

# Electric Vehicle (EV) Battery Shortage

Sourcing Intelligence and Insights to mitigate  
Electric Vehicles (EVs) Battery Supply Chain  
disruptions



# Electrification in the automotive industry

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The global push towards a greener future has led to electrification of the automotive sector, particularly in major markets like Europe and the United States. This surge in demand for EVs, and, consequently, battery demand, has naturally led to a corresponding increase in the need for lithium-ion batteries, the primary power source for most EVs.

- With 196 countries coming together to pledge their commitment to decrease carbon emissions, the accord set the pillars for a new clear and ambitious revolution - the transformation of sectors with high carbon footprints, and the automotive industry became the primary target.
- The Paris Agreement, approved on 2 December 2015, marked a historic turning point in the global fight against climate change.





## Electrification in the automotive industry

In this context, Governments worldwide are setting ambitious targets, aiming to promote the adoption of Electric Vehicles (EVs). For example, the European Union (EU) has set aggressive CO2 emission reduction targets for new cars. By 2025, the average emissions of new cars should be 15% lower than in 2021, and by 2030, this should be at least 37.5% lower. Such targets are pushing automakers to invest heavily in EVs. Also, United States have set robust zero-emission vehicle (ZEV) mandates and incentives, driving up EV adoption and, consequently, battery demand.

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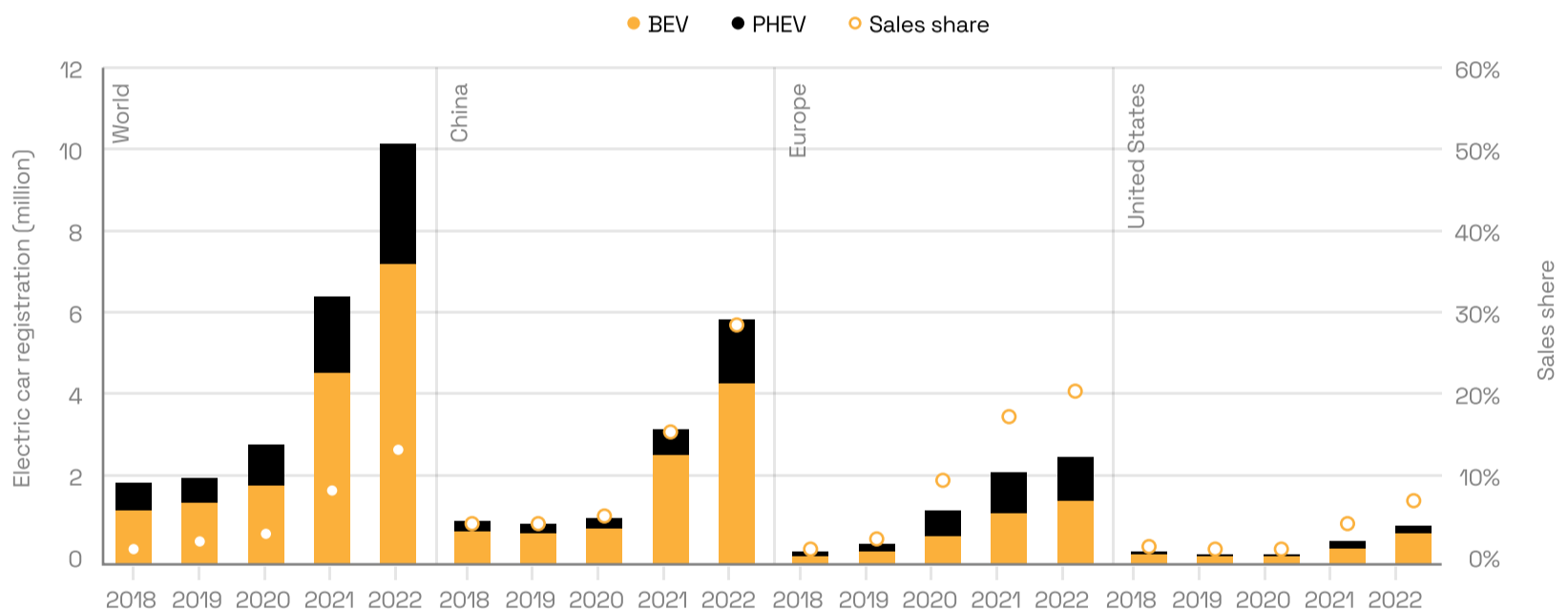
# Electric vehicles - The fastest-growing segment of the auto industry

“Electric vehicles are one of the driving forces in the new global energy economy that is rapidly emerging – and they are bringing about a historic transformation of the car manufacturing industry worldwide.”



IEA Executive Director, Fatih Birol

## Electric cars registration and sales share in China, US and Europe (2018-2022)



- ➔ **The overwhelming majority of electric car sales to date are mainly concentrated in three markets – China, Europe and the United States.**
- ➔ China is the frontrunner, with 60% of global electric car sales taking place there in 2022.
- ➔ Today, more than half of all electric cars on the road worldwide are in China.
- ➔ Europe and the United States, the second and third largest markets, both saw strong growth with sales increasing 15% and 55% respectively in 2022.

# New policies will increase EV sales and industry players competitiveness



New ambitious policy programmes are expected to further increase market share for electric vehicles in the next years. By 2030, the average share of electric cars in total sales across China, the EU and the United States is set to rise to around 60%.



