

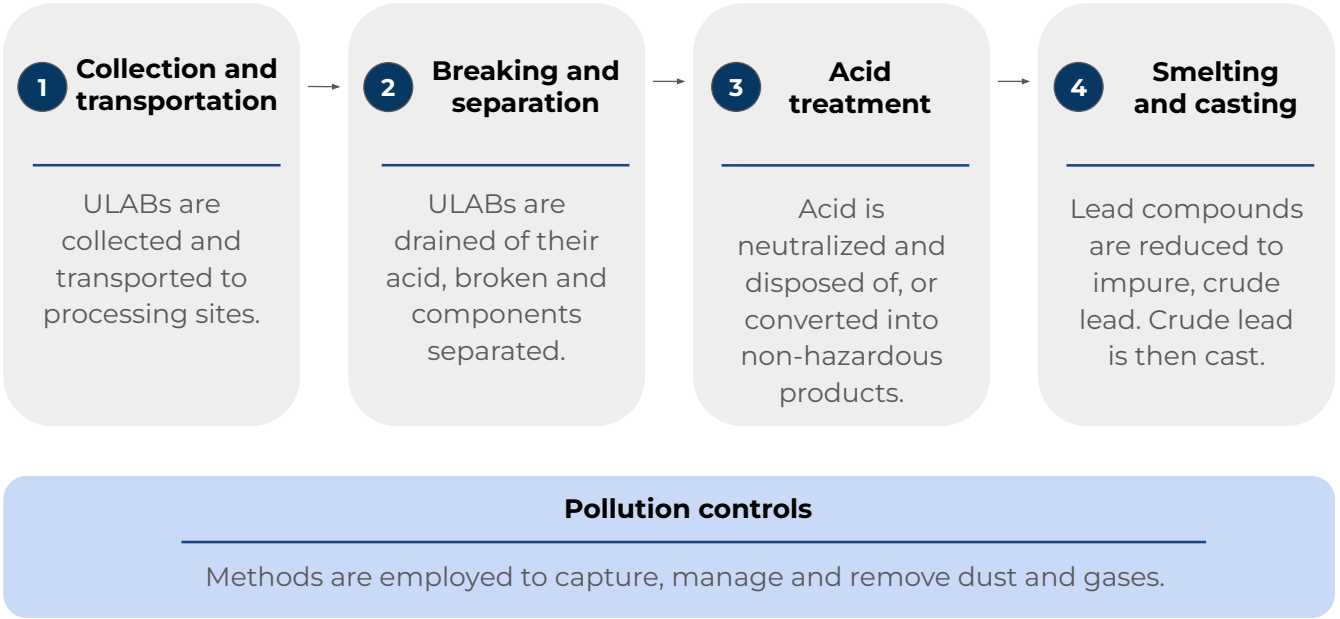
Key Findings from the Asian Development Bank ULAB Study

Tom Daniels and Steph Smith, Lead-Acid Battery Recycling Initiative

10 November 2026

Background

ULAB recycling involves several stages



Source: Partnership for Lead-Free Future, 2026; Stevenson, 2024.

There are two common policy approaches to improving ULAB recycling, depending on the national situation

Pollution driver	Policy approach
1 **High levels of informal recycling**	**Market-based policies** that support formal recyclers
2 **Significant pollution from formal recyclers**	**Monitoring and enforcement** to identify and act on non-compliance

Study Questions

1. What are the regulations on ULABs and what is the level of enforcement?
2. What does the ULAB industry look like in terms of prices, quantities, and actors in each stage?
3. What are practical actions that can be taken to address the shortcomings in the ULAB recycling industry?

Regulations and Enforcement

Question 1

The main regulatory gap is in the regulation of smelting and recycling sites

Study country	Lead emissions standard	ULAB recycling -specific regulations	EPR-like provisions
Georgia	✓	✓	✓
Uzbekistan	Partial	✓	✓
Sri Lanka	✓		✓
Nepal			
Viet Nam	✓	✓	✓
Cambodia	✓	✓	✓

Question 1

Where appropriate regulations are in place, enforcement is inconsistent

- Several DMCs have shut down smelters, often in response to public or community concerns about pollution.
- Proactive environmental sampling around formal ULAB smelters is rare or sporadic.
- Enforcement is limited by technical experience, decentralisation of oversight and limited resources.



