., 2015; Lebreton et al., 2017; Schmidt et al., 2017; Chenillat et al., 2021; Meijer et al., 2021), one of the problems with plastic taking most attention.

There have been growing publications on model simulations studying the way plastic pollution could change in the long run under different scenarios (Jambeck et al., 2015; Geyer et al., 2017; Cordier and Uehara, 2019; Lebreton and Andrady, 2019; Lebreton et al., 2019; van Wijnen et al., 2019; Borrelle et al., 2020; Hohn et al., 2020; Lau et al., 2020; Chenillat et al., 2021; Cordier et al., 2021; OECD, 2022; Yan et al., 2022). While there are variations in their approaches and results, all these publications conclude that plastic waste will increase in the next decades if no changes are made to the current trend. They also all conclude that an unprecedented and significant effort is required to reduce the amount of plastic waste accumulation. It requires system change (Lau et al., 2020), transforming the global plastic economy (Borrelle et al., 2020), or combining solutions (Cordier and Uehara, 2019; Hohn et al., 2020; Lau et al., 2020). Furthermore, technological solutions will not be enough to solve the plastics problem, and it is urgent to act on non-technological solutions, among them by changing people's behavior in waste management and waste prevention (Pahl and Wyles, 2017; Pahl et al., 2017; Cordier and Uehara, 2019; Alcock et al., 2020; Martin et al., 2020; Oturai et al., 2022). The four articles in this Research Topic highlight the importance of socio-economic dimensions of plastic pollution from various perspectives.

Conducting citizen science nationwide in the UK, where 9,701 citizens were engaged, Purkiss et al. reveal that home compostable packaging is not the socially and environmentally

effective way to settle the plastic problem. It was not easy for citizens to identify home compostable packaging. Furthermore, home compost experiments demonstrated that some certified home compostable packaging did not fully disintegrate (it was tested under different home composting conditions). This highlights the difficulty of biodegradable and compostable plastics in providing solutions to the plastic problem. Purkiss et al. report the majority of plastic products did not fully disintegrate, including 60% of those that were certified “home compostable.”

Uehara et al. and Abiola et al. conducted evidence-based studies to investigate the effectiveness of interventions to induce behavioral change. Uehara et al. examined how college students can improve their plastic waste separation behavior on campus simply by learning the correct sorting rules. People do not always comply with plastic waste separation rules because of a lack or misunderstanding of the correct rules. Such a misunderstanding may occur, for example, when the rules are not the same in all cities or municipalities of a country. However, it is extremely important to properly segregate plastic waste to ensure its reuse or recycling at the disposal stage. With a method based on a hybrid of “before–after” and “treatment–control” designs, Uehara et al. demonstrated that knowing the rules increases plastic waste separation on campus. Their results revealed that the learning improved the plastic waste separation behavior on campus in Japan. Before learning the separation rules, only 12.8% of people followed the rules correctly. After learning the rules, this percentage tripled.

Abiola et al. explored how to decrease plastic bag sales and increase the use of reusable bags in retail shops in South Africa. They tested three interventions to reduce plastic bag use: (i) providing reusable bags for free (monetary intervention); (ii) communicating about a plastic-free July campaign, which included nudges such as commercial messages for consumers in stores as well as changing the questions usually asked by cashiers to consumers (non-monetary intervention); and (iii) subsidizing reusable bags (monetary intervention). The study found the second intervention, the non-monetary one based on nudges, was the most effective. The study shows non-monetary interventions can have a higher impact in promoting pro-environmental behavior than monetary incentives. It also shows that subsidies can be ineffective and do not discourage the use of plastic bags.

Winterstetter et al. applied material flow analysis to estimate the generation of mismanaged plastic packaging and small non-packaging plastic items (PPSI) in 33 European countries based on observed data for each country for 2012 and 2018. This is an important topic since among all virgin plastic products, PPSIs represent the largest part. The same for post-consumer plastic waste, PPSIs are the largest fraction. Their results show that PPSI waste increased over time: Europeans generated 38.7 kg of PPI waste per capita in 2012. In 2018, this amount increased to 42.9 kg

per capita. This was also the case for PPSI mismanaged waste: 2.90 million tons of PPSI mismanaged waste were generated in Europe in 2012. In 2018, this amount increased to 3.01 million tons. This may seem surprising as over the period 2012–2018, most European countries succeeded to reduce their percentage of mismanaged PPSI waste (as a proportion of total waste) by improving waste collection, recycling, and disposal. However, these efforts were not sufficient to offset increasing amounts of waste generated between 2012 and 2018. As a result, the share of mismanaged waste decreased (in percentage) but the absolute amount increased (in million tons per year). Winterstetter et al. argue that a transition to a circular economy could help solve this problem and reduce the amount of plastic waste that ends up in the oceans. A proper circular economy must include waste management as well as waste prevention.

The four articles demonstrate the importance of tackling the socio-economic dimensions of plastic pollution to effectively reduce it. How we behave is a critical part of the solution to plastic pollution.

Author contributions

TU: writing—original draft. MC, JB, and BJ: writing—review and editing. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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