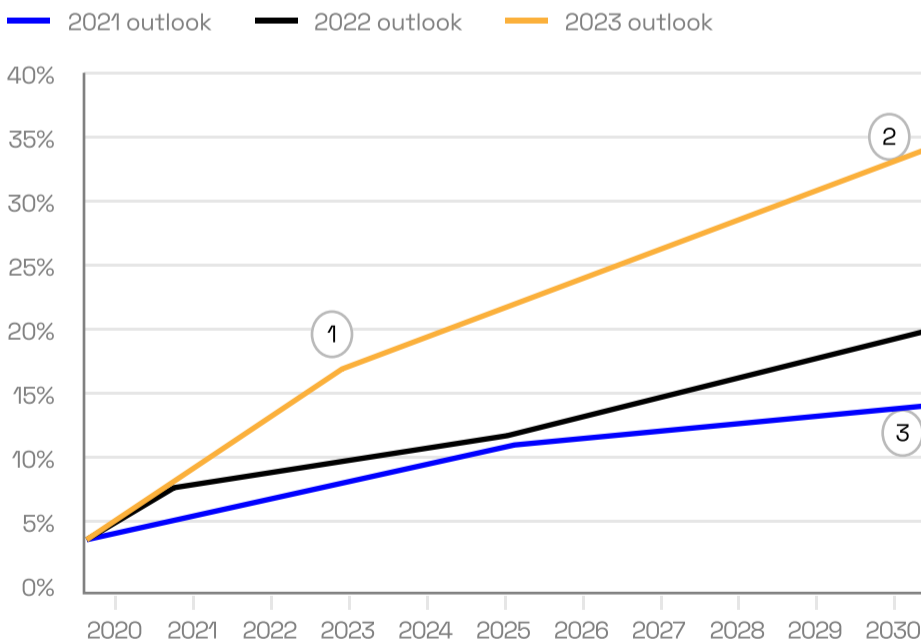
The EU's Net Zero Industry Act aims for nearly 90% of annual battery demand to be met by domestic battery manufacturers.



The US Inflation Reduction Act places emphasis on strengthening domestic supply chains for EVs, batteries and minerals. Between August 2022, when the Inflation Reduction Act was passed, and March 2023, major EV and battery makers announced investments totalling at least USD 52 billion in EV supply chains in North America.

## EVs Explosive Growth based on International Energy Agency (IEA) Predictions

Electric vehicle share of global sales in recent IEA EV outlooks



Source: [Global Electric Vehicle Outlook](#)

**1**  
EVs are due to make up 18% of sales in 2023...

**2**  
...rising to ~35% of sales by 2030

**3**  
Just two years ago, EVs were set for only 15% by 2030

✓ More than 10 million electric cars were sold worldwide in 2022

✓ Sales are expected to grow by another 35% this year to reach 14 million.

✓ This explosive growth means electric cars' share of the overall car market has risen from around 4% in 2020 to 14% in 2022 and is set to increase further to 18% this year, based on the latest IEA projections.

# Are the EV industry players ready for this “explosive” demand?

## Lithium-Ion batteries - the new oil

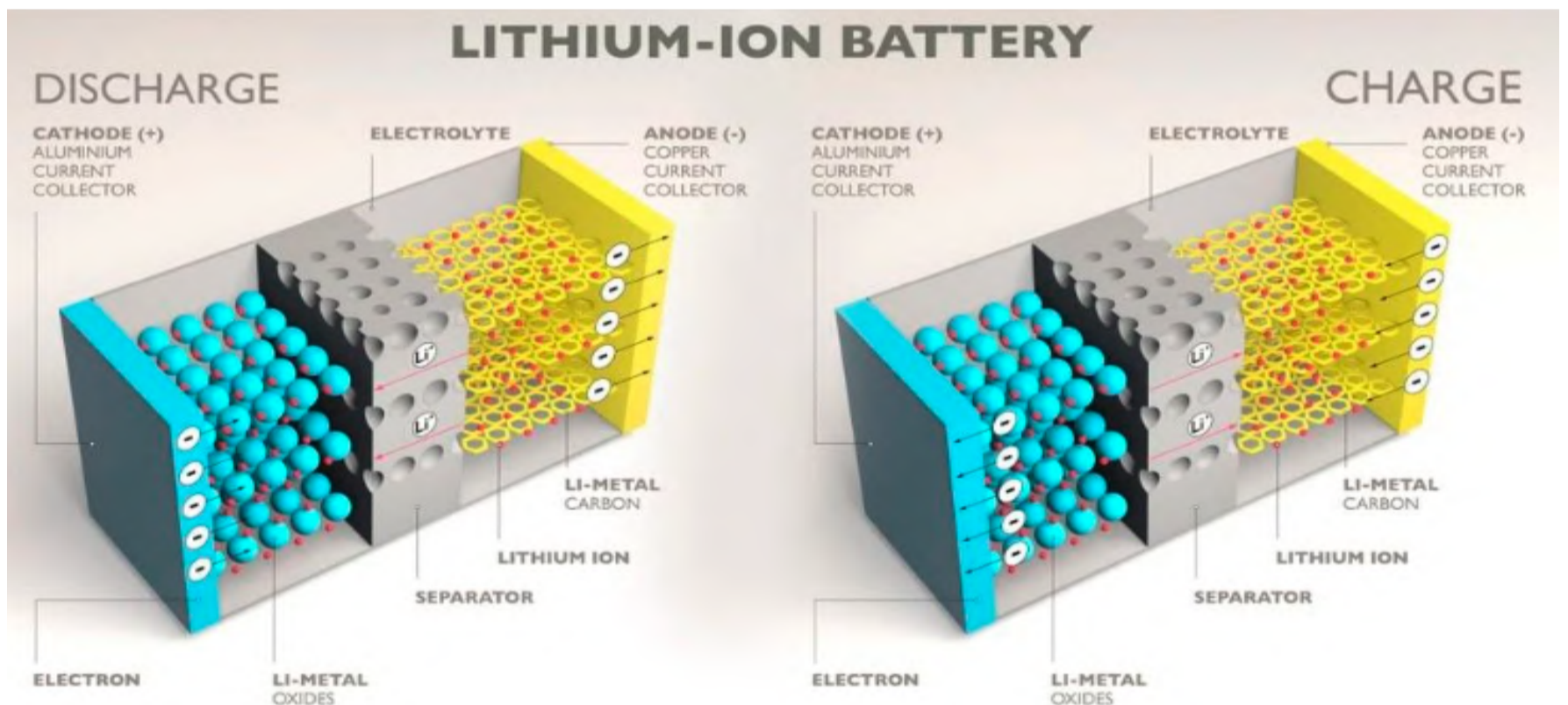
Although manufacturers use different battery chemistries, the overall functionality for the EV battery remains Lithium-ion (Li-ion). Known for its high energy density, long cycle life, and decreasing costs, the lithium-ion battery has become the primary power source for the majority of EVs on the market.

## What are Li-ion batteries made of?

Like other batteries, li-ion batteries have a positively charged cathode, a negatively charged anode, and an electrolyte that separates them. The cathode is typically made from a mix of lithium, nickel, cobalt, and manganese, while the anode is most commonly made using graphite.

