

# Settling the debate on the benefits of curbside recycling

Eleni Iacovidou

Check for updates

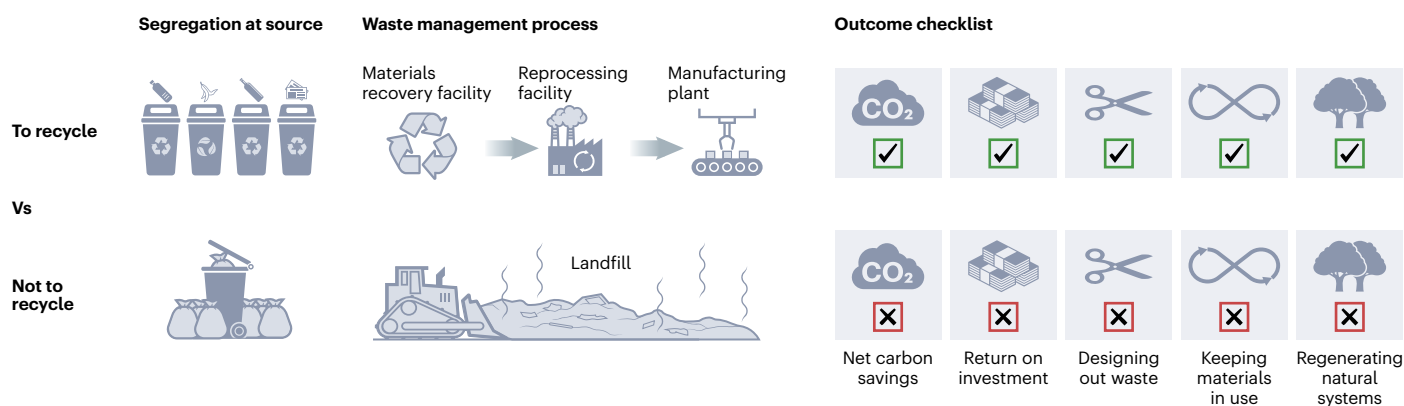
Curbside recycling is costly and performs poorly on expected environmental and economic outcomes. This raises the question of whether curbside recycling should endure or be eliminated to allow alternative services to flourish.

Following COVID-19, the recycling sector is struggling to recuperate from financial failures and closures. These failures are due to the sector's inability to make enough money to maintain its operations caused by a lower demand for recycled materials, also known as secondary commodities. The decreased demand for secondary commodities was driven by a plunge in the price of primary commodities, such as oil, biomass and metal ores, which are of better quality and, thus, preferred by manufacturers for the production of recyclable materials, components and products, such as plastic, paper, metal and glass packages. In addition, the upsurge of recyclable waste materials collected at curbside as a ramification of lockdown measures added to the costs of collection and recycling, which, in turn, raised the price of secondary commodities, making them even less competitive than their virgin counterparts<sup>1</sup>. The exposure of the recycling industry to financial threats has provoked a debate about the advantages of curbside recycling, that is, the local government's programme of collecting recyclable waste materials from households. Writing in *Nature Sustainability*, Anshassi and Townsend<sup>2</sup> contribute to settling this debate by showing that curbside recycling is an environmentally beneficial endeavour, crucial in reducing greenhouse gas (GHG) emissions in the USA, and suitable as a cost-effective climate change mitigation strategy.

In the USA, the recycling rates fluctuate due to factors such as separation at source, capacity and technological maturity of facilities,

recycling education and variations in the collection fee<sup>3</sup>. The diversity of curbside recycling programmes and the ever-changing availability of recyclable materials, components and products create confusion as to what can be recycled and what cannot. As a result, recycling operators often struggle to properly sort the recyclable waste materials, given the fact that each type of recycled material must have a specific degree of purity. Anshassi and Townsend take a deep dive into whether curbside recycling offers the potential of promoting resource efficiency from an economic and environmental viewpoint. The authors formulated a model to calculate the costs and GHG emissions associated with the management of municipal solid waste of a typical US single-family residential home, across seven US regions, emphasizing recyclables collection, sorting, sale and scrapping. They looked at secondary commodity prices over the last 15 years and estimated the cost and GHG emissions of hypothetical changes to the current recycling programme<sup>2</sup>. Using life cycle assessment, coupled with Monte Carlo sensitivity analysis, they proved that the GHG emissions footprint of household waste sent to recycling is almost negligible (0.046 tCO<sub>2</sub>eq per household per year) compared with waste being disposed of to landfill (0.27 tCO<sub>2</sub>eq per household per year). This finding is in line with the study of Turner et al.<sup>4</sup> that showed that, for several recyclable waste materials, recycling delivers net carbon savings.

