

Subject strapline: Urban waste management

Title: Settling the Debate on the Benefits of Curbside Recycling

Standfirst: *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.*

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Following COVID-19, the recycling sector is struggling to recuperate from financial failures and closures. These financial 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 primary commodity prices, such as oil, biomass and metal ores, which are of better quality and, thus, preferred by manufacturers for the production of recyclable goods, such as plastic, paper, metal and glass packages. In addition, the upsurge of recyclable waste materials collected at curbside as a ramification of lock-down 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 counterparts¹. The exposure of the recycling industry to financial threats has provoked a debate about the advantages of curbside recycling, i.e., the local government's programme of collecting recyclable waste materials from households. Writing in *Nature Sustainability*, Anshassi and Townsend², contribute to settling this debate by showing that curbside recycling is an environmentally beneficial endeavour, crucial in reducing greenhouse gas (GHG) emissions in the US, and suitable as a cost-effective climate change mitigation strategy.

In the US 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 fee³. 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 not. 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 Townsend² 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 (MSW) 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 program². Using life cycle assessment (LCA), coupled with Monte Carlo sensitivity analysis, they proved that the GHG emissions footprint of household waste is almost negligible (0.046 tCO₂ eq/HH-yr) compared to recyclable waste being disposed of to landfill (0.27 tCO₂eq./HH-yr). This finding is in line with the study of Turner et al.⁴ that showed that, for several recyclable waste materials, recycling delivers net carbon savings.

Anshassi and Townsend (2023) 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 (HDPE) and polyethylene terephthalate (PET) plastic bottles by the recycling infrastructure available. That 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 savings, hence, a tailored recycling approach is needed to maximise the positive outcomes^{3,4}.

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 reduction in costs that renders curbside recycling programs economically beneficial in nearly all market conditions, whilst reducing considerably GHG emissions. This novel finding emphasises 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 optimise their recycling programmes and gradually make improvements rather than discontinuing the diversion of high-value materials from landfill.

The Anshassi and Townsend (2023) study is comprehensive in demonstrating the benefits of curbside recycling programs in the US, 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 optimisation 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.

Figure 1.

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, whilst 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, i.e., 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 optimisation of waste separation at source, helping individuals realise that their in-household practices can contribute to value recovery maximisation, and thus, sustainable waste management. With sustainable livelihoods being at stake, expounding the role all stakeholders can play in attaining a sustainable future is imperative to mobilising a transformative, lasting change.

References

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Competing Interests Statement

I declare the author has no competing interests as defined by Nature Research, or other interests that might be perceived to influence the interpretation of the article.

Figure 1. An animated comparison of recycling versus not recycling aided by a curbside collection of recyclable waste materials.