## Lithium - the white gold

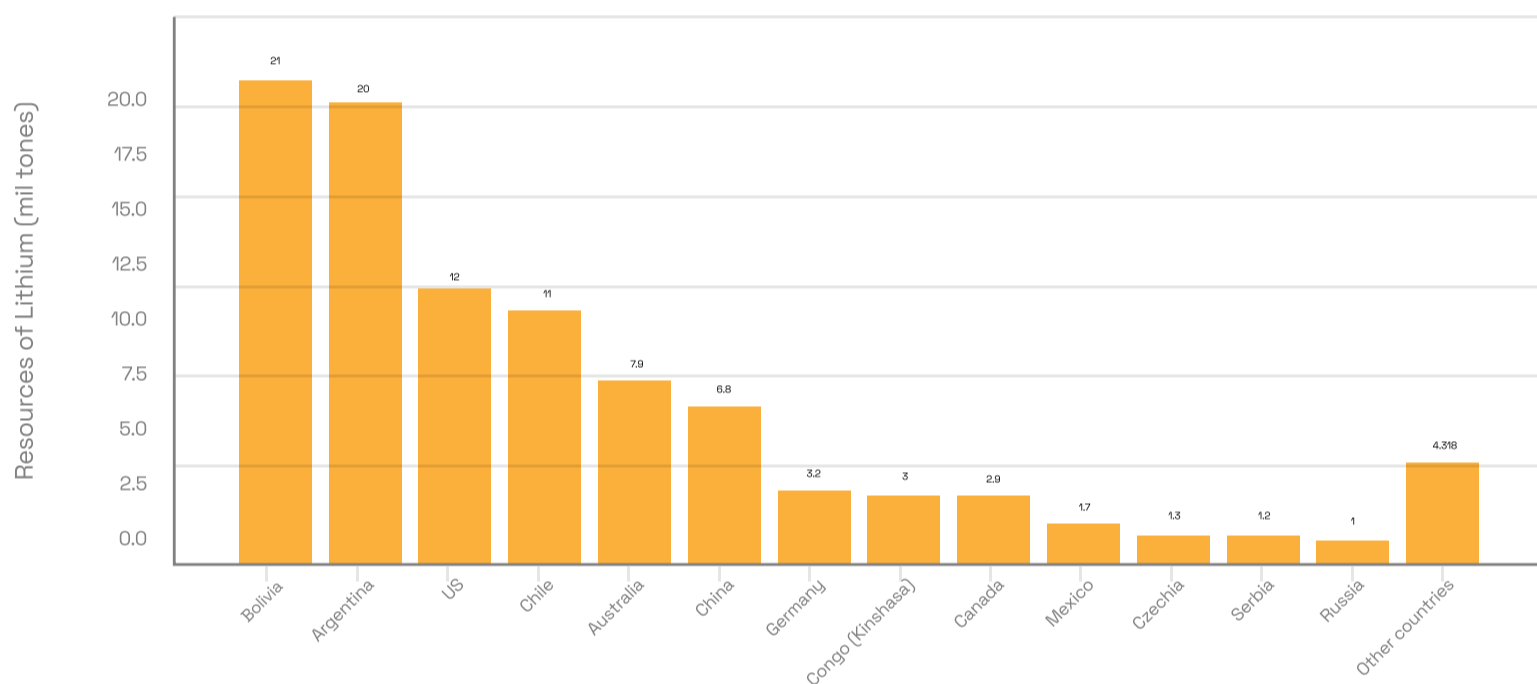
Unsurprisingly, Lithium, also named the white gold, it's a soft, silvery-white alkali metal and a key component in lithium-ion batteries. In a future powered by batteries, from our electric cars to our smartphones, lithium is quickly becoming the most valuable commodity on the planet.



# Do we have enough lithium resources for the rapidly growing demand of EVs?

According to the [U.S. Geological Survey](#), the total amount of Lithium on Earth was estimated around 98 million tonnes. Of that number, only one-quarter is economically viable to mine (this is called “reserves”).

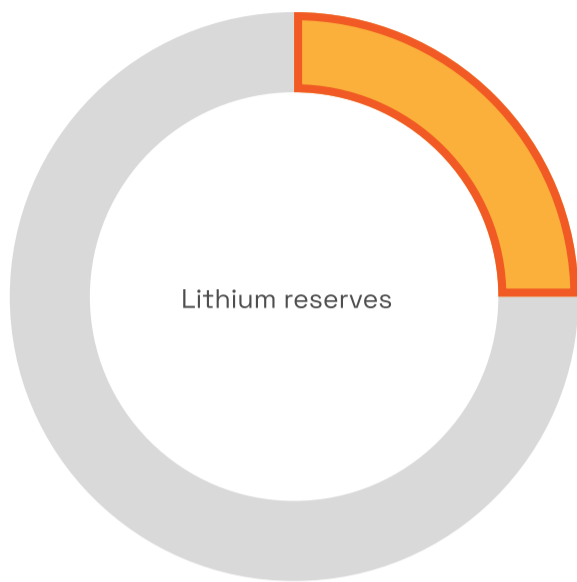
Identified Lithium Resources by Country (in million tonnes)



- ➔ Since South America is a particularly rich supply of the metal, the three nations of Bolivia, Chile, and Argentina are collectively referred to as the “Lithium Triangle.”
- ➔ Bolivia’s resources of lithium are the biggest at 21 millions tons, followed by Argentina with 20 million tons, and US with 12 million. China has 6.8 million tons of known reserves and there are news saying that India might soon appear on this list because lithium reserves of 5.9 million tones were discovered earlier this year in the federally administered region of Jammu and Kashmir, and the government has said it hopes to find more reserves later this year.
- ➔ Also a great surprise was US, who has had a gigantic jump since the previous report. See more details on how US is putting continuously efforts to develop additional sources. It is estimated that the lithium in Southern California’s Salton Sea could meet the entire US demand for EV batteries and 1/3 of world demand. New extraction techniques are unlocking new sources of lithium and enabling it to be processed faster with fewer resources.



