



## **Environmental impacts of EV batteries**

Number 37, 2021

Part of the [Tranzinfo Hot Topics](#) series, this issue offers a selection of material on the environmental impacts of electric vehicle (EV) batteries. As the global uptake of electric vehicles continues to grow, researchers, environmental campaigners, and car manufacturers are increasingly concerned about the impact that their lithium-ion batteries will have on the environment. Efforts are underway to develop a viable recycling industry for the batteries, and to improve the batteries' sustainability in the long run.

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### **The problem**

[Electric cars and batteries: how will the world produce enough?](#)

Davide Castelvecchi, Nature, 17 August 2021

Reducing the use of scarce metals — and recycling them — will be key to the world's transition to electric vehicles.

[Electric cars: what will happen to all the dead batteries?](#)

BBC News, UK, 27 April 2021

Car manufacturers are starting to turn their attention to the problem of recycling the lithium-ion batteries used in electric vehicles.

### [Millions of electric car batteries will retire in the next decade. What happens to them?](#)

Xiao Zhi Lim, The Guardian, 20 August 2021

A tsunami of electric vehicles is expected in rich countries, as car companies and governments pledge to ramp up their numbers – there are predicted to be 145m on the roads by 2030. But while electric vehicles can play an important role in reducing emissions, they also contain a potential environmental timebomb: their batteries.

By one estimate, more than 12m tons of lithium-ion batteries are expected to retire between now and 2030.

### [As electric vehicles take off, we'll need to recycle their batteries](#)

Madeleine Stone, National Geographic, May 29, 2021

Electric car batteries contain critical minerals like cobalt and lithium. We'll need to recycle them unless we want to keep mining the earth for new ones.

### [Carmakers scrutinise lithium's green credentials amid battery rush](#)

The Age, 31 August 2021

The automotive industry is raising concerns about the environmental impacts of the mining and transport of lithium to factories around the world for EV battery production.

### [Gigafactories: Europe tools up against US and Asia as a car battery force](#)

BBC News, UK, 15 June 2021

Several European countries are building giant electric battery factories to meet a surge in demand for electric vehicles.

### [BHP says electric car era is dawning earlier than expected](#)

The Age, 3 August 2021

Mining giant BHP is seeking to clean up its assets and its image by selling off mines that produce thermal coal and increasing its exposure to commodities including copper and nickel to be used in electric vehicle batteries.

### [Environmental life cycle impacts of automotive batteries based on a literature review](#)

Aichberger, C & Jungmeier, G, *Energies* 2020, 13(23), 6345;

<https://doi.org/10.3390/en13236345>

A review of 50 publications from the years 2005–2020 about life cycle assessment (LCA) of Li-ion batteries to assess the environmental effects of production, use, and end of life for application in electric vehicles

### [UN report highlights urgent need to tackle impact of EV battery production boom](#)

Green Car Congress, 4 July 2020

A new [UN report](#) calls for the social and environmental impacts of the extraction of raw materials for EV battery production, which include human rights abuses, to be addressed urgently.

### [UK needs to act to prevent electric vehicle battery waste mountain: new study](#)

University of Birmingham, 7 November 2019

Recycling technologies for end-of-life lithium ion batteries are not keeping pace with the rapid rise of electric vehicles, potentially leading to a waste management problem for the future, according to a new study by researchers at the University of Birmingham.

### [Battery-powered electric vehicles: market development and lifecycle emissions: study](#)

European Commission, 2018

As 2018 gets underway, there are probably more than three million electric cars in circulation in the world. There are also more than six hundred million electric bikes, scooters and motorcycles. Plus a few hundred thousand electric buses and other types of quadricycles having an electric motor. The first part of this paper traces the fast evolving market of electric road vehicles. The second part shows that the production of hundreds of millions of battery packs requires a lot of energy and plenty of scarce resources, which affects the real impact of electric vehicles on the climate and the environment and make it necessary to consider the recovery and recycling of used batteries.

### [Lithium batteries' dirty secret](#)

Industry Week, 17 October 2018

Once in operation, electric cars certainly reduce your carbon footprint, but making the lithium-ion batteries could emit 74% more CO<sub>2</sub> than for conventional cars.

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## Research

### [Salt battery design overcomes 'bump' in the road to help electric cars go the extra mile](#)

University of Nottingham,UK, 1 February 2021

Chinese and British researchers have designed a new type of salt-based rechargeable battery for electric vehicles, which they claim could significantly extend their range, while being fully recyclable, environmentally-friendly, low-cost and safe.

