

LITHIUM FOR ELECTRIC CARS IS KILLING THE WORLD...AND THE ELECTRIC CARS

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Lithium extraction fields in South America have been captured by an aerial photographer in stunning high definition.

But while the images may be breathtaking to look at, they represent the dark side of our swiftly electrifying world.

Lithium represents a route out of our reliance on fossil fuel production. As the lightest known metal on the planet, it is now widely used in electric devices from mobile phones and laptops, to cars and aircraft.

Lithium-ion batteries are most famous for powering electric vehicles, which are set to account for up to 60 per cent of new car sales by 2030. The battery of a Tesla Model S, for example, uses around 12 kg of lithium.

These batteries are the key to lightweight, rechargeable power. As it stands, demand for lithium is unprecedented and many say it is crucial in order to transition to renewables.

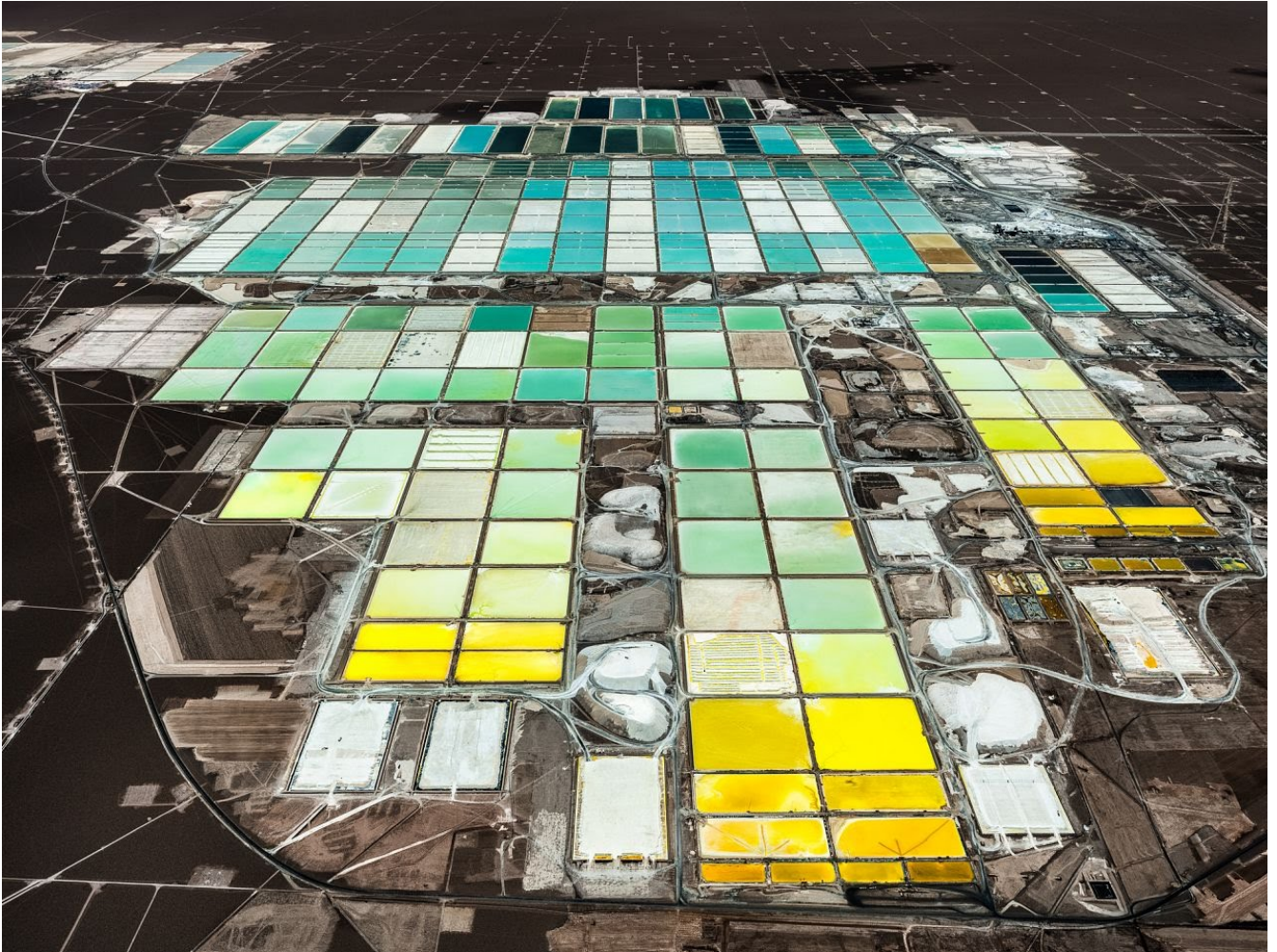
However, this doesn't come without a cost - mining the chemical element can be harmful to the environment.