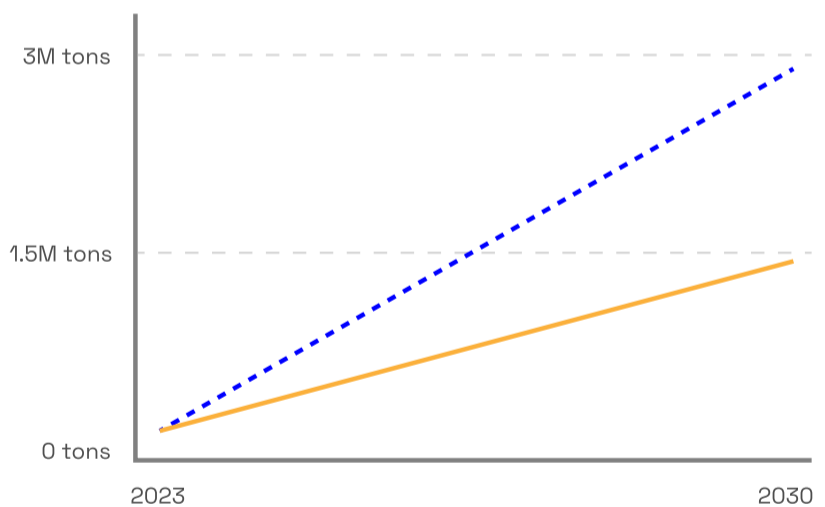
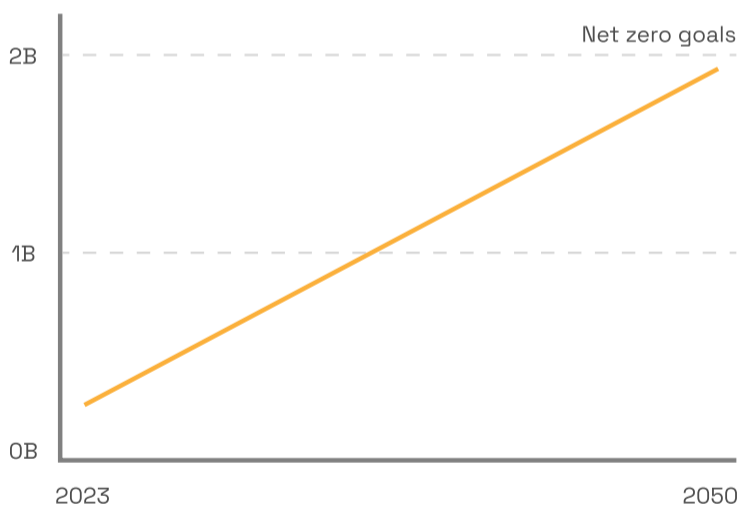
## Now let's look at the numbers...



- 98 million tonnes of lithium reserves
- 25% (24.5 million tonnes) is economically feasible for mining
- 3 billion EVs

- ➔ Out of the 98 million tonnes of lithium reserves, only 25% (24.5 million tonnes) is economically feasible for mining.
- ➔ The average lithium-ion EV battery pack requires 8 kg of lithium. This means the available 24.5 million tonnes can power roughly 3 billion EVs.

We are witnessing the creation of a new lithium mining and refining industry. There were 45 lithium mines operating in the world last year, with 11 expected to open this year and seven next year, according to Fastmarkets.



- ➔ To achieve net zero goals by 2050, we need about 2 billion EVs on the roads.

But is there enough lithium to make all the batteries?

- ➔ Forecasts of annual production of Lithium range as high as 1.5 million tons by 2030. But demand, if EV sales keep rising at double-digit annual rates, is forecast to increase to up to 3 million tons.

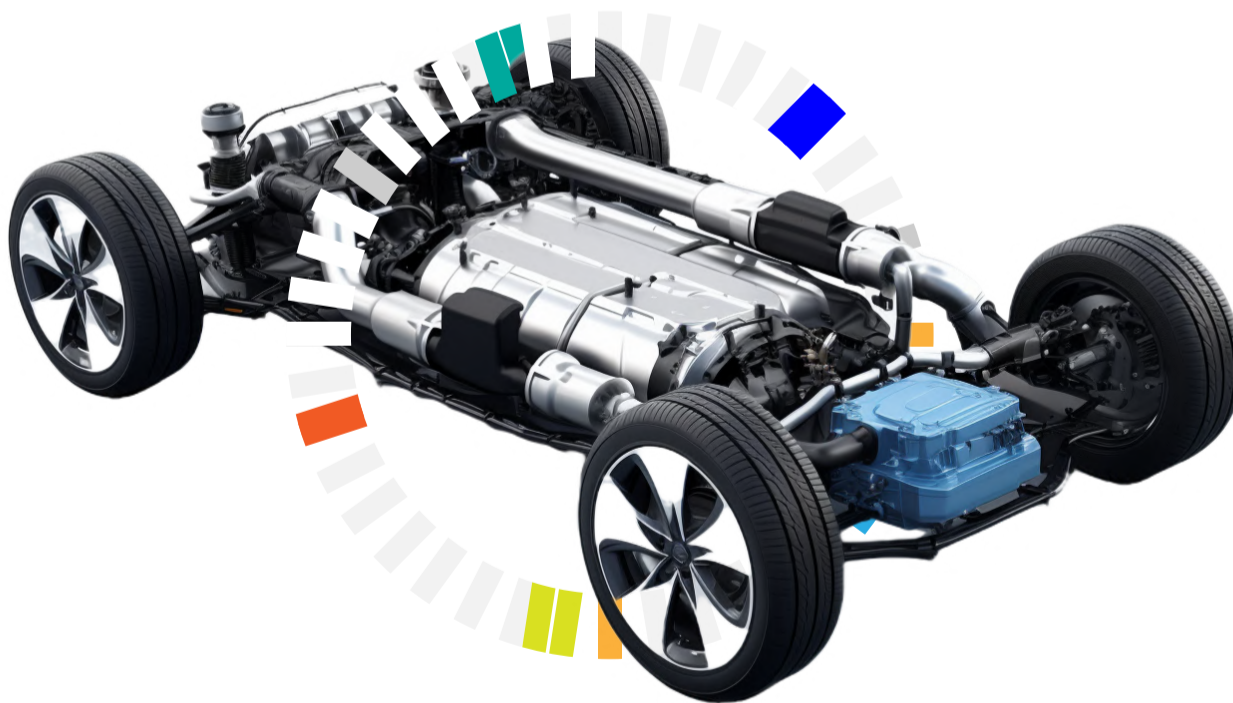


While this may seem like a narrow margin, the process of mining and refining the metal is time-consuming and not keeping up pace with the surging demand. Few companies are collecting lithium for battery manufacturing, which limits the number of products companies can produce. There are minimal miners extracting lithium from the planet because it is a finite resource.