Anshassi and Townsend go a step beyond to prove and suggest that local governments should remove the glass from their programmes and target recyclable materials with high commodity value and considerable net carbon savings, such as newspaper, cardboard, aluminium and steel cans, and high-density polyethylene and polyethylene terephthalate plastic bottles, by the recycling infrastructure available. This would unlock environmental benefits and help make well-informed and carefully planned decisions contributing to both recycling and climate change mitigation targets. The recycling processes may vary across regions, states or counties, leading to variations in the net carbon



An animated comparison of recycling versus not recycling aided by a curbside collection of recyclable waste materials.

savings; hence, a tailored recycling approach is needed to maximize the positive outcomes<sup>3,4</sup>.

The authors also showed for the first time that the environmental return on investment (ROI) of curbside recycling even under tightened market conditions is like, or better than, the ROI of switching to electric and hybrid vehicles or showing a preference for renewable energy programmes. Interestingly, they showed that at 100% recovery of the high-value materials, there is such a reduction in costs that renders curbside recycling programmes economically beneficial in nearly all market conditions, while reducing GHG emissions considerably. This novel finding emphasizes the importance of investing in tailored curbside recycling programmes to achieve desired sustainability outcomes. Local governments need to understand the limitations of their recycling system in partnership with the recycling infrastructure providers to optimize their recycling programmes and gradually make improvements rather than discontinuing the diversion of high-value materials from landfill.

The Anshassi and Townsend study is comprehensive in demonstrating the benefits of curbside recycling programmes in the USA, using two metrics, namely GHG emissions and environmental ROI. The inclusion of additional metrics, such as virgin material displacement, job creation, consumer acceptability and participation rate, and diversion of waste from landfill, among others, would have been useful in generating insights into the wider sustainability benefits of the curbside recycling programme. Moreover, the optimization of the curbside recycling programme by targeting high-value materials suggests that many potentially recyclable waste materials will be left uncollected and could end up in landfills. The environmental and economic implications of such a shift are unclear, highlighting that a holistic analysis of the potential fate of recyclable waste materials excluded from curbside recycling is needed to ensure that fixing one end of the system does not create problems for another end.

In any case, the study shows that curbside recycling services can deliver environmental and economic returns like, or better than, existing climate change mitigation strategies. Halting curbside recycling could lead to a negative carbon trajectory, while preventing the circularity of high-value materials. In addition, recycling goes beyond environmental and economic benefits – it engrains in people the responsibility of saving valuable resources going to landfill. Placing responsibility midstream of the value chain, that is, to the consumer in the household, may instil confidence and enable greater consumer participation in recycling programmes and behaviour change campaigns. Efforts should be placed on recycling education and optimization of waste separation at source, helping individuals realize that their in-household practices can contribute to value recovery maximization and, thus, sustainable waste management. With sustainable livelihoods at stake, expounding the role all stakeholders can play in attaining a sustainable future is imperative to mobilizing a transformative, lasting change.

**Eleni Iacovidou**  

Division of Environmental Sciences, College of Health, Medicine and Life Sciences, Brunel University London, London, UK.

✉ e-mail: [eleni.iacovidou@brunel.ac.uk](mailto:eleni.iacovidou@brunel.ac.uk)

Published online: 22 May 2023

## References

1. Naughton, C. C. *Resour. Conserv. Recycl.* **162**, 105050 (2020).
2. Anshassi, M. & Townsend, T. G. *Nat. Sustain.* <https://doi.org/10.1038/s41893-023-01122-8> (2023).
3. Siddique, S. F., Lupi, F. & Joshi, S. V. *Resour. Conserv. Recycl.* **54**, 163–170 (2010).
4. Turner, D. A., Williams, I. D. & Kemp, S. *Resour. Conserv. Recycl.* **105**, 186–197 (2015).

## Competing interests

The author declares no competing interests.