German aerial photographer [Tom Hegen](#) specialises in documenting the traces we leave on the earth's surface. His work provides an overview of places where we extract, refine and consume resources with his latest series exposing the "Lithium Triangle."

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This region rich with natural deposits can be found where the borders of Chile, Argentina and Bolivia meet. And roughly a quarter is stored in the Salar de Atacama salt flats in northern Chile.

- [We're facing a lithium battery crisis: What are the alternatives?](#)



'Lithium Fields' in the Salar de Atacama salt flats in northern Chile. Tom Hegen

Hegen spoke to us about the project.

"Since a lot of my work deals with the extraction, processing and use of resources, I got interested in what the transition of the mobility sector towards electromobility looked like," he begins.

"Lithium is one of the key components of building (car) batteries and I wanted to photograph the worldwide biggest examples of lithium evaporation sites in the lithium triangle of Chile, Bolivia and Argentina."

So how did he do it?



"To get the enormous mining operations in the frame, I chartered a small aeroplane and flew high above them," Hegen explains.

His images of the Soquimich lithium mine in the Atacama desert, run by leading mining operator Sociedad Química y Minera (SQM), are part of [his new project, The Lithium Series I](#).

- [The world's fastest electric ship is taking flight on Stockholm's waterways next year](#)
- [Rainwater everywhere on Earth unsafe to drink due to 'forever chemicals', study finds](#)

Why are the fields so colourful?

The vivid hues of the lithium fields, or ponds, are caused by different concentrations of lithium carbonate. Their colours can range from a pinky white, to a turquoise, to a highly concentrated, canary yellow.

A 2015 piece in the New Scientist described the fields as ["surreal landscapes where batteries are born"](#).



Tom Hegen's news photography project, The Lithium Series I. Tom Hegen

Why is lithium extraction bad for the environment?

Any type of resource extraction is harmful to the planet. This is because removing these raw materials can result in soil degradation, water shortages, biodiversity loss, damage to ecosystem functions and an increase in global warming.

But when we think of extraction, we think of fossil fuels like coal and gas. Unfortunately, lithium also falls under the same umbrella, despite paving the way for an electric future.. Lithium can be described as the non-renewable mineral that makes renewable energy possible - often touted as the next oil.

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According to [a report by Friends of the Earth](#) (FoE), lithium extraction inevitably harms the soil and causes air contamination. As demand rises, the mining impacts are "increasingly affecting communities where this harmful extraction takes place, jeopardising their access to water," says the report.



Two images from Tom Hegen's Lithium Series I. Tom Hegen

The salt flats in South America where lithium is found are located in arid territories. In these places, access to water is key for the local communities and their livelihoods, as well as the local flora and fauna.

In Chile's Atacama salt flats, mining consumes, contaminates and diverts scarce water resources away from local communities.

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The production of lithium through evaporation ponds uses a lot of water - around 21 million litres per day. Approximately 2.2 million litres of water is needed to produce one ton of lithium.

"The extraction of lithium has caused water-related conflicts with different communities, such as the community of Toconao in the north of Chile," the FoE report specifies.



Hegen's photography project, The Lithium Series I. Tom Hegen

- [‘I could have been India’s Elon Musk’: The maths teacher who built a solar car from scratch](#)
- [I borrowed a Tesla for a month and it changed my mind about electric cars](#)

Where are other lithium hotspots around the world?