## Challenges

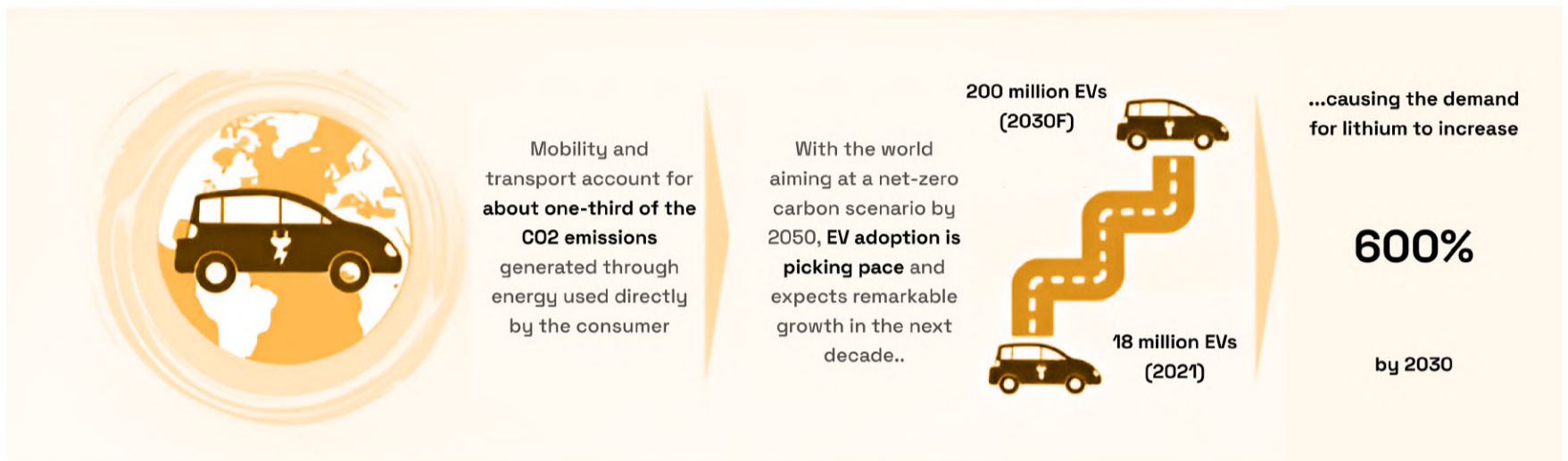
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- As per IEA analysis, between 2010 and 2019, the lithium mines that started production took an average of 16.5 years to develop. Thus, lithium production is not likely to shoot up drastically in a short period of time.
- Even if more lithium mines are built, there are not enough facilities to produce specialized types of the metal for batteries. Automakers may be forced to accept lower-quality lithium, which decreases an EV battery range.
- Furthermore, many mining companies have also been decreasing their lithium mining projects because of the negative ecological effects. Companies are working towards more sustainable production practices because lithium mining has its disadvantages - it can contaminate the local water sources, affecting the marine life and vegetation.



# Lithium supply chain disruption

## Lithium supply chain disruption is changing EV industry dynamics



→ The supply problem has been highlighted by the world's largest lithium producer Albemarle, which has sidelined plans to extract lithium in Europe after failing to find a commercially viable site.

→ In January 2023, Albemarle, indicated that the global demand for lithium would expand to 1.8 million metric tons (MMt) (~1.98 million tons) by 2025 and 3.7 MMt (~4 million tons) by 2030. Meanwhile, the supply of LCE is expected to reach 2.9 MMt (~3.2 million tons) by 2030, creating a huge deficit

## Main challenges to master are primary:

- the availability of raw materials
- the gap between demand caused by production and lithium availability
- the demand for competing applications
- production capacities

# How are industry stakeholders fighting the battery supply chain disruptions?

Automotive and battery manufacturers face a difficult period of uncertainty in the battery supply chain, and many are turning to building their own battery gigafactories or forming joint ventures to address squeezed supply.

→ There is large demand for critical minerals for batteries and a lack of processing capability. Other issues include the need to time the development of charging EV infrastructure alongside battery production, and the potential for supply chain constraints to hold back new manufacturing facilities

→ Therefore, car companies will have to manage and anticipate challenges in their supply chain, while managers need to make decisions based on imperfect information. Usually, this leads to opportunity costs, and consequently competition will arise to secure the availability and a steady supply of batteries and critical raw materials.

## Automakers are taking over the EV supply chain to achieve ambitious EV goals



Many automakers are working directly with lithium miners to establish a steady lithium supply over the coming years; Leaders are foraging into lithium mining industry



Leading automakers are investing in developing EV battery manufacturing capabilities or forming JVs with battery makers to secure the battery supply to support their long-term EV targets



Therefore, car companies will have to manage and anticipate challenges in their supply chain, while managers need to make decisions based on imperfect information. Usually, this leads to opportunity costs, and consequently competition will arise to secure the availability and a steady supply of batteries and critical raw materials. In this context, car manufacturers currently face the challenge of dealing with the battery manufacturers, which have a high influence on the EV market due to the shortage of batteries.

At the same time, these manufacturers are intensifying their efforts to satisfy the escalating demand for EV batteries.



In 2019, Volvo announced the ambition to become one of the world's leading electric car manufacturers while revealing a partnership with CATL and LG Chem, both Li-ion battery manufacturers in the automotive industry (Volvo Group, 2019).



Volkswagen's battery unit, PowerCo, signed an agreement with Canada last August to develop suppliers of "critical raw materials" including lithium, cobalt and nickel.



By 2030, Tesla itself plans to boost its capacity for producing batteries by at least 50 times, to three terawatt hours. This would take \$7 billion in investments, but that amount is significantly less when taking batteries and auto production into account.



Ford Motor Co. has signed contracts stretching up to 11 years into the future with lithium suppliers on two continents.

