Battery Boomerang: How Reverse Logistics Makes Electric Vehicle Batteries Sustainable

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As the world accelerates towards a greener future, electric vehicles have emerged as a promising solution to tackle the challenge of climate change. However, the rapid growth of the electric vehicle market comes with a significant challenge – what to do with the batteries once they reach end-of-life? It all begins with Reverse Logistics – the Battery Boomerang!

Imagine throwing a boomerang. With the right technique it will circle right back to you, ready to be thrown again. Now imagine the boomerang being an electric vehicle battery (EVB). Through the right incentives, information flows, and infrastructure, these can come back for repairing, repurposing or recycling, through a process called reverse logistics (RL).

RL is the process of moving products from the point of consumption back to the point of recovery or proper disposal. In the context of EVBs, RL includes collecting, assessing, and determining the best course of action – whether that includes repairing, repurposing for a second life or recycling the valuable components. Within traditional logistics, products do not enter a return flow, making RL a crucial enabler for sustainable development.

Proper implementation of RL is particularly important within the EV industry due to the dirty production of the EVBs. In terms of environmental sustainability, producing EVBs is highly energy demanding and requires mining of scarce metals. The mining of these metals is also associated with social sustainability concerns, further highlighting the importance of EVB circularity. Additionally, the EVBs are no longer sufficient for the automotive industry when reaching around 75% of their original capacity, indicating a significant loss at end-of-life.

Instead of discarding these batteries, they can be collected, rebuilt, and repurposed in less energy demanding applications. This initiates your second throw with the boomerang. One common second life application is using retired EVBs in battery energy storage systems. These systems can store energy from renewable sources, stabilise the energy grid, provide backup power, and enable energy access to more people, while generating money for the producers. It is like giving the boomerang a new purpose, allowing it to fly again in a different direction.

Eventually, even the toughest of boomerangs will wear out. Similarly, EVBs will reach the end of their second life making recycling the final destination. However, retrieving the raw materials allows for production of new batteries, minimising the environmental impact. This is the ultimate boomerang effect, where recycled materials come back to be used again, closing the loop of the EVB life cycle.

As you can see, RL is just like throwing a boomerang – you expect what you send out to come back!

This popular scientific article is derived from the Master Thesis: *Evaluating Reverse Logistics and Second Life Applications of End-of-Life Electric Vehicle Batteries in Kenya*, written by Alexandra Haglund and Lova Sedigh (2024).