The growing interest in lithium has seen the world’s largest-known reserves increase significantly. There are around 80 million tonnes of identified reserves globally as of 2019, according to the [US Geological Survey](#) (USGS).

After South America (chiefly Bolivia, Chile and Argentina) the next biggest lithium-producing country is the United States, followed closely by Australia and China.

In 2019, lithium exports from Australia are reported to have totalled almost \$1.6 billion (€1.3bn).

Much like historical contests and wars over gold and oil, governments are fighting for supremacy over minerals like lithium - as this could help them achieve economic and technological dominance for decades to come.

[Other countries](#) with smaller reserves are Zimbabwe, Brazil and, the only European nation, Portugal.

Lithium mining has become particularly controversial recently in Portugal, with the municipality of Pinhel now preparing to [file an injunction to stop the exploration](#). Portuguese residents have continuously rallied against the rare metal’s mining, citing huge environmental ramifications. But the government has given the green light to the extraction of the “white gold” in six different regions.

95 per cent of the local population has rejected these plans, despite the mining company’s promises that the ore’s exploitation will create around 800 jobs for locals.

So should we stop extracting lithium for batteries?

A similar [report published in 2021](#) by the nonprofit BePe (Bienaventurados de Pobres) also identifies water as a primary concern for lithium mining operations.

It claims that not enough research has been done on the potential contamination of water and “activity must be stopped until studies are available to reliably determine the magnitude of the damage.”

Gleb Yushin, a professor at the School of Materials and Engineering at Georgia Institute of Technology, US, argues that new battery technology needs to be developed using more common, environmentally-friendly materials. His paper is [published in the journal Nature](#), alongside co-authors including Kostiantyn Turcheniuk.

As reserves of lithium and cobalt will not meet future demand, suggested elements to focus on instead are iron and silicon.

Researchers like Yushin are [working on new battery alternatives that would replace lithium](#) and cobalt (another harmful metal) with less toxic and more easily accessible materials. As reserves of lithium and cobalt will not meet future demand, suggested elements to focus on instead are iron and silicon.

Unlike lithium-ion batteries, iron flow batteries are also cheaper to manufacture, renewable energy veteran Rich Hossfeld told [Bloomberg](#) recently, in an article entitled ‘Iron battery breakthrough could eat lithium’s lunch’.

“We call on materials scientists, engineers and funding agencies to prioritise the research and development of electrodes based on *abundant* elements,” maintains Yushin.

“Otherwise, the roll-out of electric cars will stall within a decade.”

Made-in-America Electric Cars: Good in Theory but a Complicated Mess in Practice

Demanding E.V. parts be made domestically could slow down the energy transition—or, alternatively, fall afoul of free trade policies the United States has worked hard to enact.



Nic Antaya/Getty Images

President Joe Biden visits the General Motors Factory ZERO electric vehicle assembly plant on November 17, 2021, in Detroit.

While it's been hailed as a [historic](#) piece of climate legislation, the Inflation Reduction Act is less a climate bill, per se, than a piece of industrial policy focused on building out domestic supply chains for clean energy that will benefit the climate. That's a big deal. By international standards, though, the United States is still catching up and relying mainly on the kinds of demand-side incentives that have long speckled the U.S. tax code.

Public and private spending on the energy transition in China last year totaled \$266 billion, compared with \$114 billion in the U.S., according to [Bloomberg](#). That's all a far cry from the \$9 trillion in annual investments that McKinsey [estimates](#) will be needed to reach net-zero by 2050. But the IRA—and the shock waves it sends through trade and investment policy—could play an outsized role shaping how and whether that money gets out the door.

The bill represents a sea change in how D.C. policy circles tend to think about climate policy, discarding narrow talk of carbon pricing and "market-fixing" in favor of viewing emissions reductions as an investment challenge in which the state can play a big role shaping markets. "Shifting from this idea of taxing something so we cut to building and investing is a really big shift," said Jonas Nahm, a political scientist at Johns Hopkins School of Advanced International Studies whose research focuses on green industrial policy. "The U.S. isn't the first country to realize that's important, and it's important for the U.S. to catch up to other places that have been doing that for a long time," he added, noting he was enthused to see the bill become law.