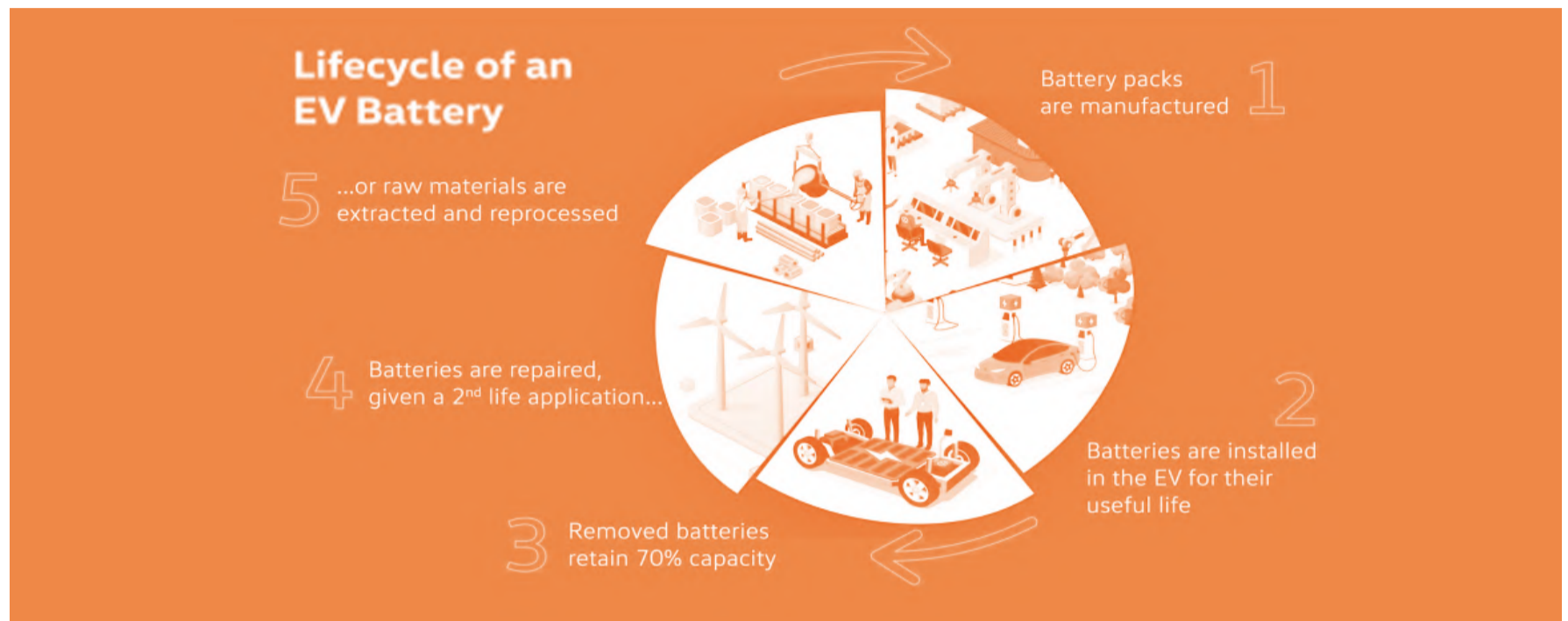


Volkswagen AG and Honda Motor Co. are trying to reduce their need for freshly mined ore by forming recycling ventures.



# Recycling EV Batteries

## A sustainable solution



The good news is that advancements in technology have made it possible to recycle a significant portion of the materials in these batteries. With current methodologies, up to 95% of the materials in a battery can be recycled.

- ➔ **Major automakers like Tesla, Ford, Volvo, and Toyota** have recognized the importance of this and are actively committed to EV battery recycling.
- ➔ For instance, in 2022, **China** recycled a staggering 414,000 tons of lithium-ion batteries, marking a 75% increase from the previous year.
- ➔ Furthermore, **gigafactories, such as the Northvolt factory in Sweden**, have set ambitious goals. By 2030, they aim to source half of their materials from recycled batteries. This commitment to recycling is evident globally.
- ➔ The **US** is also heavily invested in this initiative, with the Department of Energy allocating billions in loans to battery recycling companies and earmarking an additional \$192 million in 2023 for research in this domain.

# Identifying EV Manufacturers

## Introducing Veridion Complex Search API

In the rapidly evolving world of Electric Vehicles (EVs), understanding market dynamics becomes the first pillar for businesses aiming to make strategic decisions.

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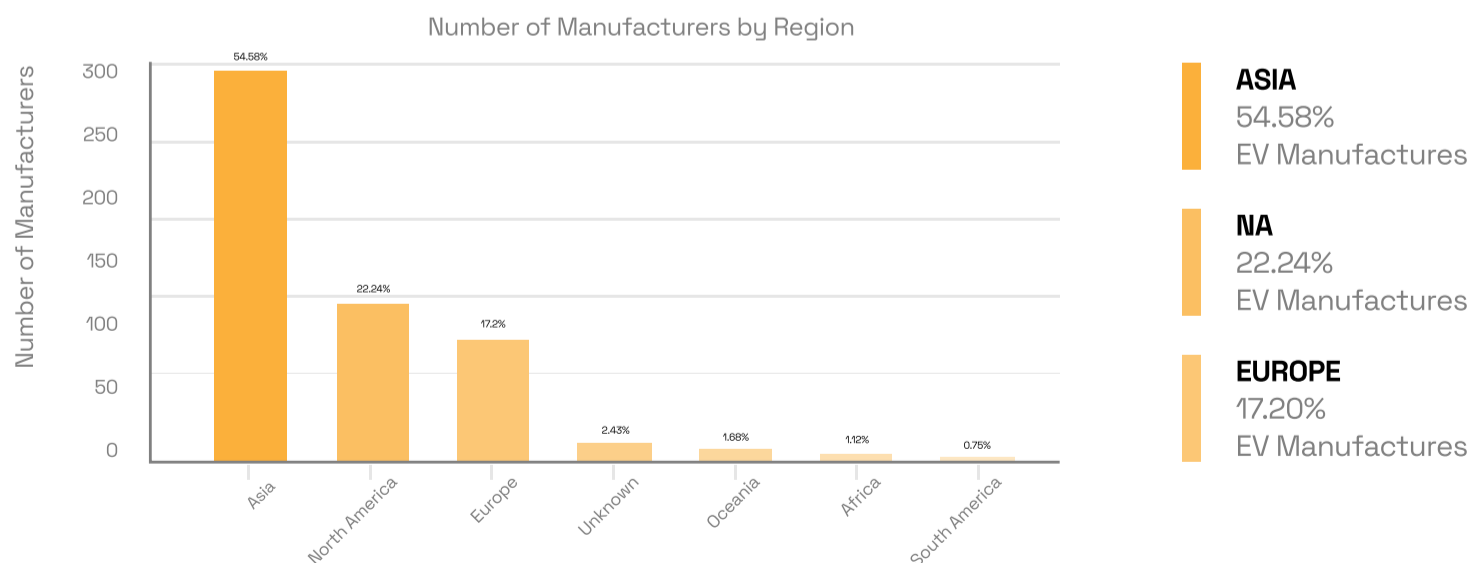
## Identifying EV Manufacturers and Their Capacities

