

Micronesia battery recycling

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A mechanic in the Indonesian city of Bandung, West Java, replaces the battery of an electric moped (Image: Dimas Rachmatsyah / Alamy)

Komang Ratih recently bought her 10-year-old son an electric moped so he could ride to school independently. They live on the Indonesian island of Bali, where electric vehicles are becoming increasingly popular. Smaller and lighter than motorbikes, electric mopeds (e-mopeds) are considered the safer of the two, as well as more convenient, because they do not require registration to drive. With a starting price of around IDR 6 million (USD 365), they are also more affordable. As of December 2023, 4,500 electric vehicles (EVs) were registered in Bali - 400 of which were four-wheelers - among a population of approximately 4.3 million. Yet, the rise of EVs here highlights a critical challenge: managing the growing pile of used batteries.

Indonesia, with its population of 275 million, had 125 million motorcycles in circulation as of 2022. That year, the country set itself ambitious targets of 2.1 million electric two-wheelers (E2Ws) by 2025 and 13 million by 2030. However, by January 2024 the number of registered E2Ws stood at just 75,000. Although numbers in Bali rose following the introduction of subsidies in March 2023, the slow uptake underlines the effort required to meet these targets.

Unlike most EVs on the market, e-mopeds use sealed lead acid (SLA) batteries rather than pricier lithium-based options. This is what makes e-mopeds at least 50% cheaper than lithium-powered alternatives. While SLA batteries are cheaper, they typically last between just one and three years.

SLA batteries have long been a critical element of combustion engine vehicles, and their component parts (plastic, lead, sulphuric acid) are mostly recyclable. Once discarded, they are often sold on as scrap and broken down for recycling. The plastic is chopped into smaller pieces and melted into pellets for reuse, while the lead is smelted into bars in a furnace and the acid is either reused in new batteries or neutralised.

"For SLA batteries, the recycling ecosystem in Indonesia is pretty much established," says Indra Perdana, who leads a battery waste research team at Gadjah Mada University in Java. "Even Astra [a major vehicle distributor] already has a dedicated unit to recycle lead acid batteries."

Although this infrastructure is already in place, safety waste disposal measures have failed to keep up. Faris Adnan Padhilah, a researcher at the Institute for Essential Services Reform in Jakarta, says that SLA batteries are not being carefully disposed of, leading to health problems in communities. In Bogor, West Java, mismanagement of SLA waste has caused lead poisoning that left multiple children with physical or mental

needs, he notes.

"It is possible that used SLA batteries go back to their factories for recycling, but the current recycling ecosystem is still not immune to dangers," Padhilah says. Leaving them outside or exposed to sunlight is dangerous, and any long-term public health impacts can take as long as ten years to fully materialise, he adds.

The Indonesian government regulates the handling of hazardous waste, requiring collectors and waste managers to obtain a permit from their district governor. However, the regulations published by the Ministry of Environment and Forestry in 2021 lack important details, making no provision on how different types of toxic waste should be treated.

The implementation of these regulations is also "not monitored", claims Catur Yudha Hariani, who heads the Environmental Education Centre (PPLH) Bali, an NGO. "Sometimes, waste pickers will disassemble batteries and sell the parts separately. That's very dangerous, because they are exposed to hazardous chemicals that can ruin their health," she says. This lack of oversight means children as young as six have been known to collect and dismantle e-waste.

To move towards greater EV adoption, authorities will need to provide clear guidelines on how to manage waste, Perdana suggests. "It requires entities to process battery-related waste, but I don't see any follow-up regulations on this," he says. Follow-up regulations designed at ministerial and district levels, he adds, could provide detail on how to implement the guidelines on the ground.

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