If the thinking behind the IRA is new, its methods are fairly conventional. The driving force behind its climate provisions is expanded tax credits devoted principally to growing demand for clean energy products. There isn't much in the way of structural support to help companies meet that demand—something other governments have included in similar packages. Structural support can take many forms, from providing money for specialized vocational training, for instance, or a dedicated infrastructure bank like KfW in Germany. "Just because there's a change in demand doesn't mean you have immediately available a workforce that can provide that service," Nahm told me.

The IRA does include some money for addressing structural constraints. The bill contains \$500 million in funding for the Defense Production Act that can be used to remedy supply chain challenges. There's also \$2 billion in funding for the Domestic Manufacturing Conversion Grant Program, for manufacturers to retrofit facilities, and \$3 billion in new loan authorities for the [Advanced Technology Vehicle Manufacturing Loan](#), aimed at the auto industry in particular. A [\\$5 billion appropriation](#) for the Department of Energy's Loan Program Office aims to issue up to \$250 billion in loans to clean energy companies, although exactly how those funds will be dispersed remains to be seen.

As Roosevelt Institute's Todd Tucker has [noted](#), the IRA grafts the kinds of provisions usually found in procurement deals onto its broad suite of tax incentives. That is, requirements that would usually be in place only when certain firms sell goods and services to the government will now be inscribed into the tax code.

Off the bat, for instance, 40 percent of the components of cars will need to be made in the U.S. or in a free trade partner to qualify for a new \$7,500 electric vehicle tax credit furnished by the IRA. That requirement will ramp up by 10 percent per year, toward an 80 percent requirement by 2027. As of now, only [21 of the 72](#) electric vehicles now available in the U.S. are eligible for the credit through the end of this year.

By 2024, cars featuring any battery components made or assembled by a "foreign entity of concern," including China, will be ineligible for the credit. The year after, batteries must exclude so-called critical minerals like lithium or cobalt that are extracted, processed, or recycled by the same countries. China currently refines 73 percent of the world's cobalt, 68 percent of its nickel, and 59 percent of its lithium—all essential components of batteries used in E.V.s and for energy storage. Such constraints, some experts argue, could make *all* E.V.s available in the U.S. ineligible for IRA-provided tax credits in the coming years.

As E&E News's Jael Holzman has [reported](#), mining companies are ecstatic about such requirements and the [other boosts](#) the bill provides to domestic minerals mining and processing. Companies will now be able to write off 10 percent of the costs of their operations if they produce any amount of "critical minerals," a relatively vague definition that can change over time. That's on top of 150-year-old rules that currently govern hard-rock mining and allow mining companies not to pay royalties to extract minerals on federal lands.

Even with these gifts to the mining industry, a fleshed-out domestic supply chain for the minerals E.V.s require will take years to build. In the meantime, stringent domestic content requirements could send companies scrambling to snap up limited supplies.

The U.S. has battled exactly these kinds of protectionist provisions from other countries in the past, in particular when it comes to Chinese industrial policy. "Washington has blamed Beijing for

unfair practices, and a lot of them weren't unfair. China was taking the industry seriously and investing in it," Nahm said, referring specifically to buy-local provisions. "I'm glad we're realizing that's a thing we should be doing." As demand for clean energy scales up, he added, "there's space for everyone." While there are likely to be significant "transition pains," Nahm largely sees the potential trade-offs of local content requirements as worth it over the long haul to build support for future climate policy.

"Some of these economic benefits need to happen domestically," he told me. "Politically, it's not sustainable to switch to technologies that are almost entirely produced abroad and need public money to be commercially attractive." While the U.S. is still likely to import clean energy components from China for at least a decade, he said, "the more we do domestically, the less upset we might be about the things that are coming in from abroad."

Trying to protect the nascent domestic clean energy industry, however, could run up against international trade rules that the U.S. has had a heavy hand in crafting. One provision in the IRA—to give bonus credits for the purchase of electricity generated by domestically made wind turbines and solar panels—could run afoul of the U.S.-Mexico-Canada Trade Agreement, since it doesn't also offer an exemption for free trade partners. The U.S. has recently [raised complaints](#) against Mexico under the same treaty, [arguing](#) that state ownership in the Mexican energy sector unfairly disadvantages U.S. firms, including clean energy companies. Already, the European Union and South Korea—a leading battery producer—have [raised alarms](#) that E.V. tax credits in the IRA violate World Trade Organization rules barring discrimination against foreign producers.