→ Using Veridion Complex Search API, EV industry players can gain a comprehensive overview of EV manufacturers globally, empowering them with actionable insights. This includes data on their production capacities, technological capabilities, and current supply chains.

→ Geographical breakdown. We used our API solution to do a geographical breakdown of the EVs manufacturers in the world. The goal is to provide a detailed analysis to understand regional strengths and opportunities. The results showed the following global distribution:

## Veridion found 535 EV Manufactures

→ The top ten battery manufacturers by market share are all based in Asian countries.



# Identifying EV Manufacturers

## Introducing Veridion Complex Search API

Beyond just geographical data, you can apply key criteria to refine your search and get a better overview on the supplier:



### Year of Establishment:

Identify newer entrants vs. established players in the market.



### Secondary locations:

Understanding a company's geographic spread can be crucial for logistics, distribution, and market penetration considerations.



### Employee number:

You may want to get an idea of the size and potentially the capacity of a company. While not a direct measure, a larger employee count might indicate greater production or R&D capacities.



### Product keywords:

You can use product keywords to narrow down your search and identify which manufacturers offer specific products and how they position them in the market.



### Certifications & Awards:

Recognize manufacturers who've achieved certain industry standards or accolades.



### Financial Health:

Evaluate manufacturers based on their financial stability and annual turnover.



## Sustainability commitments

### SICS Classification:

Understand a manufacturer's sustainability risks and opportunities based on the SASB Sustainability Industry Classification Scheme (SICS) Industry code, which is based on machine learning predictions.

### ESG Commitments:

Classified into standard industry taxonomies, check the commitments disclosed by the company such as Net Zero Pledges, Human Rights Commitments, Diversity Commitments.

### ESG News:

Understand where a EV manufacturer stands in terms of its sustainability initiatives, its impact on the environment, and governance.

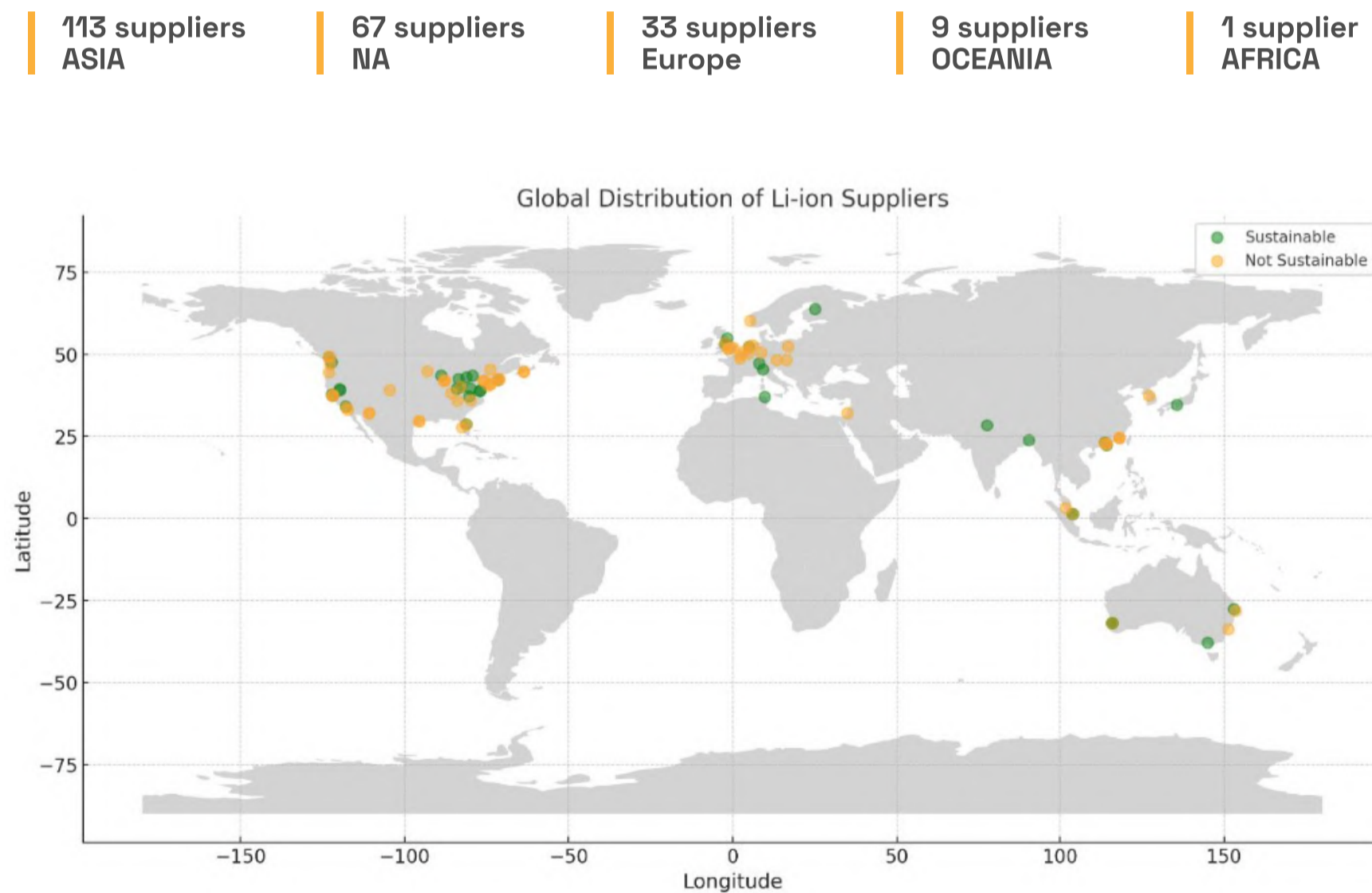
# Navigating the Li-Ion battery challenge

## Using Veridion Complex Search API

A key question for EV key industry stakeholders would be to understand the Li-ion batteries market and to see which manufacturers have an established lithium-ion supplier to make their rechargeable electric batteries.