### [A spoonful of sugar opens a path to longer lasting lithium sulfur batteries](#)

Monash University, 10 September 2021

A glucose-based additive creates a longer-lasting, lighter, more sustainable rival to the lithium-ion batteries that are essential for aviation, electric vehicles and submarines, according to Monash University researchers.

### [The car industry is betting its future on batteries](#)

The Age, 19 February 2021

Demand for electric vehicle batteries is outstripping supply, and the technology is rapidly evolving as companies compete to produce cheaper, lighter and more efficient batteries.

### [Start-up repurposing old EV batteries gets federal funds for industrial trial](#)

The Age, 25 February 2021

A Melbourne company will receive federal funding to trial its technology for reconditioning spent electric vehicle batteries to store power in commercial and industrial settings.

### [Australian landscape for lithium-ion battery recycling and reuse in 2020 - current status, gap analysis and industry perspectives](#)

Yanyan, Z et al., CSIRO, 2021

Battery usage is growing globally driven by increasing electrification of transport and renewables energy generation storage sectors. In this regard, Australia is no exception and battery usage is increasing across all sectors. Although beneficial for emissions reduction, this growth is leading to an emerging problem of end of life waste management. This report discusses the battery growth drivers and markets and the status of the Australian recycling industry. A comprehensive gap analysis and literature review was undertaken to identify key issues and challenges the incumbent battery recycling industry faces. Crucially, a stakeholder survey across all sectors of the battery value chain was undertaken with key Stakeholders to identify key barriers and challenges the industry faces.

### [Reducing new mining for electric vehicle battery metals: responsible sourcing through demand reduction strategies and recycling](#)

Institute for Sustainable Futures, University of Technology Sydney, April 2021

Reuse of batteries in 'second-life' applications, recovery of metals for battery manufacturing through recycling and shifts away from private car ownership are key strategies to minimise the need for new mining for EVs batteries.

### [Navigating the new wild west of EV battery recycling](#)

Government Technology, US, August 2021

Some battery recycling startups claim they can recover 95 percent of the lithium, cobalt, nickel and other minerals that go into batteries, dramatically cutting down the need for new mining projects.

### [Financial viability of electric vehicle lithium-ion battery recycling](#)

Lander, L et al., iScience, issue 7, July 2021

Economically viable electric vehicle lithium-ion battery recycling is increasingly needed; however routes to profitability are still unclear. We present a comprehensive, holistic techno-economic model as a framework to

directly compare recycling locations and processes, providing a key tool for recycling cost optimization in an international battery recycling economy.

### [Solar energy farms could offer second life for electric vehicle batteries](#)

MIT News, 22 May 2020

Used electric vehicle batteries could have a useful and profitable second life as backup storage for grid-scale solar photovoltaic installations, according to a study from MIT.

### [Lithium Australia's Envirostream to start recycling old electric car batteries](#)

The Driven, 1 September 2020

Envirostream Australia, which is 90 per cent owned by Lithium Australia (LIA), has announced it will start recycling electric vehicle (EV) batteries.

A transition to electric mobility can help mitigate transport-related carbon emissions and therefore climate change, but there are concerns about what happens to the lithium-ion batteries that power them once they are spent. The global battery recycling market is expected to grow by 6% to \$A31.5 billion by 2025 as end-of-life (EOL) EV battery packs are increasingly disassembled to retrieve precious metals such as cobalt, nickel and lithium, according to industry analysts.

Envirostream Australia says that with a series of successful EV battery recycling trials now under its belt, it is in the position to become a first mover in the growing field, with recycling to begin in coming weeks.

### [Effects of battery manufacturing on electric vehicle life-cycle greenhouse gas emissions](#)

ICCT, 2018

This briefing reviews recent research regarding greenhouse gas emissions from the manufacturing of lithium-ion batteries for electric vehicles. We analyze this research in the overall context of life-cycle emissions of electric cars as compared to conventional internal combustion vehicles in Europe. Finally, we discuss the primary drivers of battery manufacturing emissions and how these emissions could be further mitigated in the future.

### [All power to the proton: researchers make battery breakthrough](#)

RMIT University, 8 March 2018

RMIT researchers have developed an environmentally-friendly rechargeable proton battery, which could eventually be used to power electric vehicles.

### [Argonne National Laboratory \(US\)](#)

Articles, events, projects, references and research related to EV battery recycling.

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