"There's a very clear double standard between the embrace of industrial policy and Buy America positions in the IRA and in the CHIPS Act [the \$52 billion bill aimed at jump-starting semiconductor manufacturing] versus their continued attempts to impose the old neoliberal rules against those sorts of policies when it comes to other countries," said Tobita Chow, director of Justice Is Global, an organizing project focused on trade and industrial policy. "I don't see how you can say that these sorts of policies are good when it comes to the U.S. but that they are unfair or a form of cheating when it's Mexico or China or some other developing country doing it."

The optimistic way to look at this is that the Inflation Reduction Act could prompt a rethinking of an international trade consensus crafted in very different times, without the climate crisis in mind. Using its outside voice in the WTO, the U.S. could help level the playing field for other countries to pursue their own industrial policies and create a more resilient global clean energy supply chain, which builds in strong protections for workers and the environment. "As progressives, we've got to say industrial policy is good, and if it's good enough for the U.S., it's good enough for other countries," Chow added. "We need to establish some new rules that will allow all governments to engage in industrial policy."

<https://www.theguardian.com/environment/2021/jan/03/child-labour-toxic-leaks-the-price-we-could-pay-for-a-greener-future>

Child labour, toxic leaks: the price we could pay for a greener future

Jan 4, 2021 ... Metals such as **lithium** and cobalt provide examples of the awkward issues ... "You need tens of kilograms more copper for an **electric car** ...

<https://www.amnesty.org/en/latest/news/2016/01/child-labour-behind-smart-phone-and-electric-car-batteries/>

Exposed: Child labour behind smart phone and electric car batteries

Jan 19, 2016 ... Major electronics brands, including Apple, Samsung and Sony, are failing to do basic checks to ensure that cobalt mined by **child labourers** ...

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Are Child Miners Exploited to Manufacture Electric Car Batteries?

Nov 27, 2019 ... **Child labor** has been used in cobalt mines in the Democratic Republic of the Congo (DRC). Cobalt is a chemical element used to make rechargeable ...

<https://www.ft.com/content/c6909812-9ce4-11e9-9c06-a4640c9feebb>

Congo, child labour and your electric car | Financial Times

Jul 6, 2019 ... Congo, **child labour** and your **electric car**. Informal workers produce almost a third of the country's cobalt. Can mining groups address the ...

<https://www.buckscountycouriertimes.com/story/opinion/2021/12/21/cobalt-electric-car-batteries-mined-exploited-children/8968271002/>

Cobalt in electric car batteries mined by exploited children

Dec 19, 2021 ... A March 5, 2018 report by CBS News of its investigation into cobalt mining (used in **lithium** batteries) found **child labor** being used in the ...

https://www.youtube.com/watch?v=4-eec_0PWGo

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Nov 24, 2020 ... How **Child Labor** Could Be Fueling Your **Electric Car** ... In December last year, a landmark legal case was launched against the world's largest tech ...

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Electric vehicles have a dark side too: Blood batteries and child labour

Apr 26, 2022 ... **Electric cars** use batteries. You know that. But do you know that **lithium** and cobalt are rare metals that make up these batteries.

<https://www.business-humanrights.org/en/latest-news/electric-cars-running-on-child-labour/>

Electric cars: Running on child labour

[specifically to ensure that] cobalt mined by **child labourers** as young as seven in the Democratic Republic of the Congo (DRC) is not used in their batteries...

<https://www.bloomberg.com/news/articles/2022-07-17/ganfeng-draws-tesla-electric-cars-into-xinjiang-labor-debate>

Chinese Lithium Giant Pulls EVs Deeper Into Forced Labor Glare

Jul 17, 2022 ... Cauchari-Olaroz **lithium** salt lake in Argentina, one of Ganfeng **Lithium's** ... **Electric vehicle** makers already face criticism over **labor** ...