Also, since sustainable manufacturing is an important aspect that needs to be incorporated in every manufacturing process, we decided to check which of the Li-ion battery suppliers have incorporated sustainable initiatives such as using renewable energy sources in production, reducing waste, and sourcing materials responsibly.

**Veridion Search API found that only 32.74% of the Li-Ion battery suppliers have incorporated sustainable initiatives in their manufacturing process.**





## Interesting highlights



Paradoxically, national companies from lithium-producing countries have assembled imported lithium batteries and lithium solar cells made in China.



Even though South America, particularly the "Lithium Triangle" of Argentina, Bolivia, and Chile, holds vast reserves of lithium, the region's role has primarily been limited to raw material extraction rather than value-added manufacturing.



There are significant challenges in entering the Li-ion battery manufacturing sector for the Latin American countries. These challenges include the need for substantial financing for cell factories, accessing other essential minerals that face global competition, and the technological expertise and R&D investment required due to the fast-paced technological advancements in this field. Moreover, to develop a large-scale lithium-ion battery industry, there's a need for an electric vehicle industry in the region to create demand for these



# Identifying EV Manufacturers and Navigating the Li-Ion battery challenge

## Use Case

Imagine an EV manufacturer, planning to expand its production lines and needs to secure a steady supply of Li-ion batteries for the next five years. The company decides to collaborate with Veridion to navigate the complexities of the Li-ion battery market, ensuring they make informed decisions and maintain a competitive edge.

## How does this collaboration work?



### API Integration:

The EVs manufacturer integrates Veridion's API into its business intelligence system.



### Data Retrieval:

Through the API, it can fetch real-time data on battery manufacturers, their production capacities, and their lithium suppliers.



### Strategic Decision Making:

With this data, the EV manufacturer identifies a potential partner because of its established lithium supplier, ensuring a consistent battery supply.



### Risk Mitigation:

The data also reveals manufacturers without a lithium supplier, helping our client to avoid potential supply chain disruptions.



### Negotiation Levers:

Knowing a battery manufacturer's annual production capacity and supplier details gives the EV manufacturer an edge in price negotiations.

## Type of data shared through API



### Battery Manufacturer Details:

Name, location, establishment year, certifications, and production capacities.



### Lithium Supplier Details:

Supplier name, location, contract durations, and supply volume.



### Battery Technical Specifications:

Energy density, charging time, lifespan, and other technical attributes.



### Market Trends:

Data on emerging technologies, innovations, and market demand-supply dynamics.



### Regulatory and Compliance Information:

Details on regional and global standards and regulations pertaining to Li-ion batteries.



# The Path Forward: Mitigate Supply Chain Disruptions with Accurate Data

## Benefits of using Veridion Complex Search API

Efficient EV manufacturing hinges on accurate data, crucial for sourcing vital materials and mitigating supply chain disruptions. Even minor supply chain disruptions can escalate costs and halt production, with widespread impacts in our global market. Discover how Veridion's accurate data becomes a pivotal asset for EV manufacturers, mitigating these challenges effectively:



### Strategic Sourcing:

Knowing which regions have the highest number of suppliers can guide battery and car manufacturers in making strategic sourcing decisions. For example, with Asia having the most suppliers, manufacturers might consider strengthening their procurement strategies in that region.



### Risk Mitigation:

By diversifying their supplier base across multiple regions, manufacturers can mitigate risks associated with geopolitical tensions, natural disasters, or regional economic downturns. This ensures that a disruption in one region doesn't halt the entire production.



### Cost Optimization:

Different regions might offer varying cost structures due to labor costs, raw material availability, and other economic factors. By understanding the global distribution, manufacturers can optimize costs by sourcing from regions that offer competitive pricing.



### Supply Chain Efficiency:

With insights into where suppliers are located, manufacturers can streamline their supply chains. This can lead to reduced lead times, optimized inventory levels, and quicker response to market demands.



### Tailored Marketing and Sales Strategies:

For battery manufacturers, understanding the regions with fewer suppliers can present untapped market opportunities. They can tailor their marketing and sales efforts to penetrate these regions and capture market share.



### Regulatory Compliance:

Different regions might have varying regulatory standards concerning battery manufacturing and disposal. By understanding the distribution, manufacturers can ensure they remain compliant with regional norms, avoiding potential legal pitfalls.





## Addressing Lithium Availability:

### Diversification:

By diversifying their supplier base, manufacturers can ensure a steady flow of lithium, even if one region faces shortages.

### Innovation in Recycling:

Regions with a dense concentration of suppliers and distributors might also be hubs for battery recycling, offering opportunities for sourcing lithium from recycled batteries.

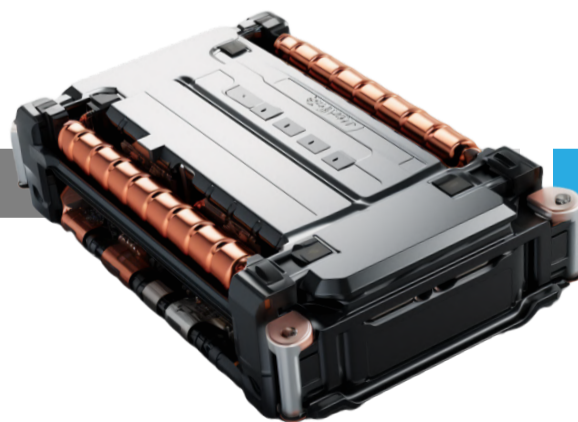
### Forecasting and Planning:

Insights into the distribution can help manufacturers forecast potential lithium shortages and plan their procurement strategies accordingly.



## Collaborations and Partnerships:

Recognizing regions with significant supplier bases can open doors for collaborative research, joint ventures, and strategic partnerships, further driving innovation and growth in the EV and battery space.





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