Police discover illegally-buried lead slag in Vietnam in 2025 (Hanoi Police, 2025)

National ULAB Markets

Question 2

Collection of ULABs is fragmented and informal

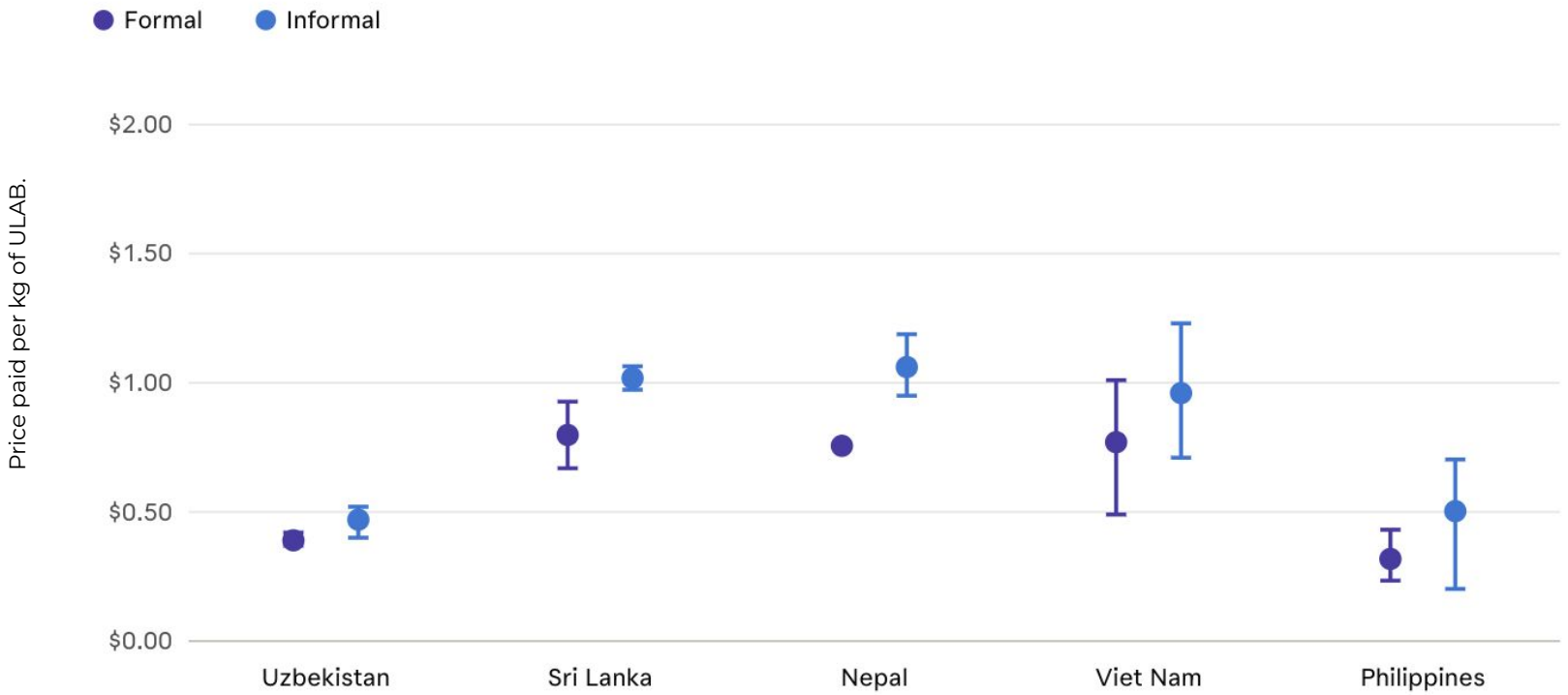
- Collection in many countries is entirely informal. Where formal collection exists, informal collectors typically offer higher prices.
- Collectors commonly drain ULABs for ease of transportation and at the request of smelters.
- Many countries have sought to encourage formal collection through EPRs. However, they vary in specificity and often lack collection targets.



An informal collector's truck for collecting ULABs, Sri Lanka (LABRI, 2026)

Question 2

Informal operators generally offer higher prices per kg of ULABs than formal operators

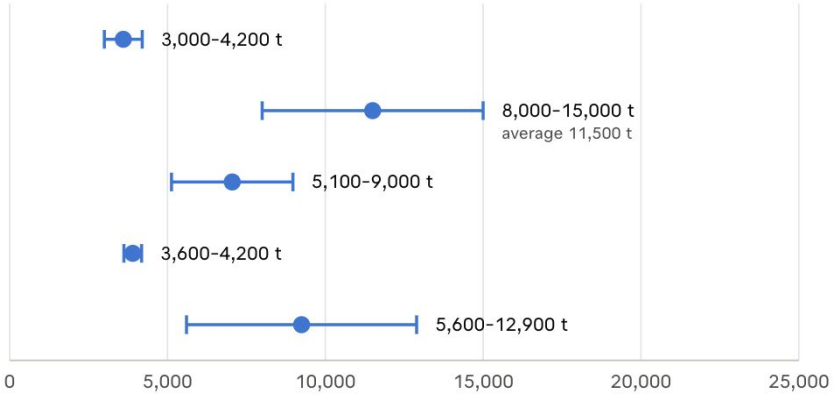


Question 2

Dismantling and smelting are much more consolidated, and is overwhelmingly conducted in large industrial facilities

- Smelting for export or manufacturing overwhelmingly occurs in industrial facilities.
- Small-scale smelting for refurbishment is common in many countries.
- Some industrial facilities are formal, whereas others are informal.

Every identified smelter processed at least 3,000 tonnes of ULABs per year



Tonnes of ULABs processed per smelter per year

Smelters in covered countries generally fall short of global best practices

- Weaknesses in pollution controls mean that smelters may be projecting lead into the surrounding environment.
- Most smelters have not implemented adequate worker protections, commonly using manual processes and inappropriate PPE.
- There have also been reports of smelters outsourcing to smaller informal operators.



An informal smelter casts molten lead without appropriate PPE (VTV1, 2024)

Recommendations

Question 3

National regulation and monitoring of recyclers

- Adopt specific standards for lead smelting that include process requirements and emissions limits.
- Identify all operating smelters and either license or close those in operation.
- Conduct environmental monitoring on a regular basis and take corrective action.



Off-gas treatment system at a formal ULAB recycling site (LABRI, 2026)

Question 3

National measures to incentivise formal recycling

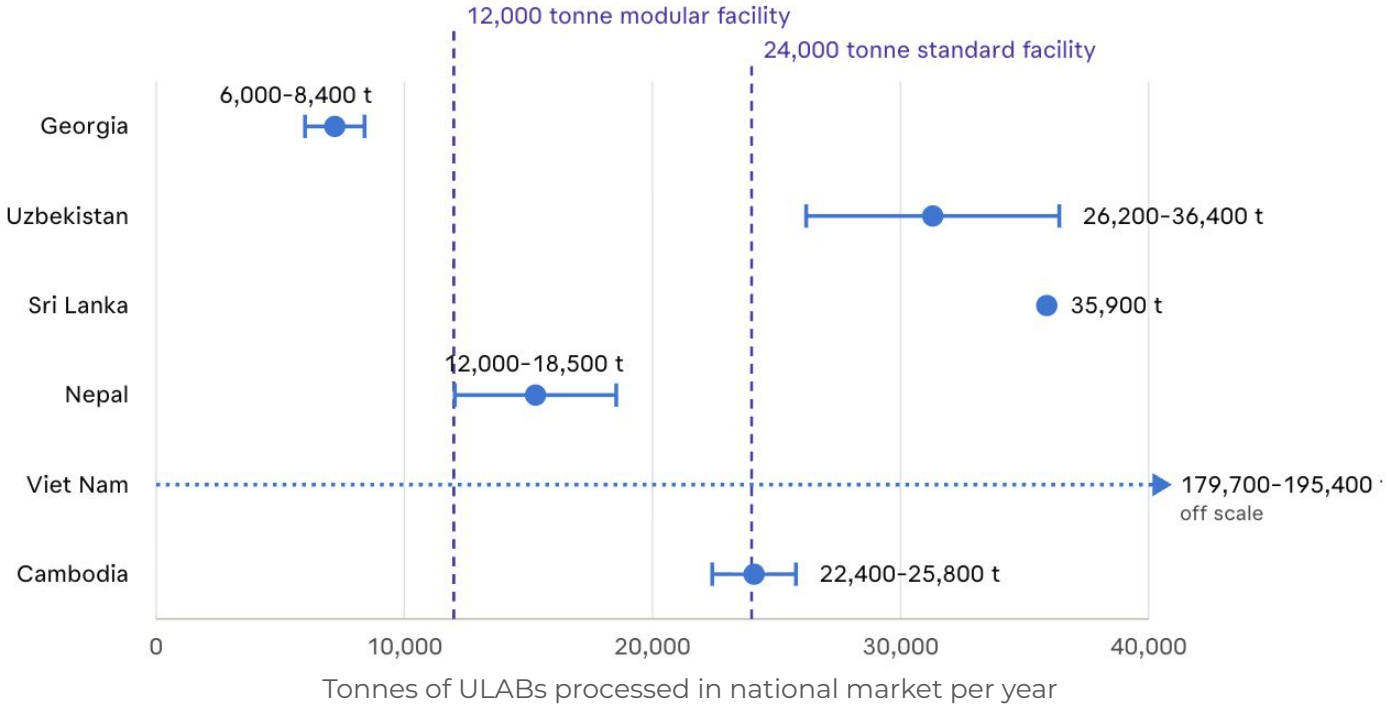
- Introduce schemes to promote formal recycling, such as extended producer responsibility schemes.
- Track the movement of ULABs across the economy using battery tracing.
- Consider incentives to support the viability of formal smelting, such as sales tax exemptions for ULABs.



New lead-acid batteries for sale (LABRI, 2026)

Question 3

Many ULAB markets may be too small to support high-standard recycling facilities



Threshold estimates from SRI (2021); USAID (2024).

Question 3

Regulators may also consider a regional approach

Identification

Find safe facilities for ULABs.

Enforcement

Close or limit the activities of current operators.

Incentives

Implement measures to incentivise exports of ULABs.