



## Waste-to-wealth: Impact of source-sorting of household waste in Cox's Bazar municipality

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- Distributing simple colour-coded sorting bins through a public-private partnership is a low-cost, replicable model for improving household waste management in urban Bangladesh.
- When households sort waste at source, the benefits extend well beyond cleaner streets: more recyclables are recovered, organic waste is composted, and greenhouse gas emissions fall.
- Formalising waste collection services alongside bin distribution opens up local recycling markets and generates income for waste pickers and households.
- Urban waste sorting programmes deserve recognition as climate investments. Evidence from Cox's Bazar shows measurable avoided emissions, directly supporting Bangladesh's national climate commitments.

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## Background

Rapid urbanisation in Bangladesh is generating more municipal solid waste than the existing system can manage (Abedin & Jahiruddin, 2015). Most local governments still rely on open dumping and poorly managed disposal sites (Ahsan et al., 2014), leaving organic waste to decompose and release methane, a potent greenhouse gas. In tourist-dependent coastal cities like Cox's Bazar, unmanaged waste also causes drainage blockage, public health problems, and damage to marine ecosystems (Islam, 2021).

Despite Bangladesh's commitments under the Paris Agreement, household waste segregation remains largely absent, cutting off opportunities for recycling and resource recovery. Local governments lack the infrastructure and financing to run effective waste systems, and communities are rarely engaged in source sorting. Cox's Bazar presents a particularly urgent case: its combination of high tourist footfall, coastal location, and dense settlement means the consequences of poor waste management are especially severe, and solutions piloted here are well-placed to be replicated across similar cities in Bangladesh.

## The study: A randomised trial in Cox's Bazar

This study examined whether providing households with simple sorting bins, alongside an existing cluster-level waste collection system, could improve waste management behaviour. Conducted between August 2025 and January 2026 across 80 clusters in Cox's Bazar Municipality, the study randomly assigned 40 clusters to a treatment group and 40 to a control group. All clusters received large 50-litre collection drums and informational leaflets on waste segregation. Treatment households additionally received two colour-coded pedal bins (a green bin for organic kitchen waste and a blue bin for dry recyclables) to encourage sorting at source.

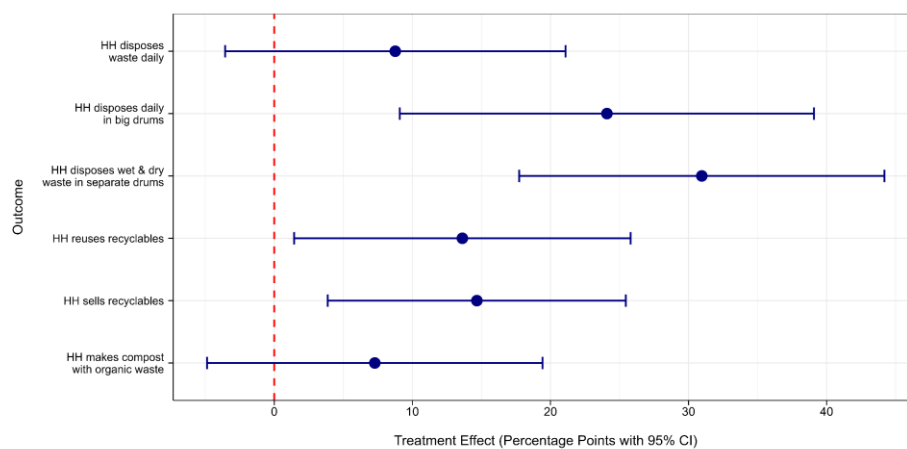
By comparing outcomes between the two groups at the end of the study period, the study identifies the specific impact of household bins on waste separation, the sale of recyclable waste, and greenhouse gas emissions. Data were collected through household surveys at the start and end of the intervention.

# Key findings

## Behavioural shifts

- **Substantial increase in source-sorting:** Households who received the bins were 31 percentage points more likely to separate wet and dry waste into different containers, showing that simple household-level tools can drive a significant shift in how people dispose of their waste (Figure 1).
- **Habitual utilisation of sorting infrastructure:** Households that received the bins were 24.1 percentage points more likely to dispose of their waste daily in the large collection drums, showing that when collection points are accessible and clearly designated, households use them regularly (Figure 1).
- **Boost to local circular economy:** Households in the treatment group were 14.7 percentage points more likely to sell their recyclable materials rather than throw them away, showing that when waste is sorted at source, households can and do earn income from their recyclables (Figure 1).

Figure 1: Impact of the intervention



## Aggregate-level impact

The intervention generated a notable aggregate-level impact, reflected in substantial changes in waste disposal patterns following the introduction of reliable daily waste collection services and household-level sorting tools (Figure 2).

**Figure 2: Trends in daily waste collection at cluster levels**



**Notes:** The figure presents three-day moving averages of waste collected from treatment and control clusters (or buildings). The shaded area indicates the period during which small, colour-coded bins were distributed to treatment households. Large bins and daily waste collection services were provided to both treatment and control groups throughout the intervention period. The majority of collected waste consisted of biodegradable (organic/wet) waste.

The intervention also produced significant environmental benefits by reducing carbon emissions over the six-month period through organic waste bioconversion at a Black Soldier Fly (BSF) larvae facility, alongside increased recycling of plastic and metal waste (Box 1)

## Policy Implications

**Integrate source sorting into municipal waste policies:** Local governments may formally embed ward-level source segregation systems into municipal waste frameworks, pairing bin distribution with clear guidelines on collection schedules and segregation requirements. Public awareness campaigns, delivered through community leaders, schools, and mosques, are needed to build and maintain the habit of sorting at source once the initial enthusiasm of a new programme fades.

Over the six-month study, the intervention diverted waste from open dumping through three linked pathways: household source sorting, organic waste composting via BSF larvae farming, and the sale of recyclable materials. Through these combined channels, the project avoided an estimated 6.43 tCO<sub>2</sub>e in greenhouse gas emissions (Bhowmik et al., 2026), the equivalent of keeping roughly 1.4 cars off the road for a year (U.S. Environmental Protection Agency, 2023). These gains were achieved through a simple, low-cost addition to an existing waste collection system, suggesting that emissions reductions at scale are achievable without major infrastructure investment.

**Harness waste-to-wealth through bioconversion system:** Municipalities should invest in organic waste bioconversion, particularly BSF larvae farming, as a practical and low-cost alternative to landfill disposal. Composting biodegradable waste through BSF systems reduces methane emissions, produces organic fertiliser, and creates local employment. National government and donor financing frameworks should recognise these systems as eligible climate investments.

**Promote green entrepreneurship:** Local governments and development partners should support small waste-to-resource enterprises, including biogas production and biofertiliser manufacturing, by providing start-up financing, market linkages, and skills training targeted at unemployed young people. Converting organic waste into sellable products turns a municipal burden into an economic opportunity.

**Strengthen recycling infrastructure and market linkages:** Household sorting only delivers results if there is a functioning system to collect and process what households separate. Local governments and private sector partners should build structured collection networks for recyclables, establish sorting facilities, and develop consistent market linkages for recovered plastics and metals. Without this downstream infrastructure, even well-sorted waste ends up in the same landfill.

**Catalyse at-home circularity and material reuse:** Beyond improving municipal collection, the intervention also yielded a significant 13.6 percentage point increase in households actively reusing recyclable materials at home. This demonstrates that providing localised sorting infrastructure successfully alters household consumption habits. Municipal policies should leverage this behavioural shift by integrating the "reuse" aspect of the circular economy directly into infrastructure rollouts. Reducing the physical friction of sorting actively encourages residents to extend the lifespan of materials, such as plastics and containers, before they enter the waste stream, thereby reducing aggregate municipal waste generation at the source.

## Implementation challenges

Scaling these recommendations will not be straightforward. Budget constraints in most Bangladesh municipalities make sustained bin distribution and collection difficult without donor support or clear cost-recovery plans. Sustaining public-private partnerships beyond a pilot phase also requires ongoing coordination between local government, waste collectors, and recycling markets, and these relationships can break down when financial incentives shift. On the behavioural side, six months may not be long enough to make sorting a permanent habit, and without reliable collection services, households are likely to fall back on mixed disposal. BSF bioconversion systems also need

trained operators and supply chains that are not yet in place across most municipalities. Addressing these challenges will require a phased scale-up, targeted capacity building, and the inclusion of waste management targets in city-level climate plans. Since findings come from a single city, replication studies across different urban contexts in Bangladesh would strengthen the case for national policy adoption.

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