Are Electric Scooters Really Green?

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Bengaluru's Electric "Revolution"

Having been a resident of this city for over 16 years, I have seen this city gradually transform into a hub for electric scooters, with an exponentially incrementing rate of adoption in recent years. From Ather to Ola Electric, the quiet hums and wails of e-scooters weaving through traffic jams and metro stations are imminent in every nook and crevice of the city. For most urban commuters, it seems only pragmatic and logically sound to shift from petroleum to lithium: cheaper rides, significantly reduced noise levels, and an overall sense of fulfilment as being a fellow "saviour" of our planet. This sparks an intriguing question: are electric scooters truly as eco-friendly as they seem, or are we unknowingly just trading one form of pollution for another?

The Myth: Electric scooters are entirely eco-friendly and produce almost no emissions.
The Reality: While electric scooters nullify tailpipe emissions, tracing their entire lifecycle reveals far more intricate and often severe environmental implications.

The Facts:

Extraction Footprint:

All electric-vehicle batteries are composed of a critical component called lithium, whose extraction can pose severe environmental challenges. Experts warn that lithium mining could lead to excessive freshwater use, deforestation, and contamination of water sources with mining byproducts due to the release of toxic gases while the ore is smelted. Furthermore, a report by MIT's Climate Lab indicates that mining one ton of lithium emits nearly 15 tons of carbon dioxide. This truly underscores the dire environmental ramifications posed by the pre-manufacturing phases of electric vehicles (EVs).

Manufacturing Footprint:

The energy-intensive nature of manufacturing lithium-ion batteries significantly aggravates the already jarring emission rates in the production of EVs. In India, the production phase accounts for approximately 46% of the total carbon emissions associated with electric vehicles, equating to about 8.8 tonnes of CO_2 emissions per vehicle. This is notably higher compared to internal combustion engine vehicles, where the production phase accounts for only 23% of all emissions.

Disposal Footprint:
Finally, we arrive at the phase of disposal, where improper lithium waste management not only presents severe environmental risks but can also induce health repercussions. In India, approximately 70% of retired batteries are handled by informal recyclers, who often employ unsafe methods like acid leaching or open burning. This releases a myriad of toxic pollutants (metals, gases, etc.), posing serious risks to neighbouring communities and ecosystems. Additionally, only about 1–5% of lithium-ion batteries are formally recycled, leading to hazardously large waste accumulations. In 2022, India generated nearly 700,000 metric tonnes of battery waste, a figure projected to exceed 2 million metric tonnes by 2040, bursting the delusional bubble of EVs being completely environmentally safe.

Comparative Data Analysis:
The data table below illustrates 3 different modes of transportation for commuters in Bengaluru: electric scooters, petrol scooters, and the Bengaluru Namma Metro network, and each of their respective carbon dioxide footprints per kilometre in the year 2022.

Mode of Transport	**CO_2 Emissions (gCO_2/km)**
Electric Scooter	14.5
Petrol Scooter	60 (mean)
Namma Metro	41.2 (per passenger)

This is direct evidence to demonstrate that although electric scooters significantly reduce carbon emissions while on the road, even when compared to the city's metro system, it is still not a null set. Here, the direct sources of electricity play a major role. In Bengaluru, a significant portion of the mains grid is still powered by coal and other fossil fuels. Charging an e-scooter with this electricity indirectly generates carbon dioxide, which diminishes the overall environmental benefit. This augments the strain on the already striking environmental repercussions through the extraction, manufacturing, and disposal stages of lithium batteries in EVs.

Conclusion:
When Electric Scooters are Green:

- When electric scooters are charged using renewable energy sources such as solar or wind power, they minimise indirect emissions from electricity generation.
- When riders use them consistently enough to offset the emissions generated during battery manufacturing and transport.

- When responsible recycling and recovery systems handle end-of-life batteries, they ensure minimal toxic leakage and resource wastage.
- When the entire supply chain and production infrastructure operate under sustainable, low-emission standards.

When They're Not:

- When the electricity used for charging comes primarily from fossil fuels like coal or natural gas, it effectively negates operational emission benefits.
- When battery extraction, manufacturing, and disposal are mismanaged, it leads to pollution, deforestation, and hazardous waste accumulation.
- When e-scooters are used infrequently or replaced too quickly, they fail to compensate for their high production emissions.
- When informal or unsafe recycling practices cause toxic chemical release and long-term